

National Grid Cable Tunnel Replacement Project

Environmental Statement Volume VI Appendix 13.1 Water Framework Directive Assessment

December 2023

Quality information

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1 Introduction

- 1.1.1 This Water Framework Directive (WFD) Assessment has been prepared in support of the Environmental Statement (ES) for the TKRE Cable Tunnel Replacement Project (hereafter referred to as 'the Proposed Development').
- 1.1.2 The Proposed Development interacts with three WFD water bodies (one surface water and two groundwater). New development must not cause deterioration or prevent the improvement of WFD water bodies, taking into account the conservation objectives of any Protected Areas (i.e. areas designated under legislation transposing former European Union Directives into English law such as Special Areas of Conservation etc.).
- 1.1.3 In accordance with the Planning Inspectorate's Advice Note Eighteen (Ref 1 and Ref 2), a three-stage approach may be adopted (Screening, Scoping and WFD Assessment).

1.2 Study Area

- 1.2.1 The Proposed Development consists of a tunnel which cuts below the River Thames between Tilbury and Gravesend. The site is situated within the administrative areas of Thurrock Council at the northern end and Gravesham Borough Council at the southern end.
- 1.2.2 For the purposes of this assessment, and consistent with ES Volume III Chapter 13: Water Environment – Tilbury and ES Volume IV Chapter 21: Water Environment - Gravesend, a general study area (ZoI) of approximately 1km from the Planning Application Boundary has been considered in order to identify water bodies that are hydrologically connected to the Proposed Development, and potential works associated with the Proposed Development, that could cause direct impacts. The WFD assessment also requires consideration of adjacent water bodies in a similar way as the impact assessment reported in the Environmental Statement assesses risks that may propagate downstream. In this case the Thames Estuary is considered the ultimate receptor and the relevant transitional and coastal WFD water body is the downstream most receptor considered.

1.3 Proposed Development

- 1.3.1 Full details of the Proposed Development components are provided in ES Volume II, Chapter 3: Project Description. However, to summarise the Proposed Development consists of the following:
- 2.2 km long cable tunnel long (from headhouse to headhouse), 4 m in diameter;
 - Two new tunnel headhouses: one at Gravesend and one at Tilbury, onshore, which would cover the shaft into the tunnel. During construction, the shaft is used to lower the Tunnel Boring Machine (TBM). Once operational, the shaft is the access point to the tunnel for maintenance work once the tunnel is built and operational; and
 - Two new cable sealing end compounds: one either side of the tunnel, onshore, which house the connection between the overhead line and underground cable. These would be a similar size and design to the existing cable sealing end compounds.
- 1.3.2 The drainage strategy can be found within the Outline Drainage Management Plan and has been prepared to support this planning application (see Drainage Management Plan (Document Reference 30003364-BHK-XX-XX-RP-C-02060). The Outline Drainage Management Plan comprises a concept design of the system, proposing to direct runoff from new road, hardstanding and roofs towards filtration trenches which collect the water to traditional piped drainage systems. Treatment measures such as a filtration trench and a vortex flow separator (currently a 'Downstream DefenderTM' is proposed) are proposed upstream of the flow control chamber. Roof water from the

headhouse shall also be captured initially by a 'Green Roof' which will help to reduce the flow from the building and the risk from diffuse urban pollutants. Any storage of diesel and electrical plant used on site will be self-bunded.

2 Methodology

2.1 Introduction to the Water Framework Directive

- 2.1.1 The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017¹, commonly referred to as the Water Framework Directive (WFD), aims to protect and enhance the water environment.
- 2.1.2 The WFD takes a holistic approach to sustainable management of the water environment by considering interactions between surface water, groundwater and water-dependent ecosystems. Ecosystem conditions are evaluated according to interactions between classes of biological, chemical, physico-chemical and hydromorphological elements known as 'Quality Elements'.
- 2.1.3 Under the WFD, 'water bodies' are the basic management units, defined as all or part of a river system or aquifer. Waterbodies form part of a larger 'river basin district' (RBD), for which 'River Basin Management Plans' (RBMPs) are used to summarise baseline conditions and set broad improvement objectives. RBMPs are produced every six years, in accordance with the river basin management planning cycle. The current RBMPs are Cycle 3 that were published in 2022.
- 2.1.4 In England, the Environment Agency (EA) is the competent authority for implementing the WFD, although objectives are delivered in partnership with other public bodies and private organisations, for example local planning authorities, water companies, rivers trusts, and private landowners and developers.
- 2.1.5 The EA is also responsible for managing flood risk and other activities on Main Rivers. Local planning authorities or drainage boards are typically responsible for consenting activities on Ordinary Watercourses. Local planning authorities are typically responsible for highways drains, and landowners are typically responsible for ditches and watercourses within their property including piped watercourses and culverts. While the EA is ultimately responsible for enforcing the WFD on any water body, local authorities are required to plan and consent WFD related activities on Ordinary Watercourses.
- 2.1.6 As part of its regulatory and statutory consultee role on planning applications and environmental permitting (under the Environmental Permitting Regulations (England and Wales) 2016), the EA and WFD-partnering organisations, must consider whether proposals for new developments have the potential to:
- Cause a deterioration of any quality element of a water body from its current status or potential; and / or
 - Prevent future attainment of good status or potential where not already achieved.
- 2.1.7 Regulation 33 of the Water Environment Regulations 2017 (i.e. the WFD) states that public bodies "*must, in exercising their functions so far as affecting a river basin district, have regard to - (a) the river basin management plan for that district as approved under regulation 31, and (b) any supplementary plan prepared under regulation 32.*" National Grid must therefore reflect water body improvement priorities as outlined in the Humber RBMP.
- 2.1.8 In determining whether a development is compliant or non-compliant with the WFD objectives for a water body, the EA and partnering organisations must also consider the conservation objectives of any Protected Areas (i.e. Natura 2000 sites or water dependent Sites of Special Scientific Interest) and adjacent WFD water bodies, where relevant.

