Thames Tideway Tunnel
Thames Water Utilities Limited

Application for Development Consent

Application Reference Number: WWO10001

Planning Statement

Doc Ref: **7.01**

APFP Regulations 2009: Regulation **5(2)(q)**

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January 2013

Thames Tideway Tunnel

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Thames Tideway Tunnel

Planning Statement
Main Report

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List of abbreviations

CEMPS	construction environmental management plans
CoCP	Code of Construction Practice
CSO	combined sewer overflow
DAS	Design and Access Statement
DCO	development consent order
HGV	heavy goods vehicle
HSE	Health and Safety Executive
NPPF	National Planning Policy Framework
NPS	National Policy Statement for Waste Water
NSIP	Nationally Significant Infrastructure Project
PPS	Planning Policy Statement
SuDS	Sustainable Drainage Systems
UK	United Kingdom

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1 Executive summary

1.1 Purpose of this document

1.1.1 This *Planning Statement* was prepared by Thames Water[1] as part of the application for development consent for the Thames Tideway Tunnel project (the 'project').

1.1.2 It seeks to bring together all of the planning issues raised by the project and to consider them within the context of relevant planning policy.

1.2 The application for development consent

1.2.1 This document explains the nature and structure of the application for development consent (the 'application'), its principal components and the documents which support the application.

1.2.2 The *Draft Thames Water Utilities Limited (Thames Tideway Tunnel) Development Consent Order* seeks necessary consents and powers to construct the project, including the compulsory acquisition of land. The works for which approval is sought are shown on a series of drawings and described as a series of works. Some flexibility is allowed for within defined parameters and most permanent above-ground structures would need to be approved in detail by their relevant local planning authority within those parameters and in conformity with a set of detailed design principles established for the project.

1.2.3 Given the size and scale of the project and the risks and liabilities involved in construction, Thames Water has been in discussions with Department for Environment, Food and Rural Affairs, the Water Services Regulation Authority (Ofwat) and Infrastructure UK as to the most appropriate delivery model for the project. The *Draft Development Consent Order* therefore contains an ability to transfer powers to another body.

1.2.4 The main tunnel would be approximately 25km long with an approximate internal diameter of 6.5m in the west, increasing to 7.2m through central and east London. The tunnel would be approximately 30m deep in the west, falling to approximately 65m in the east to provide sufficient clearance to existing tunnels and other facilities under the capital and to meet hydraulic requirements. The main tunnel would run from Acton Storm Tanks in the London Borough of Ealing to Abbey Mills Pumping Station in the London Borough of Newham) and two long connection tunnels (the Frogmore and Greenwich connection tunnels) together with nine short connection tunnels would also be provided as part of the project.

1.2.5 Works are proposed at 24 locations along the tunnel route comprising:

[1] Thames Water Utilities Ltd. The Draft Development Consent Order (DCO) contains an ability for Thames Water Utilities Limited to transfer powers to an Infrastructure Provider (as defined in article 2(1) of the DCO) and/or, with the consent of the Secretary of State, another body.

a. five main tunnel sites used to drive or receive the tunnel boring machines to construct the main tunnel

b. 16 combined sewer overflow (CSO) sites to construct CSO interception structures and connect them to the main tunnel.

c. two system modification sites to construct alterations to the existing sewerage system to control CSO flows by means other than interception

d. works at Beckton Sewage Treatment Works to draw down the tunnel system.

1.2.6 As well as its physical proposals, the application documentation includes a range of strategies which collectively seek to ensure that the project is delivered in a manner which optimises its efficiency and its environmental performance, whilst limiting as far as practical its impacts. Strategies of particular note include:

a. the *Transport Strategy,* which promotes the use of the River Thames for the transport of excavated and other materials wherever practical

b. the *Code of Construction Practice*, which sets out detailed generic and site-specific Requirements to order and limit the impact of construction activities

c. the *Design Principles,* which both project-wide and site-specific and must be observed at the detailed design stage in order to ensure that the project's vision and design objectives are satisfied.

1.3 The need for the project

1.3.1 The need for the project is established in the National Policy Statement for Waste Water (the 'NPS'), which was formally designated in March 2012.

1.3.2 London has outgrown its sewerage system. The capacities originally allowed for in the sewer network designed by Sir Joseph Bazalgette in the 1850s have been extended and now exceeded. The network is designed to allow discharges into the River Thames of untreated sewage in order to prevent the network flooding back into streets and people's homes and originally discharged rarely. However, London's CSOs now overflow more than fifty times a year, discharging more than 39 million m^3 of combined sewage into the Tideway with the result that:

a. dissolved oxygen levels in the river 'sag' or crash, which reduces bio-diversity and sometimes causes mass fish kills

b. pathogenic bacteria are discharged that pose significant health risks to river users

c. approximately 10,000 tonnes of wastewater solids and litter form slicks on the river surface or are deposited on the foreshore.

1.3.3 The Government and the Environment Agency has found these effects to be entirely unacceptable and the NPS advises:

"It is essential to reduce the likelihood of such incidents, which also have a reputational impact on the UK, as they take place in the capital city's river. The above impacts impose an economic cost on the capital, country and society…. The pollution also imposes wider 'external' social and environmental costs on society".[2]

1.3.4 Accordingly, the NPS establishes the need for a Thames Tideway Tunnel and confirms that there are no other available strategic alternatives. The tunnel is likely to run for approximately 25km from West to East London and needs to respond to the particular role for it defined by the Environment Agency.[3]

1.3.5 The NPS describes the project as both *"essential"* and *"urgent"*[4]. That urgency was reinforced, however, by a recent judgement in the European Court which has found the UK Government in breach of the Urban Waste Water Treatment Directive because of the poor quality of the River Thames and the failure to collect and treat wastewater.

1.4 Scheme development

1.4.1 The Environment Agency has evaluated all 57 CSOs along the Tideway and concluded that 34 are unsatisfactory and must be addressed. That work effectively provides a brief for the project. Detailed engineering studies found that the 34 unsatisfactory CSOs could be controlled by the following methods:

a. Method A: CSOs would be intercepted and connected to the main tunnel

b. Method B: Some CSOs would be controlled by diverting flows into the main tunnel, whilst a local connection would also be made to the existing northern Low Level Sewer No.1 to divert more flows to the main tunnel

c. Method C: Other CSOs could then be controlled by the extra capacity created in the low level sewer, ie, they would not require a worksite

d. Method D: Other CSOs would be controlled by modifications to the operating system, including to pumping stations and not all would require worksites.

1.4.2 As a consequence, only 16 CSO sites are required as construction sites for the project, in addition to the five main tunnel sites.

1.4.3 Section 4 of this document explains the careful approach taken to route and site selection. Determining the route of the tunnel and the location of main tunnel and CSO sites through the centre of London called for a specific, comprehensive site selection process, the detail of which was consulted upon before it was adopted and applied.

1.4.4 A multi-disciplinary approach was used to select the route and sites, informed by detailed engagement with relevant stakeholders and by two

[2] NPS para. 2.6.19
[3] NPS paras. 2.6.25, A.1.3.2, and A.1.3.10
[4] NPS paras. A.1.3.6 and 3.1.2

full rounds of extensive public consultation in addition to further interim and targeted consultation to address specific issues, sites or changes. The Abbey Mills route was selected as the tunnel route alignment – as the shortest route it would minimise cost and disruption, whilst requiring fewer sites.

1.4.5 Multiple options for the tunnel drive strategy were assessed before concluding that drive sites at Carnwath Road Riverside, Kirtling Street (a double drive site) and Chambers Wharf should be used. Multiple factors were taken into account including the ability for those sites to be served by river barges so that the vast majority of excavated material would not need to travel by road through London. The selection of the CSO sites was equally comprehensive and public consultation played a significant part with a number of sites being changed from those proposed at phase one consultation as a result of feedback as well as further design development. Shortlisted sites were subject to detailed Site Suitability Reports and all relevant planning and environmental considerations were taken into account in the final scheme selection.

1.4.6 In total more than 1,150 sites were examined for their suitability in what was an excellent process in the selection of the scheme.

1.5 Planning policy

1.5.1 The NPS establishes the policy framework for the project. It not only sets out Government objectives which the project must achieve but also the environmental and other principles against which the project should be assessed by the decision maker.

1.5.2 The NPS makes clear that, given the level and urgency of need for wastewater infrastructure, the decision-maker should start with a presumption in favour of granting consent for nationally significant wastewater infrastructure projects unless more specific and relevant policies in the NPS clearly indicate the consent should be refused.[5]

1.5.3 The NPS takes account of other national policy and it advises that local planning policy designations for sites can be important and relevant but that, in the event of a conflict between local policy and the NPS, it is the NPS which prevails.

1.5.4 Planning designations which affect individual sites are considered in appendices A to Z which review the planning suitability of the 24 individual worksites. In addition, London-wide policies to protect safeguarded wharves and to enhance the Blue Ribbon Network in London were taken into account.

[5] NPS para. 3.1.2

1.6 Planning assessment

1.6.1 This document reviews the project-wide impacts and the significant effects of the individual site impacts within the context of planning policy. It establishes first that the application meets the technical and documentary criteria for an application under the NPS, including that applications should demonstrate:

a. good design

b. resilience against climate change.

1.6.2 In relation to 'good design', Thames Water pursued an exemplary approach. At no stage was the project regarded as simply a piece of functional infrastructure and stretching design objectives are set in the *Design and Access Statement.* The design team sought opportunities to enhance the built environment wherever practical, particularly through new areas of public realm that may be created as part of individual site proposals.

1.6.3 The Design Council CABE was involved in two stages of design review for the individual sites and detailed engagement has taken place with local authorities, statutory consultees and the general public in order to optimise site design. The results are captured in design parameters and the design principles.

1.6.4 A series of recognisable project-wide components are proposed, particularly the ventilation columns required on each site. These were carefully designed as a 'signature' to unify the project's below-ground elements and celebrate its connection with the tidal Thames.

1.6.5 Climate change forecasts were taken into account in a number of ways. Forecasting demonstrates that the project would be resilient against climate change even in the forecast year of 2080. It would create the opportunity for London to invest in sustainable drainage strategies to complement the capacity created by the tunnel system.

1.6.6 The impacts of the project are then assessed against a series of NPS policy headings, as follows:

a. water quality and resources

b. air quality, odour and light

c. flood risk

d. biodiversity

e. landscape and visual impacts

f. land use impacts

g. noise and vibration

h. historic environment

i. traffic and transport

j. waste management

k. socio-economics.

1.6.7 Individual sites are assessed against the same headings in the site-specific appendices and the results brought together in Section 8 of this document.

1.6.8 Under each heading, the project is found to be effective in achieving its aims and objectives but also responsive to the guidance in the NPS and, particularly, to the environment in which the sites are proposed.

1.6.9 The very careful approach to site selection, scheme development and to design development through an iterative process of engagement and refinement has been successful in limiting the impacts of the development, as well as creating opportunities for significant environmental 'wins'.

1.6.10 Visual and heritage impacts would be limited as far as practical through the construction process, and the permanent designs would successfully enhance local environments. The foreshore sites in particular provide an opportunity for high quality new public realm which would create a significant series of assets for Central London. In a number of instances other public realm would be improved or sites released for new development in accordance with local policy designations. Site selection has favoured previously-developed land, including Thames Water operational land so that land use conflicts are limited.

1.6.11 The use of four greenfield sites is necessary due to the location of individual CSOs and the lack of alternatives within a dense urban environment. In each case, however, impacts are limited as far as practical and design commitments would ensure the long term enhancement of the affected spaces.

1.6.12 Any series of construction sites through London would inevitably generate short-term impacts. The *Code of Construction Practice* and *Design Principles* seek as far as practical to limit those impacts but there would be noise and traffic disturbance and some may regard construction worksites as unsightly, particularly in sensitive locations. These types of impacts, however, are unavoidable if London is to renew its wastewater infrastructure and create the capacity for further sustainable growth. Construction is not only necessary; it is a positive sign of investment and renewal.

1.6.13 The NPS anticipates that impacts will arise and sets out guidance about how they may be limited and mitigated. All appropriate mitigation proposals are made in order to limit the impacts wherever practical.

1.6.14 Overall, the assessment concludes that the extent of significant impacts from the project is remarkably small for a scheme of this scale – which is a tribute to the quality of site selection, design development and mitigation pursued by Thames Water and to the quality of its public engagement.

1.7 The overall planning balance

1.7.1 The application proposals, therefore, comply with the NPS and other relevant policy. International obligations reinforce the case for the grant of consent.

1.7.2 Balanced against the limited and temporary impacts of the project are a number of very substantial benefits which are summarised in this document under the following headings:

a. ecological and health benefits

b. aesthetic and recreational benefits

c. employment and legacy benefits, including very substantial construction employment

d. economic benefits to London and the UK.

1.7.3 The assessment concludes that the economic, ecological, health, aesthetic and reputational consequences of the project not being allowed to proceed would be severe and that development consent should be granted.

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2 Introduction

2.1 Project introduction

2.1.1 This *Planning Statement* was prepared by Thames Water Utilities Ltd[6] (Thames Water) as part of the application for development consent for the Thames Tideway Tunnel project (the 'project').

2.1.2 The project comprises a wastewater storage and transfer tunnel between Thames Water's operational sites at Acton Storm Tanks and Abbey Mills Pumping Station. The tunnel would intercept identified combined sewer overflows (CSOs) that frequently discharge into the tidal reaches of the River Thames. The flows of combined sewage (raw sewage mixed with rainwater) discharged from those CSOs would be captured, stored and pumped out for treatment at Beckton Sewage Treatment Works. A total of 24 sites in London are required to construct and operate the project. The project is described in Section 5 of this document.

2.1.3 By virtue of its location, purpose and storage capacity, the project constitutes a Nationally Significant Infrastructure Project (NSIP), under Sections 14(1)(o) and 29(1A) of the Planning Act 2008 (the '2008 Act').

2.1.4 In accordance with the 2008 Act, Thames Water is making an application for development consent (the 'application') seeking the consent and powers necessary for the construction, operation and maintenance of the project. The project has evolved through a robust site selection process, in response to extensive consultation and engagement with stakeholders, and through on-going design development.

2.1.5 The National Policy Statement for Waste Water (designated March 2012) (the 'NPS') sets out government policy for planning decisions on NSIPs for this type of infrastructure. The NPS confirms the project as the preferred solution to address the problem of discharges of untreated sewage from CSOs into the tidal Thames. Section 3 of this document explains the need for the project. Section 6 of this document provides a detailed description of relevant NPS policies.

2.1.6 As set out in NPS para. 1.1.1, the Planning Inspectorate and the decision maker (the relevant Secretary of State[7]) will use the NPS as the primary basis for deciding the application. In making its decision, the decision maker must also have regard to any local impact report submitted by a relevant local authority, any relevant matters prescribed in regulations, any Marine Policy Statement, and any other matters that it considers are both important and relevant to its decision.

[6] The Draft Development Consent Order (DCO) contains an ability for Thames Water Utilities Limited to transfer powers to an Infrastructure Provider (as defined in article 2(1) of the DCO) and/or, with the consent of the Secretary of State, another body

[7] In this case, the Secretaries of State for the Department for Communities and Local Government and the Department for Environment, Food and Rural Affairs will act as joint decision maker.

2.2 The applicant

2.2.1 Thames Water is a statutory water and sewerage undertaker. It is the United Kingdom's largest water and wastewater services company, serving around 13 million customers across London and the South East of England.

2.2.2 Given the size and scale of the project and the risks and liabilities involved in construction, Thames Water has been in discussions with the Department for Environment, Food and Rural Affairs (Defra), the Water Services Regulation Authority (Ofwat) and Infrastructure UK as to the most appropriate delivery model for the project. The *Draft Thames Water Utilities Limited (Thames Tideway Tunnel) Development Consent Order* (the '*Draft DCO*') therefore contains an ability to transfer powers to another body.

2.3 Purpose and structure of the *Planning Statement*

2.3.1 This document addresses the planning issues raised by the application and considers project-wide and site-specific matters within its scope. It describes the planning policy context for the project and reviews the planning issues raised by the project in the light of NPS policy.

2.3.2 It is a single-volume document that contains the following sections:

a. Section 2: Introduction

b. Section 3: Need

c. Section 4: Scheme development

d. Section 5: Project description

e. Section 6: Managing effects

f. Section 7: Planning policy context

g. Section 8: Planning assessment: Project-wide

h. Section 9: Conclusions

2.3.3 An appendix for each of the sites required to construct and operate the project is also provided. The site-specific appendices provide a description of the proposed works at the site and an analysis of site-specific planning considerations and compliance with relevant planning policies. The key conclusions from the site-specific appendices are referred to as appropriate in the project-wide planning assessment set out in Section 8.

2.4 The application for development consent

Consents and powers in the *Draft DCO*

2.4.1 The 2008 Act created a new system of development consent for NSIPs in England and Wales. Development consent is granted in the form of a development consent order (DCO), and may include a range of consents and powers.

2.4.2 The *Draft DCO* would, if confirmed, grant development consent for the 'authorised development' as defined in the *Draft DCO* (ie, the project). The 'authorised development' is described in more detail in the next section of this document

2.4.3 The *Draft DCO* contains, insofar as possible, all consents and powers required to construct, operate and maintain the project, including:

a. planning approval for the project subject to the Requirements specified within the *Draft DCO*

b. provisions relating to the discharge of Requirements

c. provisions specifying who may take the benefit of the development consent

d. power to undertake works on and to public highways and provisions relating to the regulation of traffic

e. powers to stop up public highways (including rights of way) permanently and temporarily and power to extinguish or suspend public rights of navigation

f. powers to conduct survey works and monitoring works on land (including buildings and structures) and to undertake protective or remedial works to buildings and structures

g. various other powers required to complete and operate the project including the ability to discharge water to watercourses and power to do works to trees

h. powers to compulsorily acquire land, new rights over land and to extinguish existing rights

i. power to use land temporarily during construction of the project

j. the requirement to pay compensation in respect of compulsory acquisition of land and rights over land and the temporary use of land and in respect of the exercise of certain other powers, for example in respect of carrying out protective works to buildings

k. powers to undertake works to statutory undertakers' apparatus including provisions for the protection of those undertakers assets

l. a deemed marine licence for works below the mean high water mark

m. provisions relating to the safeguarding of land required for construction and operation of the project

n. the removal of various other consent requirements that would otherwise apply to the project and the amendment of legislation that is inconsistent with the construction, operation or maintenance of the project.

2.4.4 The explanatory memorandum that accompanies the *Draft DCO* provides a fuller description of the powers included within it.

The authorised project and works numbers

2.4.5 Schedule 1 to the *Draft DCO* describes the proposed 'authorised project' and provides a description of works for which development consent is sought.

2.4.6 The authorised project comprises the NSIP (as defined in Section 29(1A) of the 2008 Act), development associated with provision of the NSIP and ancillary works that are also associated with the construction, operation and maintenance of the project.

2.4.7 The NSIP comprises all the tunnels and shafts included within the project that provide for the transfer and storage of wastewater. This includes the main tunnel, the long Frogmore and Greenwich connection tunnels and the nine shorter tunnels that connect CSO drop shafts to the main tunnel.

2.4.8 The associated development comprises all the other development that is needed to construct, operate and maintain the project. It includes structures for the interception of CSOs (ie, interception chambers, connection culverts etc), the new foreshore structures including cofferdams, facilities for the ventilation of the system and temporary structures necessary to construct the project (eg, temporary piers and jetties).

2.4.9 Ancillary works are works that are not development as defined in Section 38 of the 2008 Act but which are needed to construct, operate and maintain the project.

2.4.10 The NSIP and associated development are described in Part 1 of Schedule 1 to the *Draft DCO*, the ancillary works are described in Part 2 of Schedule 1.

2.4.11 Each of the main components of the authorised project is attributed a work number ('Work No.'). The works marked with an asterisk in the schedule are those that comprise the NSIP.

2.4.12 Schedule 1 first describes the main tunnel. For example, the western part of the main tunnel is Work No. 1a and is described in the *Draft DCO* as follows:

*"*Work No.1a: Main tunnel (west). A tunnel with an approximate internal diameter of 6.5 metres and approximately 6950 metres in length between Acton Storm Tanks main tunnel shaft (Work No. 2a) and Carnwath Road Riverside main tunnel shaft (Work No. 6a)".*

2.4.13 The description of the main tunnel is then followed by the NSIP works and associated development at each individual worksite. For example, the NSIP works and associated development works at Falconbrook Pumping

Station in the London Borough of Wandsworth are described in the schedule as follows:

"In the London Borough of Wandsworth

FALCONBROOK PUMPING STATION

**Work No. 10a:*	*Falconbrook Pumping Station CSO drop shaft - A shaft with an internal diameter of 9 metres which extends 1 metre above the existing ground level and which has a depth (to invert level) of 40 metres (measured from the top of Work No. 10a).*
**Work No.10b:*	*Falconbrook connection tunnel - A tunnel between Falconbrook Pumping Station CSO drop shaft (Work No. 10a) and the main tunnel (west central) (Work No. 1b).*
Work No. 10c:	*Falconbrook Pumping Station associated development - Works to intercept and divert flow from the Falconbrook Pumping Station CSO to the Falconbrook Pumping Station CSO drop shaft (Work No. 10a) and into the Falconbrook Pumping Station connection tunnel (Work No. 10b) including the following above and below-ground works and structures".*

2.4.14 The individual associated development works and structures are then listed. Associated development works often include the storage of construction plant and materials, demolition, construction of structures, and construction of accesses, although this varies between sites.

2.4.15 The description of the authorised project proceeds from west to east (matching the flow direction in the main tunnel) with the Frogmore and Greenwich connection tunnels (Work Nos. 7 and 20 respectively) inserted at the appropriate point in the description of the authorised project contained within the Schedule.

2.4.16 A description of the project is set out in Section 5 of this document and a site-by-site description is contained in the relevant site-specific appendices.

Level of detail in the application

2.4.17 NPS para. 3.2.6 acknowledges there may be a need for flexibility in project proposals. It states: "*In some instances it may not be possible at the time of the application for development consent for all aspects of the proposal to have been settled in precise detail. Where this is the case, the applicant should explain in its application which elements of the proposal have yet to be finalised, and the reasons why this is the case".*

2.4.18 In its application for development consent, Thames Water sought to achieve an appropriate balance between certainty and flexibility. Approval is therefore sought for development consent for a scheme

a. framed within
   i defined parameters, as explained in paras. 2.4.24 to 2.4.35 below
   ii design principles, as explained in paras. 2.4.42 to 2.4.46 below
b. secured, where appropriate, through DCO Requirements, as explained below.

2.4.19 Where necessary, details of matters such as the external appearance of above-ground structures and buildings would be submitted for future approval through DCO Requirements. Section 2.6 of this document provides more detail on the draft Requirements included within the *Draft DCO*.

Plans submitted with the application

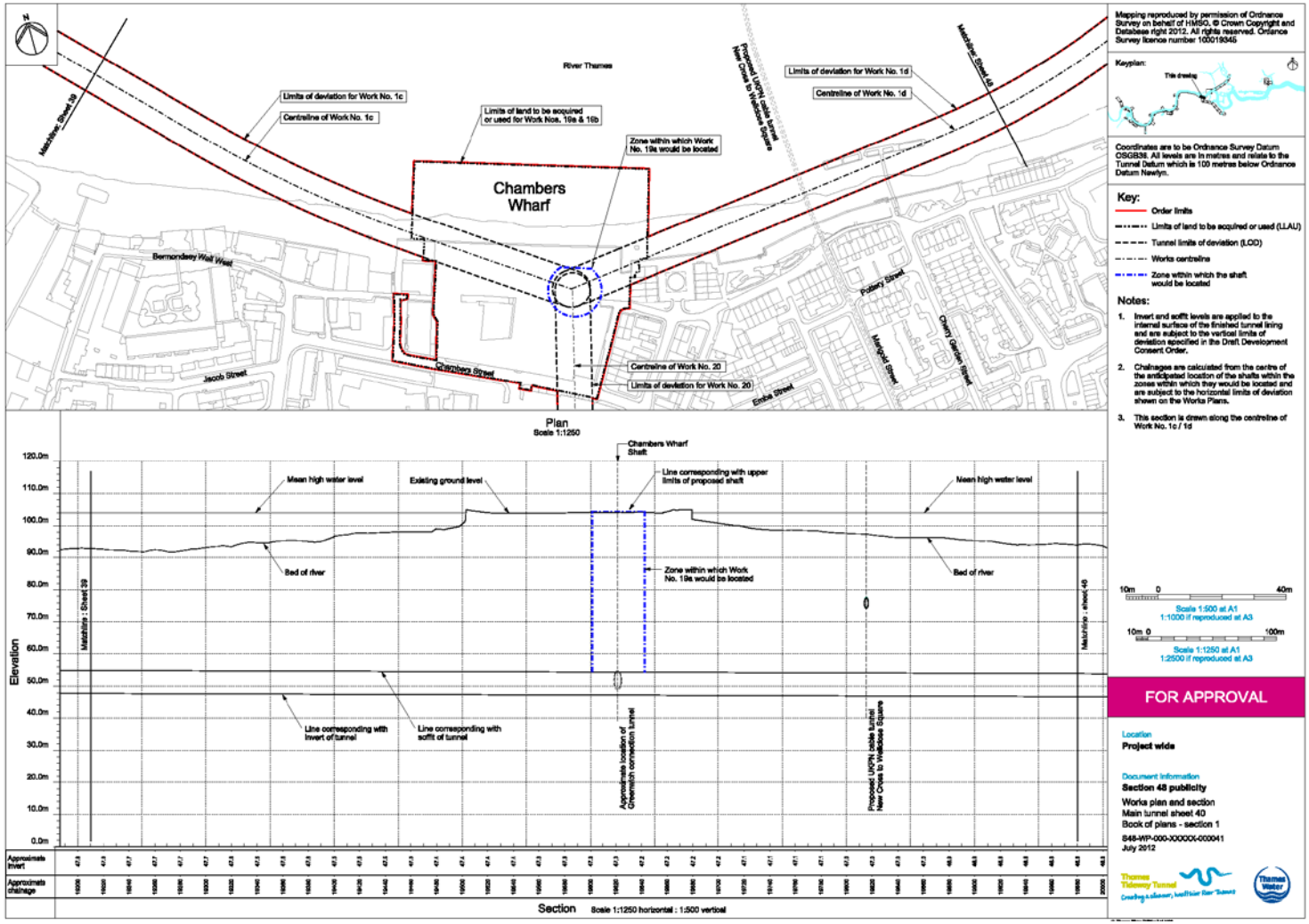
2.4.20 The plans submitted as part of the application are contained in the *Book of Plans,* which accompanies the application, in six volumes ordered to match the order of the description of the project in Schedule 1 to the *Draft DCO*.

2.4.21 These volumes include the statutorily required Works plans and Land plans. The Works plan and section drawings show in general terms the overall layout of the project.

2.4.22 The maximum extent of the area to be affected by the proposed works, including temporary working space, is defined by the limits of deviation in the case of the main and connection tunnels, and the limits of land to be acquired or used in the case of site works. The limits of deviation and limits of land to be acquired or used for the project are shown in the Work plan and section drawings contained in the *Book of Plans*. These plans also show the overall 'order limits' and the 'works centreline' for the tunnel.

2.4.23 Figure 2.1 overleaf provides an example of a Works plan and section. In this example, the limits of deviation and assumed centreline of the main tunnel (Work No. 1c and Work No. 1d), and the Greenwich connection tunnel (Work No. 20) are shown. Also shown are the limits of land to be acquired or used for works at Chambers Wharf (Work No. 19a. and 19b) and the zone within which the main tunnel shaft would be located (Work No. 19a).

Figure 2.1 Example Works plan and section drawing



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2.4.24 The Land plans (and the *Book of Reference* and the relevant schedules to the *Draft DCO*) show the land that Thames Water proposes to acquire or use temporarily for the project.

2.4.25 Land acquisition plans are also submitted. These are not a statutory requirement. They are submitted to clearly distinguish areas of land where Thames Water is seeking to acquire the surface and the subsurface from areas where it only seeks to acquire deep subsoil and from areas of land that it only needs to use temporarily to construct the project but it does not need to acquire. They show that the vast majority of the land it needs to acquire would be deep subsoil.

2.4.26 Access plans are also provided. As required these show new or altered means of access, highway and rights of way to be stopped up and new rights of way to be provided on a temporary or permanent basis and rights of navigation to be extinguished or suspended. In order to assist the understanding of the proposals at individual worksites the Access plans are included with the plans for each site as opposed to being submitted as a single package (see below).

2.4.27 The tunnel routes are shown on the Works plan and section drawings and are subject to limits of deviation described in the *Draft DCO*.

2.4.28 The works on the individual construction sites comprised in the project are shown on a series of plans for each worksite. The following categories are used to indicate the level of detail shown on the plans for each worksite. The meaning of each of these categories is explained in points a. to d. below. Subsequent sections provide practical explanations of the first three categories:

a. ‘For approval’: the detail included on the plan is submitted for approval. The development would be carried out in accordance with the details shown on the plan. Refer to para. 2.4.29.

b. ‘Indicative’: the detail shown on the plan is not for approval. The plan indicates and commits to the way in which the development would be arranged on that worksite. However, details such as materials, planting schedules etc remain to be determined. The final detail of the works would be submitted and approved under the Requirements for the worksite in the DCO. The submitted details must be in accordance with the indicative layout and the *Design Principles* submitted with the application (refer to Section 6.3 below). Refer to paras. 2.4.37 to 2.4.39 below.

c. ‘Illustrative’: the detail shown on the plan is not for approval. The plan illustrates one way in which the development or an element of it might be arranged in accordance with design principles developed for the site, but it is not a commitment to arrange the development as illustrated. The final layout of the development, or the relevant part thereof, would be submitted for approval under the Requirements for the worksite. These details may differ from the illustrative layout in the application. The details submitted for approval under the Requirement must, however, be in accordance with the Site works parameter plan,

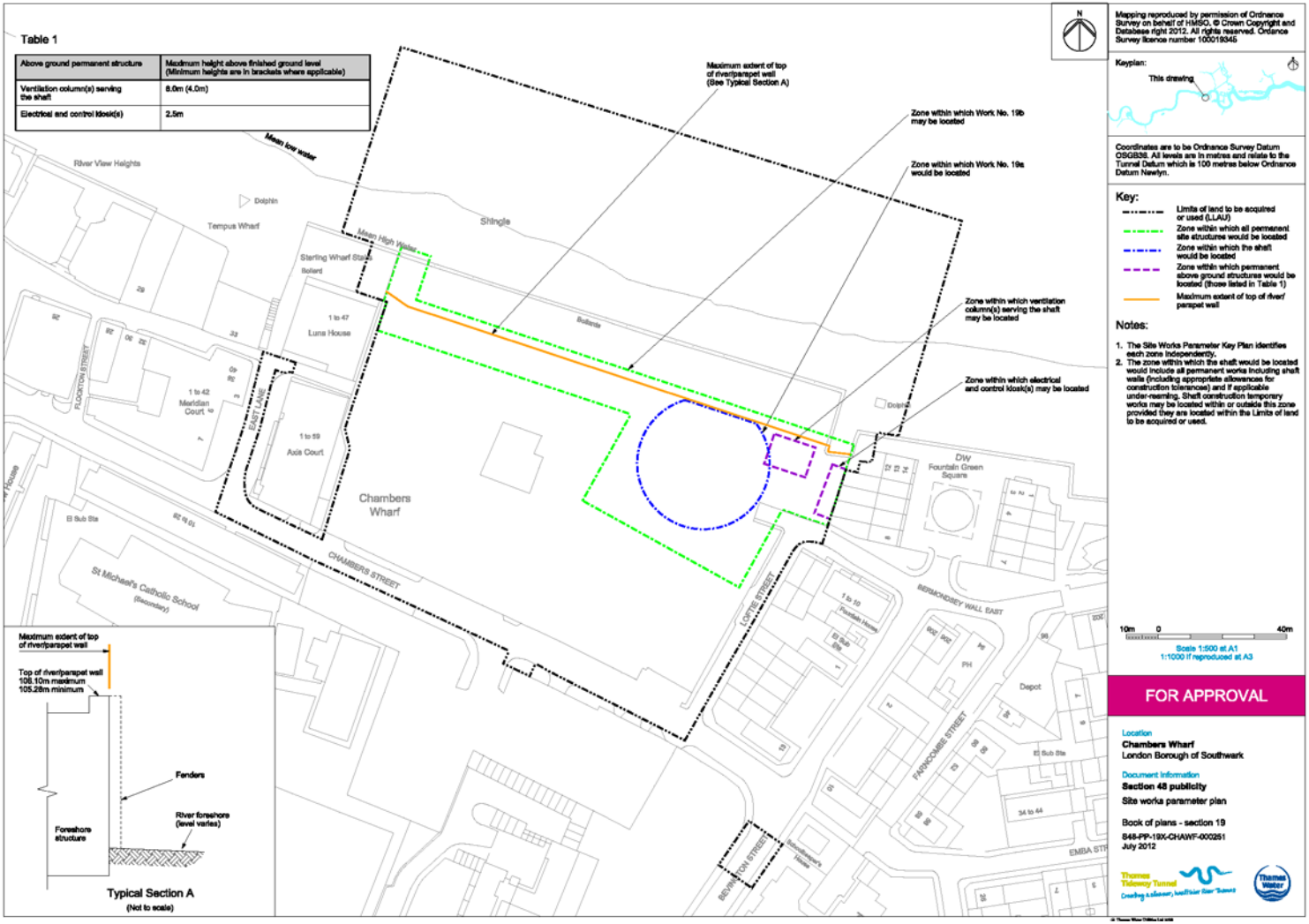
and the *Design Principles* for that site. Refer to paras. 2.4.40 to 2.4.42 below.

d. 'For information'. These plans show existing details on sites (eg, the existing site features and layout). They are not for approval as part of the application but are provided to inform consideration of the application.

Plans for approval

2.4.29 In submitting the following types of plans for approval, the information displayed on those plans is for approval and, once approved, fixed. The plans for approval are listed in Schedule 2 to the *Draft DCO*.

Figure 2.2 Example Site works parameter plan



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2.4.30 For each worksite, individual works parameters define the zones within which specific works would be carried out. These zones are defined on the Site works parameter plan for each site. An example is provided in Figure 2.2.

2.4.31 In this example, the zone within which all permanent structures would be located is indicated by a green dotted line. Within this zone are further zones that define where the main tunnel shaft (Work No. 19a) and other permanent above-ground structures, namely electrical control kiosks and ventilation structures, would be located. Maximum heights for permanent structures such as river walls and kiosks and maximum and minimum heights for ventilation structures are also included on the Site works parameter plans.

2.4.32 The parameters ensure a degree of flexibility in order to enable:

a. the contractor(s) to use a selected methodology, plant and equipment, based on the contractor(s)'s experience and expertise, in order to construct the works as efficiently and safely as possible

b. development of works designs and methodologies based on further design iteration and more detailed site and geological information that would be available by the time of construction, or in response to unforeseen circumstances

c. sites to be arranged in response to surrounding land uses at the time of construction, in order to minimise disruption and nuisance

d. alternative procurement and contract packaging arrangements, which might affect the currently planned construction phasing and duration

e. final details to be approved by the local planning authority.

2.4.33 The parameters described above are submitted for approval. Once approved, the parameters would be fixed. Within these fixed parameters there is scope for flexibility in the detailed design of the project works at individual worksites. How tightly or broadly defined the parameters are reflects the individual circumstances at each worksite, and the degree of flexibility that is required for future detailed designs. This approach achieves an appropriate balance between certainty and flexibility and responds to the particular circumstances at the worksites.

2.4.34 Where applicable, Demolition and site clearance plans are submitted with the application. These plans show the above-ground structures that would be removed, relocated or reinstated, below-ground structures to be removed or infilled, and trees that would be removed.

2.4.35 Three ventilation column drawings are also submitted with the application. These drawings show the design of the 'signature' Type A, Type B and Type C ventilation columns.

2.4.36 All of the above plans are submitted for approval as part of the application.

Indicative plans

2.4.37 A greater level of detail is provided in the application for foreshore sites, sites in close proximity to listed buildings and structures, and sites within heritage or other visually sensitive areas, because the location and nature of these sites is more sensitive. This detail is indicative (refer to para. 2.4.28b above). An example of an indicative plan is provided in Figure 2.3 overleaf.

2.4.38 The indicative Landscaping plan in Figure 2.3 indicates and commits to the way in which the development would be arranged. The final detail of the landscaping would be submitted and approved under the DCO Requirements. The submitted detail must be in accordance with the indicative layout (and the design principles for the site). In this example while the overall landscaping shown on the plan is indicative, the layout of the above-ground structures, such as the ventilation columns, is illustrative. This is because the above-ground structures are subject to the parameters shown on the Site works parameter plan for this site and consequently their position may be altered within the parameter. Hence their position is shown illustratively.

2.4.39 The final detailed design of the above-ground works would be subject to further approval through DCO Requirements, closer to implementation of the relevant part of the project. Section 2.6 of this document provides more detail on the draft Requirements included within the *Draft DCO*.

Illustrative plans

2.4.40 At less sensitive sites, where the degree of agreement with stakeholders on design is less established, or where the future use of a site and the surrounding developments is less certain, the degree of flexibility as to the final appearance is greater. For these sites, illustrative details are provided. An example of an illustrative permanent works layout plan is provided in Figure 2.4.

2.4.41 This Permanent works layout plan illustrates one way in which permanent works might be arranged within the parameters shown on the Site works parameter plan for this site (and which are also shown on this illustrative plan). Other examples of illustrative plans that are included in the application in respect specific worksites are the proposed site features plans and the proposed Landscape plans. The final design of the above-ground works or landscaping that are shown illustratively on these plans would be submitted and approved by the local planning authority under the DCO Requirements, closer to implementation of the relevant part of the project. The details submitted would need to be in accordance with the design principles for the relevant site.

2.4.42 Construction phasing plans on all worksites are illustrative. Sections and elevations are also illustrative.

Figure 2.3 Indicative landscaping plan

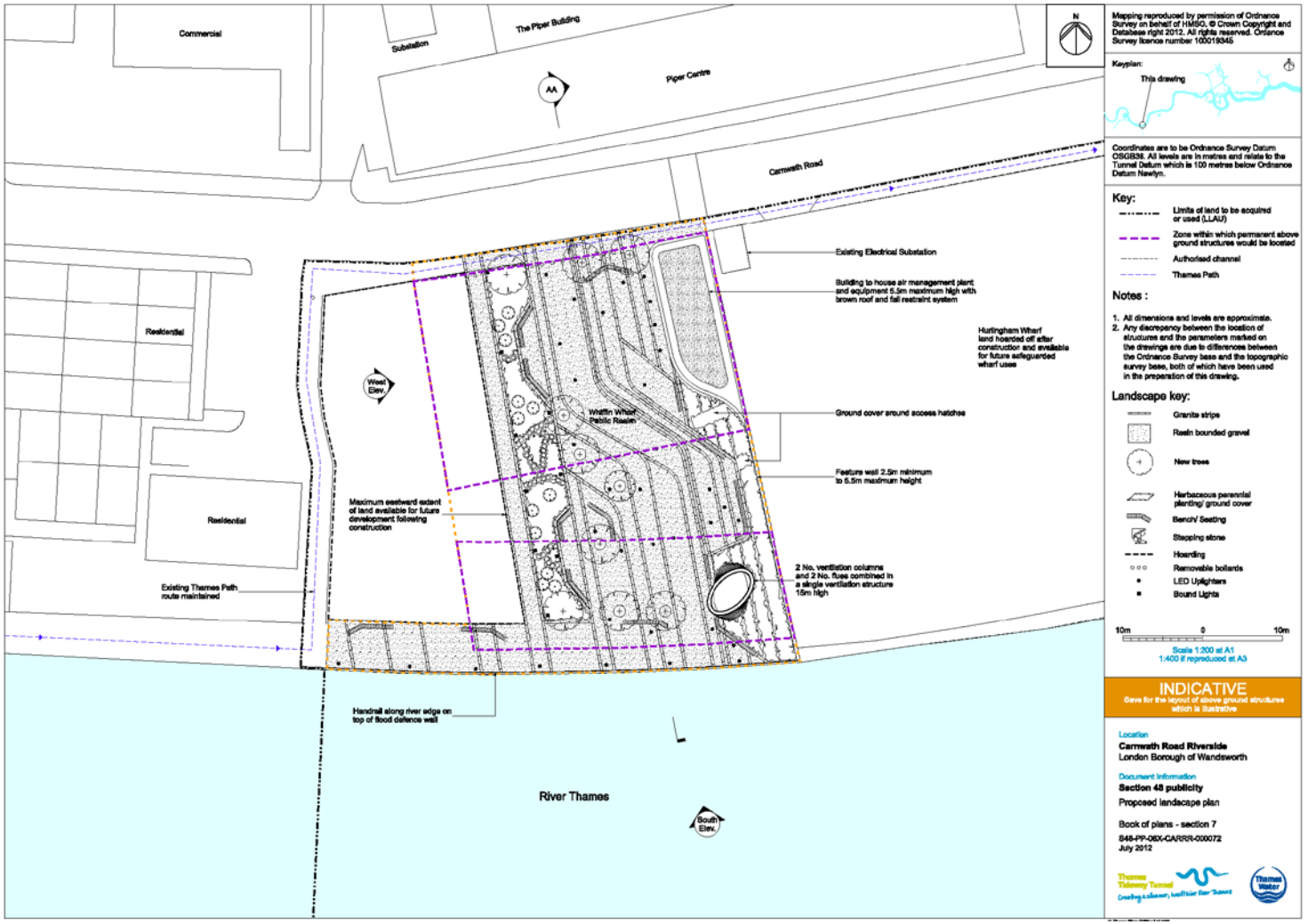
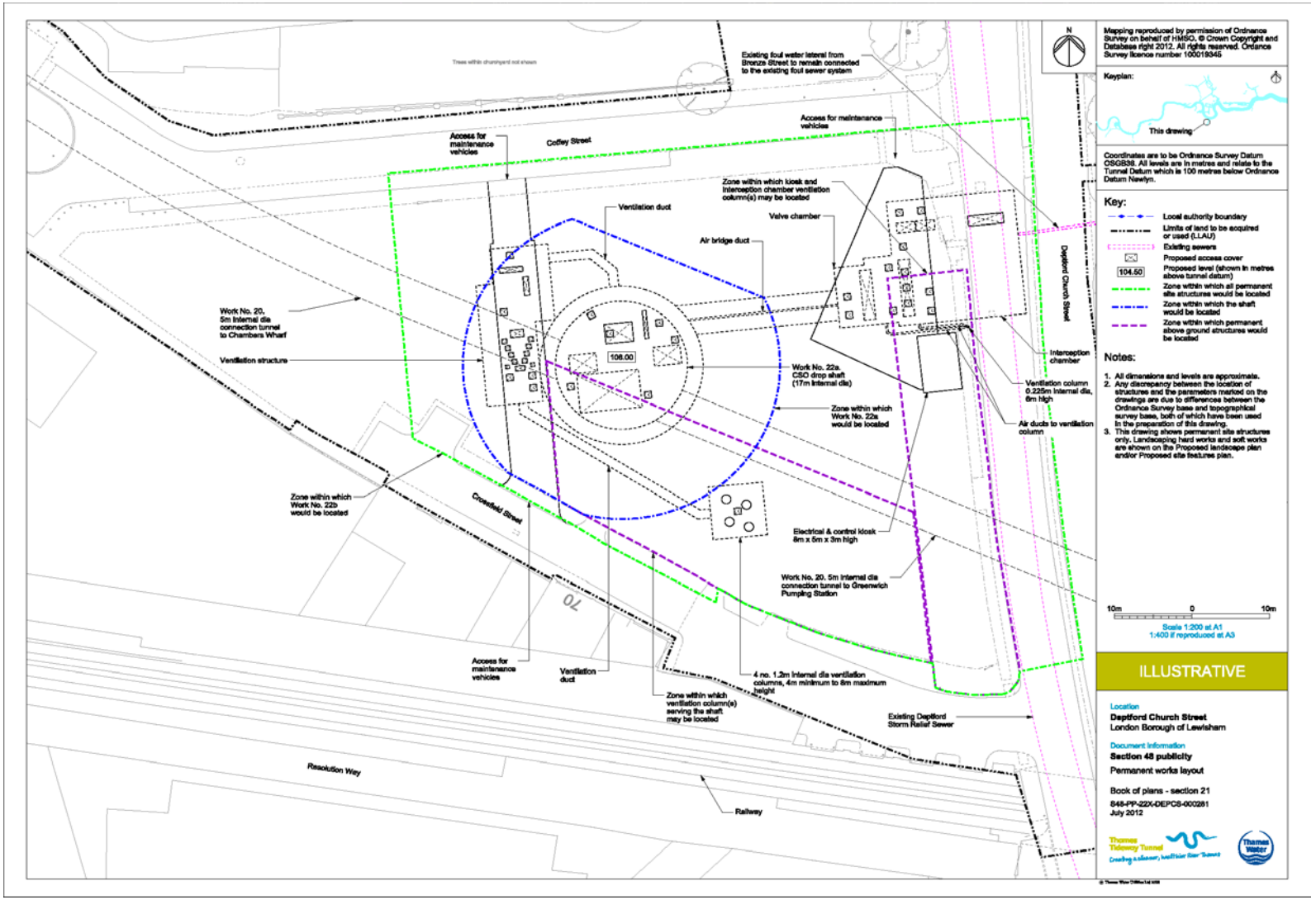


Figure 2.4 Illustrative permanent works layout plan



Design principles

2.4.43 Design principles for the design of the permanent above-ground elements are submitted as part of the application. Further information is provided in the *Design Principles* document and the *Design and Access Statement (DAS)* that accompany the application.

2.4.44 The above-ground elements for which design principles were developed include permanent structures in the River Thames, ventilation structures or columns, ventilation buildings, electrical and control kiosks and potential new public space, footpaths and landscaping. The principles apply to the permanent operational phase of the project and were prepared to cover both project-wide and site-specific design matters.

2.4.45 The principles were developed in consultation with local authorities and other stakeholders. They establish standards and principles that must be met or addressed in the final detailed design of the above-ground structures and spaces associated with the project.

2.4.46 The *Design Principles* accompanies the Site works parameter plans and the indicative and illustrative plans that are submitted with the application. It provides more detail of the design intent but still ensure some flexibility to develop the detailed designs at a later date in the light of the prevailing circumstances when the project is implemented.

2.4.47 The principles, together with the approved Site works parameter plans, and indicative and illustrative plans, are intended to provide assurance of the type and quality of design proposed.

2.4.48 The principles would be secured through DCO Requirements. For example if a site was subject to an indicative landscaping plan in the application, the Requirement would specify that the submitted scheme must be in accordance with the indicative plan and the design principles. If the landscaping plan in the application was only illustrative, the Requirement would only specify accordance with the design principles for that site. Buildings and other structures such as ventilation columns would be required to comply with the relevant design principles.

2.5 The application documents

2.5.1 The documentation submitted meets the requirements of Regulation 5 of the Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009.

2.5.2 A full description of all the application documents is provided in the *Guide to the DCO Submission,* which accompanies the application. Table 2.1 overleaf provides a visual representation of the documents and Table 2.2 provides a brief description of each document.

2.5.3 The categories of application documents reflect those suggested in Appendix 1 to the Planning Inspectorate's *Advice Note six: Preparation and submission of application documents* (June 2012). The categories are colour-coded to assist the reader.

2.5.4 This document draws on the conclusions of many of the application documents and interprets them against relevant planning policy considerations.

Table 2.1 Application documents

1 Application Form	1.1 Covering Letter	1.2 Application Form	1.3 Newspaper Notices	1.4 Guide to the Application	1.5 PINS Application Checklist	
2 Plans/ Drawings/ Sections	2.01-2.29 Book of Plans					
3 Draft Development Consent Order	3.1 Draft Thames Water Utilities Limited (Thames Tideway Tunnel) Development Consent Order		3.2 Explanatory Memorandum			
4 Compulsory Acquisition Information	4.1 Statement of Reasons		4.2 Funding Statement		4.3 Book of Reference	
5 Reports/ Statements	5.1 Consultation Report		5.2 Statement in Respect of Statutory Nuisance		5.3 Heritage Statement	
6 Environmental Impact Assessment and Habitats Regulations Information	6.1 Environmental Statement Non-Technical Summary		6.2 Environmental Statement		6.3 Habitats Regulations Assessment: No Significant Effects Report	
7 Other Documents	7.01 Planning Statement	7.02 Draft Statements of Common Ground	7.03 Section 106 Obligations: Heads of Terms	7.04 Design and Access Statement	7.05 Final Report on Site Selection Process	7.06 Open Space Assessment
	7.07 Sustainability Statement	7.08 Energy and Carbon Footprint Report	7.09 Transport Strategy	7.10 Transport Assessment	7.11 Draft Project Framework Travel Plan	7.12 Health Impact Assessment
	7.13 Overarching Archaeological Written Scheme of Investigation	7.14 Air Management Plan	7.15 Skills and Employment Strategy	7.16 Equalities Impact Assessment	7.17 Design Principles	7.18 Engineering Design Statement
	7.19 Code of Construction Practice, Part A and Part B	7.20 Navigational Issues and Preliminary Risk Assessment	7.21 Settlement Information Paper	7.22 Utilities Statement	7.23 Resilience to Change	7.24 Daylight/ Sunlight Assessment
8 Background Reports	8.1 Thames Tideway Strategic Study (2005)		8.2 Tackling London's Sewer Overflows (2006)		8.3 Needs Report (2010)	

Note:

The categories of application documents shown reflect those suggested in Appendix 1 to The Planning Inspectorate's Advice Note six: Preparation and submission of application documents.

Table 2.2 Summary contents of application documents

Category	Ref	Document	Description of Content
1. Application Form	1.1	*Covering Letter*	Covering letter supporting the application
	1.2	*Application Form*	Completed Development Consent Order application form
	1.3	*Newspaper Notices*	Notices published to advertise submission of the application
	1.4	*Guide to the Application*	Provides an overview of the application for development consent and its constituent parts
	1.5	*PINS Application Checklist*	A self-assessed version of PINS' checklist to assist PINS in the validation of the application
2. Plans/ Drawings/ Sections	2.01 to 2.29	*Book of Plans*	Contains all of the application drawings and plans
3. Draft Development Consent Order	3.1	*Draft Thames Water Utilities Limited (Thames Tideway Tunnel) Development Consent Order*	Contains the legal powers being applied for in order to construct, operate and maintain the project
	3.2	*Explanatory Memorandum*	Describes the purpose and effect of each provision in the draft Development Consent Order
4. Compulsory Acquisition Information	4.1	*Statement of Reasons*	Explains why the powers of compulsory acquisition are necessary to implement the project, and why there is a compelling case in the public interest to grant those powers
	4.2	*Funding Statement*	Explains how the project including the proposed compulsory acquisition of land would be funded
	4.3	*Book of Reference*	Contains the land referencing information relating to land proposed to be acquired or used by the project
5. Reports/ Statements	5.1	*Consultation Report*	Reports the extensive pre-application consultation activities that Thames Water undertook in respect of its proposals, the responses to these consultation activities, and how Thames Water took account of the matters raised
	5.2	*Statement in Respect of Statutory Nuisance*	States whether the project engages one or more of the matters set out in Section 79(1) of the Environmental Protection Act 1990(b)
	5.3	*Heritage Statement*	Details heritage assets that may be affected by the project and any mitigation proposed
6. Environmental Impact Assessment and Habitat Regulations Information	6.1	*Environmental Statement: Non-technical Summary*	A non-technical summary of the *Environmental Statement*
	6.2	*Environmental Statement*	Sets out the assessment of the likely significant effects of the project on the environment Volume 1 Introduction to the *Environmental Statement* Volume 2 Environmental assessment methodology Volume 3 Project-wide effects assessment (Section 15 contains the project-wide Flood Risk Assessment and Appendix A.3 contains the Excavated materials and waste strategy) Volumes 4 to 26 Site-specific assessments Volume 27 Minor works sites assessment

Category	Ref	Document	Description of Content
			The project-wide, site specific and minor works sites assessments (Volumes 3 to 27) are structured as follows: Section 1 Introduction Section 2 Project/site context Section 3 Proposed development Section 4 Air quality and odour Section 5 Ecology – aquatic Section 6 Ecology – terrestrial Section 7 Historic environment Section 8 Land quality Section 9 Noise and vibration Section 10 Socio-economics Section 11 Townscape and visual Section 12 Transport Section 13 Water resources – groundwater Section 14 Water resources – surface water Section 15 Water resources – flood risk
	6.3	*Habitats Regulations Assessment: No Significant Effects Report*	Screening report for a Habitats Regulations Assessment for the project
7. Other Documents	7.01	*Planning Statement*	Presents and reviews the project within the context of relevant planning policy including the National Policy Statement for Waste Water; Sections 1 to 9 analyse the project as a whole; the appendices contain the site-specific assessments
	7.02	*Draft Statement of Common Ground*	Identifies areas of agreement between Thames Water and stakeholders
	7.03	*Section 106 Obligations: Heads of Terms*	Sets out the scope of any required planning obligations
	7.04	*Design and Access Statement*	Covers design concepts, principles and alternatives considered, as well as access issues
	7.05	*Final Report on Site Selection Process*	Describes how the project was arrived at through the site selection process
	7.06	*Open Space Assessment*	Assesses the open spaces that would be affected by the project, incorporating a review of existing council assessments and policies
	7.07	*Sustainability Statement*	Describes the development of a series of sustainability objectives and how they would be achieved by means of design and construction practices; appraises the objectives at a project-wide and site-specific level
	7.08	*Energy and Carbon Footprint Report*	Analyses the energy and CO^2 savings that can be achieved and looks at improving energy efficiency
	7.09	*Transport Strategy*	Sets out the overarching transport strategy for the project
	7.10	*Transport Assessment*	Reports on the transport implications of the project during both construction and operation
	7.11	*Draft Project Framework Travel Plan*	Sets out a package of measures to encourage workers to use alternative modes of transport
	7.12	*Health Impact Assessment*	Assesses the project's potential impacts on health
	7.13	*Overarching Archaeological Written Scheme of Investigation*	Presents a written proposal for archaeological investigation

Category	Ref	Document	Description of Content
7. Other Documents	7.14	*Air Management Plan*	Sets out the proposals and strategy for managing air within the project infrastructure
	7.15	*Skills and Employment Strategy*	Sets out the strategy for employment, skills and training
	7.16	*Equalities Impact Assessment*	Sets out an assessment of the project's implications for equalities
	7.17	*Design Principles*	Sets out the design principles that underpin the architectural and landscape design and establish parameters that must be met in the final design of above-ground structures and spaces
	7.18	*Engineering Design Statement*	Outlines the basic engineering design requirements of the project and each site
	7.19	*Code of Construction Practice, Part A and B*	Sets out best practice and mitigation commitments to be applied during construction. Part A contains general requirements and Part B contains site-specific requirements
	7.20	*Navigational Issues and Preliminary Risk Assessment*	Assesses the potential effect on navigation in tidal waters
	7.21	*Settlement Information Paper*	Explains the arrangements for assessing, monitoring and mitigating the effects of ground settlement
	7.22	*Utilities Statement*	Indicates how the development would connect to, and impact on, existing utility infrastructure systems
	7.23	*Resilience to Change*	Outlines the project's resilience and adaptability to climate change
	7.24	*Daylight/Sunlight Assessment*	Identifies any potential impacts on residential properties in respect of daylight and sunlight
8. Background Reports	8.1	*Thames Tideway Strategic Study* (2005)	Assesses the environmental impact of intermittent discharges of storm sewage on the tidal Thames, and identifies objectives for improvement and proposed potential solutions, having regard to costs and benefits
	8.2	*Tackling London's Sewer Overflows* (2006)	Presents a preferred solution subsequent to the *Thames Tideway Strategic Study*, referred to as Option 1c, to intercept the unsatisfactory CSOs into a full length storage and transfer tunnel to convey flow to treatment at Beckton Sewage Treatment Works
	8.3	*Needs Report* (2010)	Considers the need for the Thames Tideway Tunnel building on the work undertaken and reported in 8.1 and 8.2

Strategies submitted with the application

2.5.5 A number of project-wide strategies are submitted in support of the application. These strategies set out how the project works would be carried out and how they would be mitigated. These strategies include the following documents. It is intended that they would be secured in the manner described below:

a. *Code of Construction Practice: Part A:* secured by a project-wide Requirement (ie a Requirement that has general application across the whole project).

b. *Code of Construction Practice: Part B:* secured by the site-specific Requirements, which would require works to be undertaken in accordance with the *CoCP* Part B. That Requirement would make

provision for variation of Part B with the approval of the local planning authority.

c. *Air Management Plan:* a project-wide Requirement would secure compliance with the principles specified in the *Air Management Plan*. Site-specific air management plans are required to be submitted under the *Air Management Plan*, they would be provided further to site-specific Requirements.

d. *Design Principles:* as explained in Section 2.4 above the design principles would be secured by imposition of site-specific Requirements in respect of the structures or features (eg, buildings or landscaping) to which they apply. Details submitted for approval would have to accord with the relevant design principles.

e. *Transport Strategy:* secured by way of a *S*ection 106 obligation to be entered with the Greater London Authority*.*

f. *Excavated Material and Waste Strategy:* a project-wide Requirement would secure compliance with the principles specified in the Excavated Materials and Waste Strategy. Contractor(s) would be required to obtain detailed waste disposal licences that they would require in connection with construction of the project.

g. *Navigational Issues and Risk Assessment:* DCO Requirements would limit cofferdam and permanent river walls to the alignments shown on the Site works parameter plans unless an alternative alignment within the maximum parameter for them shown on the Site works parameter plan is agreed by the Port of London Authority. Protective provisions in the *Draft DCO* would ensure that when and where necessary contractor(s) submit *Navigational Issues and Risk Assessments* to the Port of London Authority for approval.

h. *Overarching Archaeological Written Scheme of Investigation:* to be secured through a project-wide Requirement. *Site-specific Archaeological Written Schemes of Investigation* would be required to accord with the overarching scheme.

Draft Project Framework Travel Plan: secured through a Requirement to prepare a site-specific travel plan that accords with the project-wide plan.

i. *Heritage Statement:* the methodology for monitoring settlement effects on listed structures and re-use of heritage materials contained in the statement would be secured by a project-wide Requirement to undertake works in accordance with the statement.

j. *Compensation Policy* and *Settlement Information Paper* (containing a draft Settlement Deed): Thames Water policy would comply with the policies contained in these documents. The policies would be publicised on the project's website. Thames Water would of course be obliged legally to comply with the statutory compensation code that applies to the compulsory acquisition of land and rights, the temporary use of land and various other powers under the DCO.