¹ [The Water Environment \(Water Framework Directive\) \(England and Wales\) Regulations 2017 \(legislation.gov.uk\)](https://www.legislation.gov.uk/uksi/2017/1251/contents/make)

2.2 WFD Methodology

- 2.2.1 There are no fixed methods for WFD assessment. The nature of the water environment and the breadth of the legislation mean that assessments are tailored to proposals on a case-by-case basis.
- 2.2.2 The following general guidance is available which has been applied for this assessment:
- HM Government (2016). Water Framework Directive assessment: estuarine and coastal waters. (Ref 2)
 - Environment Agency (2016a). Water Framework Directive risk assessment. How to assess the risk of your activity. (Ref 5)
 - Environment Agency (2016b). Protecting and improving the water environment. Water Framework Directive compliance of physical works in rivers. (Ref 6)
 - The Planning Inspectorate (2017). Advice Note eighteen: The Water Framework Directive (Ref 1)
- 2.2.3 A stepwise approach consisting of screening, scoping and impact assessment phases is generally followed in order to: (a) rationalise the levels of WFD assessment and impact mitigation that are required; and (b) verify that proposals meet the requirements of the WFD. The general approach is described by The Planning Inspectorate (2017) and briefly summarised below.
- 2.2.4 This WFD identifies requirements (if any) for WFD impact mitigation commitments in the planning submission, and identifies requirements for further WFD impact assessment at future design stages.

Stage 1 Screening

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

Stage 2: Scoping

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

Stage 3: Impact Assessment

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

2.3 Mitigation Commitments

- 2.3.1 Proposed mitigation activities relied upon to demonstrate compliance at any of the stages referred to above must be appropriately defined and sufficiently secured. Mitigation could be secured through planning or future licence conditions (where they apply), or potentially other legally binding methods.

2.4 Further Assessments if WFD Derogation is to be Considered by the Applicant

- 2.4.1 WFD Regulation 17 and Regulation 19 set out ‘last resort’ planning and legal processes for WFD derogation that are not part of this report. Case review of any proposed justification by an applicant would be a matter for the Secretary of State, and is likely to require a substantial body of multi-disciplinary evidence.
- 2.4.2 Where the potential for deterioration of water bodies is identified, and the “body of water is so affected by human activity or its natural condition is such that the achievement of the environmental objectives set would be infeasible or disproportionately expensive”, it is possible for an applicant to present further assessments in the context of WFD Regulation 17. Derogation has not been considered herein and would require detailed further analyses of options, environmental impacts and business cases, for WFD and all relevant legislation pertaining to planning and sustainability. For WFD context, WFD Regulation 17 covers part of the procedures for WFD derogation, including but not limited to that “the environmental and socio-economic needs served by such human activity cannot be achieved by other means which are a significantly better environmental option not entailing disproportionate costs”.
- 2.4.3 Where the potential for “failure is the result of new modifications to the physical characteristics of the body of surface water or alterations to the level of the body of groundwater”, it is possible for an applicant to present further assessments in the context of WFD Regulation 19. Regulation 19 is also still commonly referred to as Article 4.7 of the original EU Directive. Derogation has not been considered herein and as above would require detailed further analyses. For WFD context, WFD Regulation 19 covers part of the procedures for WFD derogation, including but not limited to that:
- *“all practicable steps are taken to mitigate the adverse impact on the status of the body of water”.*
 - *“the reasons for the modifications or alterations, or for the sustainable development activities, are of overriding public interest”.*
 - *“the benefits to the environment and to society of achieving the environmental objectives are outweighed by the benefits of the new modifications or alterations, or of the sustainable development activities, to human health, to the maintenance of human safety, or (in the case of modifications or alterations) to sustainable development”.*
 - *“the beneficial objectives served by the modifications or alterations, or by the sustainable development activities, cannot, for reasons of technical feasibility or disproportionate cost, be achieved by other means which are a significantly better option”.*

2.5 Desk Study

- 2.5.1 A desk-based study was carried out to capture information pertaining to the Proposed Development to support the understanding of baseline conditions. Review of relevant information relating to the study area was undertaken to develop a baseline overview for WFD catchments, watercourses and surrounding areas. The following data sources were used for the desk study:
- WFD status and objectives from the appropriate River Basin Management Plan, available from the Catchment Data Explorer (Ref 7);
 - Defra’s Multi-agency geographical information for the countryside website (MAGIC), including contemporary Ordnance Survey (OS) maps (Ref 8);
 - Historical maps (Ref 9);
 - British Geological Survey maps (Ref 10);
 - Soilscape website (Ref 11);
 - Aerial photography (Ref 12);

- Hydrological information (Ref 13);
- Climate information (Ref 14);
- Environment Agency Ecology and Fish Data Viewer (Ref 15); and
- Environment Agency Water Quality Archive website (Ref 16).

Field Survey

- 2.5.2 In addition to the desk study, a site survey has been undertaken. A site walkover was undertaken on 8 August 2023. The purpose of the walkover was to ground truth water bodies provisionally identified from online sources (e.g. Ordnance Survey maps and aerial imagery), to consider their hydromorphological character, and to gather site information useful in determining the risk to water bodies or relevant to the design of the Proposed Development so as to avoid and minimise adverse impacts to water bodies (e.g. topography). The conditions of the survey were dry and sunny with some cloud; however, the previous day was very wet, and so water levels were likely to be above base flow when observed. The site visit was carried out in the morning on the 8th of August 2023 when the tide was receding with the previous high tide having occurred at 06:44 and low tide was at 12:46.

2.6 Assumptions and Limitations

- 2.6.1 This WFD assessment is based on baseline and design information available at the time of writing in November 2023. It is based on the Proposed Development's design set out in ES Volume II, Chapter 3: Project Description and further information provided in ES Volume III Chapter 13: Water Environment – Tilbury, and Volume IV Chapter 21: Water Environment – Gravesend.
- 2.6.2 Spoil material from the Tilbury and Gravesend Sites are clean and free of any contamination given their depths and location.
- 2.6.3 It is assumed that there will be no works to the launch and receiving jetties for the transfer of spoil from Tilbury to the selected reuse site (such as Cliffe Pools). It is also assumed that no dredging will be required for boat access. As these jetties are used regularly for the loading and unloading of aggregate/spoil, it is assumed that there are no impediments to this being done in safe way that avoids any risk of water pollution.

3 Baseline Conditions and Desk Study

- 3.1.1 Under the WFD, 'water bodies' are the basic management units, defined as all or part of a river system or aquifer. Water bodies form part of larger 'river basin districts' (RBD), for which 'River Basin Management Plans' (RBMPs) are used to summarise baseline conditions and set broad improvement objectives.
- 3.1.2 The study area is within two operational catchments within the Thames River Basin District. These catchments include the Lower Medway Catchment and the Essex South Catchment.
- 3.1.3 The study area falls within the following WFD water bodies (See figures within ES Volume III Chapter 13: Water Environment – Tilbury Figure 13.1 and ES Volume IV Chapter 21: Water Environment Figure 21.1):
- Surface water - Thames Middle water body (GB530603911402);
 - Groundwater - South Essex Thurrock Chalk water body (GB40601G401100); and
 - Groundwater - North Kent Medway Chalk water body (GB40601G500300).
- 3.1.4 There are also several tributaries of these water bodies present within the study area; these are predominantly unnamed ditches and drains. It should be noted that WFD requirements apply equally to all watercourses regardless of whether they are Environment Agency reportable reaches. However, these drains and ditches have been addressed more generically throughout the assessment in the terms of potential impacts and mitigation. This is because the overall character of these drains is different to the downstream water body (i.e. the Thames Estuary) and thus there is no overall WFD status or status of relevant individual parameters against which compliance with default WFD objectives can be assessed.
- 3.1.5 A full summary of the baseline conditions for the study area is provided later in this report (Section 3).

3.2 Topography and Land Use

Tilbury

- 3.2.1 Generally, the topography of the site is flat, with elevations typically ranging from 4 m and 7 m AOD. Elevations increase slowly moving away from the River Thames, however the South Essex lowlands in which the site is located is generally flat with small undulations in the landscape.
- 3.2.2 The Tilbury Site is greenfield that was marshland in the past. A Public Right of Way (PRoW) which passes close to the west of the proposed site. Land to the west is all brownfield industrial land. This includes concrete hardstanding where industrial buildings once stood, a ship cargo terminal and a sewage treatment works. There is also a concrete factory slightly northwest of the site. The existing SEC and headhouse is to the south of the site. Recent land use to the north and east of is primarily industrial waste landfill along with disposal of ash from Tilbury Power Station.
- 3.2.3 To the southeast the land has been extensively worked with large areas of bare ground that may be being used for the storage of aggregates and other materials. This has led to significant changes to natural land drainage, that would likely have been coastal marsh in the past before the creation of river flood defences. There are no statutory ecological designations applying to the north bank of the Thames Estuary.

Gravesend

- 3.2.4 Generally, the topography of both site is flat, with elevations typically ranging 3 m to 7 m with elevations increase slowly moving away from the River Thames.
- 3.2.5 The Gravesend site is located just to the west of a rifle range (Milton Rifle Range) that has been there for at least 60 years, and is partially leased and used as a Police Training Centre for rifle shooting. The land immediately west comprises of the Thameside Campus (National Maritime Training Centre), Metropolitan Police Specialist Training Centre MPSTC and Thames and the Medway Canal Association.
- 3.2.6 Land to the south of the proposed Gravesend site and the railway line is designated as the South Thames Estuary and Marshes SSSI. This continues along the southern bank of the Thames, where it is also designated as the Thames Estuary and Marshes Ramsar and SPA site (>500 m from the Site). There are no statutory ecological designations applying to the north bank of the Thames Estuary.

3.3 Geology, Groundwater and Soils

Geology and Soils

- 3.3.1 Both the Tilbury and Gravesend sites and tunnel alignment underlie the Lewes Nodular Chalk Formation, Seaford Chalk Formation and Newhaven Chalk Formation
- 3.3.2 The superficial deposits of the area consist of alluvium (clay, silt, sand and peat) which underly both the Gravesend and Tilbury sites.