2.6 Requirements and controls

Draft DCO Requirements

2.6.1 Schedule 3 to the *Draft DCO* contains the proposed Requirements that would be imposed on the DCO if it were made. These were developed in consultation with the local authorities and other stakeholders.

2.6.2 As explained above, the commitment to the design principles and parameters for individual works is secured through the DCO Requirements. The proposed Requirements also secure commitments to various strategies submitted with the application. This is explained in para. 2.5.5 above. Requirements also secure the mitigation measures identified in the Environmental Impact Assessment.

2.6.3 The proposed Requirements provide a robust framework of control to ensure the project is implemented in accordance with the principles, parameters and strategies enshrined within the application documents.

2.6.4 A number of project-wide Requirements are proposed in the *Draft DCO*. These include the Requirements to secure the strategies and policies explained at 2.5.5 above. These project-wide Requirements apply across the whole project and essentially set (alongside various other controls such as Section 106 obligations and protective provisions) the framework within in which the project would be delivered.

2.6.5 Site-specific Requirements address issues and secure mitigation at individual sites. The proposed site-specific Requirements are consequently unique to each site. Their subject matter depends on the local circumstances but include issues such as:

a. phasing of authorised development
b. works to be in accordance with approved plans/drawings
c. location of the various elements of the permanent works
d. detailed design approval for above-ground structures
e. details of works to listed buildings and structures
f. contaminated land
g. archaeology
h. landscaping
i. travel plan
j. surface water drainage.

2.6.6 As explained previously Requirements concerning the detailed design approval necessitate the submission to and approval by the local planning authority of details in accordance with the approved design principles and parameters, prior to the construction of a particular part of the authorised development. The role of indicative plans in this process is explained above.

2.6.7 The proposed site-specific Requirements are covered in more detail in the site-specific appendices of this document

2.6.8 The proposed Requirements are incorporated in the *Draft DCO* having regard to the guidance in *Circular 11/95: Use of conditions in planning permission* (as revised) consistent with the advice in the National Policy Statement. In particular the advice that Requirements should be necessary; relevant to planning and to the development to be consented; enforceable; precise; and reasonable in all other respects. The Requirements would be enforceable further to the provisions of the 2008 Act.

2.6.9 The draft Requirements were consulted upon with the local planning authorities that would be responsible for approving any submitted details.

Heads of Terms for Section 106 obligations

2.6.10 The Requirement for planning obligations in respect of the individual worksites was discussed, wherever possible, with the relevant local planning authorities. The application is accompanied by heads of terms for the Section 106 obligations that are considered necessary.

2.6.11 The obligation would be entered by agreement wherever possible but, where that cannot be achieved, would be secured by unilateral undertaking. Agreements and undertakings would be completed before the close of the examination of the application so that the Planning Inspectorate can report on their terms to the Secretary of State.

2.7 Other consents required for the project

2.7.1 The consents required to construct, operate and maintain the project have been identified.

2.7.2 The *Draft DCO* contains, insofar as possible, all consents and powers required to construct, operate and maintain the project. The powers included within the *Draft DCO* are described at Section 2.4 above. The *Explanatory Memorandum* explains and justifies those powers and the *Draft DCO* itself incorporates the necessary terms and provisions.

2.7.3 In respect of the consents that are being dealt with through the DCO, discussions/negotiations were sought with the usual consenting body, and wherever possible appropriate protective provisions and Requirements were consulted on and included in the *Draft DCO*. This would protect the normal consenting body moving forward. These bodies include Transport for London and the Port of London Authority. In some instances, the detail of the protective provisions or Requirements is still to be agreed. Negotiations are on-going but there is no reason to doubt that agreement on those provisions or Requirements would not be secured. The process is progressing positively and the relevant stakeholders are engaged.

2.7.4 However, some additional consents and licences are required to deliver the project that cannot be included in the *Draft DCO* at present. This is because Thames Water does not have formal consent from the normal consenting body to do so.

2.7.5 The main consents that fall in to this category are consents normally obtained from the Environment Agency concerning new works that perform a flood protection function and other structures (not performing a flood protection function) within 16m of a main river; and protected species licences normally issued by Natural England. At present there is no requirement for protected species licences in respect of the project. If that were to change then the obtaining of those licences would be dealt with through the normal consenting process.

2.7.6 Thames Water has sought to make progress with securing the consents that are required from the Environment Agency, and has engaged in discussions with them. The expectation is that a protective provision in favour of the Environment Agency would be included within the DCO, and in return the Environment Agency would agree to the inclusion of the consent normally issued by them within the DCO. In connection with this process various matters are being included within a Statement of Common Ground between the Environment Agency and Thames Water. As with other negotiations the process is progressing positively and the Environment Agency is engaged.

2.7.7 Finally, there are a number of consents the obtaining of which would be left to the contractor(s) employed to construct the project. This is because the contractor(s) is best placed to provide the information needed to secure the consent that is necessary. A number of these additional consents are procedural, in as much as there is a requirement that they be obtained but that in practice the obtaining of them is as a matter of process or compliance rather than principle. There is no reason to suggest these consents would not be forthcoming. In a number of instances consents that might normally be required are disapplied in the DCO in order to reduce the administrative burden on the normal consenting authority and the contractor(s) and on the basis that the provision of the DCO including the Requirements mean that amenity and environmental interests generally would not be prejudiced by disapplication of the normal consenting regime. An example of this is the Requirement to obtain licences for hoardings on public highways.

Tideway Tunnel Operating Agreement

2.7.8 As part of the Lee Tunnel project, a new CSO will be constructed at Beckton Sewage Treatment works, known as the Tideway CSO. This CSO requires an Environmental Permit to be obtained from the Environment Agency. Once the Thames Tideway Tunnel and associated connection tunnels are completed, they would be connected to the Lee Tunnel. The two tunnel systems would then be linked and referred to as the London Tideway Tunnels. Management of the flows collected by the London Tideway Tunnels would necessitate a storm overflow from the tunnels, which would discharge to the tidal Thames via the Tideway CSO at Beckton Sewage Treatment Works.

2.7.9 Operating Techniques for the management of the Lee Tunnel have been agreed between the Environment Agency and Thames Water. These techniques form a key element of the Permit for the Tideway CSO.

2.7.10 Following connection of the Thames Tideway Tunnel and associated infrastructure the operation of the Tideway CSO would change, and new Operating Techniques would apply. The *London Tideway Tunnels Operating Techniques relating to the Tideway Combined Sewer Overflow (CSO) and the Actively Managed CSOs to the tidal Thames* were agreed between Thames Water and the Environment Agency on 8 November 2012. This document describes the principles of how the London Tideway Tunnels would be operated to limit CSO discharges into the tidal Thames, including from the Tideway CSO.

2.7.11 The Environment Agency and Thames Water are currently in discussions regarding agreeing the Permit. The Permit shall be written in such a way that on commissioning the London Tideway Tunnels, the agreed Operating Techniques shall take effect.

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Thames Tideway Tunnel
Thames Water Utilities Limited

Application for Development Consent

Application Reference Number: WWO10001

Planning Statement

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Need

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January 2013

Thames Tideway Tunnel

Creating a cleaner, healthier River Thames

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3 Need

3.1 Introduction

3.1.1 London's sewerage system was designed in the 1800s to handle wastewater and run-off rainwater through a combined collecting system. CSOs were incorporated into the sewerage system as relief structures to prevent flooding caused by sewer overloading, especially during periods of heavy rainfall.

3.1.2 Much of London's sewerage infrastructure consists of combined systems, where a single set of sewers convey both foul sewage and rainwater run-off to a sewage treatment works. The current sewerage system is subject to significant flows from surface drainage and therefore generates large volumes of combined sewage (sewage mixed with rainwater). Rainfall causes combined sewerage systems to surcharge quickly. For this reason, it is normal practice to incorporate overflows that allow excess flows to discharge directly into a watercourse to reduce flood risk to properties and prevent the sewerage system overloading.

3.1.3 The capacity originally allowed for in the interceptor sewerage systems originally designed by Sir Joseph Bazalgette in the 1850s has been extended and is now regularly exceeded. This is largely due to increases in population and water usage. Areas of hardstanding have also increased. For example, the population of Inner London in 1851 was 2,652,000[8], the current population of the Beckton and Crossness catchments is 5,242,000 and this is forecast to increase to 6,222,000 in the 2020s. Increased areas of hardstanding have reduced the capability of the land to absorb rainwater, which instead now enters the sewerage network. It now takes as little as a few millimetres of rainfall to cause some CSOs to discharge combined sewage into the tidal Thames.

3.1.4 In the summer of 2010, Thames Water published a detailed *Needs Report*, which accompanies the application. This section does not seek to repeat that report, but does update it to reflect developments since its publication, such as the designation of the NPS and the delivery of the judgement by the European Court of Justice in the Infraction Proceedings.

3.1.5 One section of the *Needs Report* that requires an update is Section 3.5.2, which refers to the provisions of the Water Resources Act 1991 concerning the offence of pollution of controlled waters. These provisions have now been replaced by the Environmental Permitting (England and Wales) Regulations 2010, which came into force during 2010.

[8] See Appendix C to the Needs Report.

3.2 National Policy Statement for Waste Water

3.2.1 The National Policy Statement for Waste Water was formally designated on 26 March 2012 by the Secretary of State for Environment, Food and Rural Affairs following a debate in the House of Commons on 19 March 2012.

3.2.2 The NPS establishes the need for a Thames Tunnel[9]. NPS para. 2.6.34 clearly states that: *"The examining authority and the decision maker should undertake any assessment of an application for the development of the Thames Tunnel of the basis that the national need for this infrastructure has been demonstrated. The appropriate strategic alternatives to a tunnel have been considered and it has been concluded that it is the only option to address the problem of discharging unacceptable levels of untreated sewage into the River Thames within a reasonable time at reasonable cost"*.

3.2.3 NPS para. 2.6.16 sets out the drivers of demand for the project. It also explains that London's CSOs overflow into the tidal reaches of the River Thames approximately 50 times per year and affect:

a. biodiversity by reducing dissolved oxygen levels in the river potentially resulting in the death of adult fish and fish fry

b. health by increasing pathogenic bacteria, which potentially pose risks to river users

c. the attractiveness of the environment due to large quantities of offensive solid material being discharged into the tidal Thames and deposited on the foreshore.

3.2.4 The NPS states that a collecting system and treatment to meet the requirements of the Urban Waste Water Treatment Directive (UWWTD) (91/271/EEC) is required for the London agglomeration by 31 December 2000. NPS para. 2.6.20 summarieses the requirements of the Directive as requiring *"that sewage (domestic, industrial and rainwater run-off) is collected and conveyed to plants for secondary treatment, overflows are reduced and measures taken to limit pollution of the tidal Thames"*.

3.2.5 Other drivers include the Water Framework Directive, climate change and population growth. NPS para. 2.6.21 clearly states that the UWWTD is the *"initial driver"* for the project and that full implementation of this Directive is a basic (obligatory) measure in the Water Framework Directive.

3.2.6 The consideration of alternatives to a storage and transfer tunnel is outlined at NPS paras. 2.6.26 to 2.6.30. It recognises, as does Thames Water, that Sustainable Drainage Systems can play a key role in increasing the capacity and resilience of London's sewer network by reducing the volume of flows entering sewers. However, it also notes that the simultaneous retrofit of all London's properties and sewerage systems to the required level would be disproportionately expensive and that it has

[9] The project changed its name from the Thames Tunnel project to the Thames Tideway Tunnel project in July 2012.

not been demonstrated that this would sufficiently reduce combined sewage discharges. More detailed work in this regard can be found in the *Thames Tideway Strategic Study* (*TTSS*) and at Appendix E of the *Needs Report*.

3.2.7 Other alternatives considered included creating additional capacity within the sewerage system and converting the combined drainage system to a separate drainage system. As set out in NPS paras. 2.6.26 to 2.6.31, these alternatives were rejected on the grounds of the very high cost and level of disruption to London.

3.2.8 NPS para. 2.6.26 states that a non-intervention, or 'do nothing' strategy, is not considered feasible due to the frequency and volume of discharges and their consequent environmental impacts.

3.2.9 Therefore, as stated in NPS para. 3.4.1: *"these strategic alternatives do not need to be assessed by the examining authority or the decision maker".*

3.2.10 Following the adoption of the European Union's Directive 2001/42/EC on the assessment of the effects of certain plans and programmes on the environment, it became a statutory requirement to undertake a Strategic Environmental Assessment (SEA). The objective of the SEA Directive is *"to provide for a high level of protection of the environment and to contribute to the integration of environmental considerations into the preparation and adoption of plans and programmes with a view to contributing to sustainable development".*

3.2.11 Section 5(3) of the 2008 Act requires that, before designating a National Policy Statement, the Secretary of State must carry out an Appraisal of Sustainability of that policy. The appraisal carried out for the NPS incorporates an SEA and meets the requirements of the SEA Directive. The recommendations of the appraisal influenced the final NPS. The appraisal is available on Defra's website. The 'plan or programme' for the project is the NPS. An SEA was therefore carried out in relation to the project by the appropriate body.

3.2.12 The appraisal should be read alongside the *Appraisal of Sustainability Post Adoption Statement* (March 2012), which is a further requirement of the SEA Directive (the *Post Adoption Statement* is also available on Defra's website). The statement concluded that: *"Resolving the issue of frequent spills of untreated wastewater containing sewage into the tidal reaches of the River Thames has been subject to extensive and comprehensive studies, including consideration of a wide range of alternative solutions, for more than a decade. As a result of which the Government is satisfied that the development of the Thames Tunnel is the most cost effective and timely solution to address the problem of untreated sewage is [sic] discharging into the River Thames as demonstrated in the Waste Water National Policy Statement"* (para. 5.5.9).

3.2.13 The NPS is also clear, particularly in the Annex, as to the nature of the Thames Tideway Tunnel necessary in order to meet the identified need. NPS para. A1.3.2 states that the tunnel is *"likely to run for approximately 25km from West to East London to intercept storm sewage overflows and*

transfer them for treatment at Beckton sewage treatment works (STW) in East London. A major part of the tunnel route is likely to follow the course of the River Thames". Similar text is also set out at NPS para. 2.6.25.

3.2.14 NPS para. A1.3.10 notes that although the exact location of the tunnel and associated shafts has not yet been confirmed, the proposed scheme would span up to 14 London Boroughs, which it lists by name. The boroughs broadly span from Richmond upon Thames to Newham.

3.2.15 NPS para. 2.6.34 states that Thames Water must justify the specific design and route of the project in its application for development consent. This *Planning Statement*, the *DAS* and the *Final Report on Site Selection Process*, which accompany the application, were prepared partly for that purpose.

3.2.16 The NPS states that the Environment Agency has a particular role to play in defining the nature of the required project in more detail. In order to inform water companies' spending plans, the Environment Agency proposes various projects for inclusion in the National Environment Programme that are needed to meet statutory environmental requirements. The Environment Agency works to ensure that every environmental improvement included in the programme is necessary, addresses a known problem, and is based on evidence that action is required. The Environment Agency expects water companies to include 100 per cent of the programme in their final business plans.

3.2.17 NPS para. 2.5.2 states that the National Environment Programme must be included in any water or sewerage company business plan submitted to Ofwat. Ofwat is responsible for scrutinising the overall plan and the associated costings. NPS para. 2.5.3 indicates that: *"The Government therefore considered that the need for new waste water treatment infrastructure will have been demonstrated if the Environment Agency has concluded that the project is necessary for environmental reasons and included it in its National Environment Programme"*.

3.2.18 The project is included in the current National Environment Programme.

3.3 Infraction proceedings against the UK Government

3.3.1 As set out above, the UWWTD is identified in the NPS as the initial legislative driver for the project. The UK was required to be in compliance with the directive by 31 December 2000. On 18 October 2012 the European Court of Justice handed down a judgement in the case of proceedings brought by the European Commission, which determined that having failed to control discharges in the Beckton and Crossness Sewage Treatment Works catchments, the UK Government is in breach of the Directive.

3.3.2 The Court noted that it was not in dispute that the collection system was not in compliance with the directive. It noted that a project is underway for the construction of a new tunnel under the River Thames to intercept discharges and convey them to Beckton Sewage Treatment Works (ie the Thames Tideway Tunnel). It also noted that the costs of the project cannot be disproportionate since in April 2007 the UK Government decided to

proceed with the works identified in the *TTSS* report (November 2005), including the construction of a new wastewater transfer and storage tunnel. It further noted that the action against the UK cannot be dismissed simply because activities and works that will, in the future, ensure compliance with the UWWTD are underway. As a matter of fact therefore, the Court found that the UK has failed to fulfil its obligations under the UWWTD.

Requirements of the Urban Waste Water Treatment Directive

3.3.3 The UWWTD concerns the collection, treatment and discharge of urban wastewater and the treatment and discharge of wastewater from certain industrial sectors. Article 1 states that: *"The objective of the Directive is to protect the environment from the adverse effects of the above mentioned waste water discharges".*

3.3.4 Article 2 sets out the definitions of various terms. The term 'urban waste water' is defined as *"domestic waste water or a mixture of domestic waste water with industrial waste and/or run-off rainwater"*. A 'collecting system' is defined as *"a system of conduits which collects and conducts urban waste water*". 'Secondary treatment' is defined as *"treatment of urban waste water by a process generally involving biological treatment with a secondary settlement or other process in which the requirements established in Table 1 of Annex 1 are respected*".

3.3.5 Article 3(1) provides that*: "Member States shall ensure that all agglomerations are provided with collecting systems for urban waste water"*. For an agglomeration over 15,000, such a system is to be in place by 31 December 2000, although the earlier date of 31 December 1998 applies where the discharge is into 'sensitive areas' as defined in the UWWTD.

3.3.6 Article 3(2) states that the 'collecting systems' described in Article 3(1) must satisfy the requirements of Annex 1(A) to the Directive. Annex 1(A) provides that:

"Collecting systems shall take into account waste water treatment requirements. The design, construction and maintenance of collecting systems shall be undertaken in accordance with the best technical knowledge not entailing excessive costs, notably regarding

a. *"volume and characteristics of urban waste water,*

b. *"prevention of leaks,*

c. *"limitation of pollution of receiving waters due to storm water overflows".*

3.3.7 The footnote to Annex 1(A) provides: *"Given that it is not possible in practice to construct collecting systems and treatment plants in a way such that all waste water can be treated during situations such as unusually heavy rainfall, Member States shall decide on measures to limit pollution from storm water overflows. Such measures could be based on*

dilution rates or capacity in relation to dry weather flow, or could specify a certain acceptable number of overflows per year".

3.3.8 Article 4(1) provides that: *"Member States shall ensure that urban waste water entering collecting systems shall before discharge be subject to secondary treatment or an equivalent treatment".*

3.3.9 This is to be achieved by the dates specified, depending on the size of the agglomeration. Article 4(3) then relates Article 4(1) to the requirements of Annex 1 as follows:

"Discharges from urban waste water treatment plants described in paragraphs 1 and 2 shall satisfy the relevant requirements of section B of Annex 1I".

3.3.10 The requirements of Annex 1(B) include that:

"2. Discharges from urban waste water treatment plants subject to treatment in accordance with Articles 4 and 5 shall meet the requirements shown in Table 1".

3.3.11 Table 1 sets out certain technical requirements for discharges from wastewater treatment plants. Annex 1(B) para. 3 also makes provision for discharges into 'sensitive areas' by reference to Table 2.

3.3.12 Article 10 of the Directive states that:

"Member States shall ensure that the urban waste water treatment plants built to comply with the requirements of Articles 4, 5, 6, and 7 are designed, constructed, operated and maintained to ensure sufficient performance under all normal local climatic conditions. When designing the plants, seasonal variations of the load shall be taken into account".

Thames Tideway Strategic Study

3.3.13 Following recognition that a longer-term strategy for managing the impact of Thames Water's assets on water quality in the tidal Thames was needed, the Environment Agency and Thames Water agreed that a comprehensive study should be undertaken and funded in Thames Water's 1999 business plan. The *TTSS* was an agreed obligation, arranged and managed by Thames Water. The *TTSS* was set up in 2001 (although preliminary organisational work was undertaken in 2000) and reported in February and November 2005. The steering group was established under the independent chairmanship of Professor Chris Binnie. Its members included representatives from Thames Water, the Environment Agency, Defra, the Greater London Authority and Ofwat (as an observer).

3.3.14 The purpose of the *TTSS* was to assess *"the environmental impact of intermittent discharges of storm sewage on the Thames Tideway, to identify objectives for improvement and to propose potential solutions, having regard to costs and benefits"*. It is important to note that the steering group was established several years before any complaint was made to the European Commission. Its establishment reflected already existing concerns in relation to the environmental effects of sewage discharges into the tidal Thames.

3.3.15 As part of the study, the Environment Agency categorised the 57 CSOs from the Beckton and Crossness Sewage Treatment Works catchments according to their environmental impact and frequency of operation. The Environment Agency considered the volume and frequency of the discharges, and assessed their impact on river water quality and ecology. The CSOs were then divided into four categories according to criteria, including frequency and volume of discharge, as follows:

a. Category 1: discharges that have an adverse environmental effect and occur frequently during periods of rainfall which cannot be defined as unusually heavy.

b. Category 2: discharges that have an adverse environmental effect but only operate infrequently, during periods of heavy rainfall.

c. Category 3: discharges that do not have any significant environmental effect.

d. Category 4: discharges that occur at a similar frequency to Category 1, but were assessed as not causing a significant adverse environmental impact.

3.3.16 In total, 25 CSOs were identified as Category 1, 11 as Category 2, 18 as Category 3 and three as Category 4. The CSOs in Categories 1 and 2 are required to be controlled by either the Lee Tunnel project or the Thames Tideway Tunnel project. Category 3 and 4 CSOs do not require any action.

3.3.17 A total of 36 CSOs were identified as 'unsatisfactory' and requiring attention, of which 34 discharge into the tidal Thames and two into the River Lee. The Environment Agency has reviewed this work a number of times since 2005 and has on each occasion confirmed that all 34 Category 1 and 2 CSOs that discharge into the tidal Thames need to be controlled by the project.

3.3.18 The Abbey Mills Pumping Station CSO's discharges (Category 1) will be addressed by the Lee Tunnel Project and discharges from the Wick Lane CSO by a stand-alone project.

3.3.19 The *TTSS* developed specific environmental objectives, which the project needs to address in order to reduce:

a. the adverse environmental impacts on river ecosystems and on fish species in particular

b. the unacceptable aesthetic issues

c. the elevated health risks for recreational users of the tidal Thames.

3.3.20 The *TTSS* established that these environmental objectives can only be met at least cost by carrying out quality improvements to the sewage treatment works and intercepting unsatisfactory CSOs and diverting flows into a storage and transfer tunnel.

3.3.21 Ofwat then commissioned Jacobs Babtie to review the *TTSS*. The principal output of this review was an alternative solution, based on two shorter tunnels (one in West London and one in East London), along with further recommendations. Defra considered the various recommendations

and asked Thames Water to provide cost information on the identified tunnel solutions.

3.3.22 Defra then considered the *TTSS* and subsequent studies, including the Jacobs Babtie report, and issued a Regulatory Impact Assessment in March 2007. The Regulatory Impact Assessment specifically rejected the Jacobs Babtie solution as it did not meet the required regulatory or *TTSS* environmental objectives.

3.3.23 Ian Pearson, the then Minister of State for Climate Change and the Environment, in a letter to the Chief Executive Officer of Thames Water dated 17 April 2007, stated that:

"a full-length storage tunnel with additional secondary treatment at Beckton sewage treatment works – is needed. This is both to provide London with a river fit for the 21st century, and for the UK to comply with the requirements of the Urban Waste Water Treatment Directive concerning provision of collecting systems and, in particular, limitation of pollution from storm water overflows".

3.3.24 Furthermore, Ian Pearson subsequently requested that Thames Water *"make provision for the design, construction, and maintenance of a scheme for the collecting systems connected to Beckton and Crossness sewage treatment works which involves a full-length storage tunnel with additional secondary treatment at Beckton sewage treatment works"*.

3.3.25 It is important to note that the correspondence also stated:

"*This letter does not amount to enforcement action which would require a precise enforcement order or set of undertakings under sections 18 or 19 of the Water Industry Act 1991. At this stage we do not consider such action to be appropriate, given the further design and feasibility work that needs to be done, or necessary for Thames Water to be able to take matters forward with Ofwat and the Environment Agency".* It is thus clear that if Thames Water were to fail to progress the proposal for a tunnel it would be subject to enforcement action.

The infraction proceedings

3.3.26 These proceedings appear to have originated from multiple complaints in relation to the UK's non-compliance with the UWWTD that were made to the European Commission following a large spill of sewage into the tidal Thames in August 2004. The UK Government first received correspondence on 21 March 2005. On 10 April 2006, the European Commission sent the UK Government a reasoned opinion stating that in its view the UK Government had failed to fulfil its obligations under articles (3), 3(1), 4(1) and 10 of, and Annexes I(A) and (B) to the Directive.

3.3.27 In correspondence with the European Commission, the UK Government relied on the *TTSS* report, which advocated a full length storage tunnel for the River Thames and a separate tunnel for the River Lee, which would be completed by 2020. The Commission issued an additional reasoned opinion on 1 December 2008. On 8 October 2009, the Commission announced the commencement of proceedings against the UK Government in the European Court of Justice.

3.3.28 In January 2012, the Advocate General issued his opinion and on 18 October 2012, the European Court of Justice handed down its judgement. It is worth noting that at para. 109 of the Advocate General's opinion, it states that the European Commission accepted during the pre-litigation proceedings that the construction of a water storage tunnel would bring about full compliance with the UWWTD.

3.3.29 The consequence of the Court's decision is that the European Commission can now seek to impose fines on the UK Government for breaching the Directive. In its publication *Creating a River Fit for our Future: A strategic and economic case for the Thames Tunnel* (November 2011), Defra states (p. 7) that it estimates that the European Commission may try to seek fines upwards of £100 million a year. The Commission has not made any statement following the outcome of the infraction proceedings but it could seek to impose substantial fines on the UK. These events reinforce the need to ensure that the project is in place as soon as practicable.

3.3.30 In response to a Parliamentary question in the House of Lords on 20 November 2012, Lord De Mauley (Parliamentary Under Secretary of State Department for Environment, Food and Rural Affairs) stated that:

"If the Court of Justice of the European Union finds that a member state has failed to fulfil an obligation under the treaties, the state is required to take the necessary measures to comply with the judgment of the Court. Consequently the UK needs to take measures to address the failure to collect and treat urban waste water in London. The Court accepted that the Thames tideway tunnel represents a solution to the problem of the collecting system in London […] The decision to take forward the case will depend on the Commission's assessment of the steps the UK is taking to come into compliance. We note in this context that, as stated in the advocate general's opinion, the Commission has taken the view that the Thames tunnel represents a means to bring the UK into compliance" (Hansard, 20 November 2012, Columns WA343-5).

3.3.31 To date no financial sanction has been imposed on the UK Government by the European Court of Justice in any matter. Any such sanction would cause significant reputational damage to the UK as it would relate to the condition of the river that runs through the centre of its capital city. NPS para. 2.1.19 states that it is essential to reduce discharges into the tidal Thames as they have a reputational impact on the UK.

3.3.32 Defra also states in *Creating a River Fit for our Future: A strategic and economic case for the Thames Tunnel* that: "*the Thames Tunnel project should help to maintain the attractiveness of London for inward investment. We need to ensure that our infrastructure is maintained and that includes ensuring that the River Thames meets adequate environmental standards comparable to other major western cities. We believe that the project itself will lead to considerable economic activity*".

3.4 The need for the project

3.4.1 NPS para. 2.6.34 advises that it is for Thames Water to justify the specific design and route of the proposed project in its application, within a number of fixed parameters clearly set out in the NPS.

3.4.2 As stated in the NPS, the proposed project comprises *"a major tunnel, likely to run for approximately 25 kilometres from West to East London to intercept storm sewage overflows and transfer them for treatment at Beckton Sewage Treatment works (STW) in East London. A major part of the tunnel route is likely to follow the course of the River Thames"* (NPS para. A1.3.2).

3.4.3 The tunnel is required to *"pick up any unsatisfactory overflows discharging direct to the tidal Thames" (*NPS para. 2.6.25).

3.4.4 The NPS further identifies the role of the Environment Agency in defining the nature of the necessary project in greater detail. The Environment Agency has been involved in the project since the inception of the *TTSS* steering group in 2001 and has identified the CSOs that require interception.

3.4.5 The Environment Agency has undertaken the following assessments of CSOs:

a. 2004: assessment to determine which CSOs were unsatisfactory

b. 2006: a more detailed assessment of the impacts on health and aesthetics to assess the effectiveness of shorter tunnel options

c. 2008: a review of the categorisation of CSOs

d. 2011: a review of the categorisation of CSOs.

3.4.6 Each investigation, review and assessment was based on the best available evidence at the time. The Environment Agency has periodically reviewed the evidence as more comprehensive information has emerged.

3.4.7 The Environment Agency has stated that each review supported the initial assessments made in 2004 as part of the *TTSS*.

3.4.8 In respect of the 2011 review, the Environment Agency concluded: *"As the result of our reviews, we are satisfied that all the CSOs Thames Water are planning to connect to the Thames Tunnel are unsatisfactory and need to be addressed"*.

3.4.9 As explained in Section 4 of this document, the project for which development consent is sought has evolved on the basis of the need to control all the CSOs identified as unsatisfactory by the Environment Agency. Work on developing the project commenced before the publication of the draft NPS; however, the tunnel proposed as part of the project complies with the advice of the Environment Agency, as required by the NPS.

3.4.10 The *London Tideway Tunnels Operating Techniques relating to the Tideway Combined Sewer Overflow (CSO) and the Actively Managed CSOs to the tidal Thames* were agreed between Thames Water and the

Environment Agency on 8 November 2012. This document describes the principles in relation to the operation of the London Tideway Tunnels to reduce CSO discharges into the tidal Thames (including from the Tideway CSO, which will be created as part of the Lee Tunnel project).

3.5 Other benefits

3.5.1 There are a number of benefits that follow from the implementation of the project, which relate to:

a. meeting the ecological water quality objectives for the tidal Thames

b. reducing the risk to human health

c. addressing negative aesthetic impacts

d. reducing the reputational risk to the UK.

3.5.2 During the work on the *TTSS* bespoke water quality standards for dissolved oxygen were developed for the tidal Thames. If levels of dissolved oxygen fall, or sag, below a certain point there can be large scale fish kills. The standards are significant in terms of achieving Water Framework Directive objectives but also for ecological quality. It was reasoned that fish are the most sensitive indicator of ecological quality. Appendix F of the *Needs Report* discusses this in more detail and the effects are assessed in the *Environmental Statement* (Vol 3, Section 5).

3.5.3 There are also human health benefits. Recreational users of the tidal Thames would benefit from the improved river water quality. Users and others who live or work near the River Thames or visit it would benefit from the substantial enhancement in the aesthetic quality of the river and its foreshore. These benefits are addressed in the surface water and socio economic chapters of the *Environmental Statement* (Vol 3, Sections 10 and 14) and also in the *Health Impact Assessment*. The consequences are reflected in the assessment undertaken in Sections 8 and 9 of this document.

3.5.4 Additionally, there would be substantial, unquantifiable benefits to the reputation of London and the UK if the project can proceed and bring compliance to the capital's river. Significant economic and other benefits would flow from the project, which would provide the necessary capacity to enable the further sustainable growth of London. These matters are considered further in Sections 8 and 9 of this document.

3.6 Conclusion

3.6.1 The Environment Agency is satisfied that all the CSOs that Thames Water plans to control as part of the project are unsatisfactory and need to be addressed.

3.6.2 The case for a Thames Tideway Tunnel has been clearly established by the NPS. It sets out the urgency of the established need, which was reinforced when the UK was found to be in breach of the UWWTD in respect of the Beckton and Crossness Sewage Treatment Works catchments. The non-completion of the project means that the UK

Government continues to be in breach of the UWWTD and must take the necessary measures to comply with the judgment of the European Court of Justice. The need is urgent and the project is the only available means of achieving compliance.

Thames Tideway Tunnel
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4 Scheme development

4.1 Introduction

4.1.1 The national need for the Thames Tideway Tunnel project is established in the National Policy Statement for Waste Water.

4.1.2 This section provides a high-level explanation of the way in which the project solution emerged through the consistent use of a site selection methodology that was informed by stakeholder consultation.

4.1.3 It summarises the bespoke site selection process. It also illustrates how the multidisciplinary, sieving, iterative approach was applied in practice to develop, shape and select the scheme ('scheme' collectively refers to the route alignment, sites and tunnelling strategy).

4.1.4 Thames Water developed and used an extensive process to select sites and formulate a drive strategy to construct the main tunnel and link the sites together. This process is documented in full in the *Final Report on Site Selection Process*. The report also summarises the role of key associated reports, such as the engineering option reports and the site suitability reports.

4.1.5 This section provides a high level summary of the process used to develop the scheme and the considerations applied in the selection of specific sites. This section is structured as follows:

a. Section 4.2 Context for development of the scheme

b. Section 4.3 Site selection process: this describes the development of the *Site selection methodology paper*, including key parameters, types of sites, area of search, consideration used to sieve sites, interaction between sites and the consultation and review process for sites

c. Section 4.4 Application of the site selection process: this describes how and when the methodology was applied during the pre-application process and an overview of some of the key scheme changes

d. Section 4.5 Selection of the main tunnel route alignment: this explains the main reasons for the route selected

e. Section 4.6 Selection of main tunnel drives and sites: this explains drive options and confirms the reasons for the selection of the main tunnel tunnelling strategy and the main sites

f. Section 4.7 Selection of CSO sites: this explains how the scheme has developed to address the 34 unsatisfactory CSOs identified by the Environment Agency

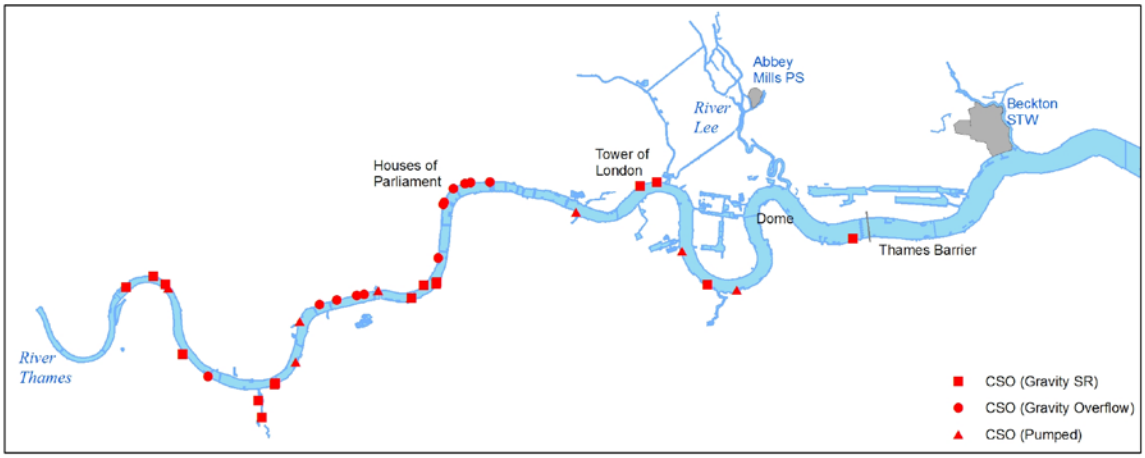
g. Section 4.8 Conclusions: the selected scheme.

4.1.6 A series of more technical annexes are included immediately following this section, which provide more detail of the work that was undertaken.

4.2 Context for the development of the scheme

4.2.1 The context to develop the scheme was set by the Environment Agency which evaluated 57 CSOs and identified 36 of them as 'unsatisfactory'. Of these, 34 CSOs would be controlled by the Thames Tideway Tunnel project, one by the Lee Tunnel project, and one by a separate project at Wick Lane. Figure 4.1 illustrates the 34 CSOs to be controlled by the project.

Figure 4.1 CSOs to be controlled by the project



4.2.2 The main tunnel would capture and store[10] combined sewage from the unsatisfactory CSOs along its route.

4.2.3 The horizontal alignment of the main tunnel would generally follow the River Thames, where possible and practical, in order to:

a. ensure the most efficient route to connect the CSOs located on both banks of the river

b. enable river transport during construction to supply and remove materials, where practicable and economic

c. minimise the number of structures the tunnel would pass beneath in order to reduce the number of third parties affected.

4.3 Site selection process

Development and consultation on the methodology

4.3.1 Due to the scale of the project and its location in a heavily constrained urban environment, Thames Water created a bespoke site selection process, having regard to relevant policy, best practice and feedback from consultation.

4.3.2 At an early stage of the pre-application process, it was recognised that most potential sites would be subject to some form of constraint. The overall aim of the site selection process was not to identify every piece of

[10] It should be noted that wastewater is only stored in the tunnel for a temporary period until it can be pumped out at Beckton Sewage Treatment Works.

land within a defined search area, but rather to identify realistic sites that would meet the needs of the project. The site selection process took into account relevant environmental, planning, engineering ('buildability' and 'operability'), property (including cost), social and economic aspects to ensure the most suitable combination of sites along the route of the tunnel was selected.

4.3.3 There was an important relationship between the processes for site selection, engineering design and optioneering of the scheme. The engineering design proceeded in tandem with the site selection process and there was an iterative relationship between the two.

4.3.4 In autumn/winter 2008 and spring 2009 prior to site identification, a draft *Site Selection Methodology Paper* was subject to two rounds of consultation with potentially affected London local authorities, and other strategic pan-London stakeholders. This draft paper was accompanied by a draft *Site Selection Background Technical Paper* that provided information in relation to the background of the project and the engineering requirements bearing upon the site selection process, such as site sizes and illustrative site layouts.

4.3.5 As part of the 2008 consultation, Thames Water held a series of three workshops to provide stakeholders with additional background information and an opportunity to discuss the draft papers. One of the outcomes from these workshops was that Thames Water agreed to set up the Thames Tideway Tunnel Forum as part of its drive for on-going engagement.

4.3.6 The general approach and principles behind the methodology were broadly supported by consultees. Both the *Site Selection Methodology Paper* and the *Site Selection Background Technical Paper* were finalised, distributed to consultees and published, along with the *Site Selection Methodology: Consultation Feedback Report* in May 2009. In spring 2010, the *Site Selection Background Technical Paper* was updated to reflect further engineering design developments.

4.3.7 After phase one consultation, a third round of consultation on changes to the *Site selection methodology paper* was carried out in summer 2011. The changes were incorporated to reflect the introduction of an additional phase of consultation on the scheme. No concerns were raised in relation to the amendments and they had no bearing on the agreed approach or principles. In summer 2011, the *Site selection background technical paper* was updated to reflect further engineering design developments.

4.3.8 The final *Site selection methodology paper* and *Site selection background technical paper* (summer 2011) were the main documents that guided the site selection process (both papers are provided in the *Final Report on Site Selection Proces*s, Vol 2).

Key parameters in the methodology

4.3.9 The *Site selection methodology paper* defined the key parameters for the identification of sites. There were two main categories of sites:

a. main tunnel sites

b. CSO sites.

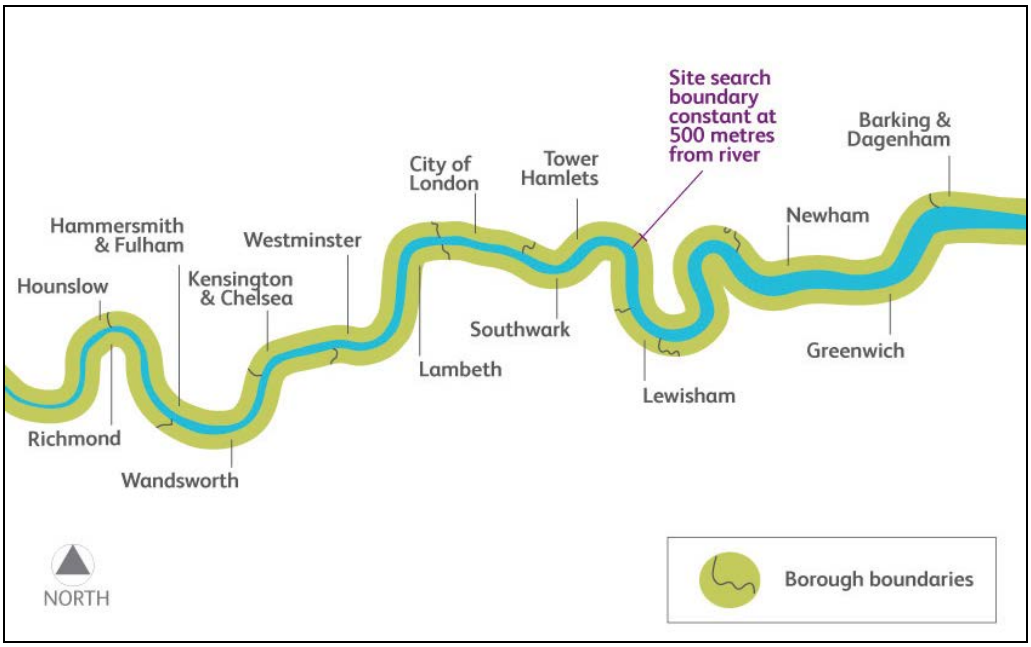
4.3.10 Figure 4.2 illustrates the search area used to identify sites for the construction and operation of the main tunnel. This area extended from west London to Beckton Sewage Treatment Works, within 500m either side of the River Thames. The particular advantages to using sites closer to the river are outlined in para. 4.2.3 above, such as the opportunity to deliver and remove materials by river.

4.3.11 Two types of areas were excluded from the site search area based on two core *London Plan* (2011) policies:

a. London's four World Heritage Sites, which are places of international importance for the conservation of mankind's cultural and natural heritage and are designated by the World Heritage Convention by the United Nations Educational, Scientific and Cultural Organisation (Policy 7.10 World Heritage Sites).

b. Housing within concentrated residential areas in order to avoid the loss of existing housing stock (Policies 3.15 Loss of housing and affordable housing and 3.15C Loss of hostels, staff accommodation and shared accommodation).

Figure 4.2 Search area for main tunnel sites



4.3.12 The approach to the search area for CSO sites was more localised than for the main tunnel sites. Each CSO was allocated an individual area of search, the extent of which varied depending on the sewer network upstream and downstream of the current overflow structure, and the river outfall/outlet location. However, all CSO sites needed to be as close to the existing line of the sewer as practicable and therefore the areas of search needed to include the river foreshore.

Overview of stages in the methodology

4.3.13 The *Site selection methodology paper* was based on the following key principles that were utilised throughout the scheme development:

a. a collaborative, multidisciplinary approach taking into account engineering, planning, environment, community and property considerations (the 'five disciplines') and the exercise of professional judgement

b. an iterative relationship between the site selection and engineering design processes, and the use of information available at that stage of the scheme development.

4.3.14 The 'sieving' process detailed in the Site *selection methodology paper* comprised three main stages, which are set out below.

Stage 1

4.3.15 This stage comprised a site identification and sieving process, which was carried out in three main parts:

a. Part 1A: creation of a long list of potential sites

b. Part 1B: creation of a short list of potential sites

c. Part 1C: creation of a preferred list of sites.

4.3.16 In Part 1A, sites were assessed having regard to the high-level considerations set out in Table 2.2 of the *Site selection methodology paper*. These included:

a. engineering considerations such as site size, site features, availability of a jetty/wharf, and means of access and (for CSO sites) the proximity to the sewer to be intercepted

b. planning and environment considerations such as heritage, landscape/townscape, open space and ecology

c. community and property considerations including neighbouring land uses, site use, Special Land/Crown land and acquisition costs.

4.3.17 In Part 1B, sites were further assessed by the five disciplines, having particular regard to the considerations set out in Table 2.3 of the *Site selection methodology paper*. These included:

a. engineering considerations such as site size, distance and route to the river, jetty/wharf facilities, means of road/rail access, site features, site efficiency, tunnelling and systems engineering requirements and (for CSO sites) connection feasibility

b. planning and environment considerations such as planning applications/permissions, *London Plan*/*Unitary Development Plan*/*Local Development Framework* allocations or special policy areas, heritage designations, landscape/open space designations, ecological designation, transport and amenity

c. property considerations such as ownership of sites, tenants on-site, estimated acquisition costs, Crown land and Special Land, access and material transfer rights

d. community considerations such as proximity to sensitive receptors, social, economic, health and equality considerations.

4.3.18 In Part 1C, a preferred list of sites was created. This process involved three steps. The first two took place concurrently and the final step brought together the findings of the first two stages. The steps are outlined below:

a. The suitability of all sites on the final short list was assessed in more detail in site suitability reports (refer to Annex 4.2 to this section).

b. An engineering options report was produced to set out tunnel drive options and CSO connection types for three potential route alignments.

c. Optioneering workshops were held at which the five disciplines discussed key factors from the site suitability reports and engineering options report, in order to determine the preferred drive options and associated sites.

Stage 2

4.3.19 This stage comprised consultation on the preferred scheme. This included seeking feedback on:

a. a preferred main tunnel route

b. a series of preferred CSO sites and main tunnel sites.

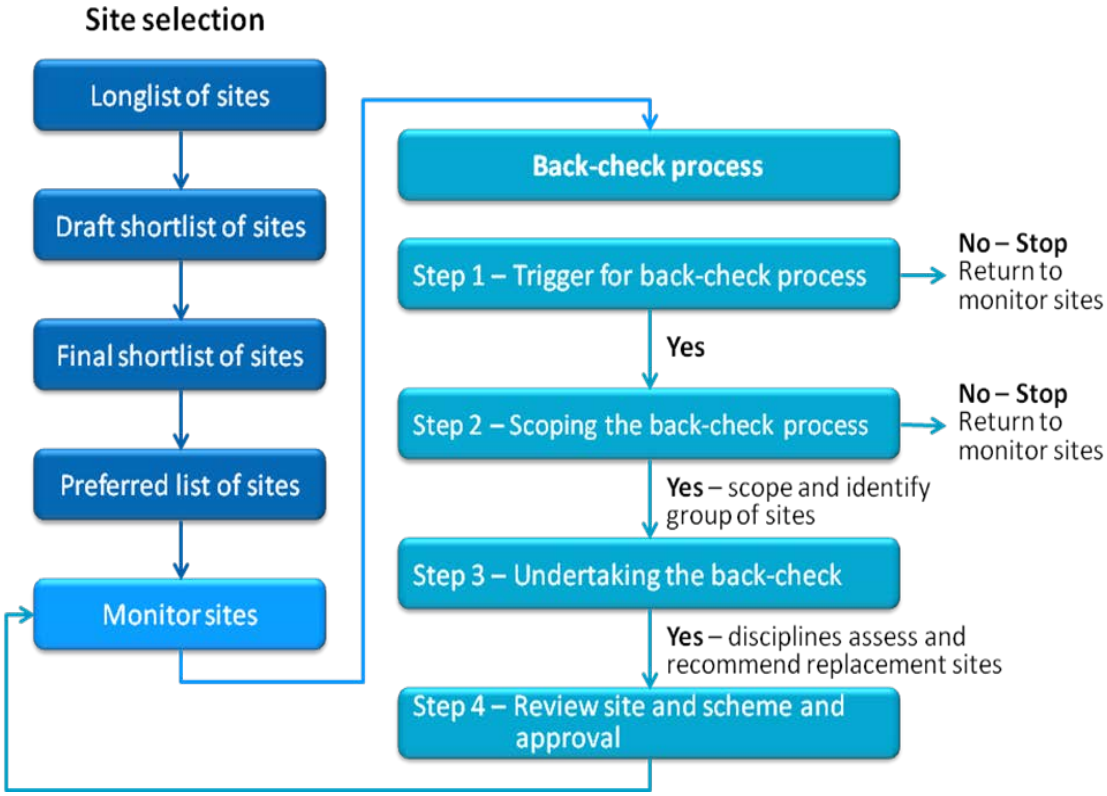
4.3.20 Consultation with key stakeholders and local communities was an important part of scheme development during the pre-application process. The consultation and engagement activities enabled Thames Water to explain and obtain feedback on the scheme. Consultation feedback was fed into the iterative process between engineering design and site selection.

4.3.21 Full details on how the consultations were carried out are provided in the *Statement of Community Consultation* and the *Community Consultation Strategy*. Thames Water responses to feedback from all consultation periods are set out in the *Consultation Report*, which accompanies the application.

Stage 3

4.3.22 Stage 3 comprised the 'back-check' process, which was used where appropriate after each consultation phase to fill in any site gaps, or to re-check sites in response to consultation or any changes of circumstances. This process was integral to the iterative relationship between scheme development and the site selection. Figure 4.3 overleaf provides an overview of the back-check process. It should be noted that even where the back-check process was not triggered, Thames Water carried out a review of the sites and drive strategy at every key phase of scheme development.

Figure 4.3 Overview of the back-check process



4.3.23 Stage 3 also required a review before and after Section 48 publicity. A final report was produced to outline and explain the whole site selection process.

4.3.24 In implementing the methodology, Thames Water sought to be transparent, accountable and fair. Over the development of the scheme, considerable effort was made to assess potential sites and tunnelling options.

4.3.25 Thames Water considered from the outset that the exercise of multidisciplinary professional judgement was the most appropriate approach for site selection. It was also agreed that the use of any type of scoring, quantitative assessment or use of weighting was inappropriate.

4.3.26 Thames Water had regard to other comparable projects and the Government's approach to the selection of sites for nuclear power stations. Evidence demonstrated that professional judgement was the more robust and useful approach.

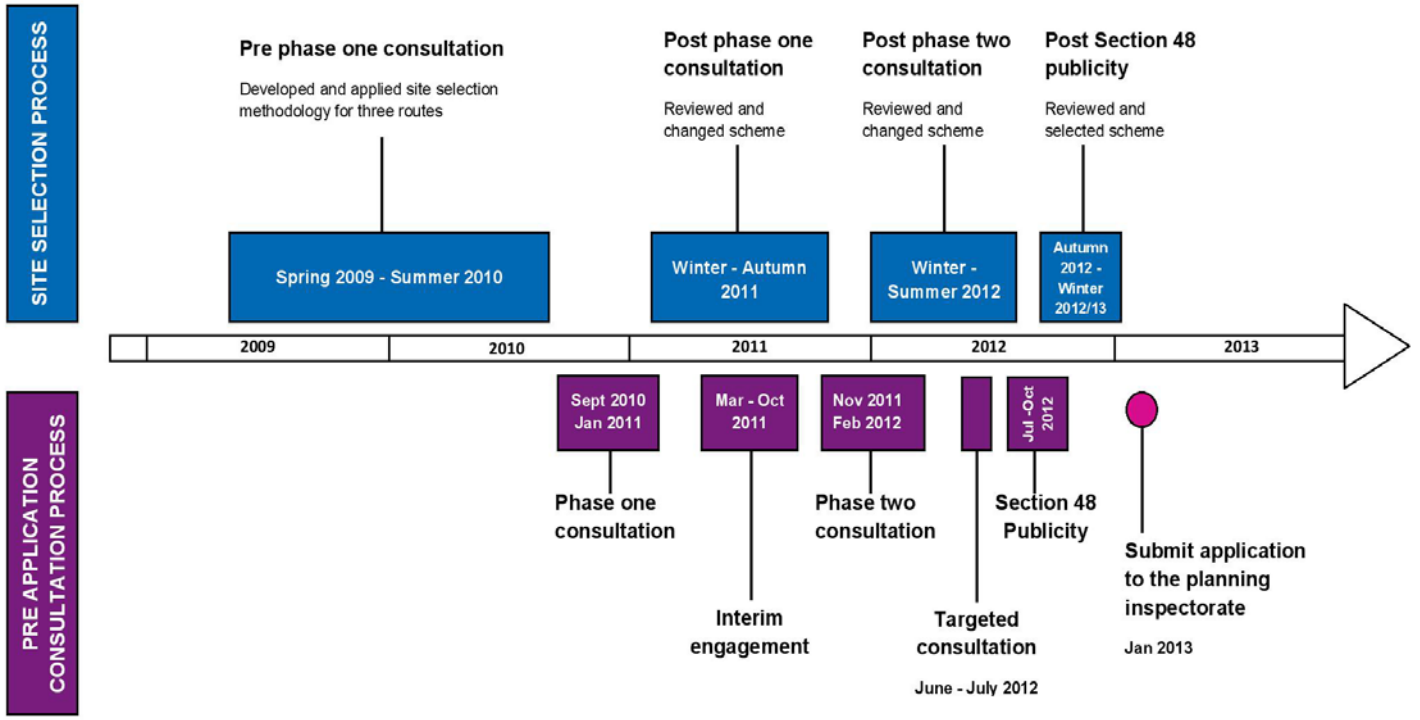
4.4 Application of the site selection process

Overview of the process

4.4.1 The site selection process in action is outlined briefly below, broken down into the principal pre-application phases. Sections 4.5 onwards discuss some of the principal issues addressed during the process. Refer to the *Final Report on Site Selection Process* for the full discussion of the decisions and changes that were made.

4.4.2 Figure 4.4 illustrates a timeline for the site selection process and consultation periods. The changes to the scheme over the four key phases of the pre-application process are summarised in Annex 4.1.

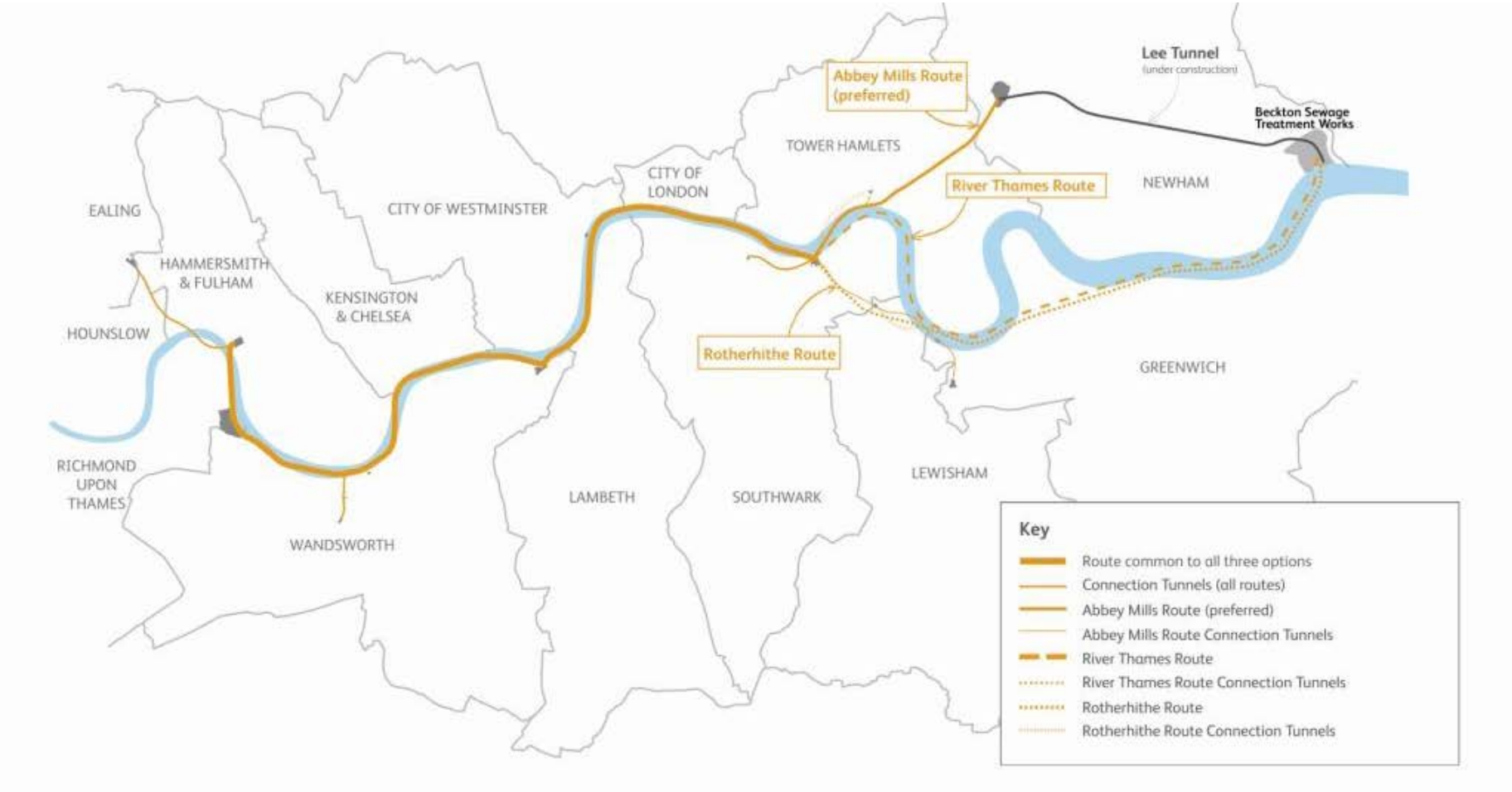
Figure 4.4 Timeline of the site selection process and consultation periods



Prior to phase one consultation

4.4.3 Thames Water considered three route alignments for the main tunnel (refer to Figure 4.5). The River Thames route was the original route proposed by the *TTSS*, in which the tunnel runs west to east, broadly following the River Thames to Beckton Sewage Treatment Works. The Rotherhithe route was considered for its potential to shorten the tunnel without diverging too far from the CSOs to be intercepted. The Abbey Mills route was also considered after further design work identified the potential to connect the main tunnel to the Lee Tunnel at Abbey Mills Pumping Station.

Figure 4.5 Three alternative main tunnel route alignments



4.4.4 In accordance with Stage 1 of the *Site selection methodology paper,* sites were originally identified and assessed for all three routes and 34 CSOs. Thames Water:

a. identified and prepared a long list of 1,142 sites (769 main tunnel sites and 373 CSO sites) in Summer 2009

b. assessed the long list of 1142 sites, 261 of which passed through the assessment of Table 2.2 of the *Site selection methodology paper* to the draft short list of sites (109 main tunnel sites and 153 CSO sites) in Autumn 2009

c. assessed the draft short list of 261 sites, 123 of which passed through the assessment of Table 2.3 of the *Site selection methodology paper* to the final short list of sites (52 main tunnel sites and 71 CSO sites) in winter 2010.