Hydrogeology

- 3.3.3 South Essex Thurrock Chalk water body (GB40601G401100) underlies the Tilbury site. This water body has Groundwater area of 3357.339 ha and a surface area of 33.573 km². It has been classified as having a poor over water quality. It has also been noted is a highly productive aquifer and classified as a Principal aquifer by the EA. Principal aquifer provide significant quantities of drinking water and water for business needs, they may also support rivers, lakes and wetlands.
- 3.3.4 The North Kent Medway Chalk water body underlies the Gravesend site. This water body has Groundwater area of 23,366.6 ha and a surface area of 233.7 km². It has been classified as having a poor over water quality. It has also been noted is a highly productive aquifer and classified as a Principal aquifer by the EA. Principal aquifer provide significant quantities of drinking water and water for business needs, they may also support rivers, lakes and wetlands.
- 3.3.5 According the 625K scale hydrogeological map (Ref 10) of the UK both aquifers yield approximately 50 to 100l/s from a large diameter borehole. Water is categorised as hard to very hard.
- 3.3.6 The superficial deposits within this area are designated as a Secondary (undifferentiated) aquifer. This aquifer type is defined by having variable characteristics which make them either a Secondary A or Secondary B. Secondary A aquifers comprise of permeable layers which can support local water supplies, and base flow to rivers, while Secondary B aquifers have slightly lower permeability layers.

3.4 Hydrology

- 3.4.1 The Thames Estuary at this location is tidal and is identified under the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (Ref 3) and Thames River Basin Management Plan (RBMP) as the Thames Middle waterbody (Waterbody ID: GB530603911402).

- 3.4.2 The closest gauging station is situated around 2.5 km upstream, Tilbury Monitoring Station (NGR 562320, 175670). River Thames average daily gauge data from August 2022 until August 2023. From this, it is evident that the River Thames at this location is highly influenced by the tide. High tides tend to range around 1mAOD to about 3.5mAOD while low tide tends to around 0mAOD to around -2.4mAOD (Ref 19).

3.5 WFD Surface Water Bodies

- 3.5.1 The Thames Estuary is considered a main river and at this location is designated under the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 and Thames RBMP as the Thames Middle transitional water body (TRaC). It is a large heavily modified water body with a surface area of 44.2 km². Under cycle 3 (2022) of the Thames RBMP (0 5) it is currently at Moderate Ecological Potential (but Good in regard to fish, invertebrates, macroalgae and phytoplankton) and failing to meet Good Chemical Status in the 2019 results. The Reasons for Not Achieving Good (RNAG) Ecological Status are listed on the catchment data explorer website (CDE) (Reg 17) as diffuse pollution from urban development, contaminated sediments, landfill leaching, sewage discharge and physical modifications. This water body achieved its lower objective of Moderate Ecological Status by 2015 (due to disproportionate costs and burdens and good status being prevented by an artificial/ heavily modified designated use).



Photo 1 Thames at TQ 66912 75642 taken at 10:38 GMT on the 8th of August (low tide at 12:46 GMT)



Photo 2 Thames at TQ 67105 75564 taken at 11:40 on the 8th of August (low tide at 12:46 GMT)

Table 3-1: Summary of the WFD status of the screened-in WFD surface water bodies (Cycle 3)

WFD Parameter	Thames Middle (Cycle 3: 2019)	Thames Middle (Cycle 3: 2022)
Ecological	Moderate	Moderate
Biological quality elements	Moderate	Moderate
Angiosperms	Moderate	Moderate
Saltmarsh	Moderate	Moderate
Fish	Good	Good
Invertebrates	Good	Good
Infaunal Quality Index	Good	Good
Macroalgae	Good	Good
Fucoid Extent	Good	Good
Opportunistic Macroalgae	High	High
Phytoplankton	Good	Good
Physico-chemical quality elements	Moderate	Moderate
Dissolved Inorganic Nitrogen	Moderate	Moderate
Dissolved oxygen	Good	Good
Supporting elements (Surface Water)	Moderate	Moderate
Mitigation Measures Assessment	Moderate or less	Moderate or less
Specific pollutants	Moderate	Moderate
2,4-dichlorophenol	High	High
2,4-dichlorophenoxyacetic acid	High	High
Arsenic	High	High
Chlorothalonil	High	High
Chromium (VI)	High	High
Chemical	Fail	Does not require assessment
Priority Hazardous Substances	Fail	Does not require assessment

3.6 WFD Groundwater Bodies

3.6.1 A summary of the WFD status of both waterbodies is given in Table 3-2.

Table 3-2: Summary of the WFD status of the screened-in groundwater bodies (Cycle 3)

WFD Parameter	South Essex Thurrock Chalk Water Body (GB40601G401100)	North Kent Medway Chalk Water Body (GB40601G500300)
Overall Water Body	Poor	Poor
Quantitative	Poor	Poor
Quantitative Status element	Poor	Poor
Quantitative Dependent Surface Water Body Status	Good	Poor
Quantitative GWDTEs test	Good	Good
Quantitative Saline Intrusion	Good	Good
Quantitative Water Balance	Poor	Poor
Chemical (GW)	Poor	Poor
Chemical Status element	Poor	Poor
Chemical Dependent Surface Water Body Status	Good	Good
Chemical Drinking Water Protected Area	Good	Poor
Chemical GWDTEs test	Good	Good
Chemical Saline Intrusion	Good	Good
General Chemical Test	Poor	Poor
Supporting elements (Groundwater)		
Prevent and Limit Objective	Active	Active
Trend Assessment	No trend	Upward trend