4.4.5 The *Final Report on Site Selection Process* explains how the *Engineering Options Report* (Spring 2010) defined the engineering requirements and set out the three main tunnel routes to be taken forward for evaluation. It explains how options for delivering the three main tunnel routes were determined. In a systematic manner, Thames Water established possible permutations of tunnel drive scenarios in order to identify all the feasible drive options for the three tunnel routes and potential shortlisted sites, based on the potential number of tunnel boring machines (TBMs) used and the main tunnel sites from which they could be driven and received.

4.4.6 The report also described the control and interception of CSO flows, tunnel hydraulic requirements, and the system's functional and operational requirements. It described the geology along the route and the implications for construction, as well as the tunnel engineering and construction requirements and methods. In particular, it stated that the spacing of main tunnel sites and the number of main tunnel sites required were influenced by the following factors:

a. The type of TBM must be appropriate to the geological conditions.

b. There is a need to deliver the project on time.

c. The risk of TBM breakdowns/servicing requirements, and the severity and frequency of these, would increase with the length of the drive.

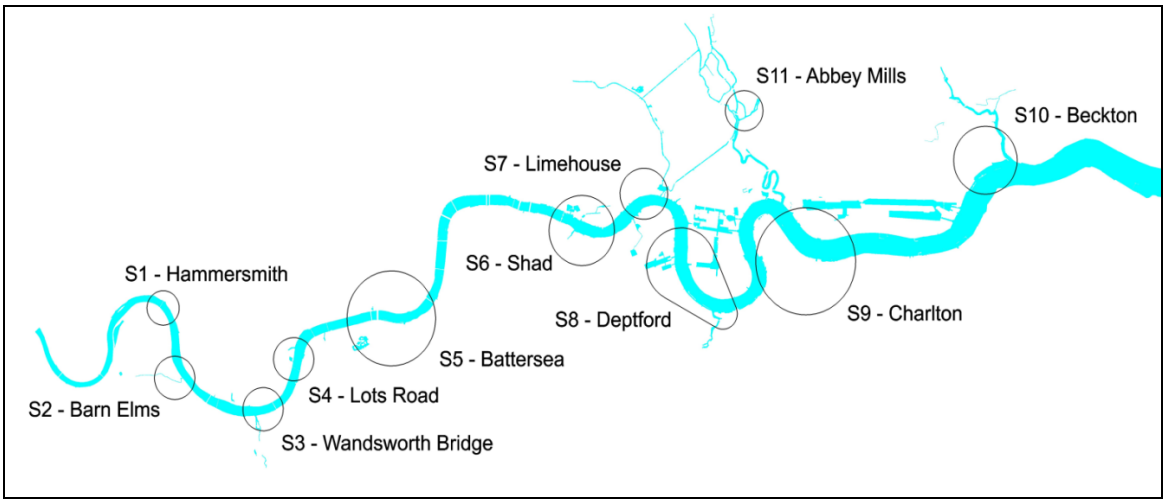
d. The emergency egress of the construction workforce would become more difficult the longer the drive.

4.4.7 The report noted that to the west of Tower Bridge, all three proposed routes followed the route of the River Thames. The options for the main tunnel drive and CSO connections for the western end of the main tunnel were therefore considered as a single alignment option. To the east of Tower Bridge, the three routes were different and were considered separately.

4.4.8 In order to manage all combinations of main tunnel drive site options, the final shortlist of sites was grouped into a limited number of main tunnel site zones. This was based on the geographical proximity of the sites to each other. Figure 4.6 illustrates the zones for all three tunnel routes. It should

be noted that Zones S8, S9 and S10 are only associated with the River Thames and Rotherhithe routes.

Figure 4.6 Main tunnel site zones for all three routes



4.4.9 Prior to phase one consultation, it was proposed that the 34 unsatisfactory CSOs would be controlled by the following methods:

a. Method A: some CSOs would be intercepted and connected to the main tunnel at a CSO site.

b. Method B: some CSOs would be controlled by diverting flows into the main tunnel at a CSO site and, next to these CSOs; a local connection would also be made to the existing northern Low Level Sewer No.1 to divert some flows to the main tunnel.

c. Method C: some CSOs would be controlled due to the extra capacity in the northern Low Level Sewer No.1 created by Method B; therefore these CSOs would not require a worksite.

d. Method D: some CSOs would be controlled by modifications to the operation of the existing sewerage system, including pumping stations and sewers, in order to store flows and transfer them to the sewage treatment works via the existing system.

4.4.10 Section 4.7 below provides further information on the development of the site selection for CSOs during the pre-application process. Table 4.3 in Annex 4.4 describes the flow control proposed for all CSOs at each stage of the pre-application process. All 34 CSOs and control methods are illustrated in Annex 4.4, Figure 4.18.

4.4.11 At phase one consultation, the *Project Overview* (Summer 2010) was produced to provide an overview of the project development leading to the phase one consultation scheme along with detailed supporting material. This report and the consultation material explained that the preferred phase one consultation route was the Abbey Mills route, comprising 23 sites (refer to Annex 4.1 for details of the five main tunnel sites (Hammersmith Pumping Station, Barn Elms, Tideway Walk, King's Stairs Gardens and Abbey Mills Pumping Station) and 17 CSO sites (ie, 21 CSOs to be controlled directly on 17 CSO sites and 13 CSOs to be controlled indirectly) and one site at Beckton Sewage Treatment Works

(ie, to transfer the flows from the Thames Tideway Tunnel via the Lee Tunnel to this site). The phase one consultation scheme is illustrated in Figure 4.7.

4.4.12 Due to the location of the two Frogmore CSOs, a long connection tunnel was required. Another long connection tunnel was also needed to connect three inland CSOs to the main tunnel (ie, Earl Pumping Station, Borthwick Wharf Foreshore and Greenwich Pumping Station). The King's Stairs Gardens main tunnel reception site would also be used to drive the long connection tunnel via these three CSO sites in order to connect them to the main tunnel. King's Stairs Gardens was also to be used to drive another connection tunnel to the Druid Street site in order to connect it to the main tunnel. All these site uses and connection tunnels are illustrated in Figure 4.7.

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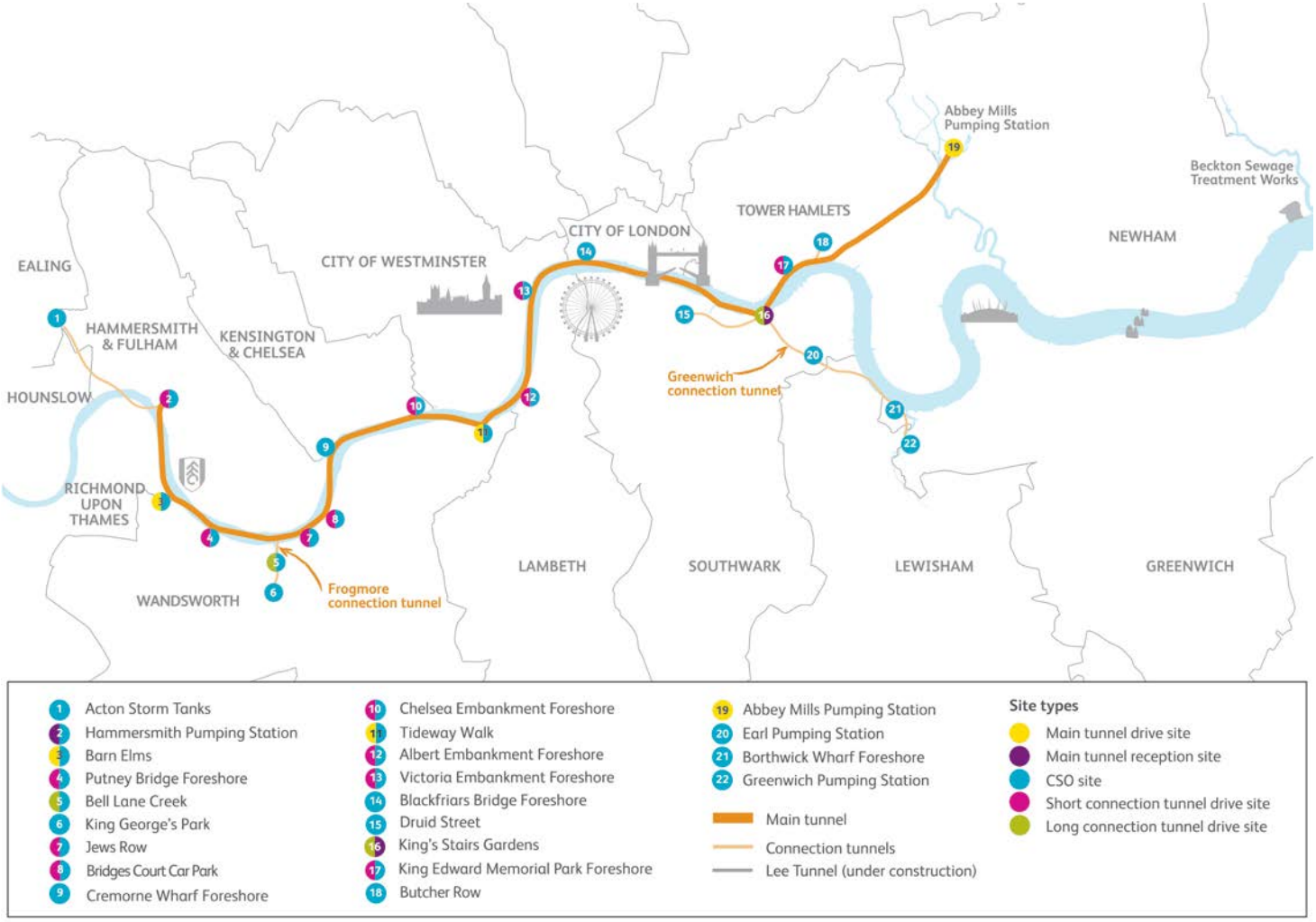
Figure 4.7 Phase one consultation scheme



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After phase one consultation

4.4.13 Thames Water considered on-going engineering developments, scheme design changes, phase one consultation feedback, interim engagement feedback, changes of circumstances and new information. These considerations led to a substantial scheme review or 'back-check' (refer to Figure 4.3) of all the main tunnel sites and drive options and nearly half the CSO sites.

4.4.14 The main drivers for the changes in the western section of the main tunnel (refer to Figure 4.9 for Zones S0 to S4) can be summarised as follows:

a. Further investigation was undertaken of the hydraulic requirements of the western end of the tunnel. It was determined that a larger diameter tunnel than initially proposed was required to meet the flow and storage requirements. This led to the addition of the new main tunnel zone: Zone S0 Acton.

b. A planning application was submitted for a residential development on land adjoining Hammersmith Pumping Station and it was concluded that there was a high risk that no site would be available in Zone 1.[11]

c. Navigational limitations of marine transport between Putney Bridge and Hammersmith Bridge were identified in relation to peak tunnelling rates. In the upper reaches of the river beyond Putney Bridge, the presence of recreational river users, such as rowers and small boats, presented a major hazard and risk to be considered when evaluating sites.

d. Some consultation feedback challenged the main tunnel sites and tunnelling strategy in the western and central sections of the main tunnel.

e. Further investigations determined that the minimum size for a main tunnel drive site in areas of London Clay geology (the western section of the scheme) could be reduced from approximately 18,000 m^2 to approximately 15,000m^2. This enabled other sites to be considered.

f. All the points above, but especially c. and d. were relevant to the main tunnel sites in Zone S2 Barn Elms (Barn Elms site) and Zone S3 Wandsworth Bridge (Carnwath Road Riverside site).

4.4.15 The main drivers for the changes in the central section (Zone S5) of the main tunnel can be summarised as follows:

a. The site size range for double drive sites changed due to further investigation into site logistics.

b. Phase one site monitoring and feedback revealed that most of the phase one consultation preferred combine main tunnel and CSO site at Tideway Walk was not likely to be available. This led to a back-check for a main tunnel site and a separate CSO site, if no other combined site could be identified.

[11] Subsequently this assumption proved to be correct and the residential development is under construction, although it is possible for a smaller site to be accommodated the interception of the Hammersmith Pumping Station CSO.

4.4.16 The main drivers for the changes in the eastern section of the main tunnel can be summarised as follows:

a. Consultation feedback on the eastern sites was considered.

b. The availability of Chambers Wharf was re-investigated as a potential alternative main tunnel site to King's Stairs Gardens. This site had previously been discounted as construction of another development appeared to have commenced. However, the owner demolished the existing buildings, stopped construction work and later put the site on the market.

c. Further investigation of barge transportation on the River Lee determined that it was unlikely to provide a reliable day-in, day-out means of barging throughout a sustained main tunnel construction period at the Abbey Mills Pumping Station site.

d. System hydraulics was studied further in relation to the storage volume in the Greenwich connection tunnel.

4.4.17 These and other factors informed the preparation of the *Engineering options report – Abbey Mills route* (Summer 2011), which contained additional options and was used to shape the phase two consultation scheme. The information in the report was summarised in the *Phase two scheme development report* (Winter 2011), which was incorporated into the *Final Report on Site Selection Process.*

4.4.18 A series of optioneering workshops were held as part of the back-check process to bring together the disciplines to discuss key factors from 33 new/revised site suitability reports, as well as the revised *Engineering options report – Abbey Mills route* (Summer 2011), in order to determine the preferred phase two consultation drive strategy, main tunnel sites and CSO sites.

4.4.19 For the Frogmore connection tunnel, the Bell Lane Creek CSO site was changed to the nearby Dormay Street CSO site, which is located within an industrial area.

4.4.20 The main tunnel sites also changed and Carnwath Road Riverside was preferred to Barn Elms. The Frogmore connection tunnel would be driven from Dormay Street to the King George's Park CSO site; the TBM would then be brought back to Dormay Street and driven to Carnwath Road Riverside. Dormay Street would again be used to drive the connection tunnel in order to minimise the impact on King George's Park.

4.4.21 The Greenwich connection tunnel was still needed to connect three inland CSOs to the main tunnel (ie, Earl Pumping Station, Borthwick Wharf Foreshore, which changed to Deptford Church Street, and Greenwich Pumping Station). However, the main tunnel site was changed from King's Stairs Gardens to Chambers Wharf. Due to these site changes, the Greenwich long connection tunnel options were reviewed and it was decided to drive the connection tunnel from Greenwich Pumping Station to Chambers Wharf.

4.4.22 The *Phase two scheme development report* (Winter 2011) was produced to provide a detailed account of how the scheme evolved prior to phase two consultation. The report re-confirmed Abbey Mills as the phase two consultation preferred route comprising 24 sites (refer to Annex 4.1 for details of the five main tunnel sites (Acton Storm Tanks, Carnwath Road Riverside, Kirtling Street, Chambers Wharf and Abbey Mills Pumping Station) and 16 CSO sites (ie, 18 CSOs to be controlled directly at 16 CSO sites and 16 CSOs to be controlled indirectly including Shad Thames Pumping Station and Bekesbourne Street at two additional worksites) and Beckton Sewage Treatment Works. The phase two consultation scheme is illustrated in Figure 4.8.

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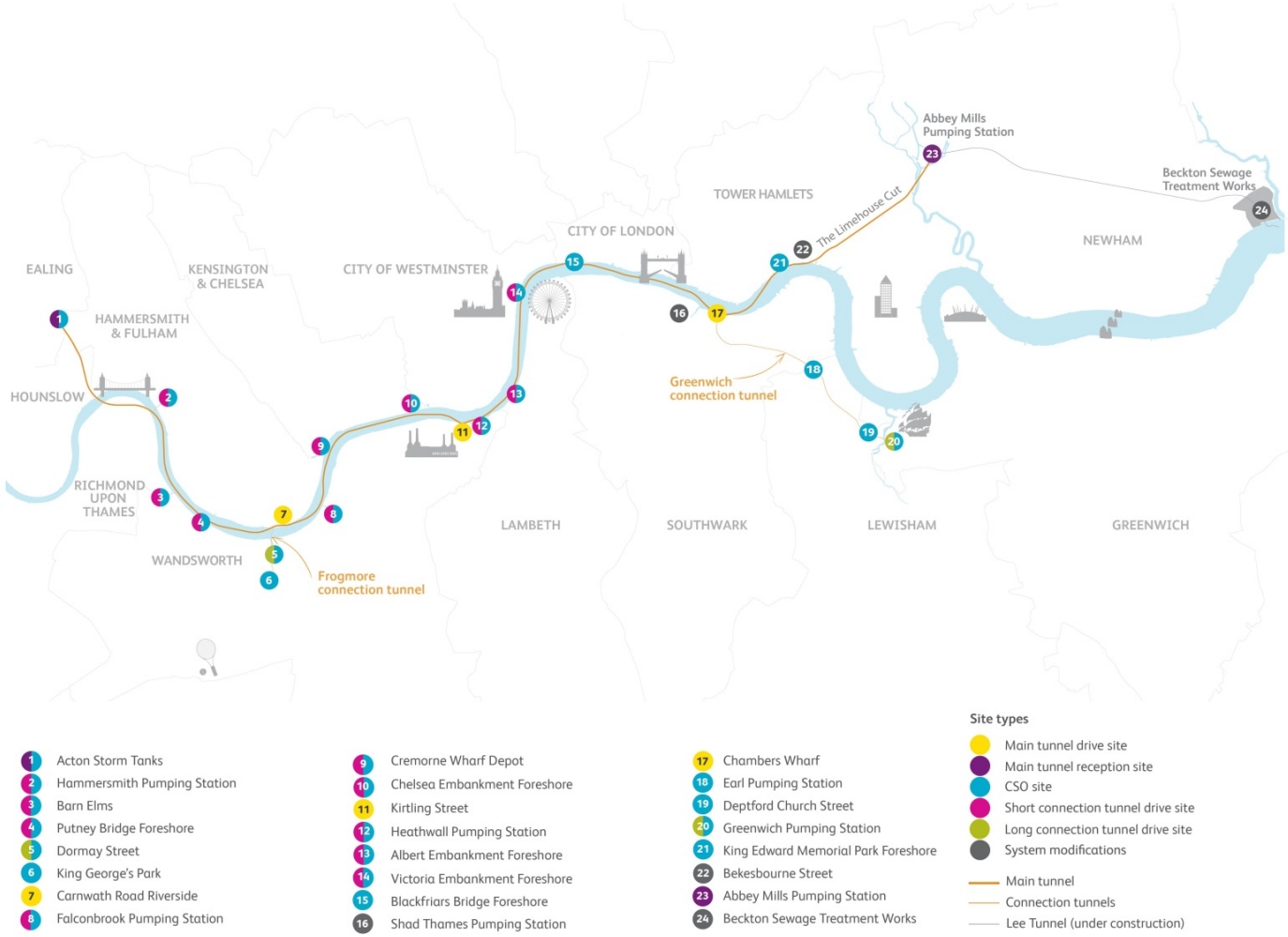
Figure 4.8 Phase two consultation scheme



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After phase two consultation

4.4.23 Thames Water repeated the process outlined above and considered phase two consultation feedback as well as the targeted consultation carried out prior to Section 48 publicity. This review resulted in one CSO site change at Putney (ie, the phase two Putney Bridge Foreshore site moved approximately 30 metres west along the foreshore and site name was changed to Putney Embankment Foreshore). This change increased the separation from the Grade II listed Putney Bridge and made it possible to retain the Putney public slipway on its existing alignment. Other scheme development after phase two consultation principally comprised detailed engineering and design changes, rather than site changes.

4.4.24 However, consultation feedback had raised concerns regarding the tunnelling strategy and associated sites, particularly in the western and eastern sections of the main tunnel (Carnwath Road Riverside and Chambers Wharf). A number of alternative drive options were suggested, which led to the preparation of the *Engineering options report – Abbey Mills route* (Spring 2012). However, this report dismissed the feasibility of these alternative drive options and concluded that the potentially feasible main tunnel drive options should remain the same as those arrived at in the *Engineering options report – Abbey Mills route* (Summer 2011). All of this information was reported in the *Site selection methodology paper*, the *Section 48: Report on site selection process* (Summer 2012), which is incorporated into the *Final Report on Site Selection Process*.

4.4.25 In accordance with *the Site selection methodology paper*, the *Section 48: Report on site selection process* (Summer 2012) was produced to outline this review and explain the site selection process to date. This report was made available as part of the publicity for the application for the proposed scheme under Section 48 of the 2008 Act. The report confirmed Abbey Mills as the proposed route comprising 24 sites as described in para. 4.4.22, except with Putney Bridge Foreshore changed to Putney Embankment Foreshore. The proposed scheme at Section 48 publicity is illustrated in Figure 4.12.

Prior to the submission of the application

4.4.26 A review of the scheme was undertaken following Section 48 publicity in order to inform the final selection of the scheme. In this final review, the Section 48 publicity feedback was taken into account in accordance with Section 49 of the 2008 Act. The review also considered any on-going design and/or new technical information and re-considered the final shortlisted sites to identify any reason to change the judgements made over the course of the site selection process. The review was carried out to ensure that Thames Water had selected the most appropriate scheme for the application. The review did not result in any changes to the Section 48 publicity scheme. The selected scheme for the application is illustrated in Figure 4.12.

4.4.27 The *Site selection methodology paper* (Summer 2011) states that a final report would be produced to explain the whole site selection process. The *Final Report on Site Selection Process* was prepared to fulfil that purpose.

This report explains the implementation of the site selection process, which led to the selection of the final scheme.

4.4.28 Sections 4.5 to 4.7 briefly outline some of the key factors that led to the selected route, tunnelling strategy, main tunnel sites and CSO sites. The site assessments provide further details in the site-specific appendices.

4.5 Selection of the main tunnel route alignment

4.5.1 Figure 4.5 above illustrates the three main tunnel route alignments. The scheme and consultation feedback comments were reviewed at four key phases of the pre-application process, but there was no information to alter the overall conclusion that the Abbey Mills route should be the selected route for the scheme.

4.5.2 The advantages of the Abbey Mills route are outlined below:

a. It is the shortest route (compared to the River Thames and Rotherhithe routes) and therefore likely to generate less excavated waste material.

b. It is the least disruptive and most cost-effective option, delivering 20 per cent savings compared to the other two options, while still meeting the project's environmental objectives.

c. It requires fewer sites and, therefore, less disruption (the other two routes require at least one other main tunnel site and an additional TBM due to the longer distance to Beckton Sewage Treatment Works)

d. It requires less tunnelling at depth through Chalk in the east compared with the other two routes, which is more difficult and entails greater health and safety risks.

4.5.3 From an overall health and safety perspective, the shorter length of the main tunnel for the Abbey Mills route reduces the likelihood of construction related risks. The River Thames and Rotherhithe routes would require the main tunnel to be driven further through faulted flint-bearing Chalk with much higher ground water pressures. This would increase wear on the TBM and the hazards to personnel carrying out TBM maintenance. These issues would also increase overall programme risk.

4.5.4 Overall, the Abbey Mills route makes more efficient use of land, uses fewer resources and presents less project risk. Therefore it is the selected route in the application.

4.6 Selection of the main tunnel drive strategy and sites

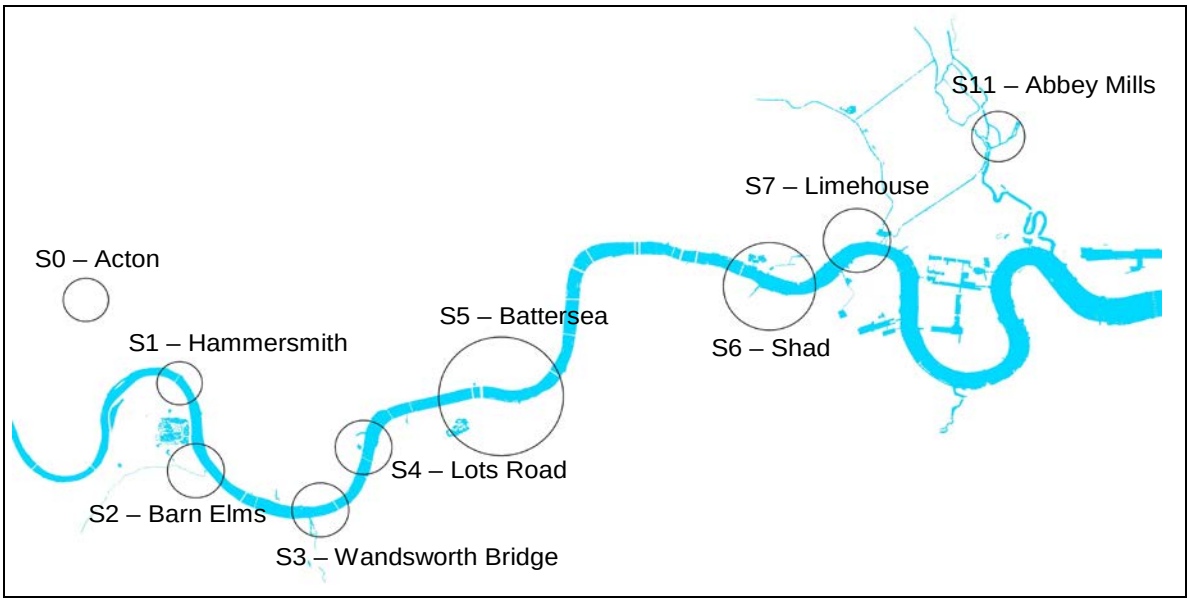
4.6.1 This section provides more detailed information on the considerations which were taken into account in the final review of the drive options (ie, tunnelling directions and implications for how the main tunnel sites are connected to one another).

4.6.2 At all key phases of the pre-application process, the identification of main tunnel sites followed a complex multi-step process that considered the site suitability reports (refer to Annex 4.2) and tunnelling drive options (refer to

Annex 4.3), which were then brought together in a series of optioneering workshops (refer to Annex 4.3, Figure 4.16).

4.6.3 In order to manage all combinations of main tunnel drive site options, the final shortlist of sites was grouped into a limited number of main tunnel site zones. This was based on the geographical proximity of the sites to each other. Figure 4.9 illustrates the zones associated with the Abbey Mills route.

Figure 4.9 Main tunnel site zones for the Abbey Mills route



4.6.4 Annex 4.3 provides an explanation and summary of the drive options and comparisons set out in the *Final Report on Site Selection Process*.

4.6.5 In order to establish the range of drive options, each drive was considered between two zones, with a drive site in one zone and a reception site in the other. Combining different zones together yielded a number of drive options. The basic components listed below were used to establish the initial number of drive options:

a. an assumed construction period of approximately six years

b. drive lengths (12 km maximum and 3 km minimum)

c. site type (double drive, single drive or intermediate/reception site)

d. the vertical alignment and gradient constraints for the tunnel

e. the distance between access points for the operation and maintenance of the permanent works.

4.6.6 Geology was another important factor in the location of main tunnel sites, particularly where it changes and where it was necessary to minimise the possibility of a tunnel drive going too far into a different type of geology. A high level summary of key geology changes across the Abbey Mills route is illustrated in Annex 4.3.

4.6.7 The selection of Kirtling Street as a double drive site (east to Chambers Wharf and west to Carnwath Road Riverside) and Acton Storm Tanks as a

combined site (to intercept the Acton Storm Relief CSO and receive the TBM from Carnwath Road Riverside) were relatively straightforward.

4.6.8 However, greater concerns were raised through engagement regarding the proposed drive sites and tunnelling strategy to construct the western and eastern sections of the main tunnel. Thames Water therefore undertook a review of sites and a series of drive option comparisons in order to test its proposals.

4.6.9 In the western section of the main tunnel, after having considered all the sites and drive options, there was a choice between a main tunnel drive site in Zone S2 at Barn Elms or Zone S3 at Carnwath Road Riverside. A drive site was only needed in one zone. The comparison of using Barn Elms or Carnwath Road Riverside as a main tunnel drive site is discussed in detail in Appendix G. However, in view of the various constraints for both sites, it was decided that Carnwath Road Riverside was a more suitable main tunnel drive site and the temporary impacts could be adequately mitigated.

4.6.10 In summary, the principal comparative reasons of why Carnwath Road Riverside was selected instead of Barn Elms:

a. Carnwath Road Riverside is a brownfield site whereas Barn Elms is a greenfield site.

b. Larger barges can be used from the existing safeguarded wharf at Carnwath Road Riverside, whereas there are navigational restrictions on the river in the vicinity of Barn Elms, where smaller barges would need to be used and there are no existing wharfage facilities.

c. There would be fewer health and safety risks for river users arise at Carnwath Road Riverside, whereas the river downstream of Barn Elms is busier with recreational river users and smaller barges.

d. Carnwath Road Riverside has better direct vehicular access.

e. There would be less impact on land use, planning designations and the Thames Path would arise at Carnwath Road Riverside, whereas Barn Elms comprises playing fields in recreational use, designated as Metropolitan Open Land and the Thames Path is a tree-lined route highly used by walkers and cyclists.

4.6.11 In the eastern section of the main tunnel, there is a complex tunnelling relationship between Chambers Wharf, Abbey Mills Pumping Station and Greenwich Pumping Station, which is discussed in the *Final Report on Site Selection Process (*Vol 18, Section 5). Consultation feedback expressed concern regarding the eastern tunnelling strategy. In particular, local people at Chambers Wharf suggested that the main tunnel should be driven from Abbey Mills Pumping Station to Chambers Wharf, which is the opposite of the application proposal.

4.6.12 The comparison of using Chambers Wharf to Abbey Mills Pumping Station as a main tunnel drive site is discussed in Appendix S. However, on consideration of all the various constraints for both these sites, it was decided that Chambers Wharf was a more suitable main tunnel drive site and that its temporary impacts could be adequately mitigated. In particular,

the use of the River Thames at Chambers Wharf would be more reliable, involve fewer health and safety risks, and be able to accommodate larger barges, as follows:

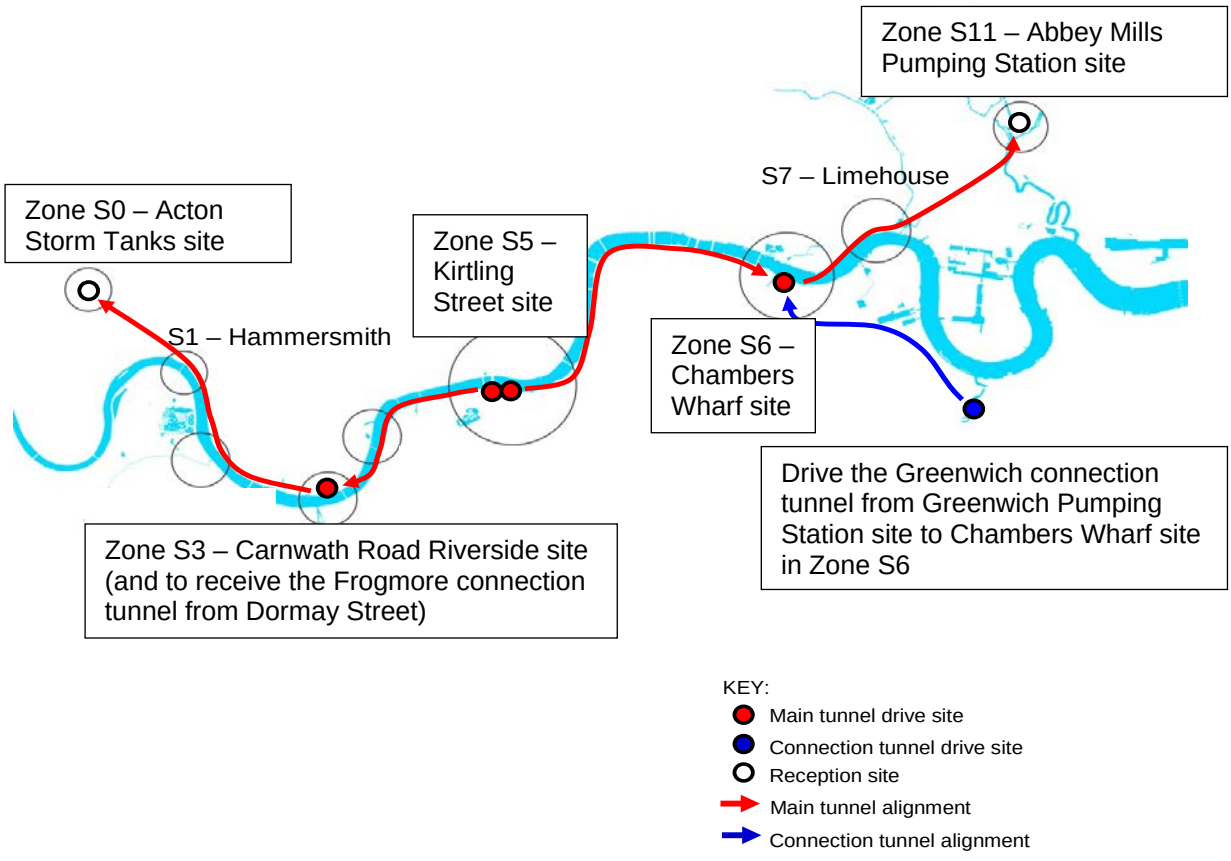
a. At Chambers Wharf, much bigger barges (1,500 tonnes) could be used on a regular, reliable basis.

b. At Abbey Mills Pumping Station, use of smaller barges (350 tonnes) on the River Lee would create substantial delivery risks within a short tidal window. For the volume of materials associated with a main tunnel drive site, it would be much less reliable and require the majority of materials to be transported via narrow residential roads.

Summary of the selected sites and tunnelling strategy

4.6.13 The selected main tunnel sites and tunnelling strategy for the Abbey Mills route is summarised in Figure 4.10. All five selected main tunnel sites are discussed in more detail in the appended site assessments. The scheme is illustrated in Figure 4.12. Thames Water believes this tunnelling strategy represents the most appropriate way to construct the main tunnel.

Figure 4.10 Selected tunnelling strategy for the Abbey Mills route



4.7 Changes and selection of CSO sites

4.7.1 During the pre-application process, design development work established that not all 34 CSOs would require separate interception works in order to be adequately controlled. It would be possible to use existing sewers and modifications to pumping station operations to control some CSOs. This has the advantage of reducing the number of worksites required. All the changes to the CSO control methods and sites are summarised in Annex 4.4 (also see Annex 4.1).

4.7.2 In summary, developments in the design and flow modelling reduced the number of the 34 CSOs controlled by the project by direct interception from 21 at phase one consultation, to 18 at phase two consultation. Below is a brief outline of when and why the control of CSOs changed during the pre-application process.

4.7.3 Thirteen of the 34 unsatisfactory CSOs are located along the north bank of the River Thames. Potential CSO sites were identified for the 13 CSOs at the same time as further hydraulic modelling was carried out. At an early stage in the scheme development, Thames Water recognised that construction activity at all 13 CSO sites in close proximity to each other would have a substantial impact, especially on areas of significant built historic interest and the road network. It was agreed with the Environment Agency that ten of the CSOs located between Chelsea (Church Street CSO) and the City of Westminster (Essex Street CSO) (refer to Annex 4.4, Table 4.3 for CSOs controlled by Method C and illustrated in Figure 4.18) could be controlled by the extra capacity in the northern Low Level Sewer No.1 that could be created by works at three CSO sites (Chelsea Embankment Foreshore, Victoria Embankment Foreshore and Blackfriars Bridge Foreshore) (refer to Annex 4.4, Table 4.3 for CSOs controlled by Method B and illustrated in Figure 4.18).

4.7.4 The works at Chelsea Embankment Foreshore, Victoria Embankment Foreshore and Blackfriars Bridge Foreshore would incorporate a connection to the northern Low Level Sewer No.1 to divert some of its flow during rainfall events into their respective drop shafts and into the main tunnel. Therefore, the ten other CSOs would not require worksites.

4.7.5 Design development showed that two of the westernmost CSOs along the river (Stamford Brook Storm Relief and North West Storm Relief) could be indirectly controlled by works at Hammersmith Pumping Station. Design development also showed that the easternmost CSO (Charlton Storm Relief, which is not on the Abbey Mills route) could be controlled by operational changes at Greenwich Pumping Station and improvements at Crossness Sewage Treatment Works. Annex 4.4, Table 4.3 shows that these three CSOs are controlled by Method D. Therefore these three CSOs would also not require worksites.

4.7.6 At phase one consultation, 21 CSOs were to be controlled at 17 CSO sites and two combined main tunnel/CSO sites, with some sites controlling more than one CSO.

4.7.7 After phase one consultation, the feedback was considered and further hydraulic modelling undertaken on the 21 directly controlled CSOs. This resulted in a further agreement between Thames Water and the Environment Agency that three more CSOs could be controlled indirectly (Jews Row CSO, Shad Thames Pumping Station CSO and Holloway Storm Relief CSO).

4.7.8 The site selection process identified CSO interception sites as a method of direct control, and the reduction of the three sites above meant that a total of 18 CSOs would be directly controlled on 16 CSO sites. As Shad Thames Pumping Station and Bekesbourne Street no longer required a CSO interception site, from a site selection point of view these were not counted as CSO sites. However, the works at these two sites were assessed and are included in the application.

4.7.9 At phase two consultation and in the application, 18 CSOs would be controlled by diverting intercepted flows into the main tunnel at 16 CSO sites (16 would be indirectly controlled, including Shad Thames Pumping Station and Bekesbourne Street at two additional worksites) and one combined main tunnel reception/CSO site at Acton Storm Tanks. Table 4.3 identifies the control method for all 34 CSOs and where a CSO site is required (also refer to Figure 4.19).

4.7.10 Overall given the local constraints around the existing CSOs, the proposals would control all 34 CSOs identified by the Environment Agency. Thames Water was able to reduce the number of CSO sites through measures to indirectly control 16 CSOs and identified 16 CSO sites that would meet the project need.

4.8 Conclusions of the selected route, sites and drive strategy

4.8.1 Figure 4.11 Summary of site selection process overleaf is a cumulative summary of all the sites[12] and key assessment reports produced during as of the development of the scheme.

4.8.2 Figure 4.12 below illustrates the scheme selected for the application via the site selection process. It also shows the additional system modifications sites (Shad Thames Pumping Station and Bekesbourne Street) and Beckton Sewage Treatment Works.

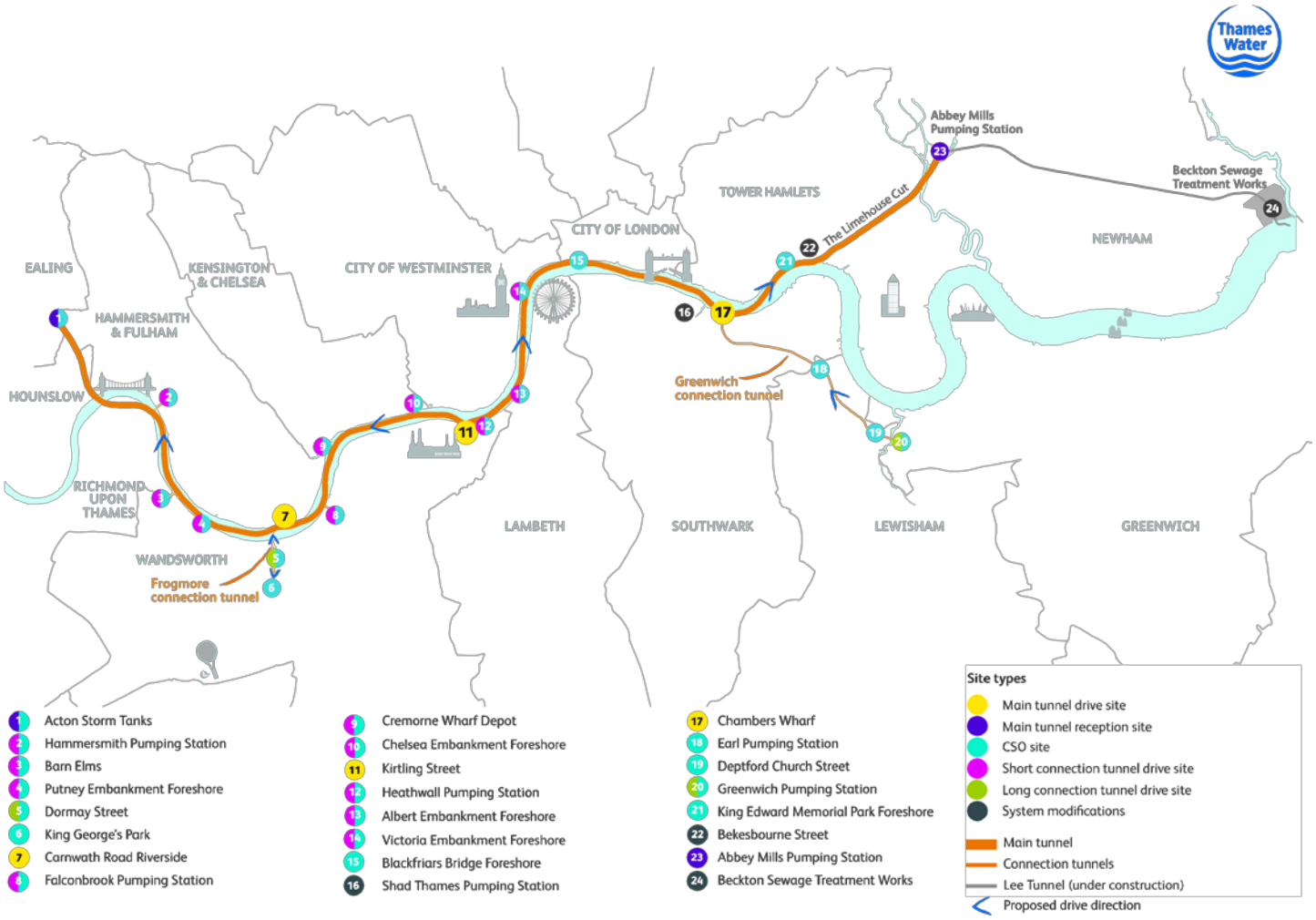
[12] Twenty-one sites were selected via the site selection process; however, the application includes three further worksites: Shad Thames Pumping Station, Bekesbourne Street and Beckton Sewage Treatment Works. There are a total of 24 sites in the application proposals.

Figure 4.11 Summary of site selection process

NOTE: the first number relates to main tunnel sites, the second number relates to CSO sites and third number is the total number of sites at each sieve of sites

4.8.3 Thames Water believes that the selected scheme would meet the needs of the project described in Section 3. The following sections and the appended site assessments analyse specific details of the project.

Figure 4.12 Selected scheme for the application



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Annex 4.1 Summary of site selection changes

Table 4.1 Summary of site selection scheme changes

Phase one preferred scheme	Phase two preferred scheme	Section 48 publicity proposed scheme	Application selected scheme
Preferred site **Site type**	**Preferred site** (**purple** = change of site) **Site type** (*pink* = change of use)	**Proposed site** (**orange** = change of site) **Site type** (**green** = access change)	**Selected site** **Site type** (**blue** = changes)
Acton Storm Tanks CSO site; connection tunnel reception	**Acton Storm Tanks** Main tunnel single reception site; CSO site	**Acton Storm Tanks** Main tunnel single reception site; CSO site	**Acton Storm Tanks** Main tunnel single reception site; CSO site
Hammersmith Pumping Station Main tunnel reception site; CSO site; connection tunnel drive	**Hammersmith Pumping Station** CSO site (moved to a different area of a larger site); connection tunnel drive to main tunnel	**Hammersmith Pumping Station** CSO site; connection tunnel drive to main tunnel	**Hammersmith Pumping Station** CSO site; connection tunnel drive to main tunnel
Barn Elms Sequential main tunnel double drive site; CSO site; access from Rocks Lane	**Barn Elms** CSO site; connection tunnel drive to main tunnel; access from Rocks Lane	**Barn Elms** CSO site; connection tunnel drive to main tunnel; access from Queen Elizabeth Walk	**Barn Elms** CSO site; connection tunnel drive to main tunnel; access from Queen Elizabeth Walk
Putney Bridge Foreshore CSO site; connection tunnel drive to main tunnel	**Putney Bridge Foreshore** CSO site; connection tunnel drive to main tunnel	**Putney Embankment Foreshore** CSO site; connection tunnel drive to main tunnel	**Putney Embankment Foreshore** CSO site; connection tunnel drive to main tunnel
Bell Lane Creek CSO site; connection tunnel drive to main tunnel; connection tunnel drive to King George's Park	**Dormay Street** CSO site; connection tunnel drive to Carnwath Road Riverside; connection tunnel drive to King George's Park	**Dormay Street** CSO site; connection tunnel drive to Carnwath Road Riverside; connection tunnel drive to King George's Park	**Dormay Street** CSO site; connection tunnel drive to Carnwath Road Riverside; connection tunnel drive to King George's Park

Phase one preferred scheme	Phase two preferred scheme	Section 48 publicity proposed scheme	Application selected scheme
Preferred site **Site type**	**Preferred site** (**purple** = change of site) **Site type** (*pink* = change of use)	**Proposed site** (**orange** = change of site) **Site type** (**green** = access change)	**Selected site** **Site type** (**blue** = changes)
King George's Park CSO site; connection tunnel reception	**King George's Park** CSO site; connection tunnel reception	**King George's Park** CSO site; connection tunnel reception	**King George's Park** CSO site; connection tunnel reception
-	**Carnwath Road Riverside** Main tunnel single drive/single reception site; connection tunnel reception	**Carnwath Road Riverside** Main tunnel single drive/single reception site; connection tunnel reception	**Carnwath Road Riverside** Main tunnel single drive/single reception site; connection tunnel reception
Jews Row CSO site; connection tunnel drive to main tunnel	- Technical solutions removed the requirement for a CSO site at this location	- Technical solutions removed the requirement for a CSO site at this location	- Technical solutions removed the requirement for a CSO site at this location
Bridges Court Car Park CSO site; connection tunnel drive to main tunnel	**Falconbrook Pumping Station** CSO site; connection tunnel drive to main tunnel	**Falconbrook Pumping Station** CSO site; connection tunnel drive to main tunnel	**Falconbrook Pumping Station** CSO site; connection tunnel drive to main tunnel
Cremorne Wharf Foreshore CSO site; drop shaft on line of main tunnel	**Cremorne Wharf Depot** CSO site; connection tunnel drive to main tunnel	**Cremorne Wharf Depot** CSO site; connection tunnel drive to main tunnel	**Cremorne Wharf Depot** CSO site; connection tunnel drive to main tunnel
Chelsea Embankment Foreshore (west of Chelsea Bridge) CSO site; connection tunnel drive to main tunnel	**Chelsea Embankment Foreshore (opposite Bull ring Gate)** CSO site; connection tunnel drive to main tunnel	**Chelsea Embankment Foreshore (opposite Bull ring Gate)** CSO site; connection tunnel drive to main tunnel	**Chelsea Embankment Foreshore (opposite Bull ring Gate)** CSO site; connection tunnel drive to main tunnel

Phase one preferred scheme	Phase two preferred scheme	Section 48 publicity proposed scheme	Application selected scheme
Preferred site **Site type**	**Preferred site** (**purple** = change of site) **Site type** (*pink* = change of use)	**Proposed site** (**orange** = change of site) **Site type** (**green** = access change)	**Selected site** **Site type** (**blue** = changes)
Tideway Walk Main tunnel single drive/single reception site; CSO site (two CSO interceptions)	**Kirtling Street** Main tunnel concurrent double drive site	**Kirtling Street** Main tunnel concurrent double drive site	**Kirtling Street** Main tunnel concurrent double drive site
	Heathwall Pumping Station CSO site (two CSO interceptions); connection tunnel drive to main tunnel	**Heathwall Pumping Station** CSO site (two CSO interceptions); connection tunnel drive to main tunnel	**Heathwall Pumping Station** CSO site (two CSO interceptions); connection tunnel drive to main tunnel
Albert Embankment Foreshore CSO site (two CSO interceptions); access along the foreshore; connection tunnel drive to main tunnel	**Albert Embankment Foreshore** CSO site (two CSO interceptions); access via Lacks Dock; connection tunnel drive to main tunnel	**Albert Embankment Foreshore** CSO site (two CSO interceptions); connection tunnel drive to main tunnel (proposed two alternative access routes: Lack's Dock and between Camelford House and Tintagel House)	**Albert Embankment Foreshore** CSO site (two CSO interceptions); connection tunnel drive to main tunnel; access (prefer Lack's Dock, but optional access between Camelford House and Tintagel House to be decided by the Inspector)
Victoria Embankment Foreshore CSO site; connection tunnel drive to main tunnel	**Victoria Embankment Foreshore** CSO site; connection tunnel drive to main tunnel	**Victoria Embankment Foreshore** CSO site; connection tunnel drive to main tunnel	**Victoria Embankment Foreshore** CSO site; connection tunnel drive to main tunnel
Blackfriars Bridge Foreshore CSO site; drop shaft on line of main tunnel	**Blackfriars Bridge Foreshore** CSO site; drop shaft on line of main tunnel	**Blackfriars Bridge Foreshore** CSO site; drop shaft on line of main tunnel	**Blackfriars Bridge Foreshore** CSO site; drop shaft on line of main tunnel

Phase one preferred scheme	Phase two preferred scheme	Section 48 publicity proposed scheme	Application selected scheme
Preferred site **Site type**	**Preferred site** (**purple** = change of site) **Site type** (*pink* = change of use)	**Proposed site** (**orange** = change of site) **Site type** (**green** = access change)	**Selected site** **Site type** (**blue** = changes)
Druid Street CSO site; connection tunnel reception	- Technical solutions removed the requirement for a CSO site at this location; instead local modifications would be made at Shad Thames Pumping Station	- Technical solutions removed the requirement for a CSO site at this location; instead local modifications would be made at Shad Thames Pumping Station	- Technical solutions removed the requirement for a CSO site at this location; instead local modifications would be made at Shad Thames Pumping Station
King's Stairs Gardens Main tunnel double reception site; two connection tunnel drives	**Chambers Wharf** Main tunnel single drive/single reception site; one connection tunnel reception	**Chambers Wharf** Main tunnel single drive/single reception site; one connection tunnel reception	**Chambers Wharf** Main tunnel single drive/single reception site; one connection tunnel reception
King Edward Memorial Park Foreshore CSO site; connection tunnel drive to Butcher Row; all facilities in the foreshore; drop shaft on line of main tunnel	**King Edward Memorial Park Foreshore** CSO site; no connection tunnel drive to Butcher Row; some facilities in the park; drop shaft on line of main tunnel	**King Edward Memorial Park Foreshore** CSO site; no connection tunnel drive to Butcher Row; some facilities in the park; drop shaft on line of main tunnel	**King Edward Memorial Park Foreshore** CSO site; no connection tunnel drive to Butcher Row; some facilities in the park; drop shaft on line of main tunnel
Butcher Row CSO site; connection tunnel reception	- Technical solutions removed the requirement for a CSO site at this location; instead local modifications would be made at Bekesbourne Street	- Technical solutions removed the requirement for a CSO site at this location; instead local modifications would be made at Bekesbourne Street	- Technical solutions removed the requirement for a CSO site at this location; instead local modifications would be made at Bekesbourne Street
Earl Pumping Station CSO site; drop shaft on line of connection tunnel	**Earl Pumping Station** CSO site; drop shaft on line of connection tunnel	**Earl Pumping Station** CSO site; drop shaft on line of connection tunnel	**Earl Pumping Station** CSO site; drop shaft on line of connection tunnel

Phase one preferred scheme	Phase two preferred scheme	Section 48 publicity proposed scheme	Application selected scheme
Preferred site **Site type**	**Preferred site** (**purple** = change of site) **Site type** (*pink* = change of use)	**Proposed site** (**orange** = change of site) **Site type** (**green** = access change)	**Selected site** **Site type** (**blue** = changes)
Borthwick Wharf Foreshore CSO site; drop shaft on line of connection tunnel	**Deptford Church Street** CSO site; drop shaft on line of connection tunnel	**Deptford Church Street** CSO site; drop shaft on line of connection tunnel	**Deptford Church Street** CSO site; drop shaft on line of connection tunnel
Greenwich Pumping Station CSO site; connection tunnel reception	**Greenwich Pumping Station** CSO site; drive connection tunnel and additional logistic land at Phoenix Wharf	**Greenwich Pumping Station** CSO site; drive connection tunnel and additional logistic land at Phoenix Wharf	**Greenwich Pumping Station** CSO site; drive connection tunnel and additional logistic land at Phoenix Wharf
Abbey Mills Pumping Station Main tunnel drive site	**Abbey Mills Pumping Station** Main tunnel reception site	**Abbey Mills Pumping Station** Main tunnel reception site	**Abbey Mills Pumping Station** Main tunnel reception site

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Annex 4.2 Site suitability report considerations

4.2:1.1 Introduction

4.2:1.1.1 This annex outlines the considerations used in the preparation of the site suitability reports produced during the pre-application period. The process for considering the findings of these reports at the optioneering workshops is explained in the final section of this annex.

4.2:1.2 Use of professional judgement

4.2:1.2.1 The site selection process was based on the use of professional judgement and did not use a scoring system or apply different weightings to different types of criteria.

4.2:1.2.2 Thames Water determined from the outset that the use of professional judgement was the most appropriate approach. It was agreed that the use of any type of scoring, quantitative assessment or use of weighting would be inappropriate.

4.2:1.2.3 Regard was had to other comparable projects including Stansted Airport and the Government's approach to the selection of sites for nuclear power stations. Experience showed that professional judgement was the more robust and useful approach.

4.2:1.2.4 Particular endorsement for this approach was contained within *Towards a Nuclear National Policy Statement* (Office for Nuclear Development, January 2009) which states that: "*Discretionary criteria inevitably require judgement and are generally qualitative rather than quantitative. Weightings may not adequately reflect the differences in the nature of some of the criteria, and the greater significance that some criteria may have in different parts of the country or different sites*".

4.2:1.2.5 Therefore the use of professional judgement was applied throughout the site selection process by a multi-disciplinary team including in all assessments, reports and optioneering workshops. For example, property experts undertook the property assessments, town planners completed the planning assessments, and a team of environmental specialists completed the environmental site assessments.

4.2:1.2.6 Each expert brought relevant knowledge of the relevant policies, procedures and standards (eg British Standards applicable to noise). They were able to assess each site on its merits and against the relevant criteria and took account of the circumstances in force at that particular site. Although no weighting was applied, an expert considered any issues or constraints identified at a site.

4.2:1.3 Introduction to the creation of the preferred list

4.2:1.3.1 In order to arrive at the preferred list of sites (Part 1C of the *Site selection methodology paper*), a further detailed assessment was undertaken of all

the sites on the final short list and potential tunnelling drive options were developed.

4.2:1.3.2 The preferred list of sites was created from shortlisted sites for each CSO and eight main tunnel site zones on the Abbey Mills route. This process involved three steps; the first two took place concurrently and the third step brought together the findings of the first two stages:

a. Thames Water assessed the suitability of all sites on the final shortlist in site suitability reports.

b. An engineering options report was produced that set out tunnel drive options and CSO connection types for the three potential route alignments, with regard to the availability and spacing of shortlisted main tunnel sites (refer to Annex 4.3 for further details).

c. Optioneering workshops were held at which the disciplines discussed key factors from the site suitability reports and engineering options report in order to determine the preferred drive options and sites (refer to Figure 4.16 for further details on the main tunnel decision making process).

4.2:1.3.3 The remainder of this annex describes the multidisciplinary considerations in the site suitability reports that were prepared at key stages in development of the scheme. 150 such reports were prepared with more than 200 different assessments on various uses of a site (ie main tunnel drive and reception site layouts and small and large CSO layouts).

4.2:1.4 Site suitability reports considerations

4.2:1.4.1 Individual site suitability reports were produced for each main tunnel and CSO site on the final shortlist, which included information from the following disciplines:

a. engineering

b. planning

c. environment

d. community

e. property.

Engineering

4.2:1.4.2 The engineering assessment for each shortlisted site was supported by various drawings and a written assessment. Generic photographs of typical construction activities for main tunnel sites and CSO sites were also provided to assist the other disciplines to assess the sites.

4.2:1.4.3 The site-specific drawings outlined:

a. available information on i) existing and known proposed tunnels, ii) significant below-ground utilities and iii) geological strata below the site

b. an indicative construction layout, including potential road access and, where applicable, jetty/wharfage facilities

c. an indicative operational layout showing the main permanent above-ground features and potential permanent access.

4.2:1.4.4 The engineering assessments considered accessibility, construction works considerations, permanent works considerations and any significant health and safety issues.

4.2:1.4.5 The final conclusion of the engineering assessments recommended the general level of suitability of the site in engineering terms, based on the relevant considerations and professional judgement.

Planning

4.2:1.4.6 The planning assessment for each shortlisted site comprised four parts, which focused on the relevant planning history and the identification and review of planning policies and designations. It also considered the consultation responses from local authorities and strategic pan-London consultees as part of on-going engagement.

4.2:1.4.7 The first part of the planning assessments considered the planning history of the site for the preceding five years (based on the normal period of validity of planning permissions) taken from the Local Planning Authority online database.

4.2:1.4.8 Where a significant extant permission was found, eg for a major redevelopment, the details of the application were considered. Thames Water checked whether any development had commenced on-site during visits and site monitoring. If no reasonable level of development activity was observed on-site, the timescales for implementation of the planning permission remained unknown and a planning issue was recorded against the site. Where development had commenced on-site, the status was re-evaluated at the workshop, taking account of the nature of the new proposal, and the site was not progressed further.

4.2:1.4.9 The second and third parts of the planning assessments focused on the existing policy context of each site. This was conducted via a map-based desktop appraisal of designations from each of the affected London local authorities and covered areas such as:

a. existing and proposed site allocations
b. public open space
c. Metropolitan Open Land
d. tree preservation orders
e. Sites of Importance for Nature Conservation
f. listed buildings
g. conservation areas
h. Archaeology Priority Areas
i. safeguarded wharves
j. Thames Policy Area
k. protected views

l. opportunity and regeneration areas

m. contaminated land

n. air quality protection zones

o. strategic transport routes

p. pedestrian and cycle routes.

4.2:1.4.10 The planning context provided a factual list of the applicable designations both on and adjacent to each shortlisted site, supported by a short summary of the wording of each related policy.

4.2:1.4.11 This section was followed by a planning commentary on how likely the proposed main tunnel and CSO construction works were to be in conformity with relevant policies and potential mitigation measures. Consideration was also given to how any permanent structures might affect the designations.

4.2:1.4.12 Site designations relating to heritage, landscape, ecology and transport were assessed from a policy point of view and further assessments were carried out by specialists as part of the environment assessment.

4.2:1.4.13 The fourth element incorporated the factual comments received from local authorities and strategic pan-London stakeholders in response to on-going engagement and all phases of consultation.

4.2:1.4.14 The final conclusion of the planning assessment recommended the general level of suitability of sites in planning terms, based on the relevant considerations and professional judgement.

Environment

4.2:1.4.15 The environmental assessments concentrated on nine technical areas:

a. transport

b. archaeology

c. built heritage and townscape

d. water resources – hydrogeology and surface water

e. ecology (aquatic and terrestrial)

f. flood risk

g. air quality

h. noise

i. land quality.

4.2:1.4.16 Following the individual appraisals by each technical expert, an overall conclusion of site suitability in environmental terms was formed. The findings on all the environmental technical topics were appropriately considered.

4.2:1.4.17 Thames Water took account of the value and number of receptors likely to be affected, the type of measures likely to be required to avoid or reduce

adverse impacts, the potential to mitigate adverse impacts, and the level of suitability attributed to the site by each expert.

4.2:1.4.18 The environment conclusion was based on the potential cumulative environmental impacts of each site and the application of the experts' professional judgement.

Community

4.2:1.4.19 This assessment focused on any important socio-economic and community impacts and issues. Thames Water based these considerations on professional judgement, information gained from site visits, relevant desktop data and research.

4.2:1.4.20 The main areas for consideration were as follows:

a. review of the social economic profile of the area surrounding the site

b. identification of potential issues and impacts from the use of the site on the local community.

4.2:1.4.21 The consideration of issues and impacts focused on the potential implications of using a site from a community perspective, such as proximity to sensitive receptors and impacts on local businesses. These issues were identified, commented on and any potential mitigation measures suggested, where appropriate.

4.2:1.4.22 The conclusions of the community assessment identified the general level of suitability of the site in community terms, based on the relevant considerations listed above and the exercise of professional judgement.

Property

4.2:1.4.23 The property considerations focused on issues of procedural risk and the potential for compensation events. Thames Water established the level of suitability of a site through a cumulative process, which sought to consider relevant property factors based on available data and professional judgement. The property assessment also used the planning history to inform acquisition valuations of the shortlisted sites and consider prospects for acquisition.

4.2:1.4.24 The consideration of shortlisted sites by the property team focused on the following topics:

a. ownership and tenancy details

b. Crown Land or Special Land

c. property valuation comments

d. disturbance compensation

e. off-site statutory compensation

f. site acquisition cost assessment

g. other statutory enquiries.

4.2:1.4.25 The property conclusions provided a view on the general level of suitability of the site in property terms, based on the relevant considerations above and the exercise of professional judgement.

4.2:1.5 Next steps in the site selection process

4.2:1.5.1 After the preparation of the site suitability reports, multidisciplinary optioneering workshops were held to consider the report findings, potential drive options (refer to Annex 4.3), consultation feedback, any new information or changes of circumstances.

4.2:1.5.2 At the workshops, a preferred site for each CSO could only be determined after the consideration and comparison of all the final shortlisted sites.

4.2:1.5.3 The decision process for main tunnel sites involved a multi-staged process (refer to Figure 4.16). In summary, the suitability and use of a site could not be determined until the main tunnel zone and drive options comparisons had been considered. That is, it would be incorrect to make an assumption on a site based solely on an individual discipline's assessment in a site suitability report.

4.2:1.5.4 The entire process required a balanced judgement both within a discipline and within a multidisciplinary workshop. By discussing all relevant viewpoints a collective decision was agreed, which was endorsed by Thames Water.

Annex 4.3 Main tunnel drive options

4.3:1.1 Introduction

4.3:1.1.1 This annex outlines the relevant part of the *Site selection methodology paper*, sets out key factors in the development of the drive options, and describes the drive options. A summary of the final drive options used to determine the scheme is presented below in Table 4.2. The process for considering the drive options at the optioneering workshops is explained in the final section of this annex.

4.3:1.2 Creation of the preferred list

4.3:1.2.1 In order to arrive at the preferred list of sites (Part 1C of the *Site selection methodology paper*), a further detailed assessment was undertaken of all the sites on the final short list and potential tunnelling drive options were developed.

4.3:1.2.2 The preferred list of sites was created from shortlisted sites split across CSOs and eight main tunnel site zones on the Abbey Mills route. This process involved three steps; the first two took place concurrently and the third step brought together the findings of the first two stages:

a. Thames Water assessed the suitability of all sites on the final shortlist in site suitability reports (refer to Annex 4.2 for further details).

b. An engineering options report was produced that set out tunnel drive options and CSO connection types for the three potential route alignments, with regard to the availability and spacing of main tunnel shortlisted sites (described in this annex)

c. Optioneering workshops were held at which the five disciplines discussed key factors from the site suitability reports and engineering options report in order to determine the preferred drive options and sites (refer to Figure 4.16 for further details on the main tunnel decision making process).

4.3:1.2.3 It should be noted that there was an important relationship between tunnel drive optioneering and site selection. It was necessary to consider how the potential main tunnel sites linked together to form possible drive options and to consider shortlisted main tunnel sites assigned to particular zones. Furthermore, it was important to recognise how the various combinations of zones and uses of main tunnel site (drive or reception) were identified as possible drive options by taking account of the design and engineering requirements.

4.3:1.3 Key considerations in the development of main tunnel drive options

4.3:1.3.1 The horizontal alignment of the main tunnel would generally follow the River Thames, where possible and practical, in order to:

a. ensure the most efficient route to connect the CSOs located on both banks of the river

b. enable river transport during construction to supply and remove materials, where practicable and economic

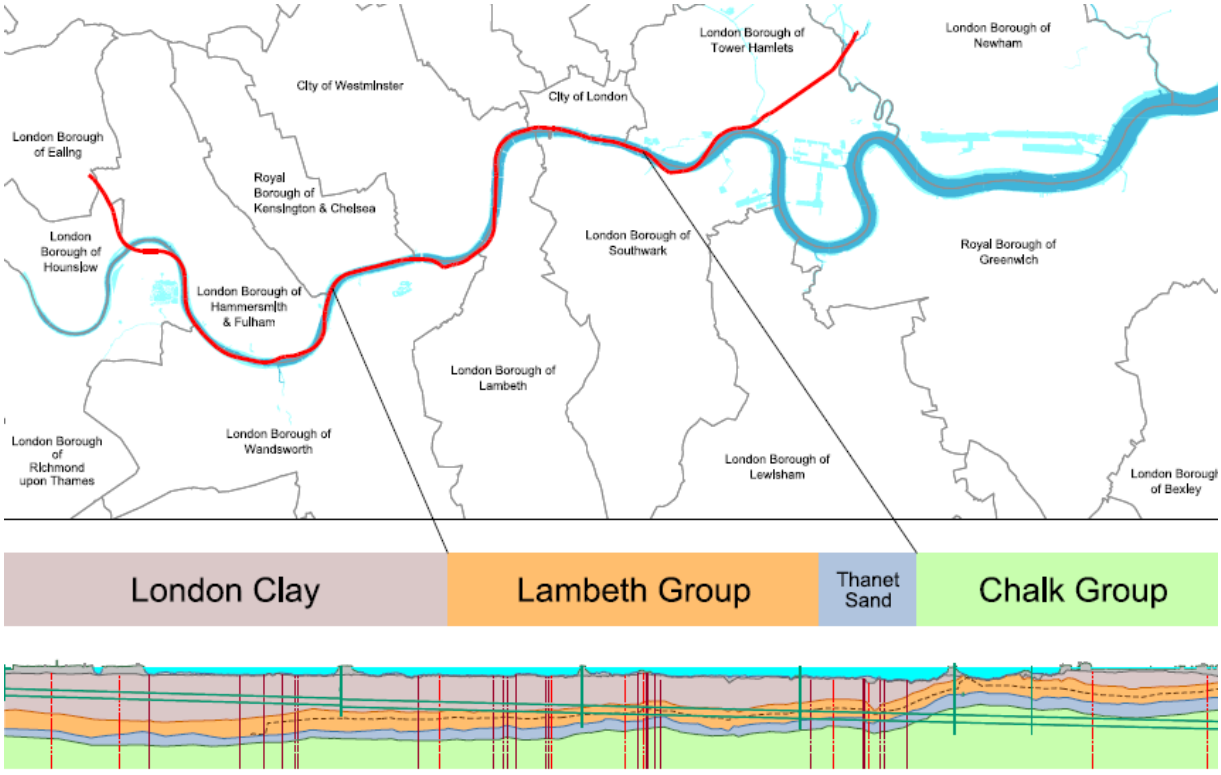
c. minimise the number of structures the tunnel would pass beneath in order to reduce the number of third parties affected.

4.3:1.3.2 The geology varies across the route. In the west the tunnel would principally run through London Clay. In the central area between Albert Bridge and Tower Bridge it would run through the 'Lambeth Group' and 'Thanet Sand Formation', which are composed of gravels, sand and clay. At the eastern end, the tunnel would run through Chalk.

4.3:1.3.3 These differences in geology, the location of the sites, and the requirement for construction below the water table influence the selection of construction techniques and machinery.

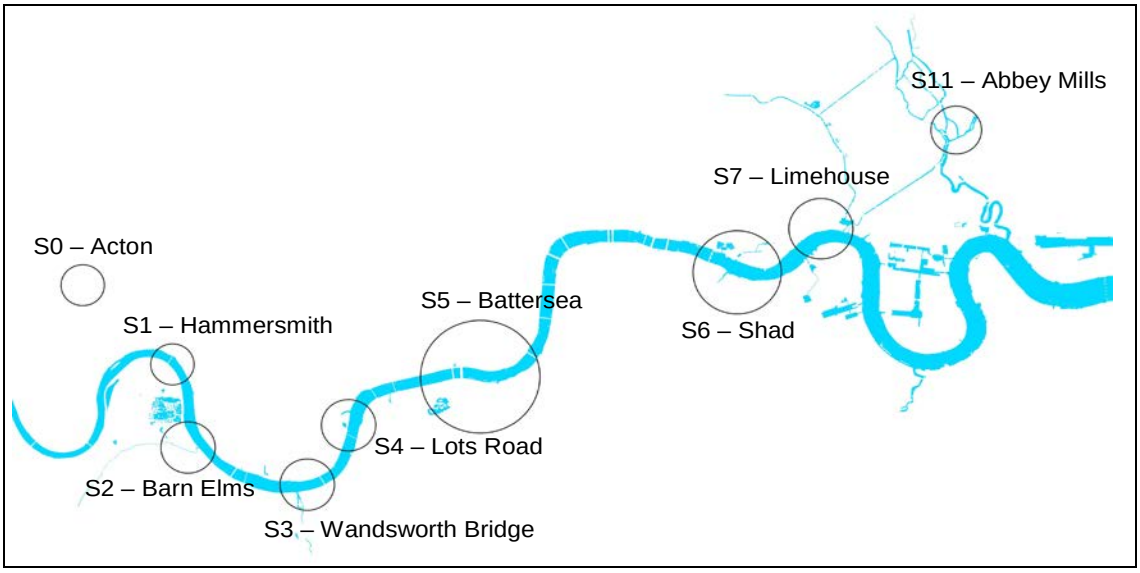
4.3:1.3.4 The main tunnel would be constructed using two types of TBM: a slurry TBM for Chalk and an earth pressure balance (EPB) TBM for London Clay, the Lambeth Group and the Thanet Sand Formation. A high level summary that shows key geology changes across the Abbey Mills route is illustrated in Figure 4.13.

Figure 4.13 Geological section of the Abbey Mills route



4.3:1.3.5 In order to manage all combinations of main tunnel drive site options, the final short list of sites were grouped into a limited number of main tunnel site zones. This was based on the geographical proximity of the sites to each other. Figure 4.14 illustrates the zones for the Abbey Mills route.

Figure 4.14 Main tunnel site zones for the Abbey Mills route



4.3:1.4 Main tunnel drive options prior to the application

4.3:1.4.1 The basic constraints below were applied to establish the initial number of drive options:

a. a construction period of six years

b. drive lengths (maximum and minimum estimated to be 12 km and 3km)

c. site type (double drive, single drive or intermediate/reception site)

d. the vertical alignment and gradient constraints for the tunnel

e. the distance between access points for the operation and maintenance of the permanent works.

4.3:1.4.2 The *Engineering Design Statement*, which accompanies the application, provides a further explanation of the technical rationale for the project. The programme for delivery is influenced by Defra's *Regulatory impact assessment – sewage collection and treatment for London*, which concluded that Thames Water should be asked to proceed as quickly as possible with a tunnel-based solution to resolve the excessive CSO discharges in London.

4.3:1.4.3 Determining the reasonable time period in which to construct the project included consideration of the above Defra document, construction industry practices, the need to work safely and efficiently, and potential environmental impacts. Working too quickly or too slowly would also adversely affect cost.

4.3:1.4.4 For planning purposes and as a basis for determining environmental impacts, the overall shaft and tunnel construction programme was based on completing the main works within a period of approximately six years (excluding any early works). This period would include setting up sites; constructing shafts; tunnelling; secondary lining; constructing other structures; mechanical, electrical, instrumentation, control and automation equipment work; and site restoration.

4.3:1.4.5 The main factors that affect the duration of the construction programme include the following:

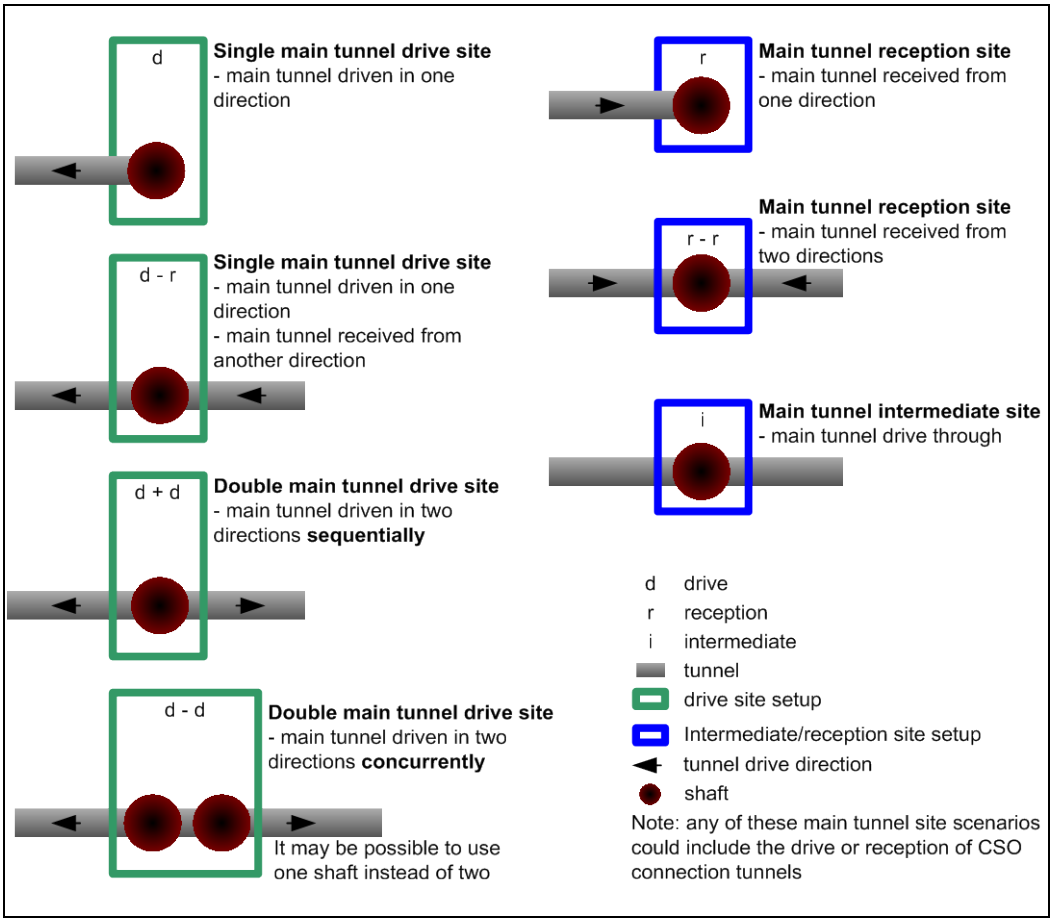
a. Depth and ground conditions at tunnel drive shafts: the time required to construct a shaft to launch a TBM is critical to the programme. Deep shafts in more difficult ground conditions that require ground dewatering and diaphragm wall methods would take longer than shallower shafts in more favourable conditions.

b. Length of tunnel drive: the duration of a drive is generally proportional to its length. The average tunnel drive rates would reduce for very short drives for which a greater proportion of the time is used to establish the back-up equipment for the TBM. The geological conditions also affect the rate of tunnelling in each area.

c. TBMs should be matched to the geology in order to optimise tunnelling production rates and to ensure that drive lengths are reasonable. Very long drives increase the risk of mechanical breakdowns and interventions to repair the cutterhead and very short drives are inefficient.

4.3:1.4.6 Figure 4.15 summarises the possible main tunnel site types that were used to establish feasible drive options.

Figure 4.15 Main tunnel site types



4.3:1.4.7 The phase two consultation feedback raised concerns regarding the tunnelling strategy in the western and eastern sections of the main tunnel (Carnwath Road Riverside and Chambers Wharf). A number of alternative drive options were suggested, which lead to the preparation of the *Engineering options report – Abbey Mills route* (Spring 2012). However this report dismissed the feasibility of the alternative drive options and concluded that the potentially feasible options remained the same as those arrived at in the *Engineering options report – Abbey Mills route* (Summer 2011).

4.3:1.4.8 Table 4.2 summarises the main tunnel drive options from the *Engineering options report – Abbey Mills route* (Spring 2012). These options were considered in the review of the scheme prior to and after Section 48 publicity as no new alternatives were raised.

Table 4.2 Summary of main tunnel drive options

	Zone										
	Acton	Barn Elms	Wandsworth Bridge	Battersea		Shad	Limehouse	Abbey Mills	**Number of drive sites**	**Number of intermediate sites**	**Number of reception sites sites**	**Number of TBMs**
Drive option	**S0**	**S2**	**S3**	**S5**		**S6**	**S7**	**S11**				
W1/E1	r	d-r	-	d	d	-	r-r	d	3	0	2	4
W1/E2	r	d-r	-	d	d	-	r-d	r	3	0	2	4
W1/E3	r	d-r	-	d	d	r-r	-	d	3	0	2	4
W1/E4	r	d-r	-	d	d	r-d	-	r	3	0	2	4
W1/E5	r	d-r	-	d	r	d-r	-	d	4	0	1	4
W1/E6	r	d-r	-	d	r	-	d-r	d	4	0	1	4
W2/E1	r	d-d	-	r	d	-	r-r	d	3	0	2	4
W2/E2	r	d-d	-	r	d	-	r-d	r	3	0	2	4
W2/E3	r	d-d	-	r	d	r-r	-	d	3	0	2	4
W2/E4	r	d-d	-	r	d	r-d	-	r	3	0	2	4
W2/E5	r	d-d	-	r	r	d-r	-	d	3	0	2	4
W2/E6	r	d-d	-	r	r	-	d-r	d	3	0	2	4
W3/E1	r	-	d-r	d	d	-	r-r	d	3	0	2	4
W3/E2	r	-	d-r	d	d	-	r-d	r	3	0	2	4
W3/E3	r	-	d-r	d	d	r-r	-	d	3	0	2	4
W3/E4	r	-	d-r	d	d	r-d	-	r	3	0	2	4
W3/E5	r	-	d-r	d	r	d-r	-	d	4	0	1	4
W3/E6	r	-	d-r	d	r	-	d-r	d	4	0	1	4

Legend: The following nomenclature/legend is used in the table to define the types of site required in the defined zones. Where 'd' denotes drive site, 'r' denotes reception site and 'i' denotes intermediate site. The tunnel is driven from a 'd' drive location to a 'r' reception location and through an 'i' intermediate location.

No site required	Single Reception	Double Reception	Intermediate	Drive and Reception	Single Drive	Double Drive
-	r	r-r	i	r-d	d	d-d

4.3:1.4.9 In order to interpret the various drive options set out in Table 4.2, it may be helpful to consider the following description of the final option above, W3/E6:

a. A site in Zone S0 Acton would be used to receive a TBM from a site in Zone S3 Wandsworth Bridge.

b. A site in Zone S3 Wandsworth Bridge would be used to drive a TBM to a site in Zone S0 Acton.

c. The same site at S3 Wandsworth Bridge would also be used to receive a TBM from the other direction, from a drive site in Zone S5 Battersea.

d. A site in Zone S5 Battersea would be used to drive a TBM to Zone S3 Wandsworth Bridge.

e. The same site in Zone S5 Battersea would also be used to receive a TBM from a drive site at Zone S7 Limehouse.

f. A site in Zone S7 Limehouse would be used drive a TBM to a site in Zone S5 Battersea.

g. The same site in Zone S7 Limehouse would also be used to receive a TBM from a drive site in Zone S11 Abbey Mills.

h. A site in Zone S11 Abbey Mills would be used to drive a TBM to a site in Zone S7 Limehouse.

4.3:1.4.10 Table 4.2 lists the 18 potentially feasible drive options and demonstrates that:

a. All 18 options would use four TBMs.

b. Four options would use four drive sites and one reception site, while 14 options would use three drive sites and two reception sites.

c. All options would require a main tunnel site in Zone S0 Acton, Zone S5 Battersea and Zone S11 Abbey Mills.

d. All options would require a main tunnel site in either Zone S2 Barn Elms or Zone S3 Wandsworth Bridge.

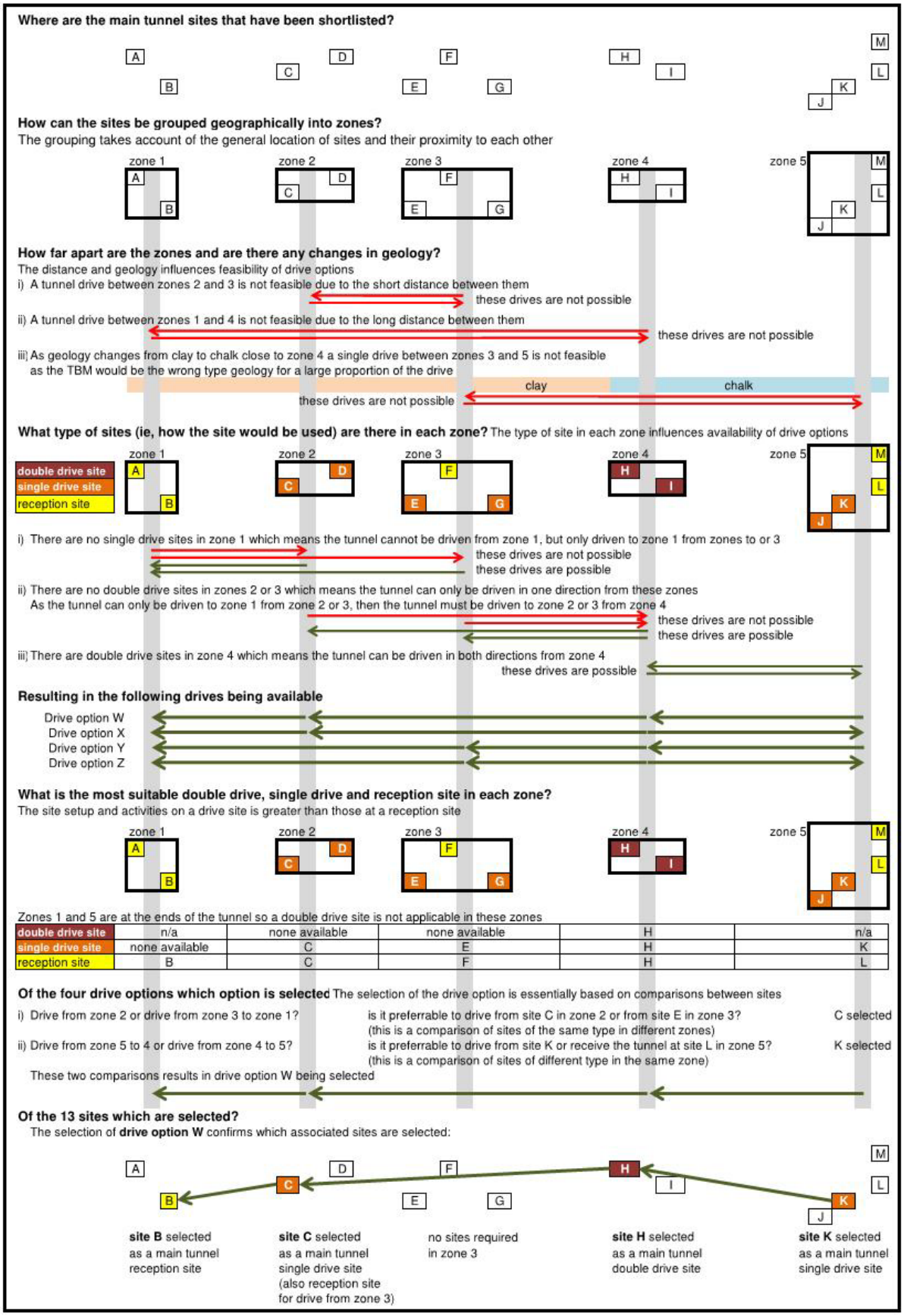
e. All options would require a main tunnel site in either Zone S6 Shad or Zone S7 Limehouse.

4.3:1.5 Next steps in the site selection process

4.3:1.5.1 After the preparation of the site suitability reports, multidisciplinary optioneering workshops were held to consider the findings, potential drive options, consultation feedback, any new information or changes of circumstances.

4.3:1.5.2 The decision process for main tunnel sites involved a multi-staged process (refer to Figure 4.16). In summary, the suitability and use (ie, main tunnel reception site or main tunnel drive site) of a site cannot be determined until the main tunnel zone and drive options comparisons had been considered.

Figure 4.16 Illustrative main tunnel decision making process



	zone 1	zone 2	zone 3	zone 4	zone 5
double drive site	n/a	none available	none available	H	n/a
single drive site	none available	C	E	H	K
reception site	B	C	F	H	L

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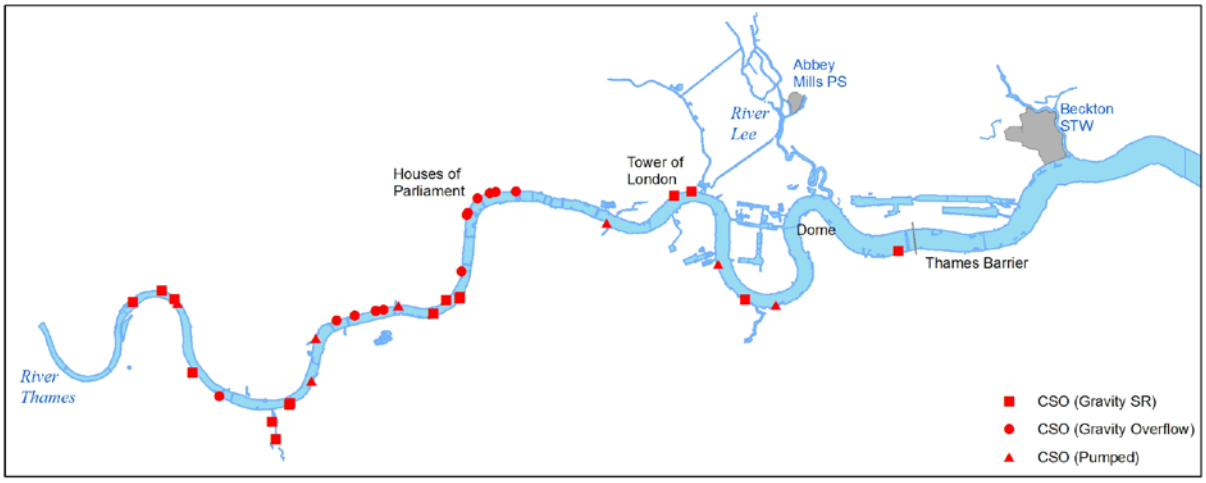
Annex 4.4 CSO flow control methods and site changes

4.4:1.1 Introduction

4.4:1.1.1 This annex describes how the 34 CSOs would be controlled by the project and all the changes that took place during the pre-application period. Figure 4.17 shows the 34 CSOs to be controlled by the project.

Figure 4.17 CSOs to be controlled by the project



4.4:1.1.2 The 34 CSOs would be controlled by the following methods:

a. Method A: some CSOs would be intercepted and connected to the main tunnel at a CSO site.

b. Method B: some CSOs would be controlled by diverting flows into the main tunnel at a CSO site and next to these CSOs a local connection would also be made to the existing northern Low Level Sewer No.1 to divert some flows to the main tunnel.

c. Method C: some CSOs would be controlled due to the extra capacity in the northern Low Level Sewer No.1 created by Method B sites. Therefore these CSOs would not require worksites.

d. Method D: some CSOs would be controlled by modifications to the operation of the existing sewerage system, including pumping stations and sewers, in order to store flows and transfer them to the sewage treatment works via the existing sewerage system.

e. Method E: local in-sewer modifications works have already been carried out and flows of one CSO are controlled (not part of the proposed development).

4.4:1.1.3 The flow control proposals for the 34 unsatisfactory CSOs are listed in Table 4.3 below. The table lists the phase one consultation CSOs for all three route alignment and associated control methods and sites. It also lists the changes made at phase two consultation, which remains the case for the application (changes are shown in **bold**).

Table 4.3 Flow control proposals for CSOs and sites

CSO	All three routes Phase one consultation		Abbey Mills route Phase two consultation to application	
	Method	**Site (if required)**	**Method**	**Site (if required)**
Acton Storm Relief	A	CSO site: Acton Storm Tanks (also receive connection tunnel)	A	**Main tunnel/**CSO **site:** Acton Storm Tanks (**revised site layout)**
Stamford Brook Storm Relief	D	No site required	D	No site required
North West Storm Relief	D	No site required	D	No site required
Hammersmith Pumping Station	A	CSO site: Hammersmith Pumping Station (also main tunnel reception and drive connection tunnel)	A	**CSO site:** Hammersmith Pumping Station **(revised location for smaller site)**
West Putney Storm Relief	A	CSO site: Barn Elms (also combine with main tunnel)	A	CSO site: Barn Elms **(revised location for smaller CSO site and revised access)**
Putney Bridge	A	CSO site: Putney Bridge Foreshore	A	CSO site at phase two consultation: **Putney Bridge Foreshore** CSO site at Section 48 publicity and application: **Putney Embankment Foreshore**
Frogmore Storm Relief – Bell Lane Creek	A	CSO site: Bell Lane Creek	A	CSO site: **Dormay Street**
Frogmore Storm Relief – Buckhold Road	A	CSO site: King George's Park	A	CSO site: King George's Park
Jews Row Wandle Valley Storm Relief Jews Row Falconbrook Storm Relief	A	CSO site: Jews Row	**E**	**No site required**
Falconbrook Pumping Station	A	CSO site: Bridges Court Car Park	A	CSO site: **Falconbrook Pumping Station**
Lots Road Pumping Station	A	CSO site: Cremorne Wharf Foreshore	A	CSO site: **Cremorne Wharf Depot**

CSO	All three routes Phase one consultation		Abbey Mills route Phase two consultation to application	
	Method	**Site (if required)**	**Method**	**Site (if required)**
Church Street	C	No site required	C	No site required
Queen Street	C	No site required	C	No site required
Smith Street – Main Line Smith Street – Storm Relief	C	No site required	C	No site required
Ranelagh	B	CSO site: Chelsea Embankment Foreshore	B	CSO site: Chelsea Embankment Foreshore **(revised location)**
Western Pumping Station	C	No site required	C	No site required
Heathwall Pumping Station	A	CSO site: Heathwall Pumping Station (combined with main tunnel site at Tideway Walk)	A	CSO site: Heathwall Pumping Station **(not combined with main tunnel site)**
South West Storm Relief	A		A	
Kings Scholars Pond	C	No site required	C	No site required
Clapham Storm Relief	A	CSO site: Albert Embankment Foreshore	A	CSO site: Albert Embankment Foreshore
Brixton Storm Relief	A		A	
Grosvenor Ditch	C	No site required	C	No site required
Regent Street	B	CSO site: Victoria Embankment Foreshore	B	CSO site: Victoria Embankment Foreshore
Northumberland Street	C	No site required	C	No site required
Savoy Street	C	No site required	C	No site required
Norfolk Street	C	No site required	C	No site required
Essex Street	C	No site required	C	No site required
Fleet Main	B	CSO site: Blackfriars Bridge Foreshore	B	CSO site: Blackfriars Bridge Foreshore
Shad Thames Pumping Station	A	CSO site: Druid Street	**D**	**System modification site: Shad Thames Pumping Station**
North East Storm Relief	A	CSO site: King Edward Memorial Park (on River	A	CSO site: King Edward Memorial Park

CSO	All three routes Phase one consultation		Abbey Mills route Phase two consultation to application	
	Method	**Site (if required)**	**Method**	**Site (if required)**
		Thames and Rotherhithe routes)		Foreshore
	A	CSO site: King Edward Memorial Park Foreshore (on Abbey Mills route)		
Holloway Storm Relief	A	CSO site: Butcher Row	**D**	**System modification site: Bekesbourne Street**
Earl Pumping Station	A	CSO site: Earl Pumping Station	A	CSO site: Earl Pumping Station
Deptford Storm Relief	A	CSO site: Borthwick Wharf Foreshore	A	CSO site: **Deptford Church Street**
Greenwich Pumping Station	A	CSO site: Greenwich Pumping Station (receive connection tunnel)	A	CSO site: Greenwich Pumping Station **with Phoenix Wharf (revised location and drive connection tunnel)**
Charlton Storm Relief (CSO only intercepted on the River Thames and Rotherhithe routes)	D	River Thames and Rotherhithe routes – CSO site: Herringham Road Abbey Mills route - no CSO site required	D	No site required

4.4:1.1.4 The phase one consultation CSOs for all three routes and control methods are listed in Table 4.3 and illustrated in Figure 4.18. The control methods and CSOs on the Abbey Mills route for the application listed in Table 4.3 are illustrated in Figure 4.19.

Figure 4.18 Phase one consultation CSOs and control methods for all three routes

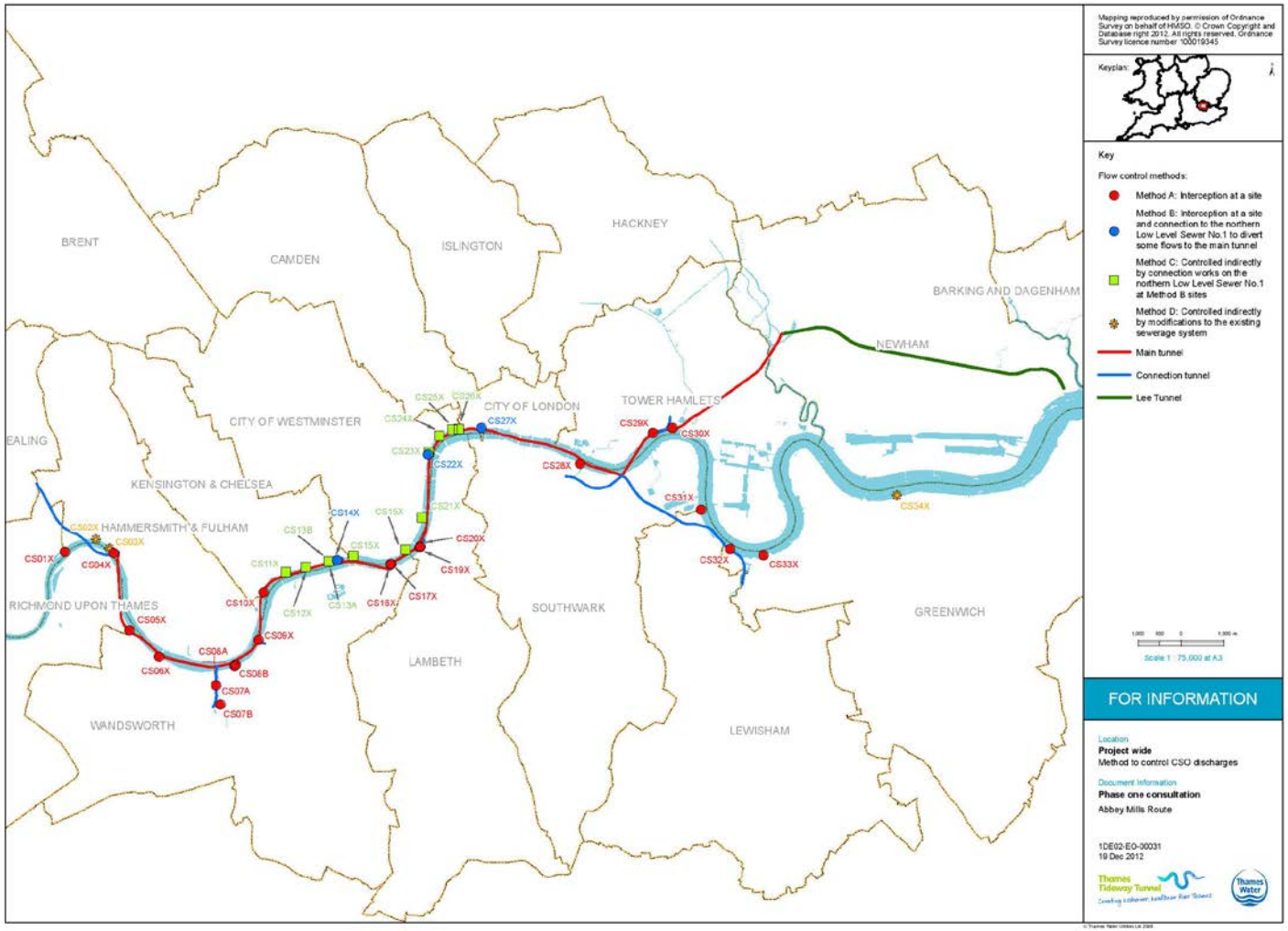
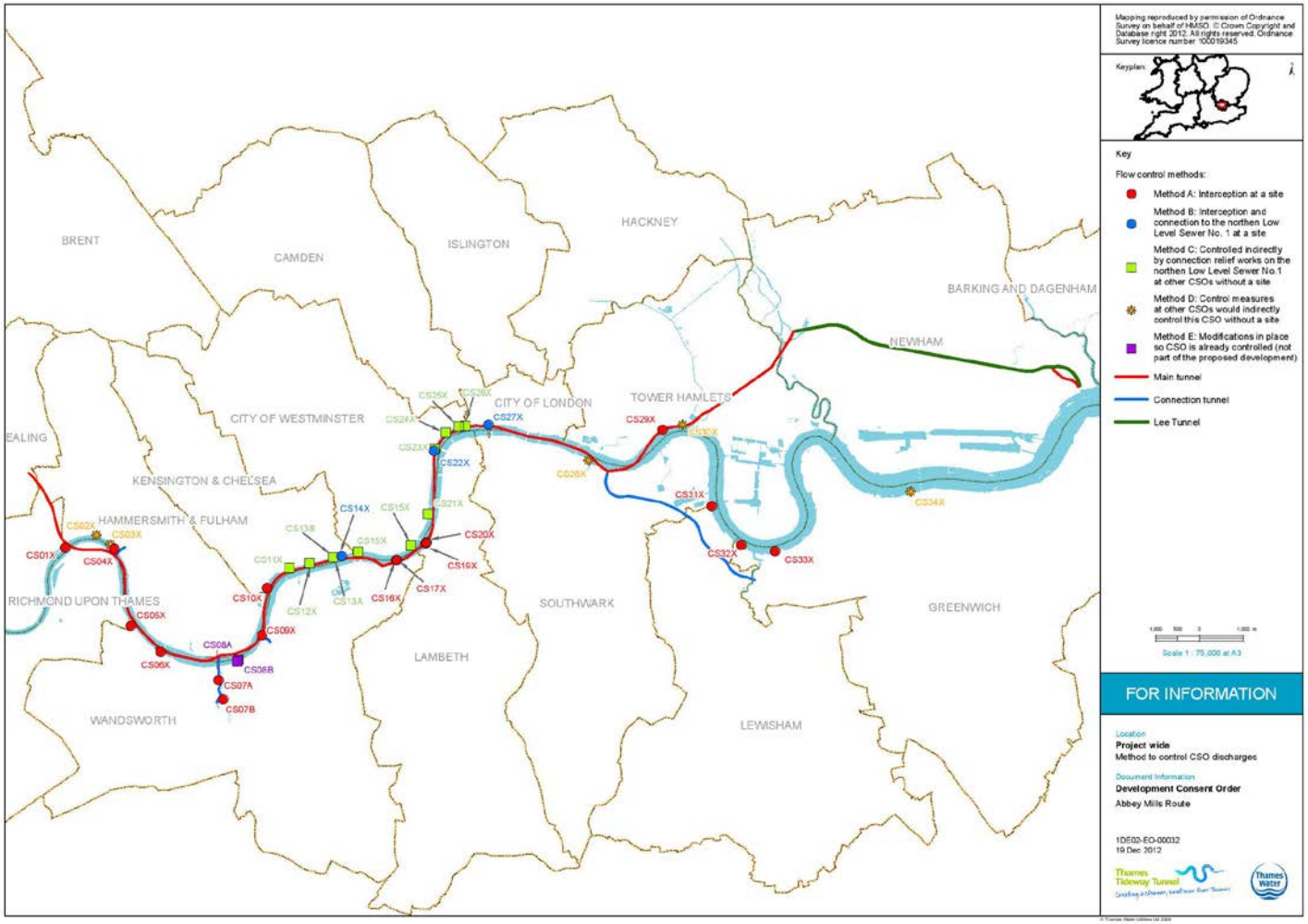


Figure 4.19 Application CSOs and control methods for the Abbey Mills route



Thames Tideway Tunnel
Thames Water Utilities Limited

Application for Development Consent

Application Reference Number: WWO10001

Planning Statement

Doc Ref: **7.01**

Project Description

APFP Regulations 2009: Regulation **5(2)(q)**

Hard copy available in

Box **43** Folder **A**
January 2013

Thames Tideway Tunnel

Creating a cleaner, healthier River Thames

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5 Project description

5.1 Overview

5.1.1 This section sets out a general project description following the site selection process as set out in Section 4.

5.2 Main works and sites

5.2.1 The works to construct the project comprise the following principal elements:

a. tunnels:
   i the main tunnel
   ii connection tunnels

b. sites:
   i main tunnel sites
   ii CSO sites
   iii system modification sites
   iv Beckton Sewage Treatment Works

c. above-ground works.

Tunnels

Main tunnel

5.2.2 The main tunnel would connect to the Lee Tunnel at Abbey Mills Pumping Station. The Lee Tunnel receives flow from the Abbey Mills Pumping Station CSO and connects Abbey Mills Pumping Station to Beckton Sewage Treatment Works. All flows entering the combined systems would be transferred to Beckton Sewage Treatment Works via the Lee Tunnel.

5.2.3 The horizontal alignment of the main tunnel would generally follow the River Thames, where possible and practical, in order to:

a. ensure the most efficient route to connect the CSOs located on both banks of the river

b. enable river transport during construction to supply and remove materials, where practicable and economic

c. minimise the number of structures the tunnel would pass beneath in order to reduce the number of third parties affected.

5.2.4 The main tunnel route would take the shortest practical line from Acton Storm Tanks to the River Thames and stay beneath the river from west London to Rotherhithe. It would then divert from beneath the river to the northeast via the Limehouse Cut and terminate at Abbey Mills Pumping Station, where it would connect to the Lee Tunnel.

5.2.5 The main tunnel would be approximately 25km long with an approximate internal diameter of 6.5m in the west increasing to 7.2m through central and east London. The approximate depth of the tunnel would be between 30m at Acton Storm Tanks and 65m at Abbey Mills Pumping Station in order to provide sufficient clearance to existing tunnels and facilities under the capital and meet hydraulic requirements.

Connection tunnels

5.2.6 Two long connection tunnels would be required in order to connect five remote CSOs to the main tunnel. The tunnels are known as:

a. the Frogmore connection tunnel (approximately 2.6m to 3m in internal diameter and approximately 1.1km long), which would be situated in the London Borough of Wandsworth

b. the Greenwich connection tunnel (approximately 5m in internal diameter and approximately 4.6km long), which would be situated in the London boroughs of Southwark and Lewisham and the Royal Borough of Greenwich.

5.2.7 A series of nine shorter connection tunnels would also be necessary to connect various CSOs that would be close to the proposed alignment of the main tunnel.

Site types

5.2.8 A detailed site selection process was carried out which identified the 24 sites set out in Table 5.1 and on Figure 5.1 as suitable for the purpose of constructing the proposed project. The sites can be categorised by function as follows:

a. main tunnel sites

b. CSO sites

c. system modification sites

d. Beckton Sewage Treatment Works.

5.2.9 Main tunnel sites would be used to construct the main tunnel as ‘drive sites’ and/or ‘reception sites’, depending on the direction in which the TBMs would be driven. The five main tunnel sites include:

a. Acton Storm Tanks (main tunnel reception site and CSO interception site)

b. Carnwath Road Riverside (main tunnel drive and reception site; Frogmore connection tunnel reception site)

c. Kirtling Street (main tunnel double drive site)

d. Chambers Wharf (main tunnel drive and reception site; Greenwich connection tunnel reception site)

e. Abbey Mills Pumping Station (main tunnel reception site).

5.2.10 A total of 16 CSO sites would be used to construct the CSO interception structures and associated connection tunnels, as follows.

a. Two CSO sites would be used to drive long connection tunnels:
    i Dormay Street (Frogmore connection tunnel double drive site)
    ii Greenwich Pumping Station (Greenwich connection tunnel drive site).
b. One CSO site would be used to receive a long connection tunnel:
    i King George's Park (Frogmore connection tunnel reception site).
c. Nine CSO sites would also be used to construct short connection tunnels to the main tunnel:
    i Hammersmith Pumping Station (Hammersmith connection tunnel)
    ii Barn Elms (West Putney connection tunnel)
    iii Putney Embankment Foreshore (Putney Bridge connection tunnel)
    iv Falconbrook Pumping Station (Falconbrook connection tunnel)
    v Cremorne Wharf Depot (Lots Road connection tunnel)
    vi Chelsea Embankment Foreshore (Ranelagh connection tunnel)
    vii Heathwall Pumping Station (Heathwall/SWSR connection tunnel)
    viii Albert Embankment Foreshore (Clapham/Brixton connection tunnel)
    ix Victoria Embankment Foreshore (Regent Street connection tunnel).
d. Four CSO sites would connect directly either to the main tunnel or to a long connection tunnel via a drop-shaft:
    i Blackfriars Bridge Foreshore (main tunnel)
    ii King Edward Memorial Park Foreshore (main tunnel)
    iii Deptford Church Street (Greenwich connection tunnel)
    iv Earl Pumping Station (Greenwich connection tunnel).

5.2.11 Two system modification sites would be used to control CSOs by locally altering the operation of the existing sewerage system rather than intercepting and connecting them to the main tunnel:

a. Shad Thames Pumping Station (Shad Thames Pumping Station CSO)
b. Bekesbourne Street (Holloway Storm Relief CSO).

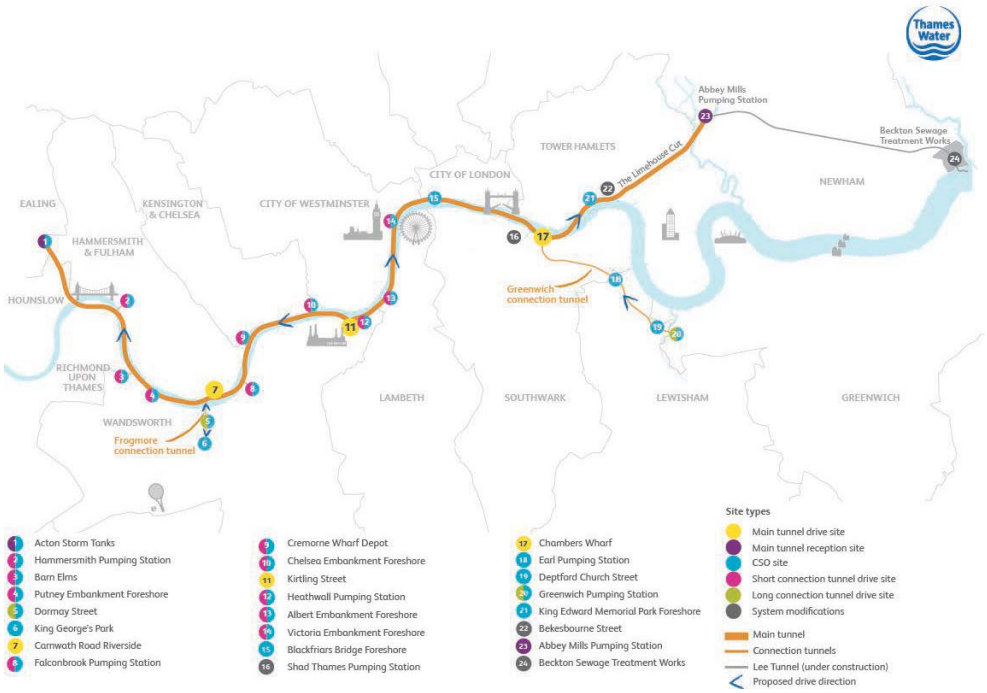
5.2.12 The Beckton Sewage Treatment Worksite would be used to:

a. extend the pumping capacity at the treatment works by installing two pumps in the Tideway Pumping Station and pipeline works to transfer the flows from this pumping station to the inlet works
b. install additional mechanical and electrical equipment at the inlet works

c. construct two shafts and a siphon tunnel to transfer tunnel overflows to the Lee Tunnel overflow shaft.

5.2.13 The full description of development at each site is provided in the relevant site-specific appendices. Figure 5.1 illustrates the proposed sites and drive options along the tunnel route.

Figure 5.1 Proposed tunnel route map with sites and drive options



5.3 CSO flow control

5.3.1 The 34 CSOs identified by the Environment Agency for control by the project would be controlled by the following methods:

a. Method A: Fifteen CSOs would be intercepted and connected to the main tunnel.

b. Method B: Three CSOs would be controlled by diverting flows into the main tunnel and making a connection to the existing northern Low Level Sewer No.1 to divert some flows to the main tunnel.

c. Method C: Ten CSOs would be controlled due to the extra capacity in the northern Low Level Sewer No.1 created by Method B. These CSOs would not be intercepted and no worksites are required.

d. Method D: Five CSOs would be controlled by means of modifications to the operation of the existing sewerage system, including pumping stations and sewers, in order to store flows and transfer them to the sewage treatment works via the existing system. Only two of these CSOs require worksites.

e. Method E: One CSO is already controlled by means of local in-sewer modification works.

5.3.2 The flow control proposals for the 34 unsatisfactory CSOs are listed in Table 5.1 below and shown in Figure 4.19.

Table 5.1 Proposed flow control for CSOs and site locations

CSO	Method of flow control	Type of site required
Acton Storm Relief	Method A: interception	Main tunnel site: Acton Storm Tanks
Stamford Brook Storm Relief	Method D: control measures at other CSOs would indirectly control this CSO	No site required
North West Storm Relief	Method D: control measures at Hammersmith Pumping Station would indirectly control this CSO	No site required
Hammersmith Pumping Station	Method A: interception and pumping station operation changes	CSO site: Hammersmith Pumping Station
West Putney Storm Relief	Method A: interception	CSO site: Barn Elms
Putney Bridge	Method A: interception	CSO site: Putney Embankment Foreshore
Frogmore Storm Relief – Bell Lane Creek	Method A: interception	CSO site: Dormay Street
Frogmore Storm Relief – Buckhold Road		CSO site: King George's Park
Jews Row Wandle Valley Storm Relief Jews Row Falconbrook Storm Relief	Method E: CSO is controlled by modifications that are already in place	No site required
Falconbrook Pumping Station	Method A: interception and pumping station operation changes	CSO site: Falconbrook Pumping Station
Lots Road Pumping Station	Method A: interception	CSO site: Cremorne Wharf Depot
Church Street	Method C: indirect control by connection relief works on the northern Low Level Sewer No. 1 at other CSOs	No site required

CSO	Method of flow control	Type of site required
Queen Street	Method C: indirect control by connection relief works on the northern Low Level Sewer No. 1 at other CSOs	No site required
Smith Street – Main Line Smith Street – Storm Relief	Method C: indirect control by connection relief works on the northern Low Level Sewer No. 1 at other CSOs	No site required
Ranelagh	Method B: interception and connection to the northern Low Level Sewer No. 1	CSO site: Chelsea Embankment Foreshore
Western Pumping Station	Method C: indirect control by connection relief works on the northern Low Level Sewer No.1 at other CSOs and possible pumping station operation changes	No site required
Heathwall Pumping Station	Method A: interception	CSO site: Heathwall Pumping Station
South West Storm Relief	Method A: interception	
King Scholars Pond	Method C: indirect control by connection relief works on the northern Low Level Sewer No. 1 at other CSOs	No site required
Clapham Storm Relief	Method A: interception	CSO site: Albert Embankment Foreshore
Brixton Storm Relief	Method A: interception	
Grosvenor Ditch	Method C: indirect control by connection relief works on the northern Low Level Sewer No. 1 at other CSOs	No site required
Regent Street	Method A: interception via connection to the northern Low Level Sewer No. 1	CSO site: Victoria Embankment Foreshore
Northumberland Street	Method C: indirect control by connection relief works on the northern Low Level Sewer No. 1 at other CSOs	No site required

CSO	Method of flow control	Type of site required
Savoy Street	Method C: indirect control by connection relief works on the northern Low Level Sewer No. 1 at other CSOs	No site required
Norfolk Street	Method C: indirect control by connection relief works on the northern Low Level Sewer No. 1 at other CSOs	No site required
Essex Street	Method C: indirect control by connection relief works on the northern Low Level Sewer No. 1 at other CSOs	No site required
Fleet Main	Method B: interception and connection to the northern Low Level Sewer No. 1	CSO site: Blackfriars Bridge Foreshore
Shad Thames Pumping Station	Method D: pumping station modifications	System modification site: Shad Thames Pumping Station
North East Storm Relief	Method A: interception	CSO site: King Edward Memorial Park Foreshore
Holloway Storm Relief	Method D: local in-sewer modifications	System modification site: Bekesbourne Street
Earl Pumping Station	Method A: interception	CSO site: Earl Pumping Station
Deptford Storm Relief	Method A: interception	CSO site: Deptford Church Street
Greenwich Pumping Station	Method A: interception and pumping station operation changes	CSO site: Greenwich Pumping Station
Charlton Storm Relief	Method D: control measures at Greenwich Pumping Station and improvements at Crossness Sewage Treatment Works would control this CSO	No site required

Above-ground permanent works

5.3.3 Some permanent above-ground infrastructure would be required and depending on the type of site and might include:

a. structures in the foreshore at seven sites (including Heathwall Pumping Station) which would enclose the below-ground functional infrastructure

b. air management facilities at all sites and would include ventilation structures and ventilation columns, which would typically be 4m to 8m high, with a maximum height of 15m at two sites: Acton Storm Tanks and Carnwath Road Riverside

c. electrical and control equipment housed in a kiosk structure at most sites, but at some sites they would be housed in existing Thames Water operational buildings.

d. a means of access at all sites

e. areas of hardstanding adjacent to shafts and/or structures to enable periodic inspection and maintenance at all sites.

5.3.4 Construction sites would be restored on completion of the works by means of levelling, in-filling, landscaping and making good.

Maintenance programme

5.3.5 All of the main tunnel shafts, CSO drop shafts and CSO interception chambers would be equipped with instruments to enable the entire tunnel system to be monitored and controlled remotely from a central location. There would be no requirement for personnel to actively operate the system.

5.3.6 Periodic access would be necessary for maintenance and inspection purposes. It is anticipated that equipment inspections would take place approximately every three to six months and tunnel and shaft inspections every ten years.

5.3.7 A full description is provided in the relevant site-specific appendices.

Thames Tideway Tunnel
Thames Water Utilities Limited

Application for Development Consent

Application Reference Number: WWO10001

Planning Statement

Doc Ref: **7.01**

Managing Effects

APFP Regulations 2009: Regulation **5(2)(q)**

Hard copy available in

Box **43** Folder **A**
January 2013

Thames Tideway Tunnel

Creating a cleaner, healthier River Thames

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6 Managing effects

6.1 Introduction

6.1.1 As set out in Section 5, Thames Water's application for development consent contains proposals that would result in environmental, social and economic effects. In developing the proposals through an iterative process of public consultation, engagement with stakeholders and by undertaking an Environmental Impact Assessment, Thames Water sought to identify these effects and incorporate suitable mitigation for any adverse effects in the proposed designs. The findings of the assessment, consultation and engagement are reported in the *Environmental Statement* and *Consultation Report,* which accompany the application.

6.1.2 The mitigation measures identified through this process form part of the proposals for which development consent is being sought. The measures are embedded in the reports and documents in Table 6.1, which are submitted in support of the application in accordance with Regulation 5(2)(q) of the Infrastructure Planning (Applications: Prescribed Forms and. Procedures) Regulations 2009.

Table 6.1 Securing mitigation

Strategy report/document	Means of securing mitigation
Code of Construction Practice	DCO Requirements
Design Principles	DCO Requirements
Excavated Material and Waste Strategy	Partly within *CoCP* through DCO Requirements and an agreement with the Environment Agency.
Air Management Plan	DCO Requirement
Navigational Issues and Preliminary Risk Assessment	DCO Requirement specifying locations of cofferdams and permanent river walls. DCO protective provision
Overarching Archaeological Written Scheme of Investigation	DCO Requirement
Section 106 Obligations: Heads of Terms	Section 106 Obligation
Transport Strategy	Section 106 agreement with the GLA
Draft Project Framework Travel Plan	DCO Requirement
Heritage Statement	DCO Requirements on specific measures

Strategy report/document	Means of securing mitigation
Skills and Employment Strategy	Section 106 Agreement and obligations to be imposed on Contractors
Compensation measures including: Thames Tideway Tunnel projcet compensation programme (including Exceptional Hardship Proecdure, Non-statutory mitigation compensation scheme, Non-statutory disturbance compensation scheme, and the Noise insulation and temporary re-housing policy)	Thames Water to give its assurance publically to honour the policy set out in the relevant documents.