3.7 Biological Quality Elements

3.7.1 According to the EA the following surveys have taken place over the last ten years (Ref 13):

- There have been fish surveys carried out at Denton Wharf (TQ6664674338) located on the southern side of the River Thames, approximately 700m west from the Gravesend site. The surveys included 33 surveys at Denton Wharf Seine net (38689), 15 surveys at Denton Wharf Kick sample (38690) and 16 surveys at Denton Wharf Beam Trawl (38691) between 2011 and 2019. In September 2019 at Denton Wharf Seine net (38689) found a total of 39 fish from 15 different species including Herring (13 fish counted), flounder (7 fish counted) and common goby (6 fish counted).
- A Benthic Invertebrate survey was carried out in May 2015 at TQ5600077000 (ID: 161276). A total of 898 of invertebrates were collected ranging from 17 different species. These include: 468 Corophium Volutator and 272 Corophiidae.

- Numerous Phytoplankton surveys have been carried out at TQ6490074600 (ID: 156465) between 2013 and 2023. In 2023, 13 different species were collected.

- 3.7.2 There have been water vole and otter surveys carried out for the Proposed Development for the surrounding unnamed water features. The results showed that water voles are present in TS3 on the Tilbury Site during the site visit in September 2023, see ES Appendix 7.5 for further details. GCN eDNA surveys were also carried out and showed that crested newt are considered likely to be absent from the Tilbury Site (see ES Appendix 7.3 for details).
- 3.7.3 There was no confirmed evidence of water voles during the site visit for the Gravesend Site. However, due to suitability for the site it is likely that water voles are present in at least low numbers in all of the ditches within or adjacent to the site (GS2), see ES Appendix 7.5 for further details. GCN eDNA surveys were also carried out and showed that crested newts are considered likely to be absent from the Gravesend Site. No surveys were carried out at the Thames and Medway Canal, but ES Appendix 7.5 identify the canal would contain suitable habitat for water voles. The Kent and Medway Biological record Centre (Ref 18) did identify a water vole record situated 15m south of the Gravesend Site. However, these water bodies are separated from the Proposed Development by areas of retained terrestrial habitat and there is negligible risk of any species using these watercourses being subject to impacts.

3.8 Physio-chemical Quality Element

- 3.8.1 Water quality data for the River Thames has been obtained from the Environment Agency's Water Quality Archive website (Ref 14) and is summarised in Table 13.9 and 13.10 in ES Volume II Chapter 12: Water Environment – Tilbury and Table 21.9 and 21.10 in ES Volume II Chapter 21: Water Environment – Gravesend.
- 3.8.2 Table 13.9 in ES Volume II Chapter 12: Water Environment – Tilbury displays the water quality data collected from Owens Buoy from January 2023 until July 2023. None of the parameters exceed the Water Quality guideline value in drinking water. The results suggest the Thames is well oxygenated with a percentage ranging from 76.5 to 96.5%.
- 3.8.3 Table 21.10 in ES Volume II Chapter 12: Water Environment – Gravesend displays the results from Thames at Gravesend from January 2023 and July 2023. Benzo(a)pyrene, Cadmium, Copper, Lead and Nickel all exceed the Water Quality guideline value in drinking water in January 2023. Other determinands in January are also incredibly high. However, between February and July 2023, determinands reduce to below the Water Quality guideline value in drinking water and settle to concentrations similar to Thames at Owens Buoy. The reason for the exceedance in January 2023 could be due to the sampling depth which was 6m below the surface, but in February 2023 to July 2023 the sampling depth was 0.2m below the surface.

4 WFD Screening and Scoping

4.1 WFD Screening

- 4.1.1 The purpose of the WFD screening stage is to identify a ZoI of the Proposed Development and to determine whether that influence has the potential to adversely impact upon WFD water body receptors. The screening stage also identifies specific activities of the Proposed Development that could affect receptor water bodies' WFD status and carries them forward to subsequent stages of the assessment process. Water body receptors that are screened out are not carried forward, and justification is provided.

Screening of WFD Water Bodies

- 4.1.2 The Proposed Development interacts with three WFD water bodies. WFD Screening of these water bodies is provided in Table 4-1. Watercourses such as smaller tributaries within each of the WFD water body catchments that may be impacted by the Proposed Development have been included in this assessment but where they flow into the Thames they are assessed more generically as the downstream WFD TRaC water body is of very different character and WFD parameters and status are not reflective of the smaller watercourse. Any other remaining downstream water bodies not mentioned below are considered sufficiently far downstream to avoid impacts of the Proposed Development and are therefore screened out of further assessment.

Table 4-1: Screening of WFD water bodies potentially impacted

Water Body (ID)	Screening Outcome	Justification
South Essex Thurrock Chalk water body (GB40601G401100)	In	WFD water bodies may be directly impacted by the Proposed Development due to a range of activities that would interact with the local watercourse network during construction and operation.
North Kent Medway Chalk water body (GB40601G500300)		
Thames Middle waterbody (GB530603911402)		

Screening of Activities

4.1.3 As described in Section 1, the Proposed Development comprises a number of activities, some of which present a potential risk to the WFD status of water bodies. These components and activities are listed in Table 4-2 together with a screening assessment.