6.1.3 For the most part, mitigation measures are embedded in the design of the project itself. Where mitigation identified in the *Environmental Statement* could not be incorporated into the design, Thames Water proposes to secure the mitigation through (a) Requirements in Schedule 3 of the development consent order (DCO), (b) Section 106 obligations, and/or (c) protective provisions in the DCO.

6.1.4 This section describes each of the above documents and explains the mitigation measures that they contain, how such mitigation would be secured, and how the proposed mitigation strategy accords with the NPS, where appropriate.

6.2 *Code of Construction Practice*

6.2.1 The *Code of Construction Practice* (*CoCP)* sets out a series of measures to be applied throughout construction to mitigate the potential impact of site activities. Significant effects from construction that may affect the natural and human environment, amenity and safety of local residents, road users and traffic flow, businesses and the public would be limited in the vicinity of the works.

6.2.2 The *CoCP* comprises two parts, Part A: General Requirements (project-wide) and Part B: Site-specific Requirements. Part B only sets out the matters that deviate from Part A or provide additional controls or information on site-specific matters.

6.2.3 The *CoCP* would be implemented and enforced through the Requirements in Schedule 3 of the DCO. There would be a project-wide Requirement in relation to the need to comply with Part A and a site-specific Requirement in relation to Part B. The site-specific Requirement would enable amendments to Part B to be agreed with the local planning authority. In addition, the measures included in both parts would be imposed through contractual obligations on the contractor(s).

6.2.4 Splitting the *CoCP* Requirements into two parts would allow the contractor(s) flexibility to deviate from the measures in Part A to address site-specific matters where these differ from the normal approach.

6.2.5 The *CoCP* was developed through on-going consultation with stakeholders as set out inTable 6.2.

Table 6.2 Consultation activities with stakeholders to develop the *CoCP*

Activity/Stage	Date
Outline content document issued for local authorities to comment	16 September 2010
EHO Forum – workshop on *CoCP* Requirements and content with local authorities and environmental team leads	11 February 2011
EHO Forum – working hours strategy presentation	8 April 2011
Working hours strategy issued for local authorities to comment	21 April 2011
Phase two consultation *CoCP* Part A included in consultation material	4 November 2011 to 10 February 2012
Draft *CoCP* Part B templates – issued to local authorities	23 December 2011
Thames Water – local authorities meetings	18 January 2012 to 9 February 2012
Thames Water – other stakeholders including the Greater London Authority meeting	14 February 2012
EHO forum update	16 March 2012
CoCP Part B – issued to local authorities	6 August 2012
CoCP Part A – issued at Section 48 Publicity	16 July 2012

6.2.6 The *CoCP* sets out a series of controls and protocols under the following headings:

a. general Requirements including environmental management system and construction environmental management plans
b. communications and community/stakeholder liaison
c. general site operations
d. public access, the highway and river transport
e. noise and vibration
f. air quality
g. water resources
h. land quality
i. waste management and resource use
j. ecology (aquatic and terrestrial)
k. historic environment
l. third-party impact and settlement.

6.2.7 The *CoCP* requires the appointed contractor(s) for each work package to produce site-specific construction environmental management plans (CEMPs) for each site. The CEMPs would be required to be in full accordance with Parts A and B and demonstrate how the *CoCP* would be implemented by the contractor(s). The CEMPs would incorporate topic-specific management plans, which are listed in the *COCP* Part A and referred to under the headings below. These would be live documents subject to updates and refinement by the contractor(s) as required in response to the changing needs of the works during construction. Alterations in the scope of the CEMPs in relation to the environment would be agreed with relevant stakeholders.

6.2.8 The *CoCP* helps satisfy a number of the criteria set out in the NPS for determining an application for development consent. These criteria are discussed below under the relevant headings from the NPS. Matters in relation to the *CoCP* Part B are addressed in the relevant site-specific appendices.

Water quality and resources

6.2.9 Section 8 of the *COCP* sets out the working methods to protect surface water and ground water from pollution and other adverse impacts, including changes to flow, flood storage volume, water levels and water quality.

6.2.10 Water management plans would be produced by the contractor(s) as part of the CEMPs to address water quality issues at each construction site, including water courses or underlying aquifers. Integrated aquatic ecology and water quality plans would be developed, where appropriate. The plans would take account of the guidance in the relevant Pollution Prevention Guidelines issued by the Environment Agency and other Construction Industry Research and Information Association documents.

6.2.11 The contractor(s) would also produce a pollution incident control plan/emergency response plan that would relate to potential effects on water resources.

6.2.12 The *CoCP* states that sustainable methods for discharges including site drainage, surface run-off, and dewatering discharges would be utilised. This includes discharging to water courses, subject to water quality, scour and rate of discharge assessments, and incorporating permeable surfacing in all areas of temporary hardstanding on non-foreshore sites, as far as reasonably practicable.

6.2.13 The contractor(s) would be responsible for providing and maintaining continuous flood defences to the statutory level and a safe refuge for any flood events during construction.

6.2.14 The *CoCP* provides codified measures to manage adverse construction effects on the water environment to ensure that they are mitigated to an acceptable level, as required by NPS para. 4.2.10. In addition, the *CoCP* provides assurance that the relevant pollution control licences and controls would be applied (NPS para. 3.7.9) and that the necessary mitigation would be secured through the *CoCP* (NPS para. 4.2.9). Finally, the *CoCP*

demonstrates that the project would be appropriately flood resilient and resistant and would ensure provision of safe access and escape routes where required.

Air quality, emissions, dust and odour

6.2.15 Section 7 of the *CoCP* sets out how gaseous and particulate pollutant emissions to the atmosphere from vehicles and plant used on the site and dust from construction activities would be controlled and limited (as far as is reasonably practicable) under the following headings:

a. vehicle and plant emissions

b. dust emissions

c. dust control

d. dust monitoring

e. asbestos

f. odour.

6.2.16 The *CoCP* sets out a comprehensive set of measures to reduce effects on air quality emissions and dust, which adhere to relevant Best Practice Guidance, including the Greater London Authority and London Councils' *The Control of Dust and Emissions from Construction and Demolition* (November 2006) and the Building Research Establishments publication *Controlling particles, vapour and noise pollution from construction sites* (2003). It also states that the contractor(s) would design and implement appropriate measures to limit the impact of dust to comply with the provisions of the Health and Safety at Work Act 1974, the Environmental Protection Act 1990, the Environment Act 1995 and the Clean Air Act 1993, and the regulations made thereunder, including the Control of Substances Hazardous to Health Regulations (SI 2002/2677).

6.2.17 The *CoCP* requires the contractor(s) to produce construction phase air quality management plans as part of their CEMPs. The plans would set out the measures required to control dust, air pollution, vehicle and plant emissions and odour arising from construction.

6.2.18 Where connections would be made to the existing sewerage systems, the *CoCP* requires the contractor(s)' method statements to consider the potential increase of odour to sensitive receptors. Contractor(s) would also be required to manage and control foul water flows as appropriate to avoid creating statutory nuisance from odours.

6.2.19 The *CoCP* would secure the appropriate mitigation to ensure that the management of construction effects to ensure the works do not lead to significant deterioration in local air quality. In addition, it ensures that measures would be taken to minimise any detrimental impact on amenity from odour to ensure it causes no significant loss of amenity or nuisance.

Biodiversity and geological conservation

6.2.20 Section 11 of the *CoCP* would ensure that the contractor(s) puts procedures in place to control and limit disturbance and damage to notable species and to areas that are of conservation interest or legally

protected. The *CoCP* requires the contractor(s) to provide an ecology and landscape management plan, which would set out procedures and mitigation measures relating to legally protected and notable species, habitat protection and reinstatement.

6.2.21 In addition, the *CoCP* includes a range of Requirements to manage impacts on biodiversity as follows:

a. The contractor(s) shall use a suitably qualified ecologist to undertake site supervision works and activities that might affect sensitive, notable or protected habitats and species. This shall include watching briefs.

b. Thames Water shall seek to protect and minimise effects on bats, nesting birds and protected species identified in Schedule 1 of the Wildlife and Countryside Act 1981. Where protection measures are required, a method statement shall be provided by the contractor(s)'s ecologist, which shall be agreed with Natural England, where appropriate.

c. Where practical, any required lighting shall be positioned as low to the ground as possible. Lighting would be capped, cowled and directed away from bat transit routes and foraging habitat.

d. The contractor(s) shall reduce effects on aquatic ecology by installing a membrane between any cofferdam fill and the underlying substrate, and consider using lattice structure barge grids rather than campsheds (where appropriate) in order to protect water courses from pollution and limit noise and vibration.

e. Works to trees would be required to use recognised methods in accordance with British Standard BS5837 (Guide for Trees) in relation to construction and all tree surgery shall comply with BS3998 (Recommendations for Tree Works), insofar as reasonably practicable.

6.2.22 The *CoCP* is drafted so that the appropriate mitigation would be in place as an integral part of the proposed development to ensure that significant harm to biodiversity and geological conservation interest would be minimised during construction.

Landscape and visual impacts

6.2.23 NPS para. 1.4.4 recognises that Nationally Significant Infrastructure Projects (NSIPs) are likely to take place in mature urban environments with many possible receptors and have adverse townscape and visual effects within a built up environment. Section 4 of the *CoCP* provides measures to reduce potential impacts resulting from the construction works, particularly any visual impacts.

6.2.24 Part A of the *CoCP* contains measures to control site layouts, including a Requirement to use hoardings or other enclosures that are appropriate to the character of the surrounding townscape. This might include one or more of the following:

a. incorporating art work that visualises the proposed development or photographic views of the local area

b. incorporating viewing windows into standard, well-maintained hoardings to preserve important views and provide opportunities to observe construction activity

c. incorporating a full cover of climbing plants on dark green painted hoardings, with plants trimmed back to allow for essential lighting and health and safety signage.

6.2.25 These measures would provide reasonable mitigation to minimise any harm to the landscape and the visual effect of the construction works.

Noise and vibration

6.2.26 Section 6 of the *CoCP* establishes the framework within which noise and vibration from the works would be controlled and further site-specific information would be produced. Part B identifies any site-specific Requirements such as restrictions on noise-generating activities (including mitigation), and any working hours, activities and locations that would require detailed consideration in Section 61 applications. It also sets out specific locations for noise and vibration monitoring.

6.2.27 The *CoCP* requires the contractor(s) to demonstrate that best practicable means (as defined by Section 72 of the Control of Pollution Act 1974) are employed at all times to all activities to minimise noise and vibration. Proposed measures to suppress typical noise and vibration are included in Section 6.4 of the *CoCP* and would have to be adopted on all sites. Detailed measures would be set out in the applications for Section 61 consent made by contractor(s) to the relevant local authority before commencing works that may cause an impact. The Requirement to apply for Section 61 consent may vary on a site-specific basis and is confirmed in the *CoCP* Part B.

6.2.28 Notification of the commencement of works and the provision of advanced information to potentially affected parties would be a key measure for mitigating the effects of noise and vibration.

6.2.29 The noise and vibration measures are addressed under the following categories:

a. Working hours: The *CoCP* states that (as far as practicable) works would be undertaken during standard working hours. Definitions of the working hours are provided in Section 4.2 of the *CoCP*. The working hours for each site are set out in the *CoCP* Part B and would be confirmed through any Section 61 consent.

b. Noise and vibration control measures: The generic measures would be consistent with the recommendations of BS5228, such as use of equipment designed to minimise noise, use of site enclosures; and other specific measures based on best practice, such as using acoustic suppression systems, shutting down equipment when not in use and using piling methods that limit noise and vibration (silent piling). Measures would also control underwater noise and vibration, particularly for works such as constructing cofferdams and jetties in order to protect fish.

c. Noise and vibration monitoring: The need to monitor noise and vibration and the potential locations for monitoring would be identified in the Section 61 consents and subject to discussion between the contractor(s), Thames Water and the relevant local authority prior to the submission of the Section 61 applications. The monitoring data would be made available to the local authority at an agreed frequency. The contractor(s) would be required to meet any site-specific noise and vibration-related conditions imposed by the local authority through the Section 61 prior consent.

d. Suitably qualified persons: The person(s) responsible for submitting Section 61 applications and any variations and the information within these applications would be required to have the training and education relevant to managing construction noise and vibration.

6.2.30 In the event that it is not practical to mitigate construction noise on-site, or reduce the duration of exposure to tolerable levels of noise, the *CoCP* sets out the main features of the project's noise insulation and temporary re-housing policy in order to provide additional protection for residential properties. The policy primarily applies to residential buildings; however, non-residential buildings would be considered where occupied by noise-sensitive uses. The *CoCP* sets out the noise trigger levels (depending on the working hours) that set the qualification criteria.

6.2.31 Through the above measures, Thames Water has sought to make all reasonable efforts to reduce the effects on the health and quality of life of surrounding communities from noise and vibration. Where all other forms of noise mitigation have been exhausted, improved sound insulation and temporary re-housing would be implemented. It is anticipated that temporary re-housing would only be necessary in a very limited number of cases.

Historic environment

6.2.32 Section 12 of the *CoCP* notes that works affecting statutorily protected assets would be undertaken in accordance with the DCO Requirements. This includes works that would directly affect listed buildings and structures, which would need to be undertaken in accordance with approved details and method statements. In addition, archaeological works would be carried out in accordance with the *Overarching Archaeological Written Scheme of Investigation*.

6.2.33 In the event that works are proposed outside the consent granted by DCO, they would be undertaken in accordance with all required consents and licences under legislation, such as the Planning (Listed Buildings and Conservation Areas) Act 1990, Ancient Monuments and Archaeological Areas Act 1979 and the Burial Act 1857.

6.2.34 The *CoCP* requires the contractor(s) to prepare site-specific heritage management plans as part of the CEMPs. The plans would indicate how the historic environment would be protected in a consistent and integrated manner. They would also be co-ordinated with any other relevant environmental topics. Protection for heritage assets on-site may take the form of both physical protection and working practices.

6.2.35 The heritage management plans would set out how the contractor(s) would discharge the DCO Requirements in relation to heritage in consultation with relevant statutory bodies such as English Heritage and the relevant local planning authority. Part A of the *CoCP* sets out some provisions for the protection of the historic environment including:

a. temporary support, hoardings, barriers, screening and buffer zones around heritage assets

b. advance assessments to inform types of plant and working methods

c. use of demolition techniques that avoid vibration

d. use of condition surveys to define settlement and vibration limits

e. procedures for emergency repair of any damage to listed buildings

f. security procedures to prevent unauthorised access to heritage assets.

6.2.36 These measures would ensure the protection of the fabric of the listed structures that would remain *in situ* during the works. Other elements would be temporarily removed during the works in order to minimise damage to their heritage value. This would result in no substantial harm to any heritage assets and would minimise any loss due to alteration or demolition.

Traffic and transport

6.2.37 Section 5 of the *CoCP* and the *Transport Assessment* set out the framework within which project-related traffic would be controlled and further site-specific information would be produced. Part B of the *CoCP* identifies any site-specific Requirements such as access/egress points for worksites, restrictions on turning movements, and temporary and permanent closures and diversions of highways.

6.2.38 The contractor(s) would be required to produce, coordinate and implement site-specific traffic management plans, which would be prepared in consultation with highway and traffic authorities and emergency services. They would be agreed by the relevant highway authority and, where required, in liaison with Transport for London. Part A of the *CoCP* sets out a list of information that would need to be included in the plans.

6.2.39 The route to/from each site from the Transport for London Road Network and Strategic Road Network is set out in the relevant site-specific section of the *CoCP* Part B. The routes were selected to limit effects on residential properties, businesses and sensitive receptors, such as schools, as far as reasonably practicable. No lorries would be parked near the worksites except in specified areas agreed with the highway authorities.

6.2.40 Works within the highway or on a Public Right of Way would need to accord with measures set out in Section 5.3 of Part A of the *CoCP*. The measures include restricting any temporary closures to as short a time as possible, providing diverted rights of way with suitable lighting and signage, informing the local residents in advance and showing

consideration to people with reduced mobility in the design and operation of the works.

6.2.41 The *CoCP* also sets out the framework within which the project-related river transport would be controlled. Part B of the *CoCP* provides further information in relation to site-specific Requirements such as moorings, loading facilities, navigational aids and signage.

6.2.42 Site-specific river transport management plans for each relevant site would be produced, coordinated and implemented by the contractor(s). The plans would be prepared in consultation with the Port of London Authority, the Maritime and Coastal Agency, the emergency services and other key river users such as freight users, London River Services and other operators. The plans would include assessments of risks to recreational and commercial river users and detailed mitigation measures. The contractor(s) would be required to regularly communicate with parties affected by the works, as detailed in Section 3 of Part A of the *CoCP*.

6.2.43 The above measures, along with the *Transport Strategy* (which accompanies the application), would mitigate the adverse effects of construction traffic on London's transport networks.

Waste management

6.2.44 The Excavated Materials and Waste Strategy provide a framework for the management of materials and waste that will be produced throughout the construction and operational phases of the project. Section 10 of the CoCP contains the measures to facilitate the delivery of this framework at the site level. At a more strategic level, it is anticipated that the delivery of the Objectives of the Excavated Materials and Waste Strategy would be secured via an agreement with the Environment Agency.

It is a statutory requirement under The Site Waste Management Plans Regulations 2008 for each site to have a Site Waste Management Plan. Section 10 of the CoCP sets out the requirements of the Site Waste Management Plans. These plans record the amount and type of waste produced during a construction project and how it will be managed in terms of re-use, recycling and disposal. The Site Waste Management Plans will be consistent with the Excavated Materials and Waste Strategy and provide a framework to facilitate best practice. They will require the recording and monitoring of environmental performance and meeting regulatory control requirements.

6.2.45 In addition, the CoCP includes the following requirements:

a. compliance with a 'duty of care' to protect the interests and safety of others from potential effects of handling, storing, transporting and depositing of excavated materials and demolition/construction wastes

b. measures to manage risk of asbestos waste during alteration and demolition works, in accordance with the Control of Asbestos Regulations 2012 and associated codes of practice.

6.2.46 Along with the Excavated Material and Waste Strategy and Excavated Materials Options Assessment, which are discussed below, the CoCP demonstrates that the project has sought to ensure that appropriate

measures for waste management can be delivered and that waste will be properly managed, dealt with appropriately by waste infrastructure and adequate steps would be taken to reduce waste arisings.

Socio-economic

6.2.47 Effects from construction noise, traffic and air quality on those who live, work or own businesses near the proposed development sites would be managed through the measures identified under the headings above.

6.2.48 The *CoCP* also requires the contractor(s) to produce a community liaison plan as part of the CEMPs. The plan would include details of community engagement, helpline/website information, as well as local authority and other stakeholder engagement and a mechanism for dealing with complaints. The *CoCP* Part A (Section 3) requires the contractor(s) to provide community/stakeholder relations personnel to engage with the community to provide appropriate information and be the first line of response to resolve issues of concern. In particular, the contractor(s) would inform occupiers of nearby properties in advance of the works, including information about the type and duration of the activity.

6.2.49 The *CoCP* would secure acceptable mitigation of the effects on people who live, work or own businesses near the sites.

6.3 *Design Principles*

6.3.1 The proposed design principles set out in the *Design Principles* document underpin the design of the permanent above-ground elements and spaces of the project. The proposed above-ground elements include permanent structures in the River Thames, ventilation structures or columns, ventilation buildings, electrical and control kiosks, potential new public space, footpaths and landscaping. The design principles apply to the permanent operational phase of the project; they do not apply to the temporary construction phase.

6.3.2 The principles would be secured through a project-wide Requirement in Schedule 3 to the DCO, which would require the permanent works to be constructed in accordance with the *Design Principles* document. Where further details need to be submitted to the local authorites for approval, site-specific requiremens are included to ensure that those details would be provided and would be in accordance with the design principles

6.3.3 The principles were developed in consultation with local authorities and other stakeholders. They establish parameters that must be met in the final detailed design of the above-ground structures and spaces. The principles serve a number of functions:

a. They helped to inform the assessment of the likely significant environmental effects of the project in the Environmental Impact Assessment.

b. They helped to inform the project's sustainability strategy by demonstrating how Thames Water would implement sustainability objectives in the design of sites.

c. They set the parameters for the detailed plans to be prepared by contractor(s) or others to satisfy the DCO Requirements.

d. The principles would be considered by the relevant local planning authorities alongside the DCO plans in assessing the detailed designs subsequently submitted for approval.

e. They help to illustrate how Thames Water has responded to public consultation feedback in relation to design.

f. They help to illustrate how Thames Water took account of the criteria for good design in the NPS in order to ensure that the development would be as attractive, durable and adaptable as it can be, taking account of regulatory and other constraints.

6.3.4 The design principles are split into the following:

a. High-level design objectives: this section sets out the overarching principles for the design of permanent structures.

b. Generic principles: this section sets out principles that represent project-wide commitments that apply generally, but not to every site (eg, lighting principles do not apply to sites at which lighting is not required). A table at the beginning of each site-specific section lists which groups of principles apply to that location.

c. Site-specific principles: this section sets out contextual principles that are unique to each site or elaborate further on the generic principles.

6.3.5 The principles work within the framework provided by the Site works parameter plans, the Landscape plans and other plans that form part of the application. They provide more detail of the design intent but still provide some flexibility to develop the detailed designs at a later date in the light of the prevailing circumstances when the project is implemented.

6.3.6 The design principles help to ensure that the project meets the criteria in the NPS with regard to the following:

a. good design (NPS para. 3.5.2)

b. locating odour sources away from sensitive developments, where practicable (NPS para. 4.3.16)

c. ensuring impacts on habitats are minimised and managed and opportunities are taken to enhance existing habitats or create new habitats of value, where practicable (NPS para. 4.5.17)

d. demonstrating that adverse landscape and visual effects would be minimised through appropriate siting, and design, including colours and material and landscaping schemes (NPS para. 4.7.17)

e. minimising the direct effects on existing land uses, or proposed uses near the sites by the application of good design principles, including the layout of the project (NPS para. 4.8.19)

f. sustaining and, where appropriate, enhancing the significance of heritage assets and making a positive contribution to the character and local distinctiveness of the historic environment (NPS para. 4.10.12).

6.4 Excavated Materials and Waste Strategy and Excavated Materials Options Assessment

6.4.1 These documents are provided in the *Environmental Statement* (Vol 3, Appendices A.3 and A.4).

6.4.2 The Excavated Materials and Waste Strategy provides a strategic direction and framework for the management of excavated materials and waste and ensures that legislative, policy and environmental drivers are addressed and met.

6.4.3 The construction of the project would generate an estimated 4.7 million tonnes of excavated materials and waste. Thames Water recognises its responsibility to ensure that this is managed in a sustainable manner.

6.4.4 Thames Water has three objectives in relation to the management of excavated material and waste as follows:

a. To minimise waste to landfill by prioritising prevention and seeking to maximise re-use and recycling.

b. To maximise beneficial use of excavated material arising from tunnel construction.

c. To minimise the impact of excavated material and waste on the environment and communities.

6.4.5 It is anticipated that these objectives would be delivered and monitored by a process identified in an agreement with the Environment Agency.

6.4.6 The Excavated Materials Options Assessment identifies suitable potential receptor sites for the treatment, handling or use of excavated material, taking into consideration the application of the waste hierarchy. The assessment is designed to provide a systematic and transparent approach for assessing the most suitable management options for reuse, treatment and/or disposal of the excavated materials.

6.4.7 The result of this assessment is a 'preferred list' that demonstrates the potential capacity to manage the excavated material in a sustainable manner. The contractor(s) would take account of the assessment and only use sites that meet or exceed the performance of the sites on the preferred list for the receipt and management of excavated material. The assessment also demonstrates that the waste could be dealt with by existing waste facilities. These commitments could be secured via Section 106 obligations.

6.4.8 Along with the *CoCP*, the Excavated Materials and Waste Strategy and Excavated Materials Options Assessment demonstrate that Thames Water has sought to ensure that appropriate measures for waste management could be delivered; that waste would be properly managed, dealt with appropriately by waste infrastructure; and that adequate steps would be taken to reduce waste arisings.

6.5 *Air Management Plan*

6.5.1 The purpose of the *Air Management Plan* is to define how air would be vented into and out of the tunnel system and how the releases would be controlled and treated. It outlines operational and management procedures for controlling air movement and treatment to meet regulatory requirements and ensures that all reasonable steps would be taken to minimise any detrimental impact from odour on amenity on surrounding uses of land and development in accordance with para 4.3.16 of the NPS.

6.5.2 The plan covers the entire project from Acton Storm Tanks to Abbey Mills Pumping Station (including the change to the operation of facilities being built by the Lee Tunnel project). A separate odour management plan exists for the Abbey Mills Pumping Station and Beckton Sewage Treatment Works.

6.5.3 All the sites would have either active or passive control air treatment plants:

a. Active control would be by means of forced air plants where extraction fans draw air from the tunnel and pass it through carbon filter odour control units for treatment before release. There would be active control plants at six locations: Acton Storm Tanks, Carnwath Road Riverside, Greenwich Pumping Station, Abbey Mills Pumping Station, Beckton Sewage Treatment Works Connection Shaft and Beckton Sewage Treatment Works Overflow Shaft. The latter three would be provided by the Lee Tunnel project. When the tunnel system is empty, air would be continuously extracted and treated at Carnwath Road Riverside and from both shafts at Abbey Mills Pumping Station. This is to maintain the negative pressure relative to atmospheric pressure within the tunnel in order to prevent air releases at other sites and to allow fresh air to enter the tunnel at preferred intake locations. These preferred air intakes would be at: Acton Storm Tanks, King George's Park, Blackfriars Bridge Foreshore, Greenwich Pumping Station and the Overflow Shaft at Beckton Sewage Treatment Works.

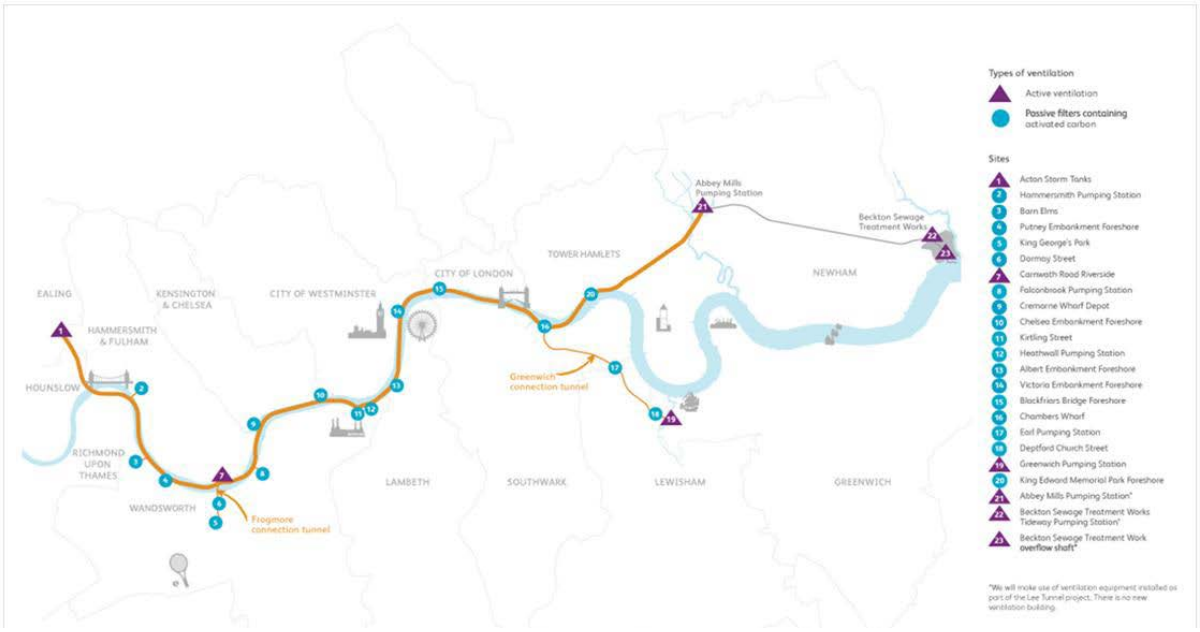
b. Seventeen sites would have passive plants that would treat the limited amount of air that could be displaced whenever the tunnel fills and drowns that particular shaft. Passive sites would also enable nominal air inflow. Both air inflow and exhaust would be controlled by the natural pressure loss through the carbon filters.

6.5.4 All the air displaced from tunnel system would be treated except during infrequent, extreme storm events (approximately once in 15 years) at the majority of sites and during heavy storm events at Carnwath Road Riverside and Acton Storm Tanks. During these events the air pushed out of the shafts could exceed the capacity of the filters and would be released untreated through a pressure relief structure to prevent damage to the filters. Therefore, in a typical year, 100 per cent of the air released would be treated at the majority of sites and 99 per cent at Carnwath Road Riverside and Acton Storm Tanks.

6.5.5 The *Air Management Plan* also sets out how the operation of the tunnel system would comply with the Environment Agency H4 odour management guidance, which provides odour standards for modelling exposure. The benchmark level for the most offensive odours at a site boundary is taken to be 1.5 odour units per cubic metre (ouE/m3) as an hourly average concentration level that is not to be exceeded for 98 per cent of the typical year. This benchmark is the highest standard and would be applied at sensitive receptors.

6.5.6 Consideration would be given to the impacts and effects of odour on surrounding land uses outside the site boundaries. The standard is intended for continually operating sewage facilities and not specifically for intermittent conditions, such as from CSO control schemes. The application of this standard therefore provides a high level of protection from odours that might otherwise cause a significant loss of amenity or nuisance from the intermittently operational tunnel.

Figure 6.2 Location of active ventilation plant and passive filters



6.5.7 The *Air Management Plan* demonstrates how Thames Water would limit the extent of nuisance odours and significant loss of amenity as required by NPS paras. 4.3.11 and 4.3.14. This would be achieved by not exceeding 1.5 odour units per cubic metre as an hourly average concentration level for 98 per cent of the typical year at surrounding sensitive receptors.

6.6 *Navigational Issues and Preliminary Risk Assessment*

6.6.1 The *Navigational Issues and Preliminary Risk Assessment* provides site-specific assessments of the 11 sites at which the project would interface with the River Thames (Putney Embankment Foreshore, Carnwath Road Riverside, Cremorne Wharf Depot, Chelsea Embankment Foreshore, Kirtling Street, Heathwall Pumping Station, Albert Embankment Foreshore,

Victoria Embankment Foreshore, Blackfriars Bridge Foreshore, Chambers Wharf, and King Edward Memorial Park Foreshore). This document is submitted for information in support of the application to demonstrate that the works are feasible.

6.6.2 For each site, the assessment identifies the navigational context, outlines studies that were undertaken to identify key issues, and identifies the navigational issues, risks and mitigation measures necessary for the proposed temporary and permanent works. The issues addressed in the assessment include:

a. intrusion: where the proposed temporary works or permanent in-river structures would protrude into the river (particularly where they would be close to, or within, the authorised channel) and impact on navigation

b. intrusion: where the proposed temporary works or permanent in-river structures would protrude into the river and change the velocity of the river flow with a consequent impact on navigation

c. the closure of bridge arches and the effect on navigation through the arches

d. the effect of works on other river users.

6.6.3 The assessment was developed through liaison and consultation with the Port of London Authority, according to its proposed methodology, and other key stakeholders.

6.6.4 The assessment provides assurance that the residual risks to navigational safety from the project would be reduced to an acceptable level.

6.6.5 The contractor(s) would provide detailed method statements and navigational risk assessments to be agreed with the Port of London Authority prior to commencing the works. These would be secured through protective provisions contained within the DCO and a works agreement between Thames Water and the Port of London Authority.

6.7 *Overarching Archaeological Written Scheme of Investigation*

6.7.1 The *Overarching Archaeological Written Scheme of Investigation* sets out the overall archaeological mitigation strategy, procedures, standards and techniques to be followed across the project. It was prepared to meet the criteria of NPS para. 4.10.20.

6.7.2 It was developed in consultation with English Heritage, the City of London and the London Borough of Southwark[13]. It is the subject of a proposed DCO Requirement in Schedule 3 to the DCO, where additional details are required to be submitted.

6.7.3 It would be complemented by a series of more detailed technical ‘scope of works’ designs for sites at which archaeological mitigation was identified

[13] City of London and London Borough of Southwark are the only London local authorities who retain their own archaeologists so have the relevant knowledge to review and Archaeological WSI.

as necessary. These *Site-specific Archaeological Written Schemes of Investigation* would include both a scope of work, informed by site-specific archaeological objectives, and method statements indicating how this would be carried out.

6.7.4 Given the level of detail in the overarching scheme, the site-specific schemes would be developed in consultation with English Heritage as appropriate (ie, all local authorities except for the City of London and the London Borough of Southwark) and submitted to the relevant local authority for approval in consultation with English Heritage through a DCO Requirement.

6.7.5 The overarching scheme provides that suitable mitigation through archaeological recording would be undertaken to advance understanding of the significance of heritage assets before they are lost, in accordance with NPS para. 4.10.20.

6.8 *Settlement Information Paper*

6.8.1 The Settlement Information Paper sets out Thames Water's approach to managing the effects of ground movement on third-party infrastructure and buildings along the route of the Thames Tideway Tunnel.

6.8.2 The approach for assessing the impacts of the construction works on third-party infrastructure and buildings is based on extensive experience of excavation and tunnelling works in London. This includes experience from recent major tunnelling projects such as the Jubilee Line Extension and the Channel Tunnel Rail Link (High Speed 1).

6.8.3 Thames Water took a risk-based, staged approach to establish the predicted impact and identify whether any special protective measures need to be implemented to allow the safe construction of the project. The assessment used conservative assumptions to identify whether assets would be at risk and used progressively more sophisticated analyses to evaluate the impact on the remainder of the assets not within this 'risk of damage' category.

6.8.4 The assessment explains the different approaches for various kinds of infrastructure including tunnels and bridges, in-river structures, utilities, flood defences, listed buildings and non-listed buildings. It also explains the processes and procedures to be used during construction to manage the interfaces with third-party infrastructure and buildings as the works progress. This includes undertaking pre-condition surveys and appropriate monitoring to provide the necessary assurance that the ground is behaving as predicted in response to the works.

6.8.5 It explains the process for reimbursing asset owners for all reasonable costs incurred for the remediation of material physical damage arising from construction, in line with the processes described. In addition, it explains how Thames Water would enter into settlement deeds. These deeds are intended to reassure property owners who, during the lifetime of the project, may from time to time require the benefit of a personal contract with Thames Water as a guarantee on their property.

6.9 *Transport Strategy*

6.9.1 The *Transport Strategy* sets out the project's aims for minimising the number of heavy goods vehicles (HGVs) required to transport materials to and from the worksites. It sets out Thames Water's commitment, which would be secured through a Section 106 obligation to the GLA, to use the River Thames to transport the following materials (where practical and economic):

a. main tunnel excavated material from the main tunnel drive sites (Carnwath Road Riverside, Kirtling Street, and Chambers Wharf)

b. import and export of cofferdam fill material at all foreshore sites

c. shaft excavated material at ten sites in the foreshore or with direct river access (Putney Embankment Foreshore, Carnwath Road Riverside, Cremorne Wharf Depot, Chelsea Embankment Foreshore, Heathwall Pumping Station, Albert Embankment Foreshore, Victoria Embankment Foreshore, Blackfriars Bridge Foreshore, Chambers Wharf and King Edward Memorial Park Foreshore)

d. excavated material for connection tunnels, CSO interception and associated structures at eight sites (Putney Embankment Foreshore, Cremorne Wharf Depot, Chelsea Embankment Foreshore, Albert Embankment Foreshore, Victoria Embankment Foreshore, Blackfriars Bridge Foreshore, Chambers Wharf and King Edward Memorial Park Foreshore)

e. import of sand and aggregates for main tunnel secondary lining for main tunnel sites (Carnwath Road Riverside, Kirtling Street and Chambers Wharf).

6.9.2 The *Transport Strategy* states that a minimum of 90 per cent of the above materials would be transported by river, which allows for some flexibility to use road transport for periods where river transport may be unavailable or for material that is unsuitable for river transportation, such as excessively wet spoil or any contaminated materials. The intention is to incentivise the contractor(s) to move as much of the materials by river as practical to achieve an amount closer to 100 per cent.

6.9.3 The *Transport Strategy* demonstrates Thames Water's commitment to use water-borne transport for the construction works instead of HGVs, where practical, in line with NPS para. 4.13.10.

6.9.4 In addition, the *Transport Strategy* requires the following to be included in the construction contracts:

a. The main tunnel secondary concrete lining must be batched on-site.

b. Ready-mix suppliers for all sites must source sand and aggregates by river or rail.

6.9.5 Within the CoCP the measures to minimise potential impacts associated with the use of road transport include:

a. best practice measures for road transport, including the adoption of EURO 5 vehicles as a minimum HGV standard

b. lorry management requirements including timed deliveries and monitoring, to reduce the potential impacts at each site

c. lorry safety measures including the use of lorries that have 'active' fitted cyclist safety measures and the requirements for lorry driver safety awareness training

d. membership of the Freight Operators Recognition Scheme, (FORS).

e. requirements for worker travel plans and measures such as restricted on-site parking, to reduce vehicle movements at each site

6.9.6 These measures will help to further reduce the volume and potential impact of road transport use during construction. NPS para. 4.13.6 notes that new NSIPs may give rise to substantial impacts on the surrounding transport infrastructure. The *Transport Strategy* therefore sets out how these impacts would be mitigated. By securing the measures via a Section 106 obligation, Thames Water has demonstrated that these measures would be imposed on the construction of the project to mitigate adverse impacts.

6.10 *Draft Project Framework Travel Plan*

6.10.1 The purpose of the *Draft Project Framework Travel Plan* is to proactively manage trips to and from worksites by reducing the number of single occupancy vehicle trips and encouraging the uptake of sustainable modes of travel. It would be secured through a Requirement in Schedule 3 to the DCO and form a contractual commitment for the contractor(s).

6.10.2 The plan focuses on the movement of workers and visitors to the worksites, whereas the *Transport Strategy* sets out the commitments and objectives for HGV trips. A guidelines document was prepared as a minimum guideline for the contractor(s) and to support the requirements for the contractor(s)'s travel management plans.

6.11 *Heritage Statement*

6.11.1 The *Heritage Statement* presents and assesses the proposals for works in the historic environment that would normally require Listed Building Consent or Conservation Area Consent. It also identifies the sites at which the designs were influenced by historic environment considerations. It supports the *DAS*, which accompanies the application.

6.11.2 The *Heritage Statement* identifies the designated heritage assets that would be directly affects by the works including Grade I, II* and II listed buildings and structures; Grade I, II* and II registered parks and gardens; and conservation areas and heritage assets whose setting would be affected, including World Heritage Sites.

6.11.3 It also sets out the high-level design objectives for the preservation and enhancement of the historic environment and explains how Thames Water took these into account and designed the works in accordance with a clear set of heritage design principles.

6.11.4 Sections 3.6 and 3.7 of the *Heritage Statement* set out details for the re-use of heritage materials and measures to be considered in monitoring ground movement in relation to listed buildings. These measures would be secured by a Requirement in Schedule 3 to the DCO and include the following:

a. procedures and principles that would seek to preserve historic materials that need to be removed

b. re-use of materials

c. how Thames Water would monitor listed buildings, structures and bridges that might be affected by ground movement during and after the tunnelling works or deep shaft excavations.

6.11.5 The *Heritage Statement* sets out the proposed monitoring method to ensure it would not adversely affect the special architectural or historic interest of the listed assets. It helps to ensure that Thames Water meets the relevant criteria in the NPS, in particular with regard to making a positive contribution to the character and local distinctiveness of the historic environment and ensuring there is no substantial harm or loss to designated heritage assets.

6.12 Noise insulation and temporary re-housing policy

6.12.1 The Policy identifies trigger levels which would generate an obligation on Thames Water to provide either noise insulation to properties or, in exceptional circumstances, to offer temporary re-housing.

6.12.2 Appropriate trigger levels are set out based on best practice and a process which allows noise insulation or temporary re-housing to be provided in advance of noise impacts, based on predicted noise levels. The policy includes a comprehensive commitment to monitoring in order to ensure that the approach remains fair and effective.

6.13 *Skills and Employment Strategy*

6.13.1 The successful delivery of the project depends upon securing specific skills, goods and services and implementing robust systems to secure the health and safety of the workforce. The planning policy framework supports the consideration and optimisation of socio-economic benefits. Thames Water also aspires to move beyond legal compliance towards best practice with regard to maximising the economic benefits of the project, as reflected in its corporate sustainability objectives and the Sustainability Statement accompanying the application.

6.13.2 The *Skills and Employment Strategy* contains a job and skills supply/demand analysis and sets out the objectives and activites relating to employment, skills and training, as well as the organisational arrangements for the delivery of the strategy. It will be secured through high level objectives within the Section 106 Agreements and through specific obligations to be imposed on the contractor(s) to deliver the measures within the *Skills and Employment Strategy*.

6.14 *Section 106 Obligations: Heads of Terms*

6.14.1 The 'heads of terms' for the proposed Section 106 development consent obligations were developed to ensure the delivery of mitigation for a number of project effects that are not covered by the design or the measures in the *CoCP* and cannot be secured through DCO Requirements or protective provisions.

6.14.2 The development consent obligations would help to deliver the project's *Skills and Employment Strategy*, the on-going maintenance of areas of public realm including the provision of new habitats and, where appropriate, monitoring of potential environmental impacts and transport mitigation. This would enable the project to deliver significant socio-economic benefits (NPS Section 4.15). It would also assist in mitigating the effects on biodiversity (NPS para. 4.5.6) and ensure good design that is attractive and durable (NPS para. 3.5.2). Finally, it would assist in mitigating the transport impacts identified in the *Transport Assessment* (NPS paras. 4.13.6 and 4.13.7).

6.15 Compensation measures

6.15.1 In order to construct the project, Thames Water would need to acquire and use third-party land. The land acquisition policy reflects the need to ensure that the project can be delivered, and that a large number of third-party-owned property interests would need to be acquired. The *Draft DCO* includes powers of compulsory purchase so that these may be available for use where appropriate, which are set out in Part 3 under articles 27 to 34 of the *Draft DCO*.

6.15.2 Where possible, sites already in the ownership and control of Thames Water would be used in order to minimise the area of third-party land required. Thames Water would also minimise the purchase of land by seeking a range of alternative agreements where land is only required temporarily or the needs of the project may be secured by the acquisition of rights only.

6.15.3 Thames Water would maintain existing residential properties and only demolish or seek temporary relocation in exceptional circumstances. Demolition of or disruption to existing businesses would also be minimised.

6.15.4 Thames Water would use all reasonable attempts to negotiate the acquisition of land and rights in land by agreement before using compulsory purchase powers. However, the acquisition of a subterranean stratum to enable construction of the tunnels would involve large numbers of individual property owners whose interests are not generally expected to be practically affected in any way. No attempt would be made to secure the subsoil interests by agreement in advance. Compulsory purchase for these subsoil interests would be sought through general vesting powers to acquire the necessary stratum, and land owners compensated in accordance with the statutory compensation code.

6.15.5 There is also a commitment to provide a Settlement Deed. A settlement deed is a formal legal undertaking concerning settlement between Thames Water and a property owner that gives effect to the process, obligations and other matters set out in the *Settlement project information paper*. A settlement deed would provide the assurance often sought by owners that their property would be protected throughout the lifetime of the project.

6.15.6 Thames Water would pay third-party owners compensation for land. Losses would be assessed as if the land and rights had been acquired and the temporary works area was occupied under DCO powers and pursuant to the Statutory Compensation Code. The compensation provisions are set out in Part 3 under articles 35 to 39 of the *Draft DCO*; reflecting model provisions, they provide no material changes to the statutory code. Thames Water would be responsible for the reasonable legal and surveyor's fees incurred by third parties in dealing with acquisitions required for the project.

6.15.7 Compensation would not be payable for the same matter under both a property agreement and another enactment, contract or rule of law (including, but not limited to, the DCO). It shall also not be payable under two or more different provisions of a property agreement.

6.15.8 Any planning obligation attached to land that is the subject of a property agreement would be taken into account in the valuation and, where the planning obligation requires payment of any sum or any works in lieu of such a sum that is for the benefit of the landowner, the value of that sum or works shall be off-set against any consideration.

6.15.9 Thames Water has acknowledged the need for non-statutory elements to be provided as part of its compensation programme. This is in recognition of the limited support provided to neighbouring or nearby property owners by statutory compensation. It reflects voluntary schemes introduced and used elsewhere by promoters of similar major infrastructure projects.

6.15.10 It is important to be clear that Thames Water would comply with all legislation employed by 'enforcing authorities' that serves to control construction activities, such as, for example, noise and vibration from construction sites. BS5228-1:2009 details the current best guidance/code of practice in use and Thames Water would work within the regulations to ensure that construction activities meet the controls required by local planning authorities. The non-statutory compensation programme would operate in parallel with these controls.

6.15.11 Thames Water has a compensation programme for owners and occupiers who may be affected by the project. Attached to the *Statement of Reasons*, which accompanies the application, are a number of documents which set out this compensation programme. These are referred to below.

Exceptional Hardship Procedure

6.15.12 The *Exceptional Hardship Procedure* is a discretionary scheme which applies to those who would not otherwise have a statutory claim for compensation. It sets out how Thames Water will be prepared to receive applications from householders with a pressing need to sell who contend that they are suffering hardship as a result of being unable to sell their

property because it is potentially affected by the project. Applications will be assessed by an independent panel.

6.15.13 Property owners making an application must be able to demonstrate that they meet all of the following criteria:

a. They are owner-occupiers of either residential or small business property. They could also be mortgagees or personal representatives of a deceased owner.

b. The property is in proximity to the Thames Tideway Tunnel works – defined as being within 100 metres of the area identified for use as a construction site. Decisions on marginal cases will be left for the discretion of the panel.

c. They have made all reasonable efforts to sell the property but have notreceived an offer within 15 per cent of the property's unaffected fair value.

d. They purchased the property before there was public awareness of the Thames Tideway Tunnel project proposals.

e. There is a pressing need to sell the property and the owner would suffer exceptional hardship if unable to sell the property before Thames Water completes the project.

6.15.14 For the *Exceptional Hardship Procedure* Thames Water has published an Application Form, an Assistance Guide to help fill out the application form and a set of Frequently Asked Questions about the Exceptional Hardship Procedure.

Non-Statutory Mitigation Compensation Procedure and Noise Insulation and Temporary Rehousing Policy

6.15.15 In constructing the project, the contractor would be under a duty to operate construction sites to control noise and other forms of nuisance in accordance with the *Code of Construction Practice* – document 7.19 at Appendix 1. Under the nonstatutory mitigation scheme, Thames Water would make provision for appropriate mitigation measures for properties identified prior to commencement of construction as being potentially affected as a consequence of the construction works. These could comprise an offer to install secondary glazing which might be necessary to provide extra protection. Details relating to qualifying criteria on this type of offer are set out in the Noise Insulation and Temporary Rehousing Policy. In very limited circumstance it may be appropriate to offer temporary rehousing and further details relating to those circumstances are also set out in the Noise Insulation and Temporary Rehousing Policy.

Non-Statutory Disturbance Compensation Procedure

6.15.16 Due to the project's potential construction working hours, its duration, and the proximity of construction sites to neighbouring properties, there may be further effects to property which may give rise to financial loss or damage to property.

6.15.17 Under the non-statutory disturbance compensation scheme those affected who are not entitled to statutory compensation can make claims to recover

loss or damage that has occurred as a direct consequence of construction works being carried out. In addition, once construction has commenced, if the actual disturbance is greater than that which was originally predicted, applicants would be entitled to make a claim under this scheme whereby their situation would be re-assessed.

6.15.18 The above compensation programme is compliant with the mitigation suggested in NPS para. 4.9.13.

6.15.19 Taken together, these measures are considered to represent a comprehensive package of mitigation and compensation provisions, directly in accordance with the guidance and expectations of the NPS.

Thames Tideway Tunnel
Thames Water Utilities Limited

Application for Development Consent

Application Reference Number: WWO10001

Planning Statement

Doc Ref: **7.01**

Planning Policy Context

APFP Regulations 2009: Regulation **5(2)(q)**

Hard copy available in

Box **43** Folder **A**
January 2013

Thames Tideway Tunnel

Creating a cleaner, healthier River Thames

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7 Planning policy context

7.1 National Policy Statement for Waste Water

7.1.1 Section 104(2) of the 2008 Act states that in deciding an application for development consent the decision maker must have regard to:

a. any relevant National Policy Statement, which in this case is the National Policy Statement for Waste Water

b. any local impact report

c. any matters prescribed in relation to development of the description to which the application relates (there are none in this case)

d. any other matter that the decision maker thinks is both important and relevant to its decision.

7.1.2 Section 104(3) further states that applications must be decided in accordance with any relevant National Policy Statement, except to the extent that to do so would:

a. lead to the UK being in breach of its international obligations

b. be in breach of any statutory duty that applies to the decision maker

c. be unlawful

d. result in adverse impacts from the development outweighing the benefits

e. be contrary to regulations in relation to how such decisions are to be taken.

7.1.3 The NPS therefore has a particularly important status in the decision to be made on the application.

7.1.4 While the decision maker will also have regard to "*any other matter which [it] thinks is both important and relevant",* the potential relevance of planning policy set out in other local or national policy documents is reduced by the following factors:

a. NPS para. 1.1.6 advises that it has already taken account of relevant Planning Policy Statements (PPS) and Planning Policy Guidance Notes, which were in any event cancelled on the publication of the *National Planning Policy Framework* (the '*NPPF*') except for PPS 10, which deals with waste.

b. The *NPPF* confirms (para. 3) that it does not set policy for NSIPs and that relevant policy is to be found within the National Policy Statements.

c. Unlike normal planning applications considered under the Town and Country Planning regime, the 2008 Act contains no requirement to decide an application for development consent in accordance with the policies of the local development plan.

d. NPS para. 1.1.6 advises that, in the event of a conflict between the NPS and any other document, the NPS prevails for the purposes of decision making.

7.1.5 This document therefore principally considers the consistency of the project with the policies in the NPS. The project was developed also having regard to local planning policies and, particularly, local land use planning designations. As NPS para.4.8.5 advises, applicants should assess any effects of precluding a new development or use proposed in the development plan. When it comes to assessing the acceptability of the application proposals on that development or use (or in assessing any other effect), however, it is the NPS that sets the relevant criteria to be applied to the application. The NPS is the primary basis for decision making on all planning issues raised by the application and will be the primary policy focus of the assessment in this document.

7.1.6 The NPS clearly states that, given the level and urgency of need for wastewater infrastructure, the decision maker should start with a presumption in favour of granting consent to applications for wastewater NSIPs unless any more specific and relevant policies set out in the NPS clearly indicate that consent should be refused (NPS para. 3.1.2).

7.1.7 The NPS identifies relevant factors for consideration and generic impacts and these are identified and set out in summary below. These are then used to comprehensively assess the application against the terms of the NPS in Section 8 of this document. This assessment considers the whole project as a single NSIP proposal; however, it also draws upon planning appraisals of the component elements of the project at the separate proposed development sites. The site assessments are set out in the site-specific appendices.

7.1.8 Section 9 of this document then applies that assessment to the decision making principles set out in Section 104 of the 2008 Act.

7.2 Government policy objectives

7.2.1 Wastewater treatment infrastructure is essential for public health and a clean environment. NPS para. 2.2.1 states that: "*without suitable treatment, the waste water we produce every day would damage the water environment and create problems for public health, water resources and wildlife, all of which would then seriously impact economic and social wellbeing*". The Government's key policy objectives in relation to wastewater are set out at NPS para. 2.2.3, as follows:

a. sustainable development

b. public health and environmental improvement: to continue to meet the United Kingdom's (UK) obligations under the UWWTD by providing suitable collection and treatment systems to limit pollution of the environment

c. improve water quality in the natural environment and meet the UK's obligations under related European Directives, such as the Habitats Directive, the Water Framework Directive and its daughter directives

d. reduce water consumption

e. reduce demand for wastewater infrastructure capacity

f. climate change mitigation and adaptation

g. waste hierarchy: to apply the waste hierarchy in terms of seeking to first reduce wastewater production, to seek opportunities to re-use and recycle resources and to recover energy and raw materials where possible.

7.2.2 NPS Section 2.3 identifies that the demand for new and improved wastewater infrastructure is likely to increase in response to the main drivers set out below.

Statutory requirements to protect the environment and water quality

7.2.3 Existing and new, more stringent environmental standards are driving improvements to wastewater treatment. In particular, there is still a need for investment in wastewater infrastructure in order to fulfil the UK's obligations under the UWWTD (1991/271/EEC), the Freshwater Fish Directive and the Water Framework Directive.

Adaptation to climate change

7.2.4 NPS para. 2.3.5 is particularly relevant and states that:

"Climate change is already a major pressure on waste water infrastructure. With the probability of wetter winters, more intense rainfall events and greater climate variability in the UK, we can expect greater pressure on public sewerage systems. Particularly regarding combined sewers which carry both foul sewage and rainwater run-off to sewage treatment works for treatment prior to discharge. The heavier the rain, the greater the flow the sewer has to carry. It is inevitable in heavy rainfall or equivalent weather events that some of these sewers will be overloaded. These combined sewerage systems incorporate combined sewer overflows (CSO) to help protect properties from flooding during heavy rainfall by allowing overflows into watercourses, but these may significantly increase pollution from untreated waste. It is not just the immediate surface water runoff from a rainfall event that causes operational CSO and treatment problems. As the sewer stock continues to age it may, in some circumstances, become vulnerable to infiltration of groundwater, levels of which may vary in response to rainfall events. Without further investment in sewerage systems, we can expect to experience more frequent overflows from CSOs or overwhelmed treatment works which could potentially lead to water quality and flooding problems".

Population growth and urbanisation

7.2.5 As cities, towns, and villages grow and new developments are established, there will be a demand for new wastewater infrastructure to provide treatment that is essential for public health and to ensure that the UK can continue to meet the standards for water quality set out in existing and new European Union and domestic legislation.

Resilience of existing infrastructure

7.2.6 There is also a need to generally maintain, extend or improve the infrastructure of varying ages. Over half of London's sewerage system dates back to Victorian and pre-Victorian times.

Meeting the need in London

7.2.7 The most directly relevant criterion of the NPS is that there should be a Thames Tideway Tunnel. The project is specifically identified in the NPS as an NSIP for which the need has been demonstrated (NPS para. 2.6). The NPS establishes the need for two specific wastewater NSIPs, comprising "*a sewage treatment works scheme at Deephams in North East London and a waste water collection, storage and transfer tunnel (the Thames Tunnel)*" (NPS para. 1.1.4).

7.2.8 The Thames Tideway Tunnel is named as the preferred infrastructure solution to address the issue of combined sewer overflows into the tidal Thames. It comprises *"a major tunnel, likely to run for approximately 25kms from West to East London to intercept storm sewage overflows and transfer them for treatment at Beckton sewage treatment works (STW) in East London. A major part of the tunnel route is likely to follow the course of the River Thames*" (NPS para. A1.3.2).

7.2.9 NPS para. A1.3.9 recognises that the location of the scheme is limited by the need to be in London and to be near the River Thames in order to intercept combined sewer overflow outfalls. The same paragraph identifies that: "*The key issue for consideration of this scheme by the examining authority and the decision maker is where several shafts from the surface connecting to the tunnel are located and also the location of construction compounds".*

7.2.10 The NPS is clear that the national need for the project has been clearly established. NPS para. 2.6.34 states that:

"The examining authority and the decision maker should undertake any assessment of an application for the development of the Thames Tunnel on the basis that the national need for this infrastructure has been demonstrated. The appropriate strategic alternatives to a tunnel have been considered and it has been concluded that it is the only option to address the problem of discharging unacceptable levels of untreated sewage into the River Thames within a reasonable time at a reasonable cost".

7.2.11 The need for the project is reinforced by the fact that the NPS has considered potential alternatives to the scheme and ruled them out. NPS para. 3.4.1 states that: "*these strategic alternatives do not need to be assessed by the examining authority or the decision maker*".

7.2.12 The NPS also very clearly states the importance of meeting the identified need. NPS paras. 2.6.15 to 2.6.18 state that London's sewerage system is now out of date. Much of the system was designed in Victorian times and now often becomes overloaded, resulting in discharges of diluted sewage into the River Lee and River Thames. This generates adverse

impacts on biodiversity, health and the attractiveness of the environment. The problem is so severe that NPS para. 2.6.19 advises that:

"*It is essential to reduce the likelihood of such incidents, which also have a reputational impact on the UK, as they take place in the capital city's river. The above impacts impose an economic cost on the capital, country and society [...] The pollution also imposes wider 'external' social and environmental costs on society".*

7.3 Factors for the examination and determination of NSIP applications for development consent

7.3.1 Part 3 of the NPS considers a number of general policies that are relevant to decision making on wastewater NSIPs. In considering any proposed development, and in particular when weighing its adverse impacts against its benefits, the decision maker should take account of (NPS para. 3.1.3):

a. its potential benefits including its contribution to meeting the need for wastewater infrastructure, job creation and any long-term or wider benefits

b. its potential adverse impacts including any long-term and cumulative adverse impacts, as well as any measures to avoid, reduce or compensate for any adverse impacts.

7.3.2 In this context, the decision maker should take into account environmental, social and economic benefits and adverse impacts that are identified at national, regional and local level (including in local impact reports).

7.3.3 Part 3 of the NPS sets out a number of criteria for applications for development consent for wastewater NSIPs. These include the criterion to prepare an Environmental Impact Assessment and, where appropriate, a Habitat Regulations Assessment. Guidance is provided on the content of these assessments, for instance, in relation to the need to reflect any flexibility reserved within the application.

7.3.4 In addition, guidance is provided on the relationship between the application and consenting regimes, under a number of headings. That guidance is considered briefly under those headings below.

Pollution control and other environmental consenting regimes

7.3.5 Pollution control and other environmental consenting regimes are separate from but complementary to the planning system. The NPS states that: "*in considering an application for development consent, the examining authority and the decision maker should focus on whether the development itself is an acceptable use of the land, and on the impacts of that use, rather than the control of processes, emissions or discharges themselves. The examining authority and the decision maker should work on the assumption that the relevant pollution control regime will be properly applied and enforced. It should act to complement but not seek to duplicate it*" (NPS para. 3.7.3).

7.3.6 The NPS advises early engagement and close cooperation with relevant pollution control regulators to discuss their requirements for environmental permits and other consents. This approach should demonstrate to the examining authority and the decision maker that development consent can be granted taking full account of environmental impacts, by ensuring that potentially polluting developments can be adequately regulated under the pollution control framework. It should also demonstrate that the potential cumulative effects of pollution would not render the new development unacceptable, particularly in relation to statutory environmental quality limits (NPS paras. 3.7.7 to 3.7.8).

Safety

7.3.7 NPS para. 3.8.1 states that: "*Applicants should consult with the Health and Safety Executive (HSE) on matters relating to safety. HSE is responsible for enforcing a range of health and safety legislation applying to the construction, operation and decommissioning of wastewater infrastructure. The decision maker will need to be satisfied that there is no reason to expect that the project will not comply*". It is also recognised that *"some waste water infrastructure may be subject to the Control of Major Accident Hazards (COMAH) Regulations 1999"*, which are enforced by HSE and the Environment Agency.

Hazardous substances

7.3.8 NPS para. 3.9.1 states that: "*applicants should consult the HSE at pre-application stage if the project is likely to need hazardous substances consent. Where hazardous substances consent is applied for, the decision maker will need to consider whether to make an order directing that hazardous substances consent shall be deemed to be granted alongside making an order granting development consent"*.

Health

7.3.9 NPS para. 3.10.1 recognises that adequate provision of wastewater infrastructure is clearly beneficial to society and to public health. However, the possibility of some adverse effects cannot be discounted. The direct impacts on health may include increased traffic, air pollution, dust, polluting water (toxicity and disease risks), hazardous waste and substances, noise, and increases in pests. New wastewater infrastructure may also have indirect health impacts, for example, if it affects access to key public services, employment, transport or use of open space and water.

7.3.10 These impacts may affect people simultaneously. Therefore, NPS para. 3.10.5 advises that the decision maker should consider the cumulative impact on health. Applicants should identify any significant adverse health impacts and identify measures to avoid, reduce or compensate for these impacts as appropriate.

Common law nuisance and statutory nuisance

7.3.11 NPS para. 3.11.1 provides detailed advice on the relationship between statutory and common law nuisance and the extent to which the powers conferred by a Development Consent Order can be relied on as a defence against a claim of nuisance.

Security considerations

7.3.12 National security considerations are acknowledged to apply across all national infrastructure projects (NPS para. 3.12.1). Overall responsibility for security of wastewater infrastructure lies with the Department for Environment, Food and Rural Affairs.

7.3.13 Government policy is to ensure that, where possible, proportionate protective security measures are designed into new infrastructure projects at an early stage in the development of the project.

7.3.14 Where national security implications are identified, the applicant should consult with relevant security experts from the Centre for the Protection of National Infrastructure and the Department for Environment, Food and Rural Affairs to ensure that physical, procedural and personnel security measures are adequately considered in the design process and that adequate consideration is given to the management of security risks.

7.3.15 In exceptional cases, where examination of an application would involve public disclosure of information in relation to defence or national security that would not be in the national interest, the Secretary of State can intervene and examine a part or the whole of the application. In that case, the Secretary of State may appoint an examiner to consider evidence in closed session.

7.3.16 In addition to the guidance on other consenting regimes, Part 3 of the NPS contains guidance on two matters of more substantive importance for this document: namely good design and climate change.

Good design

7.3.17 The NPS defines 'good design' as creating attractive, usable, durable and adaptable places and contributing to sustainable development (para 3.5.1). The expectation should be to marry good aesthetics with functional design; however, the nature of many wastewater infrastructure developments often limits the extent to which they can contribute to the enhancement of the quality of an area.

7.3.18 NPS para. 3.5.2 states that the decision maker needs to be satisfied that wastewater infrastructure developments are sustainable and as attractive, useable, durable and adaptable as they can be, taking account of natural hazards such as flooding. In so doing, the decision maker should satisfy itself that the applicant has taken account of both aesthetics and functionality (including fitness for purpose). The NPS advises that applicants and the examining authority should consider taking independent professional advice on the design aspects of a proposal, for example from the Design Council CABE.

7.3.19 The development should, by means of the use of good architecture and appropriate landscaping, be as visually attractive as possible. The NPS recognises that applicants may have no, or very limited, choice in the physical appearance of some wastewater infrastructure but that opportunities may nevertheless arise to demonstrate good design through careful siting of elements and the selection of materials. In considering applications, the decision maker should take into account the ultimate purpose of the infrastructure and bear in mind the operational, safety and security requirements that the design has to satisfy.

7.3.20 Applicants should set out the main alternatives to the design that were considered and the reasons why the favoured choice was selected, demonstrating that all proposed and alternative infrastructure meets the relevant standards.

Climate change adaptation

7.3.21 NPS para. 3.6.6 requires applicants to consider the impacts of climate change when planning the location, design, build and operation of new wastewater infrastructure, in recognition of the fact that new infrastructure will typically remain operational for many decades. The application should set out how the proposal takes account of the projected impacts of climate change using the latest UK Climate Projections available at the time of preparation. The decision maker should be satisfied that the proposals take account of the potential impacts of climate change and if any adaptation measures give rise to consequential impacts, that those impacts were appropriately assessed (NPS paras. 3.6.8 to 3.6.9).

7.3.22 NPS para. 3.6.10 states that the decision maker should be satisfied that no critical features of the design could be seriously affected by more radical changes in the climate beyond that projected in the latest set of UK Climate Projections.

7.4 Generic impacts and assessment criteria

Introduction

7.4.1 Part 4 of the NPS sets out policies that are relevant to particular physical impacts of the construction and operation of wastewater NSIPs, under a heading of Generic Impacts. The NPS also provides guidance on what should be included in the applicant's assessment, the principal considerations for decision making, and a framework of possible mitigation measures. The suggested approach in relation to specific topics is outlined below.

7.4.2 By way of background, it is relevant to note that Part 1 of the NPS explains that, in developing the NPS, the Government undertook a high level Appraisal of Sustainability, Equalities Impact Assessment and Habitats Regulation Assessment of the NPS in general and of two specific NSIP schemes, including the project. The Appraisal of Sustainability identified that the NPS could have a significant positive effect on water quality and resources. Similarly there could be positive effects for biodiversity as a result of improvements in water quality (NPS para. 1.4.3).

7.4.3 The NPS advises that no significant negative effects were identified in the Appraisal of Sustainability. However, it does anticipate that negative effects may arise in relation to a number of matters, as follows:

"*the development of waste water NSIPs is consequently likely to result in adverse townscape and visual effects within a built up environment with many possible receptors, and in the short term, noise disturbance during construction. The likely adverse effect on archaeology and cultural heritage is related to the likelihood that the public benefits of the provision of new nationally significant waste water infrastructure, for which there is no alternative, could in some circumstances outweigh damage or loss to heritage assets or their setting"*.

7.4.4 In considering the impacts of the application proposals, therefore, it is relevant that the NPS itself recognises that some impacts may be unavoidable.

Water quality and resources

7.4.5 The NPS draws attention to the statutory requirements to protect the environment and water quality. It states that *"existing and new, more stringent environmental standards are driving improvements to waste water treatment"*, (NPS para. 2.3.1). In relation to the project, the NPS recognises that "*it is essential to meet the ecological water quality objectives of a major river of national importance*" (NPS para. A1.3.6).

7.4.6 The NPS requires the applicant to undertake an assessment of the existing status of the quality, resources and physical characteristics of the water environment, and the potential impacts of the proposed project thereon. Impacts on the water environment should be given more weight, where a project would have adverse effects on the achievement of the environmental objectives established under the Water Framework Directive (NPS para. 4.2.7).

7.4.7 NPS para. 4.2.8 states that "*the decision maker should be satisfied that a proposal has regard to the River Basin Management Plans and meets the requirements of the Water Framework Directive (including Article 4.7) and its daughter directives, including those on priority substances and groundwater*".

7.4.8 The NPS requires the decision maker to consider whether the mitigation measures put forward by the applicant for the construction and operation of the development are acceptable. It also recognises that the impact on local water resources can be minimised through effective planning and design (NPS para. 4.2.12). If appropriate, the examining authority and decision maker should consider whether any Requirements should be attached to development consent and/or development consent obligations.

7.4.9 The NPS recognises that the Environment Agency has a key role both in determining which projects are needed to meet statutory environmental requirements and as the environmental regulator of the water and sewerage sectors in England and Wales. The Environment Agency is also the competent authority responsible for the implementation of the Water Framework Directive. NPS para. 4.2.5 states that: "*if the Environment*

Agency has concerns about the proposal on the grounds of impacts on water quality/resources, applicants should discuss these concerns with the Environment Agency and take all reasonable steps to agree ways in which the proposal might be amended, or additional information provided, which would satisfy the Environment Agency's concerns".

Air quality, emissions, dust and odour

Air quality and emissions

7.4.10 The construction and operation phases of infrastructure developments can have adverse effects on air quality. In such cases, an assessment of the impacts of the proposed project is required as part of the *Environmental Statement*. The *Environmental Statement* should describe the significance of air emissions, their mitigation and any residual effects, distinguishing between the construction and operational stages of the project. The NPS advises that the decision maker should generally give air quality considerations substantial weight where a project would lead to deterioration in air quality in an area, or where development causes national air quality limits to be breached. However, air quality effects are also important where substantial changes in air quality are expected, even if the level of deterioration does not lead to any breaches of air quality limits (NPS para. 4.11.4).

7.4.11 In all cases the decision maker must take account of relevant statutory air quality limits. Where a project is likely to lead to a breach of such limits, applicants should work with the relevant authorities to secure appropriate mitigation measures to enable the proposal to proceed. In the event that a project would lead to non-compliance with a statutory limit, the decision maker should refuse consent (NPS para. 4.11.5).

Dust, artificial light, smoke, steam and insect infestation

7.4.12 There is potential for the release of a range of emissions such as dust, steam, smoke, artificial light and for infestation of insects as a result of the construction and/or operation of wastewater infrastructure. All such effects could lead to a potential detrimental impact on amenity, or cause a common law nuisance or statutory nuisance (NPS para. 4.12.1).

7.4.13 The applicant should assess the potential for insect infestation and emissions of dust, steam, smoke and artificial light that may have a detrimental impact on amenity.

7.4.14 NPS para. 4.12.3 recognises that for NSIPs some impact on amenity for local communities is likely to be unavoidable. The aim should be to keep impacts to a minimum, and at a level deemed acceptable.

7.4.15 In decision making, NPS para. 4.12.7 states that the decision maker should satisfy itself that all reasonable steps have been and would be taken, to minimise any detrimental impact on amenity from insect infestation and emissions of dust, steam, smoke, and artificial light.

Odour

7.4.16 The NPS recognises that new wastewater infrastructure may generate odour emissions during stages of conveyance, treatment, and storage. The potential for adverse odour impacts is dependent on a number of factors. These include the layout and distance of the most odorous sources to receptors, the selection of process technologies and whether they have high or low 'odour potential', and the selection and on-going maintenance and control of odour abatement equipment in order to ensure effective odour management (NPS paras. 4.3.2 to 4.3.3).

7.4.17 The NPS recognises that odours from wastewater infrastructure can have a significant adverse impact on the quality of life of individuals and communities (NPS para. 4.3.1).

7.4.18 Some odour aspects of the project may be subject to regulation under the Environmental Permitting regime; however, NPS para. 4.3.11 advises that: "*The decision maker should satisfy itself that all reasonable steps have been taken and will be taken, to minimise any detrimental impact on amenity from odours on surrounding uses of land and development*".

7.4.19 The impact of odour emissions of a project should be considered from a broad perspective of impact on amenity and not from a narrow perspective of nuisance. Nuisance does not equate to a loss of amenity because significant loss of amenity would occur at lower levels of odour emission than would constitute a nuisance (NPS para. 4.3.14).

7.4.20 Mitigation measures may include one or more of the following:

a. locating the main odour sources away from sensitive receptors (such as housing, schools and hospitals, and other sensitive land uses including recreational facilities, commercial premises and open spaces)

b. selection of 'low odour' process technologies

c. containment or enclosure of the most odorous sources on the site

d. where sources are enclosed, ventilation should be provided to suitable odour abatement equipment at high enough extraction rates to control fugitive leaks

e. an odour management plan that documents the measures to be employed by the site operator to anticipate the formation of odours and to control their release from the site. The plan should include provision and obligations for suitable monitoring and testing regimes to ensure that controls are properly maintained throughout the life of the development.

Flood risk

7.4.21 In determining an application for development consent, NPS para. 4.4.10 states that the decision maker should be satisfied that, where relevant:

a. The application is supported by an appropriate Flood Risk Assessment.

b. The Sequential Test was applied as part of the site selection process.

c. The proposal is in line with any relevant national and local flood risk management strategy.

d. A sequential approach was applied at site level to minimise risk by directing the most vulnerable uses to areas of lowest flood risk.

e. Priority was given to the use of Sustainable Drainage Systems (SuDS), and the requirements set out on National Standards are met.

f. In flood risk areas, the project is appropriately flood resilient and resistant, including safe access and escape routes where required, and that any residual risk can be safely managed over the lifetime of the development.

7.4.22 Following application of the Sequential Test, if it is not possible for the project to be located in zones of lower probability of flooding than Flood Zone 3, the Exception Test may be applied (NPS para. 4.4.14). The test provides a method of managing flood risk while still enabling necessary development to be implemented. A project must pass all three elements of the test for development to be consented. In order to pass the Exception Test:

a. It must be demonstrated that the project provides broad sustainability benefits to the community that outweigh flood risk.

b. The project should be on developable previously-developed land or, where not on previously-developed land, that there are no reasonable alternative sites on developable previously-developed land.

c. A Flood Risk Assessment must demonstrate that the project would be safe, without increasing flood risk elsewhere and, where possible, would reduce flood risk overall.

7.4.23 One of the Government's key policy objectives (NPS para. 2.2.3) is to reduce demand for wastewater infrastructure capacity by diverting surface water drainage away from the sewerage system using SuDS. The NPS recommends that: "*opportunities should be taken to lower flood risk by reducing the built footprint of previously-developed sites and using SuDS*", (NPS para. 4.4.22). If SuDS are provided, the NPS states that the Development Consent Order, or any associated development consent obligations, needs to make provision for their adoption and maintenance including any necessary access rights to property (NPS para. 4.4.11).

Biodiversity and geological conservation

7.4.24 As a general principle, the NPS advises that development should aim to avoid significant harm to biodiversity and geological conservation interests, including through mitigation and consideration of reasonable alternatives. Where significant harm cannot be avoided, appropriate compensation measures should be sought (NPS para. 4.5.6).

7.4.25 In taking decisions, the decision maker should ensure that appropriate weight is attached to designated sites of international, national and local importance; protected species; habitats and other species of principal importance for the conservation of biodiversity; and to biodiversity and geological interests within the wider environment (NPS para. 4.5.7).

Specific advice is provided in relation to international sites and protected habitats and species.

7.4.26 The applicant should include appropriate mitigation measures as an integral part of the proposed development. In particular, the applicant should demonstrate that:

a. During construction, activities would be confined to the minimum areas required for the works.

b. During construction and operation, best practice would be followed to minimise the risk of disturbance or damage to species or habitats, including as a consequence of transport access arrangements.

c. Habitats would, where practicable, be restored after construction works have finished.

d. Opportunities would be taken to enhance existing habitats and, where practicable, to create new habitats of value within the site landscaping proposals (NPS para. 4.5.17).

Coastal change

7.4.27 The coastal change section of the NPS applies to onshore wastewater infrastructure projects situated on the coast, estuaries and rivers where the infrastructure may affect coastal or estuarine processes. It is therefore applicable in principle to the project, which is located within the tidal reaches of the River Thames.

7.4.28 NPS para. 4.6.2 states that coastal change means "*physical change to the shoreline, i.e. erosion, coastal landslip, permanent inundation and coastal accretion. Where onshore infrastructure projects are proposed on the coast, coastal change is a key consideration".*

7.4.29 The applicant's assessment should take into account, where relevant, coastal geomorphological and sediment transfer modelling, in order to predict and understand impacts and to help identify relevant mitigating or compensatory measures.

7.4.30 The decision maker should be satisfied that the proposed development would be resilient to coastal erosion and deposition, taking account of climate change during the project's operational life. The decision maker should also be satisfied that the benefits (including need) of the development outweigh any identified adverse impacts, and that restoration plans are provided for areas of foreshore that would be disturbed by direct works (NPS paras. 4.6.10 to 4.6.12).

7.4.31 NPS para. 4.6.13 states that, in accordance with Section 59 of the Marine and Coastal Access Act 2009, the decision-maker should have regard to the appropriate marine policy documents. This includes the UK Marine Policy Statement and any adopted Marine Plans (see below).

Landscape and visual impacts (including townscape)

7.4.32 The NPS acknowledges that the landscape and visual effects of wastewater projects vary according to the type of development, its location

and its landscape setting (NPS para. 4.7.1). In this context, references to landscape also cover townscape.

7.4.33 Applicants should therefore carry out a landscape and visual assessment, which should reference any landscape character assessment and associated studies, and take account of any relevant policies based on these assessments in local development documents (NPS para. 4.7.2).

7.4.34 It recognises, however, that: "*landscape effects depend on the existing character of the local landscape, its current quality, how highly it is valued and its capacity to accommodate change. All of these factors need to be considered in judging the impact of a project on landscape. Projects need to be designed carefully, taking account of the potential impact on the landscape. Having regard to siting, operational and other relevant constraints, the aim should be to minimise harm to the landscape, providing reasonable mitigation where possible and appropriate*" (NPS para. 4.7.6).

7.4.35 In decision making, NPS para. 4.7.11 states that "*the fact that a proposed project will be visible from within a (nationally) designated area should not in itself be a reason for refusing consent*". It advises that projects should avoid compromising the purposes of a national designation and should be designed sensitively according to the various siting, operational, and other relevant constraints.

7.4.36 Outside of nationally designated areas, the NPS acknowledges that there are local landscapes that may be highly valued locally and protected by a local designation. The NPS advises that where a local development document has policies based on landscape character assessment, the applicant should pay particular attention to these. However, it states that: "*local landscape designations should not be used in themselves as reasons to refuse consent, as this may unduly restrict acceptable development*" (NPS para. 4.7.12).

7.4.37 NPS para. 4.7.13 states that the decision maker should consider whether the project has been designed carefully, taking account of environmental effects on the landscape and siting, operational and other relevant constraints, in order to minimise harm to the landscape, including by means of reasonable mitigation.

7.4.38 Visual impact is also a consideration for the decision maker. The NPS indicates that potential visual effects on sensitive receptors should be weighed against the benefits of the development (NPS para. 4.7.14). In order to assist the decision maker in judging the weight to give to the assessment of visual impacts, the NPS suggests that the applicant may draw attention to any examples of existing permitted infrastructure that has a similar magnitude of impact on sensitive receptors.

7.4.39 The NPS recognises that reducing the scale of a project can help to mitigate its visual and landscape effects. However, reducing the scale or otherwise amending the design of the development may result in significant operational constraints or reduction in function. There may, however, be exceptional circumstances where mitigation could have a very significant benefit and warrant a small reduction in function. In these

circumstances, the decision maker may decide that the benefits of the mitigation to reduce the landscape effects outweigh the marginal loss of function (NPS para. 4.7.16).

7.4.40 The NPS recognises that adverse landscape and visual effects at site level may be minimised through appropriate siting of infrastructure, design (including colours and materials), and landscaping schemes, depending on the size and type of the proposed project. Materials and designs of buildings should always be given careful consideration (NPS para. 4.7.17).

Land use including open space, green infrastructure and green belt

7.4.41 NPS para. 4.8.1 recognises that: "*A waste water infrastructure project will have direct effects on the existing use of the proposed site and may have indirect effects on the use, or planned use, of land in the vicinity for other types of development. Given the likely locations of waste water infrastructure projects there may be particular effects on open space including green infrastructure*".

7.4.42 The NPS favours the re-use of previously-developed land for new development, noting that it can make a major contribution to sustainable development by reducing the amount of undeveloped greenfield land that needs to be used. However, the NPS recognises that it may not always be possible to locate some forms of infrastructure on previously-developed land (para. 4.8.3).

7.4.43 The NPS states that applicants should identify existing and proposed land uses near the project, any effects of replacing an existing development or the use of the site for the proposed project, or preventing a development or use on a neighbouring site from continuing. Applicants should also assess any effects of precluding a new development or use proposed in the development plan (para. 4.8.5).

7.4.44 Applicants need to consult the local community on their proposals to build on open space, sports or recreational buildings and land. Taking account of the consultation responses, applicants should consider providing new or additional open space, including green infrastructure, sport or recreation facilities to substitute for any losses as a result of the proposals. Applicants should use an up-to-date local authority assessment or, if there is none, provide an independent assessment to show whether the existing open space, sports and recreational buildings and land is surplus to requirements.

7.4.45 Where the project conflicts with a proposal in a development plan, the NPS states that the decision maker should consider the stage that the Development Plan Document has reached to decide what weight to give to the plan in order to determine the planning significance of what the proposals would replace, prevent or preclude (para. 4.8.12).

7.4.46 The decision maker should not grant consent for development on existing open space, sports and recreational buildings and land unless an assessment has been undertaken either independently or by the local authority, which has clearly shown the open space or the buildings and

land to be surplus to requirements; or the decision maker determines that the benefits of the project (including need) outweigh the potential loss of such facilities, taking into account any positive proposals made by the applicant to provide new, improved or compensatory land or facilities. The loss of playing fields should only be allowed where applicants can demonstrate that they would be replaced with facilities of equivalent or better quantity or quality in a suitable location (para. 4.8.13).

7.4.47 Importantly, the NPS states that: "*in reaching a judgment, the decision maker should consider whether any adverse impact is temporary, such as during construction, and/or whether any adverse impact on the landscape will be capable of being reversed in a timescale that the decision maker considers reasonable*" (NPS para. 4.8.14).

7.4.48 In terms of mitigation, it is recognised that applicants can minimise the direct effects of a project on the existing use of the proposed site, or proposed uses near the site by the application of good design principles, including the layout of the project. The decision maker should also consider whether mitigation of any adverse effects on green infrastructure or open space is adequately provided for by means of any development consent obligations, for example, to exchange land and provide appropriate management and maintenance agreements (NPS para. 4.8.21).

Noise and vibration

7.4.49 The NPS recognises that excessive noise can have wide-ranging impacts on the quality of life and health (eg, annoyance or sleep disturbance), and on the use and enjoyment of areas of value (eg, quiet places and areas with high landscape quality). Similar considerations also apply to vibration (NPS para. 4.9.1).

7.4.50 The project should demonstrate good design through selection of the quietest cost-effective plant available; containment of noise within buildings wherever possible; optimisation of plant layout to minimise noise emissions; and, where possible, the use of landscaping, bunds or noise barriers to reduce noise transmission (NPS para. 4.9.8).

7.4.51 The NPS advises that the decision maker should not grant development consent unless it is satisfied that the proposals avoid significant adverse impacts on health and quality of life from noise. The decision maker should also be satisfied that the proposals mitigate and minimise adverse noise impacts on health and quality of life. Where possible, projects should contribute to improvements to health and quality of life, through the effective management and control of noise (NPS para. 4.9.9).

7.4.52 The NPS states that, when preparing the Development Consent Order, the decision maker should consider whether Requirements are needed that specify mitigation measures or measurable Requirements put forward by the applicant to ensure that the noise levels from the project would not exceed those described in the assessment or any other estimates on which the decision was based.

7.4.53 NPS para. 4.9.13 advises that: *"in certain situations, and only when all other forms of noise mitigation have been exhausted, the applicant may consider it appropriate to provide noise mitigation through improved sound insulation sound insulation to dwellings or, in extreme cases, through compulsory purchase of affected properties in order to gain consent for what might otherwise be unacceptable development''*.

Historic environment

7.4.54 The NPS requires the applicant to provide a description of the significance of the heritage assets affected by the proposed development and the contribution of the asset's setting to that significance. NPS para. 4.10.7 states that the level of detail should be proportionate to the importance of the heritage assets, but no more than is sufficient to understand the potential impact of the proposal on the significance of the heritage asset.

7.4.55 The decision maker should take into account the desirability of new development making a positive contribution to the character and local distinctiveness of the historic environment. The consideration of design should include scale, height, massing, alignment, materials and use. The decision maker should have regard to any relevant local authority development plans or local impact reports on the proposed development in respect of the factors set out in relevant practice guidance (NPS para. 4.10.12).

7.4.56 In considering the impact of a proposed development on any heritage assets, the decision maker should take into account the particular nature of the significance of the heritage assets, and the value that they hold for this and future generations (NPS para. 4.10.11). This understanding should be used to avoid or minimise conflict between conservation of the significance and the development proposals. The NPS recognises that not all elements of a World Heritage Site or conservation area necessarily contribute to its significance (NPS para. 4.10.15).

7.4.57 In decision making, the NPS states that there should be a presumption in favour of conserving designated heritage assets, and the more significant the asset, the greater the presumption in favour of its conservation. Loss of any designated heritage asset should require clear and convincing justification. Substantial harm to or loss of a Grade II listed building, park or garden should be "*exceptional"*. Substantial harm to or loss of designated assets of the highest significance, including Scheduled Monuments, registered battlefields, Grade I and II* listed buildings, Grade I and II* registered parks and gardens, and World Heritage Sites, should be "*wholly exceptional"* (NPS para. 4.10.13).

7.4.58 Any harmful impact on a designated heritage asset should be weighed against the public benefit of the development, recognising that the greater the harm to the significance of the heritage asset, the greater the justification required for any loss. Where a development would lead to substantial harm to or total loss of significance of a designated heritage asset, the decision maker should refuse consent unless it can be demonstrated that the substantial harm to or loss of significance is

necessary in order to deliver substantial public benefits that outweigh that loss or harm (NPS para. 4.10.14).

7.4.59 The NPS states that the decision maker should consider imposing a Requirement on the consent or requiring the applicant to enter into an obligation where the decision maker has determined that the applicant has justified the loss of significance of any heritage asset based on the merits of the new development. The Requirement or obligation would prevent the loss occurring until it is reasonably certain that the relevant part of the development shall proceed (NPS para. 4.10.16).

7.4.60 When considering applications for developments that affect the setting of a designated heritage asset, the NPS requires the decision maker to treat favourably applications that preserve elements of the setting that make a positive contribution to, or better reveal the significance of the asset. However where there is a negative effect on setting, the decision maker should weigh those effects against the wider benefits of the application (NPS para. 4.10.17).

7.4.61 The NPS advises that any unavoidable losses of heritage assets should be recorded but also that a documentary record of the past is not as valuable as retaining the asset. Therefore the ability to record evidence of the asset should not be a contributory factor in deciding to grant consent (NPS para. 4.10.19).

Traffic and transport, including river use

7.4.62 The NPS recognises that the transport of materials, goods and personnel to and from a development during all project phases can have a variety of impacts, including economic, social and environmental effects. A new Nationally Significant Infrastructure Project may give rise to substantial impacts on the surrounding transport infrastructure. The decision maker should therefore ensure that the applicant has sought to mitigate these impacts. The consideration and mitigation of transport impacts is an essential part of the Government's wider policy objectives for sustainable development (NPS paras. 4.13.1, 4.13.2 and 4.13.6).

7.4.63 Where significant environmental effects are anticipated from traffic and transport effects, NPS para. 4.13.3 states that a *Transport Assessment* must be prepared using the NATA/ WebTAG methodology, and that consideration must be given to the construction, operational and decommissioning stages. The NPS requires projects to assess the transport effects and provide mitigation where necessary to reduce adverse transport impacts to an acceptable level. Where additional infrastructure is required, NPS para. 4.13.5 provides guidance on the potential for co-funding by government for any third-party benefits. NPS para. 4.13.7 also states that:

"Provided that the applicant is willing to enter into planning or transport obligations or requirements [sic] *can be imposed to mitigate transport impacts identified in the NATA/WebTAG Transport Assessment, with attribution of costs calculated in accordance with the Department for Transport's guidance, then development consent should not be withheld,*

and appropriately limited weight should be applied to residual effects on the surrounding transport infrastructure".

7.4.64 Where cost-effective, the NPS prefers water-borne or rail transport over road transport at all stages of projects. Where there would be substantial HGV traffic, applicants should work to control HGV movements in a specified period during construction and possibly to route such movements. Additionally, the NPS suggests the provision of HGV parking to avoid prolonged queuing on approach roads and uncontrolled on-street parking during normal operating conditions. Satisfactory arrangements for reasonably foreseeable abnormal disruption as a result of substantial HGV traffic should also be made, in consultation with network providers and the responsible police force (NPS para. 4.13.10).

7.4.65 NPS para. 4.13.11 states that: *"If an applicant suggests that the costs of meeting any obligations or requirements would make the proposal economically unviable this should not in itself justify the relaxation by the decision maker of any obligations or requirements needed to secure the mitigation".*

Waste management

7.4.66 The NPS recommends that waste generated during the construction and operation phases of a development should be subject to sustainable waste management. Sustainable waste management should be implemented through the waste hierarchy, which sets out a sequential preference for prevention, preparing for re-use, recycling, other recovery including energy recovery, and finally disposal (NPS para. 4.14.2).

7.4.67 The applicant should set out the arrangements proposed for managing any waste produced and prepare a site waste management plan. The arrangements and the management plan should include information on the proposed waste recovery and disposal system for all waste generated by the development, and an assessment of the impact of that waste on the capacity of waste management facilities to deal with other waste arising in the area for at least five years of operation (NPS para. 4.14.5).

7.4.68 In decision making, consideration should be given to the extent to which the applicant has proposed an effective system for managing hazardous and non-hazardous waste arising from the construction and operation of the proposed development. The NPS states that the decision maker should be satisfied that waste could be dealt with appropriately and would be properly managed, both on-site and off-site. Waste occurrence should not have an adverse effect on the capacity of existing waste management facilities and adequate steps should be taken to minimise the volume of waste sent for disposal, except where that is the best overall environmental outcome (NPS para. 4.14.6).

Socio-economic

7.4.69 Where a project is likely to have socio-economic impacts at a local or regional level, the applicant should undertake an assessment of those impacts during the construction, operation and decommissioning stages of the development (NPS para. 4.15.2). Potential socio-economic impacts

include the creation of jobs and training opportunities, impacts on rights of way, and effects arising from an influx of workers during the construction phase (NPS para. 4.15.3). Impacts on tourism or local business may also be relevant (NPS para. 4.15.5).

7.4.70 The applicant should describe the existing demographics of the area surrounding the development and could also refer to how the development's socio-economic effects correlate with local planning policy (NPS para. 4.15.4).

7.4.71 The applicant should assess whether a disproportionate number of a particular equalities group would be affected by the generic impacts, such as air emissions, other emissions, flood risk, noise, visual impacts, land use etc. This requires an Initial Equalities Impact Assessment to identify potential adverse, differential or positive impacts on equalities groups and whether the impacts would be direct or indirect. If significant impacts are identified at the initial screening stage, a full Equalities Impact Assessment should be undertaken. The applicant should describe the equalities impact on people who live, work or own businesses who may be displaced as a result of the development, as well as the indirect equalities impact of a loss of goods or services as a result of displacement (NPS para. 4.15.6).

7.4.72 The decision maker is required to have regard to the applicant's assessment of socio-economic effects and to other sources that it considers important and relevant. However, the NPS advises that it "*should be reasonable for the decision maker to conclude that little weight is to be given to speculative assertions of socio-economic impacts not supported by evidence (particularly in view of the need for wastewater infrastructure as set out in this NPS*)" (NPS para. 4.15.10).

7.5 Other national policy

Marine Policy Statement

7.5.1 The NPS states that, in accordance with Section 59 of the Marine and Coastal Access Act 2009, the decision maker needs to have regard to the appropriate marine policy documents, specifically the UK Marine Policy Statement and any adopted Marine Plans.

7.5.2 The Marine Policy Statement was introduced in March 2011 and applies to all UK marine waters. It seeks to help the UK achieve a shared vision for *"clean, healthy, safe, productive and biologically diverse oceans and seas"*. The UK high-level marine objectives specify the broad outcomes for the marine area from achieving this vision and reflect the principles for sustainable development.

7.5.3 The Marine Policy Statement states that: *"The objective shared by the UK Administrations is to contribute to sustainable development including the health and well-being of the community and the protection of the environment by maintaining and developing a policy and regulatory system which provides modern, high quality management and treatment of surface and waste water. The collection, treatment and disposal of waste water from housing and industry, the effective drainage of storm water and*

runoff to the sea, mitigating the effects of diffuse pollution from urban areas and agriculture by improved management and improvements to drainage design are key activities to achieve this. An important aim is ensuring that infrastructure is in place and maintained for necessary disposal activity to be carried out in compliance with EU legislative requirements[14]. Sewerage infrastructure and drainage is also essential in supporting economic and social development and for reducing the risk of flooding in urban areas"[15] (p. 44 to 45).

7.5.4 The Marine Policy Statement states (para. 3.10.3) that: "*the construction and development of new facilities will have an impact, but well managed these can be minimised so that the benefits outweigh impacts. The location of existing facilities associated with waste water discharge will impact upon and shape future terrestrial and marine planning decisions"*.

7.5.5 The Marine Policy Statement recognises (para. 3.10.4) that there are significant environmental, social and economic benefits in the provision of appropriate infrastructure for wastewater collection, treatment, discharge and surface water drainage in coastal areas. These benefits include the "*protection and improvement of water quality, improvements in public health, local amenity value and the provision of essential infrastructure in support of national priorities for growth and economic development*".

7.5.6 It also states that Marine Plan authorities should "*take account of the benefits that waste water infrastructure can provide in enabling wider socio-economic development on land, and maximise opportunities for co-existence with other activities in the marine environment*" (para. 3.10.6).

Proposed South East Marine Conservation Zone

7.5.7 The tidal Thames is part of the proposed South East Marine Conservation Zone. The conservation zone recommendations were developed by the Balanced Seas Regional Stakeholder Group which had wide cross-sector representation. The conservation zone will be set up under the Marine and Coastal Access Act of 2009 and are a new type of Marine Protected Area. They will protect nationally important marine wildlife, habitats, geology and geomorphology.

7.5.8 The Thames Estuary recommended Marine Conservation Zone stretches along the greater part of the tidal Thames from Richmond to the estuary mouth at Southend-on-Sea, following the mean high water mark and is designed to protect different species and habitats along distinct stretches of the river. As a whole, the site is considered to be an important spawning and nursery ground for various fish species, particularly Smelt (Osmerus eperlanus) and European Eel (Anguilla anguilla).

7.5.9 Defra is currently evaluating all the evidence collected, including the advice of Natural England, the Joint Nature Conservation Committee (JNCC) and the Science Advisory Panel (SAP) on the ecological evidence in order to provide its own impact assessment. This will be used during a

[14] This includes compliance with the requirements of the UWWTD, Water Framework Directive, Shellfish Waters Directive, Bathing Waters Directives and the Marine Strategy Framework Directive.

[15] Specific objectives for water and sewerage services are set out in guidance issued to the industry for each price review or price control period and in England, the government's future water strategy 'Future Water'.

three month public consultation that opened in December 2012. Following the consultation, it is anticipated that the Minister will select sites that are backed by robust evidence, to designate in summer 2013, sites where further evidence is required, to designate at a later stage and sites that are not considered suitable to progress.

National Planning Policy Framework

7.5.10 Section 104 (2) of the 2008 Act indicates that the decision maker must have regard to any NPS that has effect and to any other matters that it thinks are both important and relevant to its decision. This may require some consideration of the *National Planning Policy Framework* (*NPPF*), published on 27 March 2012. The *NPPF* now replaces the majority of the Planning Policy Guidance Notes and Planning Policy Statements, with the exception of a small number of documents including PPS 10: *Planning for Sustainable Waste* (2011).

7.5.11 The *NPPF* does not contain specific policies for NSIPs to which particular considerations apply. Para. 3 states that applications for development consent for NSIPs "*are determined in accordance with the decision-making framework set out in the Planning Act 2008 and relevant national policy statements for major infrastructure, as well as any other matters that are considered both important and relevant (which may include the National Planning Policy Framework). National policy statements form part of the overall framework of national planning policy, and are a material consideration in decisions on planning applications*".

7.5.12 In preparing local plans, the *NPPF* (para. 162) states that: *"authorities should work with other authorities and providers to assess the quality and capacity of infrastructure for transport, water supply, wastewater and its treatment*", and to *"take account of the need for strategic infrastructure including nationally significant infrastructure within their areas".*

7.5.13 In other words, the *NPPF* does not set policies or tests for wastewater NSIPs. It does advise, however, that planning authorities must take into account plans for nationally significant infrastructure when preparing plans and states that policies in a National Policy Statement shall be material considerations in the determination of town and country planning applications.

Planning for Sustainable Waste Management (PPS10)

7.5.14 While PPS 10 was not cancelled by the publication of the *NPPF*, its direct relevance to the application proposals is limited by the fact that the NPS itself contains advice on waste management (as set out above).

7.5.15 The overall objective of government policy in relation to waste is to protect human health and the environment by producing less waste and by using it as a resource wherever possible. By means of more sustainable waste management, moving the management of waste up the 'waste hierarchy' of prevention, preparing for re-use, recycling, other recovery including energy recovery, and disposing only as a last resort, the Government aims to break the link between economic growth and the environmental impact of waste. Annex F of PPS 10 considers London and, in *GOL Circular*

1/2000 Strategic Planning in London, provides advice and guidance on the planning arrangements that apply in London. It states that:

"In doing so, the SDS [Spatial Development Strategy] is expected to reflect the importance of taking a strategic approach to London's waste management and disposal, such as the need to develop sustainable and practical solutions, the specific duty to promote transportation on the River Thames, and the implications for areas outside the capital".

National Infrastructure Plan 2011

7.5.16 The *National Infrastructure Plan* (2011) contains the Government's major commitments for meeting the infrastructure needs of the UK. It sets out a new strategy for coordinating public and private investment in critical UK infrastructure projects and it places particular emphasis on delivery. The plan requires the Government to play an active role in ensuring that barriers to infrastructure delivery are resolved and that the projects identified in the plan are realised.

7.5.17 Section 2.8 of the plan explains that the Government has identified 40 priority infrastructure projects, including both major programmes and significant individual projects. The project is named as one of those projects in Table 2.B of the plan.

7.5.18 Section 3.114 of the plan states that: "*the Government wants to ensure fair and affordable water and sewerage services while maintaining excellent drinking water quality and protecting and enhancing the ecological status of water bodies such as lakes and rivers*".

7.5.19 One of the key ambitions of the plan is "*maintaining the security and performance of the water and sewerage system while reducing its environmental impacts'.* This ambition translates to the following three key areas for water and sewerage infrastructure identified at Section 3.122:

a. *"maintain the water industry's good performance (in terms of security of supply, water quality and the effective removal of waste water) in the face of rising demand and climate change pressures;*

b. *"improve the quality of England's water environment, through reduced pollution and sustainable abstraction, improving the status of water bodies in line with the objectives contained within the EU Water Framework Directive; and*

c. *"support the water regulator and industry in delivering a greater level and quality of customer service, and ensuring water and sewerage services are provided at prices households can afford".*

7.5.20 In Section 3.125, the plan states that: *"the increasing level of sewage overflowing into the River Thames is an example of where the capacity of the drainage system to cope with an increasing population and increasing urbanisation has been exceeded and there is now a need to build new infrastructure to meet both current and future needs. The proposed Thames Tunnel will, in combination with other measures, also provide resilience to likely increased intensity of rainfall as a result of climate change and help prevent the ecological status of the Thames Tideway from deteriorating after decades of improvement".*

7.5.21 In December 2012 a progress report was issued and this noted progress with the project and the intention to submit this application for development consent early in 2013.

7.6 Regional planning context

7.6.1 At a regional level, the *London Plan* sets out the Mayor's spatial planning framework for London. It aims to promote an attractive, well-designed and greener city.

7.6.2 Key policy issues at a regional level that affect the project include:

a. the Thames Tideway Tunnel policy

b. the Blue Ribbon Network

c. safeguarded wharves.

7.6.3 The *London Plan* provides direct support for the project in Policy 5.14, which states that the *"development of the Thames Tideway Sewer Tunnels to address London's combined sewer overflows should be supported in principle*". It also states that relevant Boroughs should include policies within their Local Development Frameworks to support the project in principle.

7.6.4 Proposal 10 in the Mayor's *Water Strategy* (2011) also supports the project. It explains that: "*The Mayor supports the construction of the Thames Tideway Tunnels as a solution to the problem of CSO discharges"*. In the words of the Mayor's foreword, as part of a wider set of measures for London, it would "*help us to stand on the shoulders of Bazalgette and future proof London for the challenges ahead".*

7.6.5 The *London Plan* confirms that *"the River Thames is one of London's icons and merits special attention"* (para 7.87). Accordingly, it sets out a series of policies for the River Thames and for London's strategic network of water spaces, the Blue Ribbon Network. It states that the Blue Ribbon Network plays a unique and diverse role, as follows:

"[…] the Blue Ribbon Network is multi-functional. It provides a transport corridor, drainage and flood management, a source of water, discharge of treated effluent, a series of diverse and important habitats, green infrastructure, heritage value, recreational opportunities and important landscapes and views. The starting point for consideration of development and use of the Blue Ribbon Network and land alongside it must be the water. The water is the unique aspect and consideration must initially be given as to how it can be used, maintained and improved".

7.6.6 Accordingly, the *London Plan* sets out a series of important and relevant policies for the Blue Ribbon Network including:

a. policies to increase use of the network, for example through waterborne passenger and tourist traffic (Policy 7.25)

b. policies to increase the use of the network for freight transport and, in particular, to safeguard wharves for waterborne freight handling use (policy 7.26)

c. policies to enhance the use of the network for water-borne sport and leisure use (Policy 7.27)

d. policies to restore and enhance the network, to protect the value of its foreshore and to enhance habitat value and biodiversity (Policy 7.28). Thames-side boroughs are required to identify a Thames Policy Area within their Local Development Frameworks and to formulate strategies for these areas, which seek to deliver the objectives of the *London Plan* policies.

7.7 Local planning context

7.7.1 The application will be judged by the decision maker primarily on the policies in the NPS. The Planning Inspectorate must also have regard to any local impact report prepared by affected local planning authorities.

7.7.2 A number of topics are identified in the NPS for which local policies may be a consideration in determining the application. These include local designations and policies in respect of designations in relation to land use and open space, ecology, landscape and heritage etc. Any such relevant matters are considered in the site-specific planning assessments set out in the site-specific appendices.

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Thames Tideway Tunnel
Thames Water Utilities Limited

Application for Development Consent

Application Reference Number: WWO10001

Planning Statement

Doc Ref: **7.01**

Planning Assessment Project wide

APFP Regulations 2009: Regulation **5(2)(q)**

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January 2013

Thames Tideway Tunnel

Creating a cleaner, healthier River Thames

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8 Planning assessment: Project-wide

8.1 Introduction

8.1.1 This section considers the application proposals as a whole against the policy tests identified in Section 7.

8.1.2 This assessment takes account of the appraisals of those individual constituent sites which comprise parts of the application. The site appraisals are set out in the site-specific appendices. The appraisals review individual sites against the same policy headings set out in Section 7 and draw out the principal effects of the works proposed at the individual sites. However, they do not reach overall conclusions about the planning acceptability of the individual proposals because those proposals form part of a single unified project that falls to be considered as a whole, taking account of all applicable policy tests and other important and relevant matters.

8.1.3 This section, therefore, considers the project-wide acceptability of the proposals as a whole against the policy tests. It does not repeat the analysis in the site-specific appendices but it does draw on the analysis where significant matters arise that is relevant to specific policy headings. This section, therefore, seeks to ensure that all principal effects of the project as a whole are taken into account.

8.1.4 With the benefit of this analysis against policy, Section 9 draws conclusions, applying the decision making framework set out in Section 104 of the 2008 Act.

8.2 Meeting the need in London

8.2.1 The application proposals would directly and precisely meet the specific need for the project identified in the NPS.

8.2.2 Section 3 of this document explains the nature of the need for the project. The need for the project is established by the NPS and does not need to be revisited for the purposes of the application. Nevertheless, it is important to note that the NPS identifies that the project is of national importance and that it is *"essential"* that the project is brought forward to address ecological, health, aesthetic and statutory requirements (NPS paras. A.1.3.6 and 2.6.19). The project is necessary to support the national economy and the reputation of both the UK and its capital city (NPS para. A.1.3.7). Few if any projects benefit from such strong, up-to-date and direct national policy support.

8.2.3 As Section 3 of this document explains, while the NPS advises that it is for Thames Water to justify its specific application, the NPS defines a particular role for the Environment Agency to determine the nature of projects necessary to meet statutory environmental requirements, like the Thames Tideway Tunnel project. Sections 3 and 4 of this document explain the detailed work undertaken by the Environment Agency to define

the necessary requirements of the project, including the specific extent of CSOs that must be intercepted or managed by the project. Sections 4 and 5 confirm that the application proposals were carefully designed to meet that very specific need.

8.2.4 By definition, the project was designed to meet the precise need identified.

8.2.5 The document *CSO control and performance of the Thames Tideway Tunnel, (Environmental Statement,* Vol 3, Section 11, Appendix l.1*)* reports the output from the modelling work undertaken for the project. The modelling also examines the pre-existing condition of the tidal Thames and the incremental improvements achieved by the improvements to Beckton and Crossness Sewage Treatment Works and by the Lee Tunnel. The modelling is compared with objectives set for the project, ie to help meet the requirements of the UWWTD and the bespoke water quality standards for dissolved oxygen developed in the *TTSS*. In headline terms, the report identifies that:

a. In a typical year total discharges into the Beckton and Crossness catchments are about 39 million m^3.

b. With the improvements to Beckton and Crossness Sewage Treatment Works, the annual total CSO volume reduces to about 24 million m^3.

c. With the sewage treatment works improvements and the Lee Tunnel project, the annual total CSO volumes reduce to about 18 million m^3.

8.2.6 Even with those reductions, over 50 separate discharge events are predicted at Hammersmith Pumping Station; three other pumping stations produce over 40 separate discharge events; and a total of 17 CSOs produce 20 or more discharge events in the typical year.

8.2.7 With the completion of the project, estimated residual spill volumes fall to approximately 2.4 million m^3. Twelve of the 34 unsatisfactory CSOs are predicted to have a residual discharge of four events during the typical year and the other 22 would have less than four residual discharge events. The project would facilitate the capture of approximately 94 per cent of the 39 million m^3 of CSO discharges predicted in the typical year, which would meet the standards set by the *TTSS*. Additionally, the *TTSS* report confirms that all four bespoke dissolved oxygen standards for the tidal Thames would be met (para. 6.4.15). The detailed modelling results for each CSO are set out in Tables 3.1 and l.6 of the report.

8.2.8 The application proposals, therefore, would directly meet the need identified in the NPS.

8.2.9 The importance and urgency of the need identified in the NPS is reinforced by the need to meet the requirements of the UWWTD. Section 3 of this document explains the proceedings against the UK in the European Court and the implications for the UK of the Judgement of the Court on 18 October 2012. The Government was asked to explain to Parliament on 20 November 2012 how it intends to comply with the Judgement. The Government's position was explained by Lord De Mauley, the Parliamentary Under-Secretary for Defra, as follows:

"The Court accepted that the Thames Tideway Tunnel represents a solution to the problem of the collecting system in London and the implication, therefore, is that the tunnel represents a means to come into compliance with the Judgement.

"For London, we re-examined the costs and benefits of the tunnel [...] which demonstrated that the costs of the tunnel were not disproportionate [...] We are not aware of any new information that significantly changes that analysis, and the tunnel remains the most cost effective solution to address the lack of capacity of the London sewerage system to accommodate even light rainfall" (House of Lords, Written Answer, 20 November 2012).

8.2.10 This represents up-to-date confirmation that it is government policy that the project is necessary to meet the need identified by the European Court.

8.2.11 NPS para. 2.6.24 makes clear that the need was considered urgent in 2007 and that, given the level and urgency of the need, the decision maker should start with a presumption in favour of granting consent for the project (NPS para. 3.1.2).

8.3 Factors for the examination and determination of NSIP applications for development consent

8.3.1 Part 3 of the NPS sets out a number of factors to be considered in determining a DCO application. Some of these are partly procedural, while others set important, substantive criteria.

8.3.2 Dealing first with the technical and procedural criteria, the NPS requires the application to be accompanied by:

a. an Environmental Impact Assessment and, where appropriate

b. a Habitat Regulations Assessment.

8.3.3 These criteria are met to the extent that a comprehensive Environmental Impact Assessment accompanies the application and observes the scope suggested in NPS paras. 3.2.1 to 3.2.8.

8.3.4 The NPS advises that it is not necessary for the application to examine strategic alternatives but that the *Environmental Statement* should contain an outline of the main alternatives studied by the applicant (NPS paras. 3.4.1 to 3.4.3) and this criterion is met in the *Environmental Statement* (Vol 1, Section 3).

8.3.5 NPS para. 1.5.1 explains that the Government carried out a Habitats Regulation Assessment as part of the preparation of the NPS. The Habitats Regulation Assessment of the NPS concluded that the project would not have a significant effect on a number of European sites. In relation to the Thames Estuary and Marshes Special Protection Area (SPA) and Ramsar site, however, the assessment concluded that:

"The effects of the 2 NSIP schemes (Deephams STW and the Thames Tunnel) on the Thames Estuary and Marshes SPA and Ramsar site are

uncertain and, therefore, a detailed Appropriate Assessment will be required at the project level on the basis of a more clearly defined scheme specification and design."

8.3.6 A Habitats Regulation Assessment screening of the potential effects of the project on European sites concluded that there would be no likely significant effects on any of the European sites, either alone or in combination with other projects and plans. The application is accompanied by the *Habitats Regulations Assessment: No Significant Effects Report*, the conclusions of which were endorsed in a letter from Natural England received in January 2013.

8.3.7 In relation to pollution control and other consenting regimes, the NPS requires the promoter to engage with other statutory authorities to ensure that the powers sought under the DCO are complementary to the operation of other regimes of control. These criteria s are comprehensively met by Thames Water, as explained in the *Consultation Report.* Thames Water is also developing a series of Statements of Common Ground with statutory consultees to explain the nature of the discussions undertaken and their outcome (in accordance with NPS paras. 3.7.1 to 3.7.9). This extends to the joint working with the Health and Safety Executive required by NPS Sections 3.8 and 3.9 and to consideration of any national security implications, as required by NPS Section 3.12.

8.3.8 NPS Section 3.10 requires the health impacts of an application to be considered; Thames Water has prepared a project-specific *Health Impact Assessment* to address this criterion. Specific attention was also paid to NPS Section 3.11, which addresses the potential relationship between statutory nuisance and the potential adverse effects of the project.

8.3.9 In all these matters, Thames Water had specific regard to the advice in NPS para. 3.7.3 that the examining authority and the decision maker will focus on whether the development proposed is an acceptable use of land, and on the impacts of that use, against an assumption that the relevant pollution control regimes would be properly applied and enforced.

8.3.10 Two other substantive matters are raised by NPS Section 3, namely:

a. that criteria for 'good design' have been addressed

b. that the proposals have been designed taking account of the potential impacts of climate change.

8.3.11 These two matters are considered in detail below.

Good design

8.3.12 NPS para. 35.1 defines good design as *"ensuring attractive, usable, durable and adaptable places and contributing to sustainable development".* It recognises the necessity for wastewater infrastructure developments to provide a functional purpose but expects good aesthetic and functional design to go together, while recognising that the nature of wastewater infrastructure may impose limits on what can be achieved.

8.3.13 The *DAS* sets out the project's commitment and approach to good design, taking into account the policies of the NPS. *The Engineering Design Statement* describes the engineering components of the project and sets out the factors that influenced the size, arrangement and level of detail of the components both above and below ground.

8.3.14 The *DAS* describes how Thames Water has consistently striven to develop high quality designs that respond to the below-ground engineering constraints and take account of comments from key stakeholders and the public. With the benefit of that engagement, a vision was developed for the project, as follows:

"The project would be a major, city-wide investment in London's wastewater infrastructure for the 21st century. It would build on Bazalgette's legacy, maintain London's long-term sustainability as a world-class city, and improve the quality of its largest open space: the River Thames" (*DAS para.* 5.3).

8.3.15 The *DAS* notes that a key design objective for the permanent above-ground works was to integrate them successfully with their surroundings. While a fundamentally functional, engineering project may be considered to have design limitations, the *DAS* explains how Thames Water established an integrated design team to ensure that the functional requirements were integrated with aesthetic objectives (para 4.2.2). It also describes how joint working with the Design Council CABE, English Heritage and others identified the opportunity to establish design linkages between the 24 proposed sites in order to reflect their physical below-ground connectivity and their inherent connection with the River Thames.

8.3.16 Working with the Design Council CABE, the design team recognised the value of investing time in developing common design components, such as ventilation columns, surface materials and access covers, similar to the approach to components in the original Bazalgette scheme. This approach was intended to give the project a strong identity, which would unify the above-ground structures and celebrate Thames Water's commitment to improving the river (*DAS* para. 5.2.1).

8.3.17 Other relevant project-wide opportunities were recognised, including that the designs could improve accessibility to new areas of public realm and seek to enhance local amenity in the form of new spaces.

8.3.18 Accordingly, for example, the design team developed a 'signature' design for the ventilation columns (refer to the *DAS,* Section 5.4), along with proposals for a generic design approach where practical to river walls, banded paving and cladding and access covers. In addition, the project proposes to take advantage of opportunities for interpretive materials. As noted in the *DAS*, the design approach was strongly commended by English Heritage and the Design Council CABE (*DAS,* Section 5.2).

8.3.19 In accordance with NPS para. 3.5.2, engagement with the Design Council CABE also extended to all of the site-specific proposals through two rounds of detailed design review. The process consisted of sketch reviews that focussed on urban design and other principles and final reviews based on development proposals. The process was undertaken

with the participation of affected local planning authorities and was influential in informing the proposals for phase two consultation. After phase two, the Design Council CABE also undertook additional reviews during targeted consultation.

8.3.20 As explained in the *DAS*, Thames Water is committed to leaving a positive legacy and improving spaces and movement, where possible, to ensure that the imprint left across the sites is aesthetically-pleasing and long-lasting.

8.3.21 *DAS* Section 5.3 also explains how sustainability and accessibility issues informed the application proposals but, more particularly, how a series of generic design principles were developed to give effect to the vision and design objectives. The principles are set out in the *Design Principles* document. In both the *DAS* and the *Design Principles*, they are set out under the following headings:

a. generic design principles

b. heritage design principles

c. landscape design principles

d. lighting design principles

e. site drainage principles.

8.3.22 Collectively, the principles ensure a consistent and high quality approach to the project. They are supplemented by illustrative designs within the site volumes of the *DAS*. The individual planning assessments in the site-specific appendices demonstrate the considerable care that was taken to recognise the sensitivity of individual sites and to ensure high quality outcomes.

8.3.23 Site designs are intended to be high quality and durable. In each case, the proposed design was developed to respect and enhance the individual sites as far as practical. The designs are conscious of the legacy of high quality design and public realm left by Bazalgette. In particular, it is intended that:

a. Main tunnel sites would enhance existing safeguarded wharves and be compatible with riverside development.

b. CSO sites proposed in the foreshore of the River Thames should, where practical and consistent with the functional requirements, provide new areas of riverside public realm.

c. CSO sites proposed in parks/playing fields provide the opportunity to improve the overall quality of open space.

d. CSO sites proposed in developed areas would blend in with existing built development as far as practical.

8.3.24 The designs recognise the quality and importance of the below-ground engineering. They meet safety, functional, environmental, maintenance and access requirements. Structures and finished surfaces would be robust and of appropriate quality.

8.3.25 NPS para. 3.5.4 indicates that applicants also need to demonstrate that all proposed infrastructure meets the relevant EU or UK technical standard for design, construction, installation and maintenance, where such standards exist. Section 3.11 of the *Engineering Design Statement* performs this function.

8.3.26 For a number of sites, the design ambitions are captured in additional site-specific design principles, which set out additional design requirements for individual sites. As explained in Sections 2 and 5 of this document, above-ground elements of the project are principally proposed in outline, which means that the final designs would be subject to the approval of the local planning authority, following further public consultation. The principles and other controls provide a framework for that process and the illustrative designs in the *DAS* set a standard against which Thames Water expects its subsequent applications to be judged.

8.3.27 The planning assessments of the individual sites review each site against the NPS criteria of good design. The assessments chart the progress of design development at each site and demonstrate the care that was taken to respect the context of the sites, to listen and respond to feedback, and to develop proposals that would live up to Thames Water's aspirations for the project. This approach directly accords with that required by NPS para. 3.5.3.

8.3.28 As the *DAS* and the site assessments show, the project would have the capacity to achieve some spectacular 'wins' for the quality and character of London's townscape. Foremost amongst the opportunities are the six foreshore sites. Opportunities do not ordinarily arise to enhance London's immediate river environment due to its special character, which is protected by heritage and ecological designations. However, a number of interventions at the river's edge or even within the river itself would be necessary for the project. In many cases, the effects would be temporary and the works would be removed or cut back in the operational stage to limit effects on ecology or flood risk. In some cases, however, permanent structures would be necessary, which would create a limited number of opportunities to add meaningfully to the quality of the river edge and London's relationship with the River Thames. Particular examples include:

a. Chelsea Embankment Foreshore: the opportunity would be taken to add a new area of public realm at the river's edge. The *DAS* shows how the design evolved to a semi-circular space to complement the half circle of the Bull Ring Gate, in line with the Monumental Walk axis between the Royal Hospital Chelsea and the gate.

b. Albert Embankment Foreshore: a new public viewing area would be created in the river offering Londoners and visitors spectacular views towards the Palace of Westminster.

c. Blackfriars Bridge Foreshore: a new structure would be created in the river that would be shaped to specifically respond to the heritage of the location. It would offer some of the best views of London landmarks from the River Thames, away from the hostile environment of traffic on the embankment.

d. Victoria Embankment Foreshore: a specific objective to enhance access to the river would be made good through a unique sequence of horizontal terraces providing seating and standing spaces adjacent to the river, in the historic heart of the capital and building on the legacy of Bazalgette's embankment.

8.3.29 On a smaller scale, attention to detail has enabled a short section of the Thames path to be proposed for improvement at Heathwall Pumping Station, promising what the Design Council CABE described as "a moment of delight".