Table 4-2: Screening of the Proposed Development's activities against WFD quality elements

Activity	Description	Screening Outcome	Justification
Operation			
Bored Cable Tunnel	2.2 km (headhouse to headhouse), 4 m wide (internal), 4.5m (external) and approximately 35 m deep.	Out - South Essex Thurrock Chalk water body (GB40601G401100), North Kent Medway Chalk water body (GB40601G500300), Thames Middle water body (GB530603911402), other water bodies	The Proposed Development is 35m within ground and so will not interact with any surface waterbodies. As such, there is no mechanism for impact to surface water bodies (Thames Middle water body). It is not anticipated that there would be interaction with groundwater during the operational phase as long a tunnelling is designed to prevent water ingress.
Tilbury – Sealing End Compound (SEC) and headhouse	The Tilbury SEC containing the headhouse is located approximately at TQ 66317 75873 on land owned by Port of Tilbury, London. The Tilbury SEC will occupy an area of approximately 7,339m² / 0.73ha and have an approximate maximum height of 13 m (compound gantry). Within the Tilbury SEC, the headhouse will occupy an area of up to approximately 481.75m² / 0.048ha (based on an indicative footprint of 23.5 m x 20.5 m and have an approximate maximum building height of 10 m above ground level).	Out – South Essex Thurrock Chalk water body (GB40601G401100), Thames Middle waterbody (GB530603911402), other water bodies Not Applicable - North Kent Medway Chalk water body (GB40601G500300),	The Proposed Development includes new impermeable surfaces and so increased water runoff will occur. Runoff from the roofs of new buildings and accesses will contain diffuse urban pollutants. However, there are plans to use green roofs, filter strips and a Vortex Flow Separators to capture any runoff from new roofs of the headhouse. This will also minimise contamination to other water bodies within the site area.

Activity	Description	Screening Outcome	Justification
	Planning Drawings PDD-10116-LAY-046 present the layout of the SEC and headhouse.		
Tilbury – Drainage design and outfall	A new outfall to convey surface water runoff is proposed. It will discharge into an ordinary watercourse located approximately at TQ 66368 75854. The outfall is relatively small (300mm diameter at the outfall) and will be limited to a discharge rate of 0.4 l/s. Prior to discharge there will be treatment of water from a filtration trench, a 'vortex flow separator, plus a green roof is proposed in the SEC.	Out – South Essex Thurrock Chalk water body (GB40601G401100), Thames Middle waterbody (GB530603911402), other water bodies Not Applicable - North Kent Medway Chalk water body (GB40601G500300),	Certain activities on or near water bodies are exempt from the requirement for Environmental Permits for Flood Risk Activities, and hence would also be considered low risk activities that would unlikely require a WFD assessments. This includes outfalls less than 300 mm diameter (Section 12 in Ref 21). Discharge rates will be low and there is treatment prior to discharge from filtration trench, vortex flow separator and green roofs. There is no direct new outfall to the Thames, instead the outfall will discharge into ditch adjacent to site. Contamination to this other watercourse will also be minimised by the prior treatment. No deterioration or prevention of future improvement in WFD water body status would be predicted.
Tilbury – Access	The proposed Tilbury SEC is accessible from an existing private road belonging to Port of Tilbury, which connects first to local road, Fort Road, and then the A1089 Ferry Road and the wider Strategic Road Network (SRN). No new permanent access roads would be required to be built to access the Tilbury SEC. One new bellmouth junction would be required from the existing road.	Out – South Essex Thurrock Chalk water body (GB40601G401100), Thames Middle water body (GB530603911402), other water bodies Not Applicable - North Kent Medway Chalk water body	There is no anticipated mechanism for impacts to the groundwater body, as no significant changes in runoff patterns compared to existing are expected from the internal access tracks.
Tilbury – Foul Drainage	A 9,000 Litres underground cess pit will be provided at both sites. The cess pit will be	Out – South Essex Thurrock Chalk water Body (GB40601G401100),	As there would be no discharge of foul water to a water body, no further WFD assessment of