8.3.30 Other examples are more local in character, but were no less carefully conceived. At King Edward Memorial Park Foreshore, for instance, the need for permanent works in the foreshore creates a unique opportunity to enhance and add to the adjacent park. The *DAS* illustrates a sensitive approach to design and layout that would bring about a long-term, lasting benefit to the park and improve the quality of the riverside walk.

8.3.31 Similarly, at Putney Embankment Foreshore, an opportunity arises for a new public space carefully sited to serve as a starting location for the traditional University Boat Race.

8.3.32 Elsewhere, design objectives are apparent in proposals to transform the quality of open space at Deptford Church Street or to improve the appearance and potential of a safeguarded wharf at Carnwath Road Riverside. A number of sites are in poor condition, such as Carnwath Road Riverside or land adjacent to Earl and Falconbrook Pumping Stations. The proposals provide the opportunity for comprehensive site clearance and renewal and surplus land would be released after the temporary construction period. The *DAS* and the site assessments demonstrate a high quality approach to design – from careful site selection to the judicious location and layout of permanent structures, responding to consultation feedback, and the detailed site-specific design principles.

8.3.33 Good design considerations extended to the construction and the operational phase of the project. Each site assessment explains the approach taken to limit impacts through design. The *CoCP* contains generic principles to limit construction effects and site-specific Requirements to address particular sensitivities at some sites.

8.3.34 Judged against the criteria of the NPS, Thames Water's approach is considered to be exemplary. At no stage was the project simply regarded as a functional infrastructure project and the approach is consistent with the NPS (para 3.5.1), which expects good aesthetic and functional design to go together. In accordance with the NPS, considerable efforts were made to ensure that the designs are as attractive, durable and adaptable as they can be and it is clear that the applicant has taken account of both aesthetic and functional considerations in consultation with stakeholders including local residents, local authorities and the Design Council CABE. While many detailed design issues are reserved for subsequent approval, the *DAS* sets an appropriate benchmark. The commitment to the *Design Principles* should ensure that the NPS expectations for sensitive design and use of materials would be achieved. The individual site planning assessments explain design alternatives that were considered through the

iterative process towards the application proposals (in accordance with NPS para. 3.5.4).

8.3.35 Subsequent passages of this section consider the landscape and townscape impact of the proposals; however, from the perspective of good design, there can be no doubt that the criteria of the NPS are met.

Climate change

8.3.36 The NPS requires applicants to consider the impacts of climate change when planning the location, design, build and operation of new wastewater infrastructure, in recognition of the fact that new infrastructure will typically remain operational over many decades (NPS para. 3.6.6).

8.3.37 As required by NPS para. 3.6.8, the *Environmental Statement* took into account the potential impacts of climate change, using the latest UK Climate Projections, based on the Met Office Hadley Centre climate models.

8.3.38 The base cases for the Environmental Impact Assessment were developed by factoring in climate change predictions, eg, increased river levels, increased river temperatures and changes to annual precipitation.

8.3.39 The topic assessments factored in climate change variables and influenced changes to the design proposals to recognise the importance of energy targets and climate change. Examples of project proposals include:

a. Transport: the application seeks to maximise the use of river transport over road transport where practical and economic – particularly for the transport of main tunnel arisings and cofferdam material.

b. Flood risk: the design of the project would provide the opportunity in the future to increase the overall level of flood protection afforded by flood defences.

c. CSO control: the design life of the project was assured by undertaking climate change modelling and population growth assessments.

8.3.40 The *Resilience to Change* report, which accompanies the application, considers the impact of forecasted warmer, drier summers and warmer, wetter winters. Account is also taken of forecast population growth to the 2080s. In the baseline condition (sewage treatment works upgrades and the Lee Tunnel in operation without the Thames Tideway Tunnel project), the total typical year CSO discharge volume is about 18 million m^3 and some unsatisfactory CSOs discharge to the tidal Thames over 40 times per annum (refer to above at para. 8.2.5).

8.3.41 However, when the project is in operation, it is estimated that the total discharge volume would reduce to 2.4 million m^3 and the maximum number of residual discharge events from the controlled CSOs would be four. When the median climate change scenario is applied, along with the projected population growth in the catchment, the total discharge volume for the 2080s is estimated to increase to 3.5 million m^3 and the maximum number of CSO events from controlled CSOs increases to five. This

demonstrates that the tunnel would continue to provide the required level of service.

8.3.42 Changes in temperature, however, combined with lower summer flows will affect the future water quality in the tidal Thames. Summer river water temperatures are predicted to increase by between 2.5 and 3.0^{o} by the 2080s. This change would take place within the context of a much reduced frequency of CSO discharges, assuming the operation of the Thames Tideway Tunnel. However, an increased temperature and potentially reduced freshwater flow would mean that, when residual CSO discharges do occur, there would be an increased risk of failure of the current dissolved oxygen standards.

8.3.43 Over time, therefore, improvements beyond the extra storage capacity of the tunnel would be necessary. Appropriate additional adaptations that could be implemented in the future are highlighted in the *Resilience to Change* report and include further improvements to the sewage treatment works, and the progressive, catchment wide implementation of SuDS. Although SuDS are not a feasible short-term option to deal with the urgent scale of CSO discharges now, the longer term development of SuDS would augment the CSO control that would be achieved by the project and mitigate the further effects of climate change. The application proposals, therefore, provide the capacity to meet urgent immediate needs. The proposals are also resilient against forecast increases in the volume of demand and form an essential component of a longer-term strategy that would create the opportunity for SuDS and other strategies to be put in place to meet other long-term impacts of climate change.

8.3.44 The application proposals, therefore, meet the criteria of Part 3 of the NPS by ensuring that their design and effect take full account of and are resilient to forecast climate change.

8.4 Generic impacts and assessment criteria

8.4.1 This section considers the project against the policy guidance set out under a series of generic headings in NPS Section 4 and summarised in Section 7.4 of this document.

Water quality and resources

8.4.2 The NPS seeks to protect against adverse impacts on water quality and resources but, more particularly, to ensure that proposals have regard to River Basin Management Plans and meet the requirements of the Water Framework Directive.

8.4.3 The NPS also sets out the necessary scope of the applicant's assessment and that scope is reflected in the project-wide assessment reported in Vol 3, Section 10 of the *Environmental Statement*.

8.4.4 The project is directly consistent with the *River Basin Management Plan* (2009) developed by the Environment Agency for the River Thames as part of the requirements of the Water Framework Directive. In particular, the plan states that the London Tideway Tunnels and the proposed sewage treatment works upgrade projects:

"represent the primary measures to address point source pollution from the sewerage system and are fundamental to the achievement of good status in this catchment".

8.4.5 The plan reports that the current and predicted potential 2015 status of the upper and middle tidal Thames is *"moderate"* but sets out a status objective of *"good"* potential for 2027.

8.4.6 The project-wide assessment reports that the effects of the project on water quality were assessed using two water quality models. The changes in water quality forecast as a result of the project are set out in absolute terms but also by reference to the bespoke water quality standards developed in the *TTSS*. As set out in Section 8.2 above, the project would meet the need identified in the NPS and the objectives set for it by the *TTSS*.

8.4.7 The project would play a major role in contributing to the following enhancements in water quality:

a. a substantial reduction in the risk of exposure to pathogens for recreational users of the tidal Thames (refer to the *Environmental Statement,* Vol 3, Table 11.6.4)

b. a dramatic reduction in the volume of sewage derived litter entering the tidal Thames in a typical year; from the base case estimate of 10,000 tonnes per annum, the assessment forecasts a reduction to 585 tonnes

c. an additional 13km of the tidal Thames classified as *"good potential"* with the project in place (*Environmental Statement,* Vol 3, para. 14.6.18*).*

8.4.8 The assessment and mitigation criteria of the NPS, therefore, are directly addressed.

8.4.9 Overall, the project would achieve a significant enhancement in the water quality of the tidal Thames. Its construction and operation is an essential component of the strategy set out in the *River Basin Management Plan* to meet the requirements of the Water Framework Directive.

Air quality, emissions, dust, odour and artificial light

8.4.10 The NPS requires applicants to consider significant air emissions, any necessary mitigation and to report residual effects. Substantial weight should be attached to emissions that lead to deterioration in air quality in an area where the air quality breaches any national or air quality limits. It is also important to consider any substantial changes in air quality even if this does not lead to any breach of the air quality limits.

8.4.11 This issue is assessed in the *Environmental Statement* (Vol 3, Section 4) and in the individual site assessments. The assessment focusses on the construction phase and particularly construction traffic, as no other characteristics of the project would likely generate significant project-wide air quality effects. The project-wide assessment was undertaken in accordance with the Highways Agency's *Design Manual for Roads and Bridges* guidance, which identifies that the only road that meets the criteria

for assessment (due to construction traffic of greater than 200 HGV per day) over the project-wide network is the A2 road corridor comprising Shooters Hill Road, Rochester Way Relief Road and East Rochester Way.

8.4.12 For that road corridor, however, any change in air quality at modelled receptors, as a result of the project, was classified as a minor effect. The project was not assessed as likely to cause any area to exceed air quality limits. In fact, against a trend of improving air quality, annual mean NO_2 levels are predicted to decrease between 2010 and the project-wide assessment year (year 3 of construction) in all cases, with or without the project.

8.4.13 A similar picture is apparent in relation to PM_{10} concentrations, where any predicted change as a result of the project is even less significant and classified in all cases as *"negligible"*.

8.4.14 Thames Water undertook the assessment required by the NPS, the result of which is that there would be no significant adverse air quality impacts from the project at almost all sites; however, some adverse impacts would arise for very close receptors at the Shad Thames Pumping Station and Bekesbourne Street sites. The impacts are typical of the type of impacts that arise from construction projects in this type of location.

Dust, odour and artificial light

8.4.15 All large scale construction projects have the potential to generate dust and to have a detrimental impact on amenity. As the NPS advises:

"For nationally significant infrastructure projects of the type covered by this NPS, some impact on amenity for local communities is likely to be unavoidable. The aim should be to be keep impacts to a minimum and at a level that is acceptable" (NPS para. 4.12.3).

8.4.16 Consistent with the guidance in the NPS, the application is accompanied by a detailed *CoCP* which sets out generic, project-wide controls in Part A and additional, site-specific controls in Part B. Appropriate dust and emission control measures are included, which were developed having regard to the Greater London Authority's Best Practice Guidance. Measures relate to vehicle and plant emissions, measures to reduce dust formation and re-suspension, and measures to reduce particulate emissions.

8.4.17 The *Environmental Statement* assesses the potential for amenity impact at each site. In each case, the *Environmental Statement* concludes that the *CoCP* measures would be successful in minimising detrimental impacts on amenity so that the construction activity under these headings would not give rise to a significant loss of amenity.

8.4.18 The *Air Management Plan* explains the engineering design and proposed operation of the tunnel ventilation system. Air in the tunnel would normally be managed by the creation of a small, negative pressure. It is proposed that all sites would have either active or passive air treatment plants.

8.4.19 Three new active control plants would be built as part of the Thames Tideway Tunnel project at Acton Storm Tanks, Carnwath Road Riverside

and Greenwich Pumping Station. The active plant sites would have ventilation columns generally set at 15m above ground level, while passive sites would have columns at a height between 4m to 8m. When the tunnel system is empty, continuous extraction and treatment of tunnel air is proposed to take place at Carnwath Road Riverside and Abbey Mills Pumping Station. The other active plants would only operate for on average approximately 15 per cent of the typical year, while the passive control sites would operate infrequently, for an average of 20 hours over a typical year (approximately ten hours a year at the western end of the tunnel and 50 hours a year at the eastern end).

8.4.20 The *Air Management Plan* commits to the highest standards contained in the Environment Agency H4 *Odour Management Guidance,* a standard that is robust even in the most sensitive locations.

8.4.21 Accordingly, while the *Environmental Statement* assesses potential odour impacts at each site, no likely adverse impacts on odour nuisance or loss of amenity are identified.

8.4.22 In accordance with NPS para. 4.3.16, the *Air Management Plan* would be enforced through the DCO Requirements.

8.4.23 The NPS identifies a number of other issues that have the potential to have a detrimental impact on amenity, or cause nuisance under this general heading. Dust, smoke, steam and insect manifestation are all identified as possible issues in NPS para. 4.12.1. However, smoke, steam and insect infestation were not included in the scope of the *Environmental Statement*, as Thames Water is confident that they will not cause any significant impacts.

8.4.24 In accordance with NPS, therefore, appropriate mitigation measures are proposed to ensure that the project would not lead to significant deterioration of or substantial change in, air quality, odour or dust during construction or operation at virtually all sites, with some very local impacts arising at two sites only.

8.4.25 Similarly, in relation to artificial light, NPS para. 4.3 requires that amenity impacts from a range of sources, including artificial light may be unavoidable but should be kept to a minimum and at a level that is acceptable. Best practice guidance is captured in the *CoCP* Part A (Section 4.6). The individual site assessments consider the effects and conclude that all reasonable steps have been taken to minimise any detrimental lighting impacts on amenity, in accordance with the NPS.

Flood risk

8.4.26 A project-wide *Water Resources Flood Risk Assessment* (*Environmental Statement* Vol 3, Section 12) was undertaken. It considers the implications of the project on tidal and fluvial flood risk to surrounding areas through changes in water levels as a result of built footprint in the foreshore, flood defence changes and scour implications. The assessment identifies any residual flood risks to and from the project. The local flood risks to each site were separately assessed and are reported in the site-specific volumes of the *Environmental Statement*.

8.4.27 The application proposes development within Flood Zones 3a and b. Indeed, the project proposes eight foreshore sites where temporary works (including solid structures) would be present during the construction phase. At six of these sites, smaller permanent operational structures would remain within the tidal Thames.

8.4.28 The proposed foreshore works are within the tidal reaches of the River Thames and were assessed through hydraulic modelling to determine the changes associated with the footprints of the proposed structures for both the permanent and the temporary works. The modelling assumptions were agreed with the Environment Agency. The key findings of the modelling study are as follows:

a. The structures in the foreshore would act as a barrier to incoming tidal flow, reducing the flow (and volume) of the flood tide progressively up the tidal Thames, so that the tidal phase is slowed margin0ally as a result of the works.

b. As a consequence, there is an increased volume of flood storage available progressively up the tidal Thames during tidally dominated scenarios. This increased volume is greater than the volume taken up physically by the works themselves, resulting in a net gain of flood storage.

8.4.29 Consequently, the modelling demonstrated that the proposals would cause no significant change in either the probability of flooding or the consequences if flooding did occur. Because there would be a net increase in flood storage and because changes in water levels would not increase flood risk, compensatory storage is not required for either the temporary or permanent works in the tidal Thames.

8.4.30 These results are set out in the *Project-wide Flood Risk Assessment,* which also considers a number of other relevant issues raised by guidance in the NPS. In particular:

a. The tidal flow modelling took account of climate change projections.

b. A Scour and accretion monitoring and mitigation plan *(Environmental Statement,* Vol 3, Appendix L.4) would be in place for temporary works in the foreshore. Any relevant construction activity would be monitored and protective measures would only be provided where an appropriate trigger level is reached.

c. The approach to scour protection for the permanent worksites is set out in the *Engineering Design Report* and the potential extent of scour protection works is outlined in the Site works parameter plans for each foreshore site. Monitoring is proposed to ensure that the designs are successful, with the potential for remedial action to take place if necessary.

d. The project design principles require the consideration of SuDS, including planted brown roofs and other attenuation measures across the project to ensure no increase in flood risk from the hardstanding proposed as part of the permanent works.

e. There are not considered to be any groundwater flood risks arising from the project due to the limited interaction between tunnel construction and groundwater flooding.

f. The project is designed to operate during flood conditions but any new river walls at the foreshore sites were designed to be raised at a later date, if required, as a result of climate change monitoring.

8.4.31 NPS para. 4.4.11 states that for construction work with drainage implications[16], approval for the project's drainage system will form part of the development consent issued by the decision maker. The NPS requires that on-site drainage is designed in accordance with relevant National Standards and the Flood and Water Management Act 2010[17]. Site drainage is addressed as part of the project-wide design principles. There is a project-wide design principle for brownfield sites that requires drainage to be designed to comply with the Mayor's Essential Standards to include use of SuDS measures, wherever practical, and achieve 50 per cent attenuation of the undeveloped site's surface water run-off at peak times (in accordance with NPS para. 4.4.21). The application includes a Requirement for drainage details relating to all sites to be submitted and approved in writing by the appropriate authority.

8.4.32 The NPS also requires the application of the Sequential Test and the Exception Test (NPS paras. 4.4.14 to 4.4.17). As the project-wide assessment set out in the *Environmental Statement* (Vol 3, Section 15) explains, the Sequential Test was applied during the site selection process to all site options in defined flood zones and this information was used to assess the suitability of the sites. It is inherent in the nature of the project, however, that CSOs require interception or other forms of control in close proximity to their point of discharge, ie at or close to the foreshore. As a consequence, most CSO sites fall within Flood Zones 3a and 3b. In addition, an important characteristic of main tunnel sites is the ability for tunnel arisings to be transported by river. The main tunnel sites, therefore, are also located within Zones 3a and 3b. The exceptional circumstances of the project mean that the Sequential Test is satisfied.

8.4.33 The first and third elements of the Exception Test raise similar issues. The *Flood Risk Assessment* does demonstrate that the proposals would not generate additional flood risk and, in fact, would actually increase flood storage capacity. The project would generate far reaching sustainability benefits, particularly by facilitating sustainable urban living in London. These requirements of the Exception Test are easily passed.

8.4.34 The Exception Test additionally requires that the project should be on previously-developed land or, if not, that there are no reasonable alternative sites on developable, previously-developed land (NPS para. 4.4.17b).

8.4.35 Of the 24 proposed sites, 13 are situated exclusively on previously-developed land; two occupy previously-developed land and an element of

[16] As defined in para. 7(2) of Schedule 3 to the Flood and Water Management Act 2010

[17] The National Standards set out requirements for the design, construction, operation and maintenance of SuDS and may include guidance to which the Secretary of State should have regard.

foreshore; six are exclusively foreshore sites; and only four are proposed on greenfield land (King George's Park, Barn Elms, King Edward Memorial Park Foreshore and Deptford Church Street).

8.4.36 As explained in the *Final Report on Site Selection Process*, the criteria used to assess the suitability of shortlisted sites included the extent to which the sites were in fact greenfield open space through either a formal or informal designation. The site-specific appendices explain all the factors that led to the selection of each site, including the four greenfield sites.

8.4.37 Thames Water favoured previously-developed land where reasonably practical, as demonstrated in the site selection process. For example, at phase one consultation, there were three main tunnel sites on previously-developed land (Hammersmith Pumping Station, Tideway Walk and Abbey Mills Pumping Station) and two greenfield main tunnel sites (Barn Elms and King's Stairs Gardens). In the application proposals, all the main tunnel sites (Acton Storm Tanks, Carnwath Road Riverside, Kirtling Street, Chambers Wharf and Abbey Mills Pumping Station) are on previously-developed land.

Biodiversity and geological conservation

8.4.38 NPS para. 4.5.6 clearly states that development should aim to avoid significant harm to biodiversity and geological conservation interests, including through mitigation and consideration of reasonable alternatives and that, where significant harm cannot be avoided, appropriate compensation measures should be sought. The NPS requires specific consideration to be given to effects on designated sites of nature conservation interest.

8.4.39 The River Thames is designated as a Site of Metropolitan Importance. It is also part of the proposed South East Marine Conservation Zone that was submitted to the Government in 2012. The purpose of the conservation zone is to protect the full range of nationally important biodiversity, as well as certain rare and threatened species, and habitats. Specific local designations are also important and the *Environmental Statement* (Vol 3, Table 5.4.1) records those designations, which include three Sites of Special Scientific Interests and five local nature reserves along the River Thames between Acton Storm Tanks and Abbey Mills Pumping Station.

8.4.40 In addition, the Thames Estuary and Marshes SPA is a European designated site situated further east in the lower reaches of the River Thames. The SPA is the subject of special consideration in the *Habitats Regulations Assessment*, which identifies no likely significant effects from the project.

8.4.41 The impact of the project on terrestrial ecology was scoped out of the *Environmental Statement* on a project-wide basis, although local effects are reported in its site-specific volumes. No significant adverse impacts on terrestrial ecology are likely when account is taken of measures proposed in the *CoCP*. In particular, Part B of the *CoCP* sets out site-specific proposals to enhance ecological interests including tree protection and planting and the provision of bat boxes.

8.4.42 The assessment of the impacts of the project on the aquatic environment is set out in the *Environmental Statement* (Vol 3, Section 5). All potentially significant effects are assessed, including those that might arise from sediment disturbance and scour. The most significant effects during construction would arise from construction at foreshore sites.

8.4.43 Permanent in-river structures are proposed at seven locations. During the construction phase there would be a temporary land take of approximately 2.2 ha of intertidal habitat and 1.2 ha of subtidal habitat across all of the foreshore sites, which represents approximately 0.15 per cent of the River Thames and Tidal Tributaries Site of Metropolitan Importance. On completion of the construction works, the footprint of the foreshore sites would be reduced to that which is operationally necessary, so that the land take of the overall permanent footprint would be 0.74 ha of intertidal habitat and 0.59 ha of subtidal habitat, representing 0.2 per cent and 0.04 per cent respectively of those habitats within the Site of Metropolitan Importance.

8.4.44 The *Environmental Statement* explains the care that would be taken in the construction of the foreshore sites. The specific measures set out in the *CoCP* include the use of a geotextile layer to protect the existing habitat and a range of measures during construction activity to minimise impacts. These measures include:

a. avoiding piling at night to ensure windows of opportunity for migrating fish

b. limits on allowable noise and vibration at all times and the use of low noise/vibration techniques, where practical

c. measures to limit the release of suspended sediment from construction work

d. a range of best practice requirements for contractor(s)

e. lighting design sensitive to the aquatic environment to avoid, for instance, direct lighting of water courses where practical.

8.4.45 Despite these measures the temporary and smaller permanent loss of habitat is assessed as a *"moderate adverse"* impact. In order to mitigate and compensate for that impact, however, a number of measures are described. These are set out in more detail in the *Environmental Statement* (Vol 3, Section 8). In summary, they fall into the following categories:

a. Intertidal terraces are proposed as part of the foreshore construction at Dormay Street and Albert Embankment Foreshore, giving a total area of newly created intertidal habitat of 880m^2. The terraces offer vegetated high-tide habitat, which is uncommon in the context of the main tidal Thames, and would have a disproportionate biodiversity value compared with an equivalent area within the main channel.

b. At Chelsea Embankment Foreshore an option for the proposed design is to provide terraces connecting the interception chamber and the CSO drop shaft structure, designed to maximise their biodiversity benefit.

c. An existing campshed at Dormay Street may be removed, as required.

d. Installation of a fish pass on the Bell Land sluice on the Lower River Wandle would make 1km of the river accessible to fish at all states of the ride, with particular benefit to priority species such as the European Eel.

e. Where appropriate, generic design principles were developed to promote aquatic ecology, for instance, through the use of timber fendering.

f. Additional compensation schemes were identified on tidal creeks, namely:

   i lowering and notching the Lewisham College Weir on the Ravensbourne River, making 16km of that water course accessible to similar species

   ii removing invasive plants at Abbey Mills Pumping Station

   iii setting back river defences at Abbey Mills Pumping Station.

8.4.46 In all of these respects, the application proposals directly address the criteria of the NPS that effects should be limited, mitigated and then residual effects compensated. In addition, the approach directly accords with NPS para. 4.5.14, which calls on applicants to recognise the many opportunities that can be taken to build in beneficial biodiversity features as part of good project design.

8.4.47 The principal operational effect of the project, of course, is the significant improvement that it would achieve in the water quality of the tidal Thames. The *Environmental Statement* identifies the relationship between reductions in dissolved oxygen and hypoxia (mass fish mortalities). One of the most notable recent examples was in June 2011, described in a press release by the Environment Agency at the time as follows:

"the incident…caused the release of more than 250,000 tonnes of storm sewage into the river from CSOs and at least 200,000 tonnes of storm sewage from the Mogden sewage treatment works […] more than 26,000 fish were killed along a 2km stretch of the river between Barnes and Chiswick".

8.4.48 As part of the *TTSS* and in addition to the dissolved oxygen standards that were identified, the Tideway Fish Risk Model was developed to provide a more detailed evaluation for different fish species of the water quality standards that needed to be achieved. Those standards identified the water quality that would need to be attained if hypoxia events were not to occur at such frequency as to threaten the sustainability of fish populations. In base line conditions, that work identified that five out of eight species (which were each used as indicators for a wider range of species) would be unsustainable based on the currently assessed water quality in the tidal Thames.

8.4.49 Water quality standards were also found to be adversely impacting on the density and range of invertebrates across the study area.

8.4.50 Modelling results for the project identified that completion of the tunnel is necessary to achieve all of the dissolved oxygen standards throughout the tidal Thames. Additionally, outputs from the Tideway Fish Risk Model demonstrated that, during operation, standards would be met and any mortalities associated with hypoxia would be sustainable. Mortalities for all species fall below the criterion by a large margin. Accordingly, the *Environmental Statement* identifies that the improvements arising from the project are considered to have a significant beneficial effect on aquatic ecology receptors.

8.4.51 In all of these respects, therefore, the project conforms with the objectives of the NPS, for instance at NPS para. 4.5.4 to halt and, where possible, reverse declines in priority habitats.

Coastal change

8.4.52 In practice, the project is not expected to have any significant interaction with coastal or estuarine processes or other matters that relate exclusively to the Marine Policy Statement. Other sections of this document have demonstrated how the project has taken into account the effects of climate change and how it is unlikely to have any significant adverse impacts on the Thames Estuary and Marshes SPA. In addition, modelling was undertaken to assess the potential effects of the project on the morphology of the designated Thames Estuary habitats (*Environmental Statement,* Vol 3, Section 6, Appendix C). That work identifies no anticipated deleterious effect on the morphology of the Thames Estuary.

Landscape and visual impacts (including townscape)

8.4.53 The project is nationally important infrastructure for which an urgent need has been identified. It necessarily runs through Central London and requires a number of construction sites which often need to be adjacent to the River Thames and, therefore, in relatively prominent locations. It follows that elements of the project would be highly visible, particularly during the construction phase.

8.4.54 This much is anticipated in the NPS, which recognises (NPS para. 1.4.4) that negative effects in relation to landscape/townscape and visual effects are likely to arise because of the context of the new wastewater NSIPs within a mature urban environment. It states:

"the development of waste water NSIPs is consequently likely to result in adverse townscape and visual effects within the built up environment with many possible receptors […]".

8.4.55 The potential for such impacts was identified in the Appraisal of Sustainability undertaken prior to the designation of the NPS. Government policy support for the project, therefore takes full account of these likely impacts.

8.4.56 The NPS requires the applicant to undertake an assessment of landscape and visual impacts and this criterion is comprehensively met in the *Environmental Statement*. That assessment recognises that the project would have adverse visual impacts on townscape during the construction phase. It also identifies that construction activity would be visible from

sensitive locations such as parks, within conservation areas and even from World Heritage Sites. As NPS para. 4.7.11 advises, however:

"the fact that a proposed project will be visible from within a designated area should not in itself be a reason for refusing consent".

8.4.57 Similarly, NPS para. 4.7.12 advises that local landscape designations should not be used themselves as reasons to refuse consent, as this may unduly restrict acceptable development.

8.4.58 Instead, the NPS places emphasis on the need for projects to be designed carefully, taking account of their potential impacts with the aim of minimising harm to the landscape and providing reasonable mitigation where possible and appropriate (NPS para. 4.7.6). Similarly, NPS para. 4.7.9 requires the decision maker to be assured that the project would be carried out to high environmental standards. Where this approach has been taken there is no expectation within the terms of the NPS that development consent would be refused.

8.4.59 This document has already considered Thames Water's careful approach to ensuring good design in accordance with the criteria of the NPS. Additionally, it is appropriate to consider the comprehensive nature of the *CoCP* Parts A and B which contain detailed requirements on contractor(s), aimed at minimising the impacts of construction.

8.4.60 The *Design Principles* requires a high quality approach to detailed design both generically and site-specifically, while the illustrations and objectives set out in the *DAS* set a benchmark for the design of matters that require subsequent approval. There can be no doubt that Thames Water has followed closely the guidance in the NPS to minimise impacts, ensure high quality design and impose high environmental standards.

8.4.61 It is against this background that the individual site assessments in the *Environmental Statement* should be considered, along with the planning assessments in the site-specific appendices.

8.4.62 At a site-specific level, the individual site assessments demonstrate a careful, collaborative approach to design and also to limiting visual impacts during construction. Sensitive receptors are identified and the proposals respond appropriately, for instance, with Requirements for the raised height of boundary hoardings to screen views from nearby receptors or the use of enclosures to screen the noise and visual impact of main tunnel works at Chambers Wharf and Carnwath Road Riverside. Additionally, mitigation is proposed in the design of hoardings to ensure that they are appropriate to the sites. For instance, green planted hoardings are proposed at Barn Elms; open mesh hoardings to retain important, open views; and artwork at other sites in more urban environments. Advanced planting is also proposed at Acton Storm Tanks, King George's Park and Falconbrook Pumping Station.

8.4.63 The NPS suggests that applicants may find it helpful to draw attention to examples of existing permitted infrastructure of a similar magnitude. The advice is useful in recognising that the sight of major construction activity is not unusual, particularly in London – either at a strategic level with

projects such as Crossrail and Thameslink 2000 or more locally to sites such as the regeneration areas proposed at Vauxhall Nine Elms Battersea or South Fulham Riverside. Even well controlled construction activity can be awkward and unsightly but it is a common and necessary feature of a modern urban environment.

8.4.64 As the assessment for Blackfriars Bridge Foreshore notes:

"the Central London landscape is considered to have a high capacity to accommodate change; this is certainly the case at Blackfriars Bridge Foreshore where the adjoining Blackfriars station redevelopment has resulted in major construction work to create a new station that spans the Blackfriars Rail Bridge" (Appendix Q, Section 5).

8.4.65 The permanent works are much more limited in scale and impact. Because of the care taken with the design, the project would generate a number of beneficial landscape and townscape effects including clearing derelict or unsightly uses, creating new high quality public realm, and implementing sympathetic new planting. In addition, the permanent foreshore sites would create new high quality opportunities for Londoners and visitors to enjoy the city's world class townscape characteristics.

Land use including open space, green infrastructure and green belt

8.4.66 Section 4 of this document summarises the site selection process, full details of which can be found in the *Final Report on Site Selection Process.* While the NPS provides limited advice on site selection, and Thames Water had to devise a bespoke process, there can be no doubt that the approach taken was exceptionally high quality. Considerable care and substantial resources were devoted to optimising the selection of sites in order to reduce the impacts of the project while maintaining its ability to meet the fundamental functional requirements.

8.4.67 Identifying 24 construction sites, many of which are of significant size, within London is a very considerable challenge. The project spans a dense urban environment and sites were principally, but necessarily, sought close to the River Thames where the competition for land is even greater. Sensitivities necessarily arise and land use conflicts are, perhaps, inevitable – at least for the temporary construction period.

8.4.68 As a matter of record, the selected sites can be categorised in a number of ways but the following may be helpful:

a. previously-developed land: 15 sites

b. greenfield: four sites

c. foreshore: six sites

8.4.69 The numbers add up to more than 24 because King Edward Memorial Park Foreshore is categorised here as both a greenfield and foreshore site.

8.4.70 It is relevant to categorise the sites in different ways according to other land use characteristics, for example:

a. Thames Water operational land: five sites

b. part Thames Water operational land: four sites

c. safeguarded wharves: four sites.

8.4.71 A concentration on previously-developed land is directly consistent with NPS para. 4.8.3, and the use (where practical) of Thames Water operational land is sensible in both planning and acquisition terms. Land use conflicts are unlikely to arise on operational land where the works are of a similar character and purpose to the existing use.

8.4.72 Nevertheless, land use conflicts can arise even from the most carefully selected sites and potential land use issues are considered in turn below. A more detailed assessment is contained in the site-specific appendices. In those assessments, particular consideration was given to any conflict with local development plan designations or any potential impact on existing land uses or proposed land uses as a result of the project.

8.4.73 Four sites are proposed on safeguarded wharves. In its consultation responses, the Greater London Authority supported the use of safeguarded wharves to enable river transport during construction. The project does not propose any permanent above-ground structures on the safeguarded wharves. Furthermore, once the project is operational, all four safeguarded wharves would be made available again as wharves in an improved condition.

8.4.74 Some of the proposed sites involve the use of additional land (eg, beyond Thames Water operational land or beyond the boundaries of safeguarded wharves) and this characteristically takes land in existing employment use. Examples include land at Carnwath Road Riverside, Cremorne Wharf Depot, Earl and Greenwich Pumping Stations. In no case would high quality industrial land be taken and the land is generally of relatively poor quality and appearance. Thames Water is committed to promoting a relocation strategy for affected industrial users and no in-principle land use planning objection appears to arise from the use of these areas of land to construct the project.

8.4.75 Where practical, the opportunity was taken to clear and improve sites and to make them available for redevelopment once the project construction phase is complete. That process should facilitate the achievement of land use policies for those sites. Examples include the industrial plots adjacent to Earl Pumping Station, which are designated for development within a regeneration area, and Kirtling Street, where the majority of the site would be released for designated regeneration.

8.4.76 At some sites, there are aspirations for residential development. Different issues arise in relation to the sites individually, as follows:

a. Hammersmith Pumping Station: close collaborative working with the prospective developer enabled the project design to complement the residential led regeneration proposals for Hammersmith Embankment and Fulham Reach.

b. Chambers Wharf: implementation of a planning permission for a 587 residential unit development would be deferred during the construction

period but the operational layout for the project was designed to facilitate that future residential development.

c. Cremorne Wharf Depot: a planning application has been submitted by others for residential use of the depot site which challenges its designated waste and safeguarded wharf status. The project proposals, however, are consistent with the existing status.

d. Kirtling Street: the project proposals are considered to be consistent with the existing safeguarded wharf status but proposals have been submitted by others for a residential marina. Those proposals have been made the subject of a safeguarding direction from the Secretary of State preventing the grant of planning consent.

e. Carnwath Road Riverside: the land is subject to three planning applications for residential redevelopment, all of which have attracted safeguarding directions from the Secretary of State.

8.4.77 This evident competition for land is unsurprising, particularly in sought-after riverside locations. In each case, however, the project proposals are consistent with the existing development plan status.

8.4.78 These land use issues perhaps arise most sharply at Carnwath Road Riverside where there are individual residential-led applications for each of the three component parts of the site and the adopted *Core Strategy* sets out a vision for the area as part of a residentially-led South Fulham Riverside Regeneration Area. The issues are addressed at length in Appendix G. In short, however, no land use planning conflict arises from the project proposals because:

a. The *Core Strategy* vision for the area anticipates residential-led redevelopment "*by the 2020s",* which would allow for the project to be completed and the land released.

b. The Hurlingham Wharf component of the site is identified as a safeguarded wharf. Although the London Borough of Hammersmith and Fulham sought to remove that designation in the draft *Core Strategy*, it was obliged to delete that aspiration by the Core Strategy Inspector because of its conflict with the *London Plan*.

c. The Core Strategy Inspector concluded that there was no pressing need for additional residential development as existing allocations already met the relevant strategic target.

8.4.79 Six of the project sites occupy the foreshore of the River Thames[18]. In addition, the proposed developments at Kirtling Street and Heathwall Pumping Station have some impact on foreshore. These proposals, however, raise issues of ecology, flood risk, visual impact etc, rather than strict land use issues. No other existing or proposed land use is displaced as a result of the proposals.

8.4.80 Where competing land use issues do arise, it is relevant to note that the Government has taken active steps to protect the project through a series

[18] Putney Embankment Foreshore, Chelsea Embankment Foreshore, Albert Embankment Foreshore, Victoria Embankment Foreshore, Blackfriars Bridge Foreshore and King Edward Memorial Park Foreshore.

of safeguarding directions. On 21 December 2012, the Department for Communities and Local Government wrote to all 14 London Boroughs affected by the project serving Directions under the Town and Country Planning (Development Management Procedure) Order preventing the grant of planning permission for developments on land affected by the project without first consulting with Thames Water and notifying the Secretary of State. By way of explanation, the letter advised:

"*As you are aware, Government supports the Thames Tideway Tunnel (TTT) project, taken forward by TWUL. In September 2010, via a written Ministerial Statement, the Department for Environment, Food and Rural Affairs indicated the current government's continued support for a proposed tunnel solution and this was reinforced via a second Ministerial statement on 3 November 2011. In March 2012, the Government approved the Waste Water National Policy Statement which established the need for the proposed Thames Tideway Tunnel, which is now a designated Nationally Significant Infrastructure Project (NSIP) under the Planning Act 2008*."

8.4.81 None of the potentially competing land uses can claim an equivalent level of up to date Government policy support

8.4.82 The principal land use issues, therefore, might arise from the proposals for the use of four greenfield sites. As with land use policies, flood risk policies normally prefer the use of previously-developed land. For the reasons that are set out above, however, the four selected sites are necessary components of the project as no reasonable alternative sites were found to be available.

8.4.83 The NPS itself recognises the likelihood that some greenfield land will form a necessary part of such projects. NPS para. 4.8.1 anticipates that a wastewater infrastructure project may have effects on existing uses and that: *"given the likely locations of waste water infrastructure projects there may be particular effects on open space, including green infrastructure"*.

8.4.84 Similarly, while NPS para. 4.8.3 promotes a preferred use of previously-developed land rather than countryside or undeveloped greenfield land, it continues: *"however, this may not be possible for some form of infrastructure"*.

8.4.85 The issues raised in each case are addressed in the relevant site planning assessments. Having regard to the guidance and decision making criteria set out in the NPS, the following is a summary of the approach taken in relation to the four relevant sites:

a. King George's Park: the London Borough of Wandsworth recognised the inevitability of the use of the park but was concerned to ensure that the impact of the proposals would be as limited and beneficial as practical. Detailed design development limited the necessary footprint so that during construction the loss would be approximately 1.74 per cent of the total area of the park and the permanent hardstanding would amount to only 0.3 per cent. The area required is at the northern tip of the park, remote from the main area in use. As part of the design development, the opportunity was taken to provide a small

permanent area of hardstanding with timber seating, intended as a multifunctional area of public space. The hardstanding would be complemented by sensitive planting and materials.

b. Barn Elms: there would be no permanent loss of sports pitches or any reduction of playing field capacity. The project would also provide an enhanced replacement changing room facility to complement the use of the open space.

c. King Edward Memorial Park Foreshore: the temporary loss of 0.52 ha of the park and the temporary loss of the river frontage is one of the most significant impacts of the project and should not be underestimated. However, 85 per cent of the park would remain available during the construction phase. It is apparent from Appendix T that considerable efforts were made to limit the impact on the park in two important respects:

   i The permanent proposals would provide an additional 0.26 ha of open space on the foreshore (an eight per cent increase in the area of the park), thereby extending the park and adding value to its open space function as well as enhancing the quality of the riverside.

   ii A further package of enhancement and mitigation measures is proposed as part of a Section 106 agreement with the Borough council.

d. Deptford Church Street: the temporary loss of this open space is again to be regretted; however, at present it is not in good condition and is lightly used. There are alternative open spaces nearby during the construction phase. The application proposals were carefully conceived to promote significant long-term improvements to the park. The Design Council CABE advised in its consultation response in June 2011 that these proposals represent "*the best long-term solution for this space […] a genuine attempt to redress its short comings so that it can make a more valuable contribution to the community it serves".*

8.4.86 These short summaries do not do justice to the full assessment set out in the site-specific appendices. They do seek to explain, however, that the careful site selection and scheme development process limited the land use impacts of the project as far as reasonably practical. Significant impacts would arise in only a limited number of cases. In those cases, detailed design work and consultation focussed on limiting impacts and enhancing the sites following construction.

8.4.87 It is not part of Thames Water's case that the affected open spaces are surplus to requirements. Reliance is placed, however, on the limited nature of the impacts, the long term improvements proposed to the affected areas and the advice in paragraph 4.8.13 of the NPS that the decision maker can be entitled to determine that;

"...*the benefits of the project (including need) outweigh the potential loss of such facilities, taking into account any positive proposals made by the applicant to provide new, improved, or compensatory land or facilities*."

8.4.88 Thames Water's overall approach, therefore, is considered to comply with the guidance in the NPS. Judgements do need to be made between competing land uses and about the approach taken by the applicant in this case. NPS para. 4.18.4, however, provides the following advice:

"In making a judgement, the decision maker should consider whether any adverse impact is temporary, such as during construction, and/or whether any adverse impact on the landscape will be capable of being reversed in a timescale that the decision maker considers reasonable."

8.4.89 Addressed in this way, the application proposals meet the criteria of the NPS.

Noise and vibration

8.4.90 NPS para. 1.4.4 recognises that the development of wastewater NSIPs within a mature urban environment is likely to result in noise disturbance during construction. Consequently, the guidance set out in NPS Section 4.9 provides that:

"The project should demonstrate good design through selection of the quietest cost effective plant available; containment of noise within buildings wherever possible; optimisation of plant layout to minimise noise emissions; and, where possible, the use of landscaping, bunds or noise barriers to reduce noise transmission."

8.4.91 This approach was closely followed for the project. The site selection process directly considered the potential sensitivity of nearby receptors. Design development focussed on detailed issues that could improve the environmental performance of the sites during construction and operation.

8.4.92 In addition, the *CoCP* sets out a series of detailed Requirements for contractor(s) in order to limit potential noise and vibration effects. The principal measures include the following:

a. Standard working hours would be followed where practical (8am to 6pm weekdays and 8am to 1pm Saturdays). Mobilisation and maintenance periods are allowed outside these hours but these cannot include significant noise and vibration generating activities.

b. On a limited number of sites, longer working is required, including 24-hour working on tunnel drive sites. Where appropriate, however, contractor(s) are obliged to submit applications to the relevant local authority for an application for prior consent under Section 61 of the Control of Pollution Act and to abide by the conditions imposed.

c. Best practical means must be employed at all sites at all times and for all activities. This includes the selection, location and operation of noise and vibration generating equipment for which specific, detailed measures are set out at Section 6.4 of the *CoCP* Part A.

d. Noise and vibration monitoring is anticipated to be regulated via Section 61 consents at all relevant sites.

8.4.93 In addition, specific consideration was given to additional measures that could be taken on individual sites. The *CoCP* Part B sets these out and, for instance, at Carnwath Road Riverside requires additional measures as follows:

a. The site security/hoarding will include a 5m high hoarding/noise barrier on the western end of the site and 7.5m on the eastern end. Barriers on the eastern and western ends can be office/welfare facilities.

b. The western access will be only used for emergency access or specific deliveries and not routinely used due to the proximity of adjacent properties.

c. The construction area around the main shaft would be covered by an enclosure/building during the main construction and secondary lining works. The building would have cladding with a specified sound reduction value. The building openings will be designed to be away from sensitive noise receptors and will be kept closed when not in use at night. There will only be essential use of openings at night.

d. The enclosure with a suitable structure and acoustic attenuation material the concrete batching plant, grout plant, conveyors to load barges and storage/handling areas.

e. The material handling area will be screened by a three sided enclosure and the roof clad with a suitable noise attenuation material

f. The barge loading area to be suitably located to consider the noise impacts on riverside properties on both the east and west of the site.

8.4.94 Collectively, these measures amount to a model response to the criteria of the NPS.

8.4.95 Inevitably, however, effects would arise for nearby receptors during the temporary construction period. In these circumstances, NPS para. 4.9.9 requires the decision maker to be satisfied that the proposals meet the following aims:

a. *"avoid significant adverse impacts on health and quality of life from noise*

b. *"mitigate and minimise adverse impacts on health and quality of life from noise*

c. *"where possible, contribute to improvements to health and quality of life through the effective management and control of noise".*

8.4.96 The NPS advises that mitigation can take the form of engineering measures, site layout and administrative actions such as noise limits, restrictions on hours of activity etc. These are the measures proposed in the *CoCP* Parts A and B.

8.4.97 In the event that further mitigation is required, NPS para. 4.9.13 advises:

"In certain situations, and only when all other forms of noise mitigation have been exhausted, the applicant may consider it appropriate to provide noise mitigation through improved sound insulation to dwellings, or, in

extreme cases, through compulsory purchase of affected properties in order to gain consent for what might otherwise be unacceptable development".

8.4.98 Accordingly, Thames Water published a Noise insulation and temporary re-housing policy alongside the application, which identifies levels of noise from construction activity that would trigger either noise insulation or (in a very limited number of cases) temporary re-housing of residents.

8.4.99 The *Environmental Statement* Vol 3, Section 7) considers project-wide vibration impacts during construction generated by below-ground construction activities. All residential receptors within 65m of the tunnel alignment were considered in the assessment, together with all non-residential receptors that are particularly sensitive to vibration within 250m. Thames Water sought to engage directly with potentially sensitive receptors. Given the depth of the tunnelling works, no wide-spread effects are anticipated and no significant effects on residential receptors are expected. The likelihood of impact on sensitive non-residential receptors was also assessed to be low; however, a monitoring and compensation scheme is proposed in order to fully address the requirements of NPS Section 4.9.

8.4.100 Project-wide noise and vibration effects are assessed in the *Environmental Statement* (Vol 3, Section 7), and noise and vibration effects at individual sites are assessed in the relevant site-specific chapters of the *Environmental Statement*. Those assessments demonstrated that the level of noise impacts necessary to trigger re-housing in the noise insulation and temporary re-housing policy are only predicted to be met in the case of the house boats at Putney Embankment Foreshore and Kirtling Street. The lower level trigger for noise insulation is anticipated to be reached at eight sites[19].

8.4.101 Recognising that noise and vibration impacts are probably inevitable in a project of this nature, therefore, the NPS sets out a regime for applicants to follow in order to limit, mitigate and, ultimately in extreme cases, to compensate for noise and vibration effects. This regime was closely followed at each stage of the development of the project proposals.

Historic environment

8.4.102 In accordance with the NPS, the application includes a detailed description of the significance of the heritage assets likely to be significantly affected by the proposed development and the potential impact of the project proposals on those assets. The principal assessment can be found within the *Heritage Statement*, although heritage issues are also directly addressed within the project-wide and the site-specific volumes of the *Environmental Statement* and the site-specific appendices.

8.4.103 It is apparent that heritage considerations were central to the selection and design development of the project. Section 4 of this document explains that World Heritage Sites were one of only two areas excluded from the

[19] Hammersmith Pumping Station, Kirtling Street, Heathwall Pumping Station, Shad Thames, Chambers Wharf, King Edward Memorial Park Foreshore, Earl Pumping Station and Bekesbourne Street.

selection of the main sites and CSO interception sites, while heritage designations were one of the criteria directly applied as part of the site selection process. Heritage considerations were one of the principal drivers behind individual site selections. For example, the selection of Chelsea Embankment Foreshore rather than Ranelagh Gardens or Victoria Embankment Foreshore rather than Victoria Embankment Gardens. Thames Water has worked closely with English Heritage throughout the process of site selection and scheme development.

8.4.104 The application proposes specific protection for heritage considerations both through the *CoCP* and the *Design Principles*. The *CoCP* Part A contains specific provisions to protect the historic environment through the construction phase. In particular, contractor(s) are required to prepare a site-specific heritage management plan indicating how the historic environment would be protected and how the contractor(s) would discharge the Requirements of the DCO in relation to heritage, in consultation with English Heritage and the local planning authority.

8.4.105 An *Overarching Archaeological Written Scheme of Investigation* accompanies the application and sets out an approach to recording archaeological interest, which was agreed with English Heritage.

8.4.106 The heritage management plan would also indicate how the *Overarching Archaeological Written Scheme of Investigation* would be implemented and, where applicable, *Site-specific Written Schemes of Investigation* prepared.

8.4.107 Part B of the *CoCP* sets out additional, site-specific procedures to be applied during the construction phase at those sites with particular heritage interest.

8.4.108 This comprehensive framework of control is complemented by the *Design Principles,* which contains 11 heritage-specific principles that would be applied at the detailed design stage. Those principles include a range of Requirements, such as:

a. Where interventions are necessary to the fabric of listed structures, they shall be designed to remove as little of the original fabric as possible.

b. Materials and detailing shall be compatible with the visual character of heritage assets.

c. Interpretative materials shall be provided at appropriate sites where this would be of wider public benefit.

d. The project shall seek to reuse any significant historic materials that are removed where practical and appropriate.

8.4.109 It is recognised that the project has the potential to damage historic buildings and structures through settlement. A detailed assessment was undertaken (the *Listed Buildings Settlement Report*) and the environmental consequences are recorded in the *Environmental Statement* (Vol 3, Section 7).

8.4.110 An assessment area was derived based on a contour or boundary where 1mm or more of settlement is predicted due to tunnelling works. There are 19 listed bridges and viaducts within the area of assessment and 34 other listed buildings. Each of those structures was assessed in turn in order to consider location-specific settlement that could affect each asset. For the majority, the assessment considers that the likely magnitude of change is only negligible, and the risk of damage limited to hairline cracks of a typical maximum width of 0.1mm. A low magnitude of change, however, is predicted for three bridges (Putney, Battersea and Chelsea) and two listed buildings (Lots Road Pumping Station and Greenwich Pumping Station).

8.4.111 In order to mitigate these potential impacts, the *Environmental Statement* sets out a commitment to monitor impacts on all listed buildings and structures within the assessment area during and following the construction works to ensure that any damage is notified and rectified using appropriate conservation techniques. As a result, the *Environmental Statement* concludes that no impacts would be greater than minor adverse, and most would be negligible.

8.4.112 In addition to these project-wide effects, there is a potential for impacts to arise at the individual project sites. That potential is assessed in the site-specific volumes of the *Environmental Statement* and in the planning assessments of the individual sites. By way of short summary, those sites where there is particular heritage interest principally include:

a. Putney Embankment Foreshore: there would be potential effects on the Grade II listed Putney Bridge and on five Grade II listed bollards, as well as on the setting of nearby listed buildings and on the Putney Embankment Conservation Area.

b. Cremorne Wharf Depot: potential effects may arise on the Grade II listed Lots Road Pumping Station.

c. Albert Embankment Foreshore: potential affects may arise in relation to the Grade II* listed Vauxhall Bridge and the Albert Embankment Conservation Area.

d. Blackfriars Bridge Foreshore: potential effects on the Grade II listed Victoria Embankment and Grade II* listed Blackfriars Bridge and the Temples and Whitefriars Conservation Areas.

e. King Edward Memorial Park Foreshore: there would be potential effects on the Grade II listed Rotherhithe Tunnel ventilation building and the Wapping Conservation Area.

f. Deptford Church Street: the site affects the setting of the Grade I listed St Paul's Church, other nearby heritage assets, and the St Paul's Conservation Area.

g. Greenwich Pumping Station: the site contains four listed heritage assets.

h. Victoria Embankment Foreshore: there would be potential effects on the Grade II listed river wall, listed lamp stands, standards and benches, Whitehall Gardens Grade II listed historic park and the Whitehall Conservation Area.

8.4.113 In addition, a number of the sites lie within Archaeological Priority Zones.

8.4.114 A project that requires a number of significant sites through the centre of London is likely to encounter significant heritage issues. However, Thames Water has viewed the interface with the historic environment as an opportunity as much as a constraint. In particular, it worked hard to develop opportunities to protect and enhance heritage assets.

8.4.115 The individual site assessments recount the particular care that was taken in this regard, in close consultation with English Heritage, the Design Council CABE, land owners and local authorities. An exemplary approach was taken to design and sensitive solutions were developed in every case so that site and design proposals developed with the benefit of a thorough understanding of the sites and their heritage status. Examples of the care taken include:

a. Cremorne Wharf Depot: necessary control equipment would be carefully sited within the listed building. All ducting would be below ground and a redundant gas main would be used to limit the need for new interventions.

b. Albert Embankment Foreshore: the new structure was deliberately designed to have a low profile, to minimise its connection with the listed bridge and maintain the open view of the eastern arch. The design approach was specifically supported by English Heritage.

c. Putney Embankment Foreshore: the site was moved upstream to retain the Putney public slipway and to increase the separation from Putney Bridge. Although the five listed bollards need to be removed, they would be refurbished and re-instated.

d. Blackfriars Bridge Foreshore and Victoria Embankment Foreshore: listed lamp standards and lamps would be removed but reinstated and replica lamp standards would either be replaced with originals or with new castings.

e. Greenwich Pumping Station: the proposals would bring back into compatible operational use the East Beam Engine House, which has been disused for more than half a century.

8.4.116 More detail is provided in the site-specific assessments; however, it is apparent that detailed consideration was given in every case not only to limiting impacts on heritage assets but also to promoting heritage gains through sensitive design.

8.4.117 The sites at which the works would have the most direct impact on the fabric of heritage assets include the embankment sites, which were part of Bazalgette's visionary work. In principle, the adaption of those structures to ensure that London's sewerage system remains fit for purpose is entirely appropriate.

8.4.118 In summary, it can be concluded that the approach taken in the application is directly consistent with that required by the NPS and that the heritage impacts of the proposals have been limited and mitigated in direct accordance with the NPS.

8.4.119 This document cannot do full justice to the detail of the site-specific assessment set out in the relevant volumes and appendices. It is relevant, however, that none of the assessments identify substantial adverse impacts on the historic environment. Some moderate adverse effects are identified but these principally relate to the construction phase of the project where the assessment identifies that the setting of nearby heritage assets would be adversely affected. In relation to these impacts, however, it is relevant to identify that:

a. Short-term construction impacts would be inevitable, temporary and (to some extent) positive in the sense that they signify renewal and investment. Heritage assets themselves were once constructed with comparable effects.

b. NPS para. 1.4.4 recognises the inevitability of some short-term effects on landscape, townscape, heritage and visual effects. In fact, the Appraisal of Sustainability for the NPS anticipated that there would be adverse effects on archaeology and cultural heritage as a consequence of the geographical location of such projects in very large conurbations. That paragraph also postulates that those likely adverse effects can be mitigated to some extent but that the public benefits of new nationally significant wastewater infrastructure could in some circumstances outweigh damage or loss to heritage assets or their setting.

c. In this case, however, the care that was taken with site selection and design which is committed to for the implementation phase of the project means that adverse impacts would be substantially avoided or mitigated and that the project would achieve a number of positive gains for the historic environment.

Traffic and transport (including river use)

8.4.120 The NPS recognises that NSIPs may give rise to substantial impacts on the surrounding transport infrastructure. The emphasis of the NPS, therefore, is to ensure that these effects are properly assessed but, particularly, to promote mitigation where practical (para 4.13.6). Where the applicant is willing to enter into commitments to secure the mitigation of transport impacts, NPS para. 4.13.7 advises that development consent should not be withheld and: *"appropriately limited weight should be applied to residual effects on the surrounding transport infrastructure"*.

8.4.121 Amongst the potential forms of mitigation identified, NPS para.4.13.10 states that water-borne or rail transport is preferred over road transport at all stages of the project, where it is cost-effective. Consistent with this approach, Thames Water has developed and committed to a far-reaching *Transport Strategy,* which provides for the following materials to be transported by river:

a. main tunnel excavated material from the main tunnel drive sites at Carnwath Road Riverside, Kirtling Street and Chambers Wharf

b. shaft excavated material at ten sites in the foreshore all with direct river access

c. imported temporary and permanent cofferdam fill and exported temporary cofferdam fill materials at all foreshore sites

d. excavated material from short connection tunnels, interception chambers and associated structures at eight sites

e. imported sand and aggregates for main tunnel secondary lining works at the main tunnel sites.

8.4.122 The *Transport Strategy* was informed by detailed feasibility exercises undertaken by Thames Water, its engineering team and its transport consultants. The exercises considered the practicality and cost-effectiveness of the transportation of material by river in order to meet the aspirations set out in the NPS.

8.4.123 Appendix B to the *Transport Strategy* sets out circumstances in which it may not be possible to achieve the objective of transporting all of these identified materials by river. Those circumstances reflect events that can arise on the River Thames such as river works by other parties, adverse weather conditions, or mechanical breakdown of river transport vessels. Thames Water's commitment extends to using reasonable endeavours to achieve 100 per cent of the movement of the identified materials by river, therefore, the *Environmental Statement* proceeds on the conservative assumption that only 90 per cent of these materials would be moved by river.

8.4.124 The project-wide *Transport Assessment* is set out in the *Environmental Statement* (Vol 3, Section 9). It estimates that the assumed usage of the river would account for approximately 53 per cent of the total tonnage of all construction material and arisings moved during the project. The sustainability and amenity benefits of the proposed strategy are obvious and directly consistent with the NPS.

8.4.125 Strategic effects on the highway network were modelled using Transport for London *Highway Assignment Models*, taking account of growth, the movement of construction workers and a number of other identified inputs. At a strategic level, the assessment concludes that the impact of the project construction traffic would be "*extremely small*".

8.4.126 The assessment also models the effect of barge movement on the River Thames. There would be an increase in barge traffic on the river, particularly downstream of Albert Embankment Foreshore (because of the accumulation of traffic from the upstream sites). No significant difficulties are anticipated from this increased use of the river.

8.4.127 The assessment recognises, however, that there is a potential for more local traffic impacts on the highway network. Accordingly, the site-specific volumes of the *Environmental Statement Transport Assessment* and the individual site planning assessments examine those local impacts in detail. As with other aspects of the project, it is apparent that considerable care was taken to limit impacts as far as practical. A number of detailed site-specific measures are set out in the *CoCP* Part B to manage effects in the vicinity of the individual sites.

8.4.128 The sub-area traffic modelling examines the potential for project traffic to cause delay on the network and investigates, for example, whether problems may arise in areas where there is a cluster of project activity. Overall, little or no difference in average travel speeds is forecast, although two links are forecast to show a "*low adverse impact on delay"* in the AM peak hour in west London and one link within the Central London area. A similar level of impact is forecast in the PM peak hour in West London.