Activity	Description	Screening Outcome	Justification
	positioned adjacent to a road to allow access for maintenance / emptying.	Thames Middle water body (GB530603911402), other water bodies Not Applicable - North Kent Medway Chalk water body	foul waste from the Proposed Development is proposed. No deterioration or prevention of future improvement in WFD water body status would be predicted.
Gravesend – Headhouse and Sealing End Compound (SEC)	The Gravesend SEC will occupy an area of approximately 6,210 m² / 0.621ha and have an approximate maximum height of 13 m (compound gantry). Within the Gravesend SEC, the Gravesend headhouse will occupy an area of up to 230 m² / 0.023 ha (based on an indicative footprint of 15 m x 16 m) and have an approximate maximum building height of 8 m above ground level. A larger, temporary working area of approximately 12,146 m² / 1.2 ha will be requiring during the construction phase to accommodate construction equipment and storage areas.	Out – North Kent Medway Chalk water body (GB40601G500300), Thames Middle waterbody (GB530603911402), other water bodies Not Applicable - South Essex Thurrock Chalk water body (GB40601G401100),	The Proposed Development includes new impermeable surfaces and so increased water runoff will occur. Runoff from the roofs of new buildings and accesses will contain diffuse urban pollutants. However, there are plans to use green roofs, filter strips and a vortex flow separator to capture any runoff from new roofs of the headhouse.
Gravesend – Drainage design and outfall	A new outfall associated to the drainage system is planned. It will discharge into An Ordinary Watercourse size situated TQ 66368 75854. The outfall is relatively narrow (300m diameter at the outfall and has discharge 0.4 l/s. Prior to discharge there will be treatment of water from a filtration trench and a vortex flow separator (currently a 'Downstream Defender TM ' is proposed) and green roofs.	Out – North Kent Medway Chalk water body (GB40601G500300), Thames Middle waterbody (GB530603911402), other water bodies Out - South Essex Thurrock Chalk water body (GB40601G401100),	Certain activities on or near water bodies are exempt from the requirement for Environmental Permits for Flood Risk Activities, and hence would also be considered low risk activities that would unlikely require a WFD assessments. This includes outfalls less than 300 mm diameter (Section 12 in Ref 21). Discharge rates will also be low and there is treatment prior to discharge from filtration trench, vortex flow separator and green roofs. There is no direct new outfall to the Thames, instead the outfall will discharge into

Activity	Description	Screening Outcome	Justification
			ditch adjacent to site. Contamination to this other watercourse will also be minimised by the prior treatment. No deterioration or prevention of future improvement in WFD water body status would be predicted.
Gravesend – Access	The proposed Gravesend SEC is accessible from an existing private road belonging to National Grid, which connects to the Thames and Medway Canal Road (private road owned by Network Rail), which runs alongside the Thames and Medway Canal. The Thames and Medway Canal Road connects first to Mark Lane, then Norfolk Road, which then connects to Prospect Grove, then the A226 Milton Road and the wider SRN.	Out – South Essex Thurrock Chalk water Body (GB40601G401100), North Kent Medway Chalk water body (GB40601G500300), Thames Middle water body (GB530603911402), other water bodies	There is no anticipated mechanism for impacts to the groundwater body, as no significant changes in runoff patterns compared to existing are expected from the internal access tracks.
Gravesend – Foul Drainage	A 9,000 Litres (9 m ³) underground cess pit will be provided at both sites. The cess pit will be positioned adjacent to a road to allow access for maintenance / emptying	Out – South Essex Thurrock Chalk water body (GB40601G401100), North Kent Medway Chalk water body (GB40601G500300), Thames Middle water body (GB530603911402), other water bodies	As there would be no discharge of foul water to a water body, and only small volumes would either be discharged to a foul sewer indirectly via a suitable waste management contractor, or directly with Anglian Water consent, no further WFD assessment of foul waste from the Scheme is proposed. No deterioration or prevention of future improvement in WFD waterbody status would be predicted.
Construction			
Tilbury - Bored Cable Tunnel and Shaft Construction	The tunnel construction will commence from the Tilbury side and drive south underneath the River Thames. A main compound would be required at Tilbury to facilitate the construction of the drive shaft for the TBM.	In – South Essex Thurrock Chalk water body (GB40601G401100), Thames Middle water body (GB530603911402), other water bodies	The construction of the tunnel will be carried out using the tunnel boring machine which will likely line the tunnel as the machine moves along. Therefore, impacts to groundwater around the tunnel are negligible. However, the shaft

Activity	Description	Screening Outcome	Justification
	Main Compound – 62,339m² area comprising of project offices, welfare facilities, spoil storage, shaft rung and tunnel ring storage, workshop maintain equipment and parking. Drive Shaft Construction – shaft depth 41m with a 11,800m² working area. Tunnel Construction – this will occur straight after shaft construction. Tunnel segments will require a storage area of 1,500m².	Not Applicable - North Kent Medway Chalk water body (GB40601G500300),	construction may have the potential to create pathway to the aquifer leading to contamination. Small amounts of dewatering may be required for shaft construction however the impacts of this will be temporary and small. Deposition or spillage of soils, sediments, oils, fuels, or other construction chemicals, or through mobilisation of contamination following disturbance of contaminated ground or groundwater have the potential to impact both the quality of the Thames Middle water body and the South Essex Thurrock Chalk water body. There is also potential impact to other water bodies around the site.
Tilbury - Spoil Storage and Removal	Spoil handling - the required area is based on the type of TBM selected, i.e. EPB = stockpiled prior to removal and slurry machine = processing plant is required to separate the arisings and then stockpiled. Spoil Removal – approximately 72,700m³ of spoil material from the tunnel and 13,000m³ of spoil material from the Tilbury Shaft spoil will be transported to a receptor site via an existing jetty at the Tilbury site, or via a berth at Tilbury Docks. The composition of the spoil from the tunnel will be chalk. The composition of the shaft spoil will be a mix of chalk, made ground, alluvium and river terrace deposits.	In – South Essex Thurrock Chalk water body (GB40601G401100), Thames Middle water body (GB530603911402), other water bodies Not Applicable - North Kent Medway Chalk water body (GB40601G500300),	There is possible impact to the Thames Middle water body and the South Essex Thurrock groundwater body. With the deposition or spillage of soils, sediments, oils, fuels, or other construction chemicals, or through mobilisation of contamination following disturbance of contaminated ground or groundwater. There is also potential impact to other water bodies around the site.

Activity	Description	Screening Outcome	Justification
Gravesend – Bored Cable Tunnel and Shaft Construction	At Gravesend, the satellite construction compound will require an area of approximately 12, 146m² / 1.2ha to facilitate the construction works. The reception shaft at Gravesend would be the same diameter as the drive shaft at Tilbury. The reception shaft is only required for the removal of the TBM, once the tunnel drive has been completed. For this, a crane and fleet of lorries will be required. Their size is dependent on the TBM chosen and the size of the parts following disassembly. Typically, a TBM can be split in to three parts. Due to the weight of the TBM, it is possible that foundations or potential ground improvements are required to support the crane track.	In – North Kent Medway Chalk water body (GB40601G500300), Thames Middle water body (GB530603911402), other water bodies Not Applicable - South Essex Thurrock Chalk water B]body (GB40601G401100),	The construction of the tunnel will be carried out using the tunnel boring machine which will likely line the tunnel as the machine moves along. Therefore, impacts to groundwater around the tunnel are negligible. However, the shaft construction may have the potential to create pathway to the aquifer leading to contamination. Small amounts of dewatering may be required for shaft construction however the impacts of this will be temporary and small. Deposition or spillage of soils, sediments, oils, fuels, or other construction chemicals, or through mobilisation of contamination following disturbance of contaminated ground or groundwater have the potential to impact both the quality of the Thames Middle water body and the South Essex Thurrock Chalk water body. There is also potential impact to other water bodies around the site.
Gravesend – Spoil Storage and Removal from shaft construction	The Gravesend site will have a similar set up to the Tilbury site. However, spoil material from the shaft construction will be transported to a receptor site via HGV instead.	In – North Kent Medway Chalk water body (GB40601G500300), Thames Middle water body (GB530603911402), other water bodies Not Applicable - South Essex Thurrock Chalk water body (GB40601G401100),	There is possible impact to the Thames Middle water body and the North Kent Medway Chalk water body. With the deposition or spillage of soils, sediments, oils, fuels, or other construction chemicals, or through mobilisation of contamination following disturbance of contaminated ground or groundwater. There is also potential impact to other water bodies around the site.

4.2 WFD Scoping - Thames Middle Waterbody

4.2.1 A scoping assessment is required to determine which estuarine receptors may be impacted by the Proposed Development, and therefore need to be assessed in the WFD impact assessment. These receptors are defined in accordance with the Environment Agency's Clearing the Waters for All Guidance (Ref 17) and are based on the water body's quality elements; the receptors include:

- Hydromorphology;
- Water quality;
- Biology – habitats;
- Biology – fish; and
- Protected Areas.

4.2.2 As the scoping assessment outlined in the Clearing the Waters for All Guidance (Ref 17) is designed for coastal and estuarine waterbodies it is applied here to the River Thames water body only.

Hydromorphology

4.2.3 Hydromorphology refers to the physical characteristics of waterbodies. Hydromorphological quality elements include the size, shape and structure of the waterbody, and the flow and quantity of water and sediment. Impacts on hydromorphology include changes to morphological conditions (for example variation in the structure of the seabed and intertidal zone) and tidal patterns (for example dominant currents, freshwater flow and wave exposure). Hydromorphology is only a WFD quality element for high status waterbodies, but significantly influences other elements, particularly biological ones, and thus is an important part of the assessment.

4.2.4 The Proposed Development does not include any changes to the current hydromorphology. The proposed tunnel will be well below the River Thames at 35m bgl. There is already an existing and working jetty on the southeast of the Tilbury site, which may be utilised for shaft and tunnel spoil removal on the Tilbury side. Therefore, there will be no changes to the current hydromorphology and so no operational or construction risk.

4.2.5 The scoping assessment of the potential effects to hydromorphology is provided in Table 4-3. The risk criteria in the table is taken from the Environment Agency guidance on WFD assessment for estuarine and coastal waters (Ref 5).

Table 4-3: Scoping assessment of risks to hydromorphology

Risk	Requires Impact Assessment	Impact Assessment Not Required	Hydromorphology risk issue(s)
Could impact on the hydromorphology (e.g. morphology or tidal patterns) of a water body at high status		✓	N/A
Could significantly impact the hydromorphology (i.e. bed morphology and substrate) of any water body		✓	N/A
Activity is in a water body that is heavily modified for the same use as your activity		✓	N/A

Water Quality – Physicochemical Quality Elements

- 4.2.6 Impacts to ecological water quality relates to effects on any of the following: Water clarity, temperature, salinity, oxygen levels, nutrients, microbial patterns for longer than a spring neap tidal cycle (approximately 14 days). In addition to the above, if the water body has a history of harmful algae or a phytoplankton status of Moderate, Poor or Bad, this will need to be considered.
- 4.2.7 During construction, fuel, hydraulic fluids, solvents, grouts, paints and detergents and other potentially polluting substances will be stored and/or used on-site. Spoil material will be temporally stored on site until transferred to a suitable receptor site. There would be the potential for conveyance of fine sediment and chemical spillages to any of these water bodies through uncontrolled site runoff or through any existing drains that discharge to these watercourses, if not mitigated.
- 4.2.8 During operation, increased run-off from roofs and new impermeable areas could allow contaminants to enter the WFD body. However, mitigation measures such as using filter strips, green roofs and the use of a downstream defender will help to reduce these risks