8.4.129 The greatest level of activity would be associated with the tunnel drive sites but also with two locations where the project involves intervention in the highway itself over a sustained period of time (at Blackfriars Bridge Foreshore and Deptford Church Street). The position in relation to each of these locations is summarised briefly below:

a. Carnwath Road Riverside: a junction improvement to Carnwath Road/Wandsworth Bridge Road is proposed as part of the application in order to allow articulated vehicles to turn left into Carnwath Road without over running the kerb, which would provide a permanent enhancement to the operation of the junction. With the benefit of that improvement and with the detailed site management issues set out in the *CoCP*, no significant adverse transport effects are anticipated.

b. Kirtling Street: the *CoCP* Part B sets out a number of measures to limit and manage the impact of construction traffic and to maintain the operation of the Thames Path. With the benefit of those measures, the assessment forecasts low levels of "*small delays*" on the immediate road network.

c. Chambers Wharf: detailed measures are proposed local to the site in order to manage impact, enhance safety etc. With the benefit of these and the commitment to the use of the river, the assessment concludes that some minor delays to journey times may be experienced.

d. Blackfriars Bridge Foreshore: more complex management arrangements are proposed here in recognition of issues raised by the need for the project to temporarily close the Blackfriars Bridge westbound off-ramp for part of the construction works. A management strategy is proposed (in consultation with Transport for London and City of London), which includes the temporary diversion of the Thames Path, the temporary suspension of coach parking, strict controls on lorry time arrivals, carriageway narrowing etc. The assessment concludes that although adverse effects would be experienced, the measures would reduce the transport effects to acceptable levels and that no more can practically be done to mitigate impacts that necessarily arise from working in this location. The assessment makes clear that alternative access strategies were considered as well as alternative locations for connection to the Low Level Sewer No. 1 but all were considered to cause greater disruption to traffic.

e. Deptford Church Street: it is anticipated that the two northbound lanes of Deptford Church Street would need to be temporarily closed for a period of approximately 12 months to enable the construction of the interception chamber. A detailed management strategy is proposed

through this period to limit adverse effects on traffic, although delays are still forecast on the immediate road network.

8.4.130 Although transport effects would necessarily arise, the application proposals conform to the guidance in the NPS by maximising the use of the river, where practical and cost-effective, and by working to mitigate and limit impacts on a site-specific basis.

Waste management

8.4.131 The Excavated Materials and Waste Strategy, which accompanies the application, provides a framework for the management of materials and waste that would be produced throughout the construction and operational phases of the project. The strategy demonstrates Thames Water's commitment to an overarching aim of pursuing a zero waste solution for the project by making the most efficient use of resources and maximising the re-use, re-cycling and recovery of those resources, instead of treating them as 'waste' with no innate value. The strategy applies to all project waste including excavated material, which would generally be categorised as non-waste but is included within the strategy for completeness and given its importance and the quantities involved.

8.4.132 An estimated 4.7 million tonnes of excavated material would be generated over the construction phase and the strategy sets out a hierarchy to manage the material in accordance with the Government's sustainable waste management hierarchy set out at NPS para. 4.14.2.

8.4.133 In order to give effect to this strategy, detailed provisions are set out in Section 10 of the *CoCP* Part A, which requires compliance with the strategy and obliges contractor(s) to produce site waste management plans for each site. A series of detailed provisions are set out that represent best practice and accord directly with the strategy and mitigation criteria set out in NPS Section 4.14.

Socio-economic

8.4.134 Consistent with the NPS, the analysis set out above has established that the project is both essential and urgent. Indeed, without it, it is not clear how one of the Government's key policy objectives set out in the NPS can be achieved. That is, the objective for 'Sustainable development', which is explained in the following terms at NPS para. 2.2.3:

"to seek waste water infrastructure that allows us to live within environmental limits and that helps ensure a strong, health and just society, having regard to environmental, social and economic considerations".

8.4.135 Unsurprisingly, the detailed assessments contained within the *Environmental Statement* (Vol 3, Section 8), the *Health Impact Assessment* and the *Equalities Impact Assessment* all conclude significant positive project-wide benefits. The project would be a very substantial investment to enhance the sanitation of the country's capital city.

8.4.136 The direct and indirect employment benefits of the project would be substantial. It is estimated that the project would generate 4,250 gross

direct construction jobs and up to 5,100 indirect jobs during the construction phase. This is a total of approximately 9,350 jobs, providing an equivalent of 19,000 employment years. In addition, it is expected that the project would stimulate activity in the river-borne transport sector and in the construction of concrete tunnel segments.

8.4.137 Thames Water is working closely with the Crossrail team in order to ensure that its strategy complements the one put in place for Crossrail and in recognition of the fact that the project should integrate well with the timing of the Crossrail construction, thereby making a significant contribution towards enhancing and sustaining the 14,000 jobs estimated at the peak of Crossrail construction.

8.4.138 The project is supported by a comprehensive *Skills and Employment Strategy*, the commitments of which would be passed on to contractor(s). Based on a detailed review of local capacity and skills, a series of measures is proposed to stimulate learning, facilitate training and to provide well-paid, high-quality working conditions. A feature of the project is its distribution across a number of sites throughout London, which enables the project to work closely with local authority employment strategies.

8.4.139 The local impacts of the project are principally assessed and reported under separate headings. Amenity impacts, of course, can have social and economic effects but NPS para. 4.15.12 recognises that high quality design can improve the visual and environmental experience for visitors and for the local community. As explained above, this aspect of the project was given very considerable attention in order to limit (as far as practical) the local effects of the project through the construction period and to take opportunities to enhance the quality of the local environment.

8.4.140 An important group of receptors for these purposes are recreational users of the River Thames. An assessment of health and other impacts on recreational users of the River Thames was conducted and reported by the Health Protection Agency in 2007: *The Thames Recreational Users Survey Final Report* (2007). The report estimated that there were between 3,000 and 5,000 recreational users of the tidal Thames and identified that the background concentration of microbiological indicator organisms exceeded the World Health Organisation guidelines for recreational users, particularly in the upper tidal Thames at Kew, Barnes and Putney. There was evidence of an elevated health risk from infections for recreational users of the upper tidal Thames for between two and four days after a CSO spill event, with 77 per cent of reported cases taking place within three days of a CSO spill event. Unsurprisingly, the British Rowing website contains a sewage discharge warning system for members.

8.4.141 The work of the Environment Agency reported in Section 3 of this document records the acknowledged health and aesthetic impact caused by large quantities of wastewater solids and litter either floating on the water surface or deposited on the foreshore of the River Thames. Modelling for the project (*Environmental Statement,* Vol 3, Appendix L) forecasts that the total number of spill hours would fall from the baseline

estimate with the sewage treatment works improvements and a Lee Tunnel in place (698 hours) to only 36 hours once the project is in place. The *Environmental Statement* (Vol 3, Section 8) consequently, assesses that the project would have a "*major beneficial effect on river users*".

8.4.142 The benefits, however, are even more far-reaching. As NPS para. 2.6.19 recognises:

"It is essential to reduce the likelihood of such incidents, which also have a reputational impact on the UK, as they take place in the capital city's river. The above impacts impose an economic cost on the capital, country and society….The pollution also imposes wider "external" social and environmental costs on society."

8.4.143 Defra's publication *Creating a River Thames fit for our future – a strategic and economic case for the Thames Tunnel* (November 2011) identifies a positive, net present value for the project but also identifies:

"There are other, unquantifiable, benefits that could result from a Thames Tunnel. These include employment and regeneration benefits, reputational issues, the protection of habitats and species, and the reduction in sewer flooding risks".

8.4.144 The Defra publication anticipates that these benefits could impact on tourism and also influence the extent to which business chooses to locate in London.

8.4.145 Related issues are addressed in Thames Water's publication *Why Does London's Economy Need the Thames Tunnel?, w*hich was based on research by KPMG and was externally peer reviewed. Consistent with the NPS, the study recognises the lack of sewerage capacity in London as a potential environmental limit. It postulates that, in the absence of the project, London's ability to grow sustainably would be reduced, with consequent significant impacts for the regional and national economy. Even if only 18 per cent of the forecast housing growth in London to 2031 was deferred or foregone, the work identifies a loss of £5 billion to £15 billion of GDP.

8.4.146 The NPS is concerned to ensure that mitigation measures are put in place to address adverse socio-economic impacts. In practice, however, it is apparent that the net effects of the project would be substantially beneficial.

Other policy considerations

8.4.147 Section 7 of this document identifies that other policy considerations may be important and relevant to a decision on the application. These matters were largely considered, however, in the assessment set out in this section and the individual site assessments. Those assessments considered, for instance, the relevance of the Marine Policy Statement and site-specific planning designations contained in local planning policy documents. They also considered the relevance of *London Plan* policies for safeguarded wharves.

8.4.148 It is relevant, however, to consider *London Plan* policies for the Blue Ribbon Network, which effectively provide the land use policy designation that covers the application as a whole.

8.4.149 Unsurprisingly, the project is supported directly in the *London Plan* and in the Mayor's *Water Strategy*; indeed, it is central to the achievement of that strategy. The project also strongly supports and is supported by policies for the Blue Ribbon Network. In fact, it is difficult to contemplate a project that could do more to meet the principal objectives of the Blue Ribbon Network policies that seek to:

a. increase the use of the network for freight and tourist traffic

b. safeguard (and enhance) protected wharves

c. enhance the use of the network for water borne sport and leisure use

d. restore and enhance the network in order to enhance its habitat value and bio-diversity.

Policy conclusions

8.4.150 The project was conceived and designed in an exemplary fashion through collaborative working, extensive consultation and iterative design development in order to ensure that it meets its essential objectives while limiting and mitigating its impacts and taking opportunities to achieve enhancements to the built environment through the centre of London.

8.4.151 Some impacts are inevitable, although significant impacts are remarkably few. Even where those impacts would arise, however, the policy framework of the NPS clearly advises the applicant and the decision maker that development can proceed so long as a careful approach is taken to design, operation, control and mitigation. Thames Water's approach to each area of potential impact fully satisfies the policy criteria.

8.4.152 The project is in accordance with and is supported by the NPS and all other planning relevant policy.

Thames Tideway Tunnel
Thames Water Utilities Limited

Application for Development Consent

Application Reference Number: WWO10001

Planning Statement

Doc Ref: **7.01**

Overall Planning Balance and Conclusions

APFP Regulations 2009: Regulation **5(2)(q)**

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January 2013

Thames Tideway Tunnel

Creating a cleaner, healthier River Thames

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9 Overall planning balance and conclusions

9.1 Introduction

9.1.1 With the benefit of the project-wide planning assessment set out in Section 8, it is appropriate to consider that assessment in the context of Section 104 of the 2008 Act which sets out a statutory framework for decision making on applications for development consent for NSIPs.

9.1.2 In particular (and in summary), the 2008 Act requires the decision maker to decide the application in accordance with any relevant NPS except to the extent that one or more of the following applies:

a. if deciding the application in accordance with an NPS would lead to the UK being in breach of any of its international obligations

b. if deciding the application in accordance with an NPS would lead to the UK being in breach of any duty imposed by any enactment

c. if deciding the application in accordance with an NPS would be unlawful

d. if the adverse impact of the proposed development would outweigh its benefits

e. if any condition prescribed for determining an application otherwise than in accordance with a NPS is met.

9.1.3 Section 8 of this document has established that the proposals accord directly with the NPS. The other matters to be taken into account, therefore, are the matters set out at a. to e. above. In particular, the following are likely to be particularly relevant:

a. the relationship of the proposals to legal or international obligations

b. weighing the adverse impacts of the proposals against the benefits.

9.2 Legal and international obligations

9.2.1 Unusually, the project is required not only to enable the UK to meet its own policy objectives but also to enable it to meet the requirements of European Directives. Rather than providing a reason why consent may not be granted, therefore, the UK's international obligations reinforce the case for the grant of development consent.

9.2.2 This much is apparent from the NPS itself. NPS para. 1.5.3 confirms that failure to substantially reduce discharges into the tidal Thames could result in failure to achieve environmental objectives established under the Water Framework Directive. Even if the project had the potential to adversely affect some designated features within European sites, the same paragraph of the NPS advises that improvements to surface water quality could potentially represent an overall benefit of primary importance to the environment. In the case of the project, of course, no such adverse effect on European sites arises but it is helpful that the NPS confirms that, even

in those circumstances, the balance would lie strongly in favour of the projects for which a need is established in the NPS.

9.2.3 Similarly, NPS para. 2.6.20 recognises that the UK has obligations arising from the UWWTD including the collection of sewage for treatment that would otherwise be discharged into the tidal Thames. NPS para. 2.6.21 confirms that improvements to the sewage treatment works along the tidal Thames and the construction of the London Tideway Tunnels represent the "*primary measures to address point source pollution from the sewerage system and are fundamental to the achievement of good status in this catchment".* The same paragraph confirms that, while the UWWTD is the initial driver for the project, full implementation of this Directive is a basic (obligatory) measure in the Water Framework Directive.

9.2.4 Section 3 of this document has explained that the European Court has found the UK to be in breach of UWWTD Directives and that both the Court and the UK Government have identified the implementation of the application proposals as the means by which the UK can achieve compliance. As the Government's Statement in the House of Lords on 20 November 2012 advised:

"if the Court of Justice of the European Union finds that a member state has failed to fulfil an obligation under the treaties, the state is required to take the necessary measures to comply with the judgement of the Court".

9.2.5 Accordingly, the UK's International and legal obligations strongly reinforce the case for the grant of development consent.

9.3 The balance of benefits and adverse effects

9.3.1 This document confirms that the application proposals would directly meet the need established by the NPS. It also considers the potential adverse effects of the application proposals against the criteria for assessment established by the NPS. With the benefit of mitigation measures proposed as part of the application, it is concluded that the proposals accord directly with the criteria of the NPS.

9.3.2 That planning assessment can be reached, however, without significantly considering the benefits that would flow from meeting the need identified in the NPS. These benefits are important and relevant to the decision and reinforce the case for the grant of development consent.

9.3.3 In practice, substantial benefits would be derived locally, regionally and nationally from the implementation of the project. These benefits do not need to be set out at length in order to understand their significance. In brief, however, they may be categorised under the following headings:

a. ecological and health benefits
b. aesthetic and recreational benefits
c. direct project benefits, such as employment and legacy benefits
d. economic benefits to London and the UK.

9.3.4 Each of these is considered briefly in turn below.

Ecological and health benefits

9.3.5 The results from the water quality modelling are clear that the completion of the project would enable the tidal Thames to meet the standards set for dissolved oxygen so that the upper and middle tidal Thames can achieve 'good potential'. In addition, the project would enable the river to achieve the standard set by the Tideway Fish Risk Model, which is necessary to ensure that sustainable conditions are achieved for a wide range of fish species and invertebrates.

9.3.6 In reducing the discharge of untreated sewage into the tidal Thames from approximately 18 million m^3 per annum to 2.3 million m^3 per annum, significant health benefits would be achieved for recreational users of the river. Rather than some CSOs discharging 40 or 50 times a year, all CSO spills would be reduced to four or less. The number of pathogen risk days would be reduced by 96 per cent.

9.3.7 The project would dramatically enhance the water quality of the tidal Thames.

Aesthetic and recreational benefits

9.3.8 With each rainfall event that causes an overflow, it is typical for the discharge to contain human pathogens and bacteria as well as large quantities of wastewater solids (eg condoms, human faeces, syringes, tampons and other sanitary products); industrial and commercial wastewater constituents (eg chemicals, solvents, kitchen grease, rags); suspended sediment; street litter; and other debris. It has been calculated that approximately 10,000 tonnes of solid sewage matter is discharged from the CSOs into the tidal Thames every year, creating offensive slicks of sewage in the water and large deposits of solid material on the foreshore. The Environment Agency rightly considers the current conditions to be completely unsatisfactory.

9.3.9 Most parts of the river are now accessible to the public. Tourist and commuter boats operate throughout the tidal Thames and there are extensive areas of waterside housing. Some areas are more sensitive than others, especially in the upper reaches where there is greater public access, substantial recreational activity and less volume of tidal water for mixing and dilution.

9.3.10 The project would capture approximately 94 per cent of these materials and dramatically enhance the aesthetic quality of the tidal Thames as it flows through the nation's capital city.

Employment and legacy benefits

9.3.11 The Thames Tideway Tunnel is a major infrastructure project. It is estimated that it would generate 4,250 direct construction jobs and up to 5,100 indirect jobs. A high quality approach is proposed to education, training and recruitment and the project would build upon and sustain the construction and training legacy of the Crossrail project. The commitment to the use of the river for the transport of materials is also expected to stimulate training and investment in London's river-related industries.

9.3.12 Careful site selection means that a number of the selected sites are currently of poor visual quality and would be enhanced by the clearance, temporary use, and release by the project. Safeguarded wharves, for instance, would be refurbished; river walls repaired and outdated buildings removed. More particularly, the opportunity was taken to propose the positive enhancement of a number of significant sites across the capital. Unique new public realm would be created at the river's edge. Parks, public realm and the Thames Path would be enhanced.

9.3.13 In addition, the operational infrastructure itself is designed to a high standard, with bespoke unifying elements celebrating its otherwise unseen contribution to the sustainable future of London as a leading world city.

Economic benefits to London and the UK

9.3.14 Effective and reliable infrastructure is an essential component of sustainable urban life. In London, it is clear that the capital has outgrown its existing sewerage system and, if further growth is to be sustainable, that constraint needs to be addressed. Seen in this light, this is one of the most important infrastructure projects in the UK.

9.3.15 London is the economic power house of the country. Its prosperity and its ability to continue to grow are central to the national economy. London is a world centre for business, tourism, media and culture and the home of the UK Government. Inner London (with its close relationship to the River Thames) contributes around 14 per cent of the UK's GDP.

9.3.16 London was the fastest growing region across England and Wales in the period 2001/2011. Nine of the twenty local authorities with the fastest growing population in England and Wales were in London and population growth is forecast to continue. The *London Plan* predicts an increase of 790,000 households in the capital by 2031 and forecasts a growth of 776,000 jobs.

9.3.17 In planning for future growth, the *NPPF* (para. 162) emphasises the need for local authorities to work with providers to assess the quality and capacity of infrastructure including "*waste water and its treatment"* and, specifically, to plan for the ability to meet forecast demands. Para. 21 requires planning policies to recognise and address potential barriers to investment, including a poor environment and a lack of infrastructure.

9.3.18 The *London Plan* (para. 5.58) confirms that "*effective waste water infrastructure is fundamental to sustainable urban life and therefore investment and expansion are required". London Plan* Policy 5.14 confirms that "*development proposals must ensure that adequate waste water infrastructure capacity is available in tandem with development"*. Against this background, it is unsurprising that Policy 5.14 directly supports the project. Without it, it is not obvious either how the UK would meet its international obligations or how London would meet its need to provide sufficient infrastructure capacity to support sustainable growth.

9.3.19 The project, therefore, is a critical element in enabling London to continue to grow, in the regional and national interests. The substantial,

unquantifiable benefits of enabling this growth weigh heavily in support of the application.

9.4 Applying the decision making framework

9.4.1 It is apparent that the Thames Tideway Tunnel is a project of considerable national importance. Substantial benefits would flow from its implementation and that implementation would accord directly with the most up-to-date and authoritative national policy.

9.4.2 Against this background, the adverse effects of the project would need to be very considerable if they were to challenge its benefits and justify a decision taken not in accordance with the NPS.

9.4.3 The potential adverse effects of the project were limited through an exemplary approach to scheme development and site selection, careful design and a rigorous approach to mitigation. The principal residual adverse effects would be temporary in nature, which is characteristic of construction activity that is necessary if major new infrastructure is to be provided and if London is to continue to renew itself.

9.4.4 The economic, ecological, health, aesthetic and reputational consequences of the project not being allowed to proceed would be severe.

9.4.5 The overall planning balance lies strongly in favour of the grant of development consent.

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Glossary of terms in relation to the Thames Tideway Tunnel project

Term	Description
above ordnance datum	Ground level/elevation relates to the mean sea level at Newlyn in Cornwall, referred to as Ordnance Datum (OD), and are reported in metres above or below OD.
abstraction	Removal of water from a source of supply (surface or groundwater).
acoustic enclosures	An enclosed structure installed around plant or machinery to reduce or attenuate noise.
acquiring authority	A body with compulsory purchase powers. In the case of the Thames Tideway Tunnel project, Thames Water would be the acquiring authority once a DCO with compulsory purchase powers is approved.
acquisition cost	The cost of acquiring an interest in a property, either by agreement or by compulsory purchase. The acquisition cost includes the value of the property, disturbance compensation, owner's fees and other reasonably incurred losses and costs.
acquisition of new rights	An acquisition of something less than the freehold, eg, rights of temporary occupation or rights of access (temporary or permanent).
acquisition risk	The risk of failure to acquire a property via agreement or compulsory purchase.
advanced tree planting	Trees planted before the main construction activities commence.
aeration tanks/plant	Tanks in which sewage undergoes biological treatment due to aeration.
aesthetic	Aesthetic effects are associated with human sensory or emotional values and judgements. They often relate to environmental effects on human receptors through the senses of sight, smell, taste, and sound.
aggradation	The increase in land elevation due to the deposition of water-borne sediment.
aggregate	Coarse particulate material used in construction, including sand, gravel, crushed stone, slag, recycled concrete and geosynthetic aggregates.
air management structures	Collective term for ventilation equipment

Term	Description
air pollutants	Amounts of foreign and/or natural substances occurring in the atmosphere that may result in adverse effects on humans, animals, vegetation and/or materials.
Air Quality Management Area	Areas where the local authority has determined that the national air quality objectives are not likely to be achieved by the relevant deadlines.
air quality sensitive receptors	People, property or designated sites for nature conservation that may be at risk from exposure to air pollutants that could potentially arise as a result of the proposed development.
air treatment chamber	A structure containing carbon that absorbs odour from air flowing out of a tunnel, without the assistance of mechanical pumping.
alluvium	Sediment lain down by a river.
ambient	Of the surrounding area or environment. For noise, for example, it is the totally encompassing sound in a given situation at a given time, usually composed of sound from many sources near and far.
amount	The proposed floor space for each proposed use (DCLG Guidance on information requirements and validation, March 2010).
anaerobic environment	An environment with reduced oxygen levels.
ancient monument	A monument protected under the *Ancient Monuments and Archaeological Areas Act 1979*.
ancillary use	A subsidiary or secondary use or operation closely associated with the main use of a building or piece of land.
aquifer	A permeable geological stratum or formation that is capable of both storing and transmitting water in significant amounts. A permeable strata, either through intergranular and/or fracture permeability, that is capable of supporting water supply and/or river base flow. There are two types of aquifers, principal and secondary, depending on whether they are regionally or locally important.
archaeological priority area/zone	Area of archaeological priority, significance, potential or other title, often designated by the local authority.
artesian	Water rising to the ground surface under internal hydrostatic pressure.
asset	An existing or proposed/planned physical object, whose stability, form or function is responsive to ground movements to such an extent that these responses need

Term	Description
	to be fully understood and investigated prior to commencing construction works.
asset control limits	Predetermined values of structural response (typically movements and strains) that where experienced in practice trigger specific countermeasures on the part of the contractor in an emergency preparedness plan.
Asset Management Plan (AMP)	A plan agreed with Ofwat on a five-yearly basis for the management of water and wastewater assets. AMP4 covered the investment period of April 2005 to March 2010. AMP5 covers the period of April 2010 to March 2015.
A-weighted decibel	A-weighted decibels, abbreviated dBA, or dBa, or dB(a), are an expression of the relative loudness of sounds in the air as perceived by the human ear.
base case	An assessment of a future case, without the project, in a particular assessment year.
baseflow	The component of river flow derived from groundwater sources rather than surface run-off.
baseline	The existing conditions against which the likely significant effects of a proposed development are assessed.
baseline concentration	Pollutant concentration for any scenario with the proposed development not in operation.
bathymetric	Of or relating to measurements of the depths of oceans, rivers or lakes.
beneficial use	The use of excavated material for a positive purpose including recycling, use in industrial processes, use in development, land remediation, habitat creation and landfill restoration.
biochemical oxygen demand (BOD/BOD_5)	The amount of dissolved oxygen used by micro-organisms in the biological process of metabolising organic matter in water. The more organic matter there is (eg, in sewage and polluted bodies of water), the greater the BOD. The greater the BOD, the lower the amount of dissolved oxygen available for higher animals such as fish. The BOD is therefore a reliable gauge of the organic pollution of a body of water. It is most commonly expressed in milligrams of oxygen consumed per litre of sample during five days of incubation at 20°C.
biodiversity	Biological diversity – or 'biodiversity' – is the term given to the variety of plant and animal species in a given environment and the natural patterns they form.
Blue Ribbon Network	The Blue Ribbon Network, which is part of the *London*

Term	Description
(BRN)	*Plan*, includes the River Thames, the canal network, and other tributaries, rivers and streams within London and London's open water spaces, such as docks, reservoirs and lakes. It includes culverted (or covered over) parts of rivers, canals or streams.
borehole	A hole drilled into the ground for geological investigation or for the exploitation of geological deposits or groundwater. An abstraction borehole is a well sunk into an aquifer from which water is pumped.
British Standard	Produced by the BSI Group in order to set up standards of quality for goods and services.
brown roof	A roof that supports a wide variety of plant and animal species and reduces storm water run-off.
brownfield land/ brownfield site	Previously developed land and premises that may be partially occupied or used. It is most commonly associated with derelict urban land with redundant industrial buildings. Excludes agriculture or forestry land.
building recording	Recording of historic buildings to document buildings, or parts of buildings, that may be lost as a result of demolition, alteration or neglect. Four levels of recording are defined by Royal Commission on the Historical Monuments of England (RCHME) and English Heritage. Level 1 (basic visual record); Level 2 (descriptive record), Level 3 (analytical record), and Level 4 (comprehensive analytical record).
Building Research Establishment Limited (BRE)	The trading name of Building Research Establishment Limited. Originally known as the Building Research Station and later the Building Research Establishment. Formally a government establishment, BRE became a private company in 1997. As well as research, BRE undertakes testing and consultancy.
bund	An embankment which acts as a visual or noise screen. A bund may also enclose and retain materials that are being stored
bunding	Also called a bund wall, bunding is a separated area within a structure designed to prevent inundation or breaches of various types.
cable duct	Pipework (generally below-ground) in which a cable is housed.
caisson	A watertight chamber that is open at the bottom (sometimes containing air under pressure) that is used to carry out construction work under water.
campshed	An area of stone, concrete or timber lain on the river/sea bed that is exposed at low tide to allow vessels to rest

Term	Description
	safely and securely in place.
capture zone	An area from which groundwater is drawn.
carbon filters	Filters that would remove odours as air is passed through.
carbon footprint	The total set of greenhouse gas (GHG) emissions caused by an organisation, event, product or person, often expressed in terms of the amount of carbon dioxide, or its equivalent of other GHGs, emitted.
cast *in situ* concrete	Concrete (mass or reinforced) that requires a 'shutter' or similar temporary works to facilitate the casting process, until the concrete has gained sufficient strength to dispense with any temporary works.
catchment	The area from which surface water and/or groundwater collects and contributes to the flow of a river, abstraction or other specific discharge boundary. Can be prefixed by 'surface water' or 'groundwater' to indicate the specific nature of the catchment.
Catchment Abstraction Management Strategy (CAMS)	The Environment Agency's strategy for water resources management in England and Wales through licensing water abstraction. CAMS is used to inform the public on water resources and licensing practice; provide a consistent approach to local water resources management; and to help balance the needs of water-users and the environment.
catenary	A curve formed by a perfectly flexible, uniformly dense and inextensible cable suspended from its endpoints.
Chalk	In the project area, chalk is firm, white, fine-grained limestone with conspicuous semi-continuous nodular and tabular flint seams.
Code of construction practice (CoCP)	A document that sets out control measures to be adopted during the construction period.
cofferdam	A temporary wall that is constructed around the outside of a working area within a river that is then pumped dry. The inside of the cofferdam can be filled to create a safe working area.
collecting system	A system of conduits that collects and conducts urban wastewater.
combined sewer	A sewer that conveys both rainwater and wastewater of domestic or industrial origin.
combined sewer overflow (CSO)	A structure, or series of structures, that allows sewers that carry both rainwater and wastewater to overflow into a river when at capacity during periods of heavy rainfall. The flows are discharged to river in order to prevent the

Term	Description
	sewers backing up and flooding streets or houses. Flows may discharge by gravity or by pumping.
compliance statement	A document prepared for each third-party asset thatrecords how the asset owner's concerns have been addressed and how the basis of the asset assessments will be verified during construction.
compulsory purchase	The acquisition of property using statutory powers where the agreement of the owner is not required.
Compulsory Purchase Order (CPO)	An order that authorises the compulsory purchase of interests in land.
condition survey	A survey of an asset that is undertaken prior to construction works that may affect the asset. A further survey can be carried out once construction is complete, if required.
confirmation of DCO	The point at which the minister approves the DCO. The powers contained in the DCO may then be used (assuming there is no appeal).
connection culvert	A covered linear channel to connect two structures.
connection tunnel	A tunnel that connects two structures or tunnels.
conservation area	An area designated by a local authority or English Heritage that has special architectural or historical interest. Defined in the Planning (Listed Buildings and Conservation Areas) Act 1990 as "an area of special architectural and historic interest, the character or appearance of which it is desirable to preserve or enhance."
consolidation tanks	A tank in which a liquid containing suspended solid material is stored to enable gravity to separate the solid material from the carrier liquid.
construction site	The area of a site used during the construction phase.
contaminated land	Land that has been polluted or harmed in some way rendering it unfit for safe development and usage unless decontaminated.
crawler crane	A mobile crane, usually with caterpillar tracks.
Crown land	An interest in land owned by a Crown body, such as a central government department, the Duchy of Lancaster or the Duchy of Cornwall.
CSO site	A site that contains the CSO interception chambers, connection culverts and the drop shaft and other structures.. Each site needs to be able to provide enough space for all construction-related activities.

Term	Description
culvert	A covered structure that conveys a flow under a road, railroad or other obstruction. Culverts are mainly used to divert stream or rainfall run-off to prevent erosion or flooding on highways.
curtilage	An area of land or structures around a dwelling or other structure.
cut	Excavated material to be reused as part of the project as 'fill' or removed off-site.
dB $LA_{eq,T}$	An equivalent continuous A-weighted sound pressure level that has the same energy as a fluctuating sound over a specified time period T.
decibel (dB)	Logarithmic ratio used to relate sound pressure level to a standard reference level.
Design and Access Statement	A statement to be submitted as part of an application for development consent that covers the concepts and principles of design and addresses access issues.
Design Council CABE	An enterprising charity comprising the Design Council and the Centre for Architecture and Built Environment (CABE) that provides advice and support on all aspects of design, including architecture.
Design Development Report (DDR)	Design development reports describe the process behind the development of the proposed designs of the permanent above-ground elements of the Thames Tideway Tunnel project and the integration of these elements into the surrounding environment.
Design Council CABE design reviews	Hosted by the Design Council CABE and undertaken in consultation with the local planning authorities and pan-London stakeholders, these two-stage reviews have provided independent advice and guidance on the emerging design of the Thames Tideway Tunnel project sites.
detention tank	A tank built to store run-off and release it at a controlled rate so that the peak flow is reduced and the flow is spread over a longer period.
determination	The process by which an appropriate authority reaches a decision on whether a proposed development requires planning permission.
development	Development is defined under the 1990 Town and Country Planning Act (as amended) as "the carrying out of building, engineering, mining or other operation in, on, over or under land, or the making of any material change in the use of any building or other land". Most forms of development require planning permission.

Term	Description
development brief	The document to be used to guide the detail design of individual plots within the site and the controls on future operational activities.
Development Consent Order (DCO)	An order under the Planning Act 2008 approving a development that is or forms part of a Nationally Significant Infrastructure Project. The order can grant planning permission and compulsory purchase powers. The order is granted by government ministers.
development plan	In London, this refers to the LPA/local authorities' unitary development plan, core strategy, other development plan documents and the *London Plan*.
development plan document (DPD)	Development plan documents are a statutory element of the local development framework and are subject to independent examination by an inspector. DPDs include the following types of documents: a. core strategy: sets out the long-term vision and overarching policies for the borough b. site-specific land allocations and policies c. area action plans (where needed): set out the planning framework for areas of significant change and conservation areas d. general development control policies e. a proposals map: illustrates the spatial extent of policies.
dewatering	The removal of water from solid material or soil by wet classification, centrifugation, filtration, or similar solid-liquid separation processes, such as removal of residual liquid from a filter cake by a filter press as part of various industrial processes. Construction dewatering is a term used to describe removal or draining groundwater or surface water from a riverbed, construction site, caisson or mine shaft, by pumping or evaporation.
diaphragm wall	A diaphragm wall is a reinforced concrete retaining wall constructed *in situ*. A deep trench is excavated and supported with slurry, and then reinforcing material (normally steel) is inserted into the trench. Concrete is poured into the trench and only after this can excavation in front of the retained earth commence.
discharge point to river	Where combined sewage is released into the river.
discretionary purchase cost	The cost of acquiring a property that is affected by works and where the owner has met the eligibility criteria under

Term	Description
	Thames Water's hardship scheme.
dissolved oxygen level	Indicator of water quality – a higher level is preferable.
disturbance compensation	Compensation to cover costs of relocation from a property that is needed for works and has been acquired.
domestic wastewater	Wastewater from residential settlements and services that predominantly originates from the human metabolism or household activities.
drawdown	A lowering of the water level in a borehole or aquifer, usually in response to abstraction.
Drinking Water Standards	Legal standards set in the Europe in the Drinking Water Directive 1998 together with UK national standards to maintain wholesomeness of potable water.
drive (shaft) site	Drive (shaft) sites lie at the start of tunnel drives and accommodate the majority of tunnelling activities. A shaft would be constructed and where appropriate a tunnel boring machine (TBM) installed. The TBM would then be used to construct the tunnel by excavating the ground.
drive/drive option	A possible tunnelling option.
drop shaft	A vertical concrete structure to drop flows from a CSO to a tunnel.
dust	Coarse particulate matter (between 1µm and 75µm in diameter) produced as a result of abrasive activities during the construction phase of a development.
earth pressure balance (type of TBM)	A mechanised tunnelling method in which spoil is admitted into the tunnel boring machine via a screw conveyor arrangement, which allows pressure at the face of the tunnel boring machine to remain balanced without the use of slurry.
ecology	The relationship between organisms and their environment.
effect (environment)	The result of an impact on a particular resource or receptor.
effluent	Treated wastewater discharged from a sewage treatment works.
electrical and control kiosk	A structure that houses electrical and control equipment
elevation (building)	The actual façade of a building, or a plan showing a drawing of a façade.
emergency preparedness plan	A plan prepared for each asset where required, which details actions to be taken at each trigger level that links directly to the outcomes of risk workshops.

Term	Description
encroachment	With regards to the Thames Tideway Tunnel project, this refers to the extent that proposed structures extend into the river or foreshore.
Environmental Impact Assessment (EIA)	An assessment of the likely significant effects that a proposed project may have on the environment that considers natural, social and economic aspects, which is prepared in accordance with the Infrastructure Planning EIA Regulations 2009.
environmental quality standards (EQS)	The concentration of chemical pollutants assessed to have detrimental effects on water quality in terms of the health of aquatic plants and animals. EQS are established in the Water Framework Directive (Annex V) through testing the toxicity of the substance on aquatic biology.
Environmental Statement (ES)	A document to be prepared following an EIA that provides a systematic and objective account of the EIA's findings, prepared in accordance with the Infrastructure Planning EIA Regulations 2009. All of the specialist scoping exercises, desktop studies, survey work, baseline and mitigation reports.
estuarine	That which is formed or deposited in an estuary.
eutrophication	The enrichment of water by nutrients especially compounds of nitrogen and/or phosphorus, causing an accelerated growth of algae and higher forms of plant life.
evaluation (archaeological)	A limited programme of non-intrusive and/or intrusive fieldwork that determines the presence or absence of archaeological features, structures, deposits, artefacts or ecofacts within a specified area.
excavated material	The earth/soil/ground material removed when shafts, tunnels and other structures are excavated. Excavated material can be either topsoil, subsoil or other material, such as rock, etc.
excavation (archaeological)	A programme of controlled, intrusive fieldwork with defined research objectives that examines, records and interprets archaeological remains, retrieves artefacts, eco-facts and other remains within a specified area. The records made and objects gathered are studied and the results published in detail appropriate to the project design.
exchange land	Land that is acquired by an acquiring authority in order to re-provide open space needed for works.
fill	Material required to raise existing ground levels. This may comprise 'cut' material generated within a site or imported material.

Term	Description
final effluent	Treated liquid that results from a treatment process, at the point of discharge to a watercourse.
final settlement (sewage treatment)	The process stage in a sewage treatment works where 'mixed liquor' is treated prior to discharge of the final effluent.
findspot	The location at which an item is found.
flood plain	Generally low-lying areas adjacent to a watercourse or the tidal lengths of a river or sea where water flows in times of flood or would flow but for the presence of flood defences.
flood risk assessment	An assessment of the likelihood of flooding in a particular area in order to carefully consider development needs and mitigation measures.
fluvial	The processes associated with rivers and streams and the deposits and landforms they create.
foreshore	Ground uncovered by a river when the tide is low.
foul water sewer	A sewer that conveys wastewater of domestic or industrial origin, but little or no rainwater.
future baseline	The situation that would prevail if a proposed development does not proceed. Predicted impacts are compared to this theoretical scenario.
global warming	The gradual increase in the temperature of the earth's atmosphere, believed to be due to the greenhouse effect, caused by increased levels of carbon dioxide, chlorofluorocarbons, and other pollutants.
Green Flag	A benchmark national quality standard for parks and green spaces in the UK.
greenfield settlement	The term used to describe predicted movements at the ground surface, calculated on the premise that the ground is a 'green field' (ie, free of development) used as a starting point for ground movement calculations.
greenfield sites	Land not previously developed, can include agricultural land.
greenhouse gas (GhG)	Greenhouse gases are gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and emit radiation at specific wavelengths within the spectrum of infrared radiation emitted by the Earth's surface, the atmosphere and clouds. This property causes the greenhouse effect.
ground investigations	Information gathering and collation regarding existing geotechnical ground information to enable the design process (eg, boreholes, groundwater monitoring, trial

Term	Description
	holes, etc).
ground treatment	A range of measures to improve the properties of the naturally occurring ground or to counter the potential pore water pressure changes arising from underground working/excavations in order to facilitate construction and/or reduce ground movement caused by works.
groundwater	All water below the surface of the ground in the saturation zone and in direct contact with the ground or subsoil.
groundwater body	Distinct volume of groundwater within an aquifer or aquifers
grout	A material that is commonly injected in a fluid state to improve the engineering properties of poor ground conditions, fill voids (eg, between a structural tunnel lining and cut ground)
habitable rooms	Living rooms, studies, bedrooms, kitchen-diners and larger kitchens, generally used in connection with density assessments and assessment of daylight and sunlight levels for residential amenity.
habitat wall	A wall that acts as a wildlife resource for insects and small mammals to feed, shelter and procreate.
haul roads	Temporary roads provided within a contractor's site area to allow the transportation of material around the site.
hazardous waste	Waste that is harmful to human health or the environment, either immediately or over an extended period of time.
health and safety documentation	Health and safety and Construction Design and Management document production for enabling items, preliminary design and reference design (eg, Construction Design and Management documents for topographical surveys, boreholes, etc).
health and safety reviews	Review of proposed designs or solutions to ensure health and safety and Construction Design and Management opportunities are maximised in the proposed solution (eg, on-going Thames Water Operations input, hazardous operations, buildability reviews).
hectare (ha)	A unit of area, defined as 10,000m^2, primarily used in the measurement of land.
heritage asset	A building, monument, site, place, area or landscape positively identified as having a degree of significance that merits consideration in planning decisions. Heritage assets are the valued components of the historic environment. They include designated heritage assets and assets identified by the local planning authority

Term	Description
	(including local listing).
Heritage Statement	Description of the significance of the heritage assets affected, and the contribution of their setting to that significance (Policy HE6 of PPS5).
historic environment	Above-ground and buried heritage assets that are considered to be significant because of their historic, archaeological, architectural or artistic interest. They might comprise below and above-ground archaeological remains, buildings, structures, monuments or heritage landscapes within or immediately around proposed development sites.
historic environment record (HER)	An archaeological and built heritage database held and maintained by the county authority. Previously known as the Sites and Monuments Record.
historic parks and gardens	A park or garden of special historic interest graded I (highest quality), II* or II as designated by English Heritage.
hogging	Bending upwards; the opposite of sagging.
home zone	A designated residential area with streets designed to operate primarily as a space for social use.
Hydrogeology/hydrology	The area of geology that deals with the distribution and movement of groundwater in the soil and rocks of the Earth's crust (commonly in aquifers).
Impact (environment)	A physical or measurable change to the environment that is attributable to the project.
impermeable surface (geotechnical)	Surfaces or ground unable to absorb rainfall eg, concrete, most tarmac surfaces and hardstanding.
infiltration	The process whereby water seeps into a pipe via imperfections such as cracks, etc.
Infrastructure provider	Infrastructure provider means any body appointed (by the Secretary of State for the Environment) as an infrastructure provider for the authorised project or part(s) of the authorised project under Section 36B of the Water Industry Act 1991 (as amended by Section 35 of the Flood and Water Management Act 2010).
inlet pumping station	A structure that contains pumps to lift fluid.
instrumentation and monitoring specification	An approach to instrumentation and monitoring that includes roles and responsibilities, triggers and action plans, a regime to control construction works and the specification of instruments.
interception chamber	A structure constructed around an existing combined sewer that diverts storm water from the sewer into a new system of structures to transfer storm water flow to a

Term	Description
	sewage treatment works.
interceptor sewer	A sewer that captures spillages from existing sewers and transports them to be properly treated.
intermediate site	A site that contains intermediate shafts to support construction of the main tunnel with activities such as secondary lining. Each site needs to provide enough space for all construction-related activities (also see reception site).
Lambeth Group	A complex sequence of highly variable inter-bedded sediments that includes clay, sands, pebble beds and Shelly beds.
landscape character areas	Areas of landscape that have a broadly homogeneous pattern of topography and drainage, vegetation cover, settlement, land use and visual structure.
launch shaft or drive shaft	The shaft from which a tunnel boring machine is 'launched' ie, starts from. Excavated material is removed from and segments are fed into the tunnel at the launch/drive shafts.
layout	The way buildings, routes and open spaces are placed or laid out in relation to each other on the ground.
Lee Tunnel	The Lee Tunnel comprises a storage and transfer tunnel from Abbey Mills Pumping Station to Beckton Sewage Treatment Works and the interception of the Abbey Mills Pumping Station CSO.
limits of deviation (LODs)	Land boundary limits within which the permanent works would be located.
limits of land to be acquired and used (LLAU)	Land boundary limits around the worksites encompassing both the permanent works and their associated construction facilities and activities to build them.
lining	A structural member that is used in tunnels or shafts (vertical or inclined) to withstand ground and hydrostatic loads, both internal and external
listed buildings	A structure of architectural and/or historical interest included on the Secretary of State's list, which affords statutory protection. Such buildings are subdivided in to Grades I, II* and II (in descending importance).
locally listed buildings	Buildings designated by the local planning authority as having local significance, which are included on a local list. Although such buildings are not statutorily protected, in general close scrutiny will be given to any development affecting them as a recognised heritage asset.
London clay	Fine sandy-silty clay to silty clay.

Term	Description
London Plan	The *London Plan* is the strategic spatial planning document for London produced by the Mayor of London. It sets out a fully integrated, economic, environmental, transport and social framework for the development of the capital to 2031, and forms part of the development plan for greater London.
London Tideway Improvements (LTI)	London Tideway Improvements comprises three major engineering schemes to help prevent sewer overflows and improve water quality in the River Thames. This includes upgrades to all five major sewage works in London, and construction of the Lee Tunnel and the proposed Thames Tideway Tunnel.
main tunnel	The large diameter tunnel from Acton Storm Tanks to Abbey Mills Pumping Station.
main tunnel site	A site from which the main tunnel would be built. Each site needs to provide enough space for all construction-related activities, which would vary depending on the type of tunnel boring machine used and whether the site is a drive site, double drive site or reception site.
Marine Policy Statement	The framework for preparing marine plans, which is applicable to all UK waters. It provides direction for new marine licensing and other authorisation systems, and sets out the general environmental, social and economic considerations that must be taken into account in marine planning.
method statement	Under Construction Design and Management regulations, a method statement must be prepared for each task prior to work commencing on-site. The statement provides details of how the task will be carried out and include possible risks or dangers, along with methods of control to be established to ensure safety.
Metropolitan Open Land (MOL)	A London-specific designation that protects strategically important open spaces within the built-up capital and affords the same level of protection as greenbelt land.
mitigation design report	A report that must be prepared for each asset that requires mitigation works. It comprises the detailed design and mitigation works identified in the Stage 3 assessment report.
mitigation measures	Proposed actions to prevent or reduce adverse effects arising from the whole or specific elements of a development.
modelling	Simulation of a proposed design (eg, hydraulic modelling of a drainage network, physical modelling of drop shafts or odour modelling, etc).

Term	Description
monitoring	Monitoring, recording and collection of existing situation data prior to construction (eg, CSO spill frequency, vehicle or pedestrian traffic movements or building settlement monitoring before or during construction).
oil interceptor	An underground tank split into sections and connected into a drainage system that contains oil and prevents it being discharged into rivers and streams, etc.
open space	All space of public value, including landscaped public areas, playing fields, parks and play areas as well as areas of water such as rivers, canals, lakes and reservoirs that offer opportunities for sport and recreation or provide visual amenity.
operational phase	Once construction work is complete and the tunnel system is in use.
orthogonal	That which has a set of mutually perpendicular axes meeting at right angles.
overflow weir chamber	Used to manage and divert overflows from an existing sewer into another system
overlooking	The outlook from a development or building over adjoining land or property.
particulate matter	Solid particles or liquid droplets suspended or carried in the air that remain once deposited onto a surface. The term includes all size fractions of suspended matter such as dust, PM_{10} and $PM_{2.5}$.
pathogenic organisms	Creatures capable of producing disease.
penstock	A gate used to control wastewater flow.
Permeability (geotechnical)	A measure of the ability of a material (such as rocks) to transmit fluids.
permitted development	Permission to carry out certain limited forms of development without needing to make an application to a local planning authority, as granted under the terms of the Town and Country Planning (General Permitted Development) Order 2010.
Planning Inspectorate	An independent body that examines applications for development consent for Nationally Significant Infrastructure Projects.
planning obligations and agreements (Section 106)	A legal agreement between a planning authority and a developer, or an undertaking offered unilaterally by a developer, that ensures that certain extra work related to a development is carried out.
porous (geotechnical)	Containing void spaces. Most sedimentary rocks are porous to some extent, and the term is commonly applied

Term	Description
	in a relative sense, generally restricted to rocks that have significant effective porosity.
pre-application discussions	Meetings and consultation with relevant local authorities and statutory stakeholders prior to submitting an application for development consent.
precast concrete segmental lining	Tunnel or shaft lining composed of precast, usually reinforced, concrete elements (segments) designed to form a specific shape, normally circular.
preferred site	Sites assessed as most suitable following a review of the suitability of shortlisted sites, having regard to engineering, planning, environment, property and community considerations.
preliminary design	An outline design process to develop provisional solutions.
Preliminary environmental information report (*PEIR*)	A document that sets out initial environmental information. It is subject to pre-application consultation under the Planning Act 2008.
preliminary treatment	The initial treatment stage in a sewage treatment works where physical separation techniques are used to remove larger objects and grit to ensure that sewage is amenable to treatment.
preservation by record	Preservation by recording and advancing understanding of an asset's significance. This is a standard archaeological mitigation strategy in which heritage asset remains are fully excavated and recorded archaeologically and the results are published. For remains of lesser significance, preservation by record might comprise an archaeological watching brief.
preservation *in situ*	An archaeological mitigation strategy in which nationally important (whether designated or not) heritage assets are conserved *in situ* for future generations, typically through modifications to design proposals to avoid damage or destruction of such remains.
primary treatment	Treatment of urban wastewater by a physical and/or chemical process that involves settlement of suspended solids or other processes in which the BOD_5 of the incoming wastewater is reduced.
public realm	Any publicly-owned area, including streets, pathways, parks, publicly accessible open spaces, and public and civic facilities.
Public Right of Way	Route to which the public has right of access.
public sewer	A sewer that is owned and maintained by a UK water and

Term	Description
	sewerage undertaker.
public transport accessibility level (PTAL)	A method of measuring how accessible a location is to rail, tube and bus services.
public water supply	A term used to describe the supply of water provided by a water company.
pumping station	A vertical structure with pumps used to lift water up to a higher level
Ramsar site	Sites identified under the Ramsar Convention (the Convention on Wetlands of International Importance, especially as Waterfowl Habitat) relating to the conservation and sustainable utilization of wetlands, recognizing the fundamental ecological functions of wetlands and their economic, cultural, scientific, and recreational value.
raw sludge	Sewage solids that have settled out during primary sedimentation. These particles collect and form sludge.
reach	A section of river between two points.
real-time control	Live data is used to manipulate control equipment in order to best manage the flow of storm water and sewage within a system's capacity.
reception site	A tunnel site that would contain the shaft from which a tunnel boring machine would be 'received' ie, ends up.
receptor	A person, animal, plant, eco-system, property, surface or groundwater environment, or historic environment that may be impacted by a project.
recharge (geotechnical)	Water that percolates downwards from the surface to replenish the water table.
red route	The red route is a network of roads designated by Transport for London to carry heavy volumes of traffic, which is essential for the movement of traffic and public transport. It mainly comprises major routes into and around London. Transport for London is responsible for enforcing the red routes, which include clearways, parking and loading bays, bus lanes, yellow box junctions and banned turns.
reference design	A design process used to support site selection.
regeneration	The economic, social and environmental renewal and improvement of rural and urban areas.
reinforced grass	An area of grass reinforced with a mesh to improve load bearing capacity and wear resistance.

Term	Description
risk assessment	Assessment of the risks associated with an activity or object and possible accidents involving a source or practice. This includes assessment of consequence.
River Basin Management Plans (RBMP)	Management plans that outline the state of water resources within a River Basin District relevant to the objectives of the Water Framework Directive.
run-off	Run-off is the movement of rain water over land. Run-off consists of precipitation that does not evaporate, transpire or penetrate the surface to become groundwater. Excess run-off can lead to flooding, which occurs when there is too much precipitation.
safeguarded wharf	A wharf that is protected by the Mayor of London and the Port of London Authority, to ensure that it is retained as a working wharf and protected from redevelopment into other uses.
saturated zone (geotechnical)	The zone in which the voids in a rock or soil are filled with water at a pressure greater than atmospheric pressure.
scale	The height, width and length of proposed buildings in relation to their surroundings.
scheduled monument	An ancient monument or archaeological deposit designated by the Secretary of State as a 'Scheduled Ancient Monument' and protected under the Ancient Monuments and Archaeological Areas Act 1979.
scoping opinion	The formal view of the determining authority on the range of topics and issues to be considered by the environmental impact assessment.
scoping report	A document that sets out the proposed approach to the Environmental Impact Assessment, including the range of processes, desktop studies, actions, topics and issues to be addressed.
scour	Movement of riverbed materials due to the force of the water.
screening opinion	The formal view of the determining authority on the need to undertake an Environmental Impact Assessment.
screens (treatment)	As part of the wastewater treatment process, screens are used to physically remove larger objects, including floating debris, from the incoming flow to ensure that sewage is amenable to treatment.
secant piles	Alternate piles in-filled with concrete to form a water-tight retaining wall.
secondary lining	A second internal lining of the tunnel to enhance durability and performance including strength and permeability.

Term	Description
secondary treatment	The biological treatment of settled sewage, utilising micro-organisms to oxidise the biochemical oxygen demand.
Section 106 agreement	A legal agreement under Section 106 of the 1990 Town and Country Planning Act. Section 106 agreements are legal agreements between a planning authority and a developer and related parties as necessary, or undertakings offered unilaterally by a developer, that ensure that certain extra works related to a development are undertaken.
segments	Multiple precast concrete segments made in factories that are joined together to build a tunnel. Shafts are also sometimes constructed from segments.
sensitive asset	An asset that has limited scope to accommodate the effects of ground movements without adverse effects. This may be due to age, value (heritage and financial), ownership, location, form, function and nature, and construction materials.
settled sewage	Sewage after suspended solids have settled during primary treatment.
settlement	Predicted ground movements arising from construction.
sewage derived litter	Rubbish that originates from sewage, such as toilet paper.
sewage or wastewater	Water-borne wastes from uses of water, derived from households, trade and industry.
sewerage	A system of pipes to collect and transport domestic and industrial wastewater.
sewerage undertaker	A statutory undertaker for sewerage who is responsible for sewerage provision and maintenance.
shaft	A deep vertical structure, duct, pipe or vertical tunnel.
shortlisted sites	Sites that were identified following an assessment of a long list of sites in accordance with the *Site selection methodology paper* (*SSMP*).
signature ventilation column	The project's own specially designed ventilation column (a ventilation column is a vertical pipe through which air is released).
site definition	The initial stage to define the area of interest for each main tunnel sites, CSO sites, system modification sites or other construction sites, ie, agreeing the area of study for topographical and other survey works, or information requests from third-parties, etc. The area of interest included working area, compound, access route, etc, as

Term	Description
	necessary. The definition of the area of interest enabled the instruction of surveys, information requests, etc.
sites and monuments record	A resource and repository of information regarding the archaeological and historic landscapes under the care of an organisation such as the National Trust and local authorities.
slipway	A sloping surface leading down to a body of water from which boats may be launched.
sludge	Sediment deposited during the treatment of sewage.
Slurry TBM (type of TBM)	Slurry tunnel boring machines - a mechanised tunnelling method using slurry to support the face and transport excavated material through a pumped system. The slurry is normally a mixture of bentonite and water which forms a dense liquid capable of supporting open excavations.
source control	Methods of managing and reducing storm water run-off at site level.
spalling	The crumbling away of the face of bricks or stone blocks. This may be due to a number of reasons such as poorly maintained guttering leading to soaking brickwork or repeated frost cracking.
special parliamentary procedure	Once a compulsory purchase order or development consent order is confirmed, it must be approved by Parliament if it includes some types of special land. A special parliamentary procedure is used to seek this approval.
specimen trees	Specially selected large trees with a height over 7m and a girth over 50cm when planted.
spill event	A spill occurrence isolated by at least 24 hours of no spill before and after.
sprayed concrete lining (SCL)	A structural element formed by the application of a mixture of cementitious material, aggregate, water, fibre or other types of reinforcement and admixtures, projected into place from a nozzle at high velocity to produce a dense, homogenous mass that is applied directly to the ground surface in one or more layers.
storage and transfer tunnel	A sewer that captures spillages from existing sewers and transports them to be properly treated.
storm water	Rainwater that mixes with sewage
surface water	A general term used to describe all water features such as rivers, streams, springs, ponds and lakes.
surface water run-off	Water that travels across the ground and hard surfaces rather than seeping into the soil eg, from paved roads and

Term	Description
	buildings.
surface water sewer	A sewer that conveys surface water.
suspended solids	The small solid particles that remain in suspension within a liquid.
sustainable urban drainage systems (SUDS)	A drainage system that controls the quantity and speed of rainwater run-off from a development as defined in the Environment Agency and London Plan hierarchy.
temporary works	Works required to facilitate construction, including any works left in place after completion (eg temporary steel piles that do not need to be removed).
Thames Water	Thames Water Utilities Ltd. The *Draft Development Consent Order* (DCO) contains an ability for Thames Water to transfer powers to an Infrastructure Provider (as defined in article 2(1) of the DCO) and/or another body, with the consent of the Secretary of State.
Thanet Sand	Coarsening upward sequence of well-sorted fine grained sand that has a higher clay/silt content towards the lower part of the sequence, and evidence that intense bioturbation has removed bedding structures.
tidal excursion	The length of river channel that is swept by water from a discharge point in one tidal cycle. In the case of the tidal Thames, this is considered to be 13km up and downstream of the river's discharge point.
Tideway	The tidal area of the Thames (ie, from Teddington to the Thames Estuary).
townscape/cityscape	The general appearance of a built- up area, for example a street, town or city.
Transport Assessment (TA)	A formal assessment of traffic and transportation issues relating to a proposed development. The findings are usually presented in a report that accompanies an application for development consent.
Transport for London Road Network (TLRN)	The network of major or 'strategic', high capacity roads managed by Transport for London.
tree preservation orders	A designation of trees that significantly contribute to the amenity value of an area. An application must be submitted to the local authority before any works are carried out on a tree protected by a TPO designation, including routine maintenance.
tunnel alignment	The horizontal and vertical routes of a tunnel.
tunnel boring machine (TBM)	A machine that has a circular cross-section used to excavate tunnels through a variety of geological conditions.

Term	Description
tunnel datum	A datum based on Ordnance Datum used to design tunnels that pass below sea level. By using a lower datum as the base point, negative numbers can be avoided in calculations, which eliminates a possible source of mistakes.
underground pressure release chamber	An enclosed space below ground where air is released to the atmosphere when pressure within a tunnel exceeds a set value.
urban wastewater	Domestic wastewater or the mixture of domestic wastewater with industrial wastewater and/or rainwater run-off.
Urban Wastewater Treatment Directive 1991 (UWWTD)	The overall aim of the UWWTD is to protect the environment from the adverse effects of urban wastewater discharges.
utilities	A basic service such as electricity, gas, or water
Utilities Statement	A report that outlines the utilities that would be required for the construction and operation of the project and considers how existing utility assets would be affected.
valve chamber	An underground structure on the sewer system that contains valves used to isolate the flow between different parts of the sewerage system.
ventilation building	A building that contains fans and filters to remove and treat air.
ventilation column	A vertical pipe through which air is released.
ventilation duct	Pipework (generally below ground) through which air moves.
ventilation structure	An above-ground or below-ground structure that is part of the tunnel ventilation system.
Venturi	A constricted section of pipe designed to reduce pressure when a fluid flows through it
wastewater or sewage	Water-borne wastes from domestic uses of water, derived from households, trade and industry.
watching brief (archaeological)	An archaeological watching brief is a formal programme of observation and investigation conducted during any operation carried out for non–archaeological reasons.
Water Framework Directive (WFD)	A European Commission (EC) Directive that seeks to improve water quality in rivers and groundwater in an integrated way (2000).
water table	The level below which the ground is saturated with water. The water table elevation may vary with recharge and groundwater abstraction.

Term	Description
weir	A dam in a watercourse or sewer that alters and manages the flow.
wet weather discharges	Spillages of storm sewage due to bad weather.
wet well	The part of a pumping station that receives and stores incoming sewage flow before it is removed by pumps.
works	All construction work associated with the construction of the Thames Tideway Tunnel project.
worksite	Site on which construction works are carried out.

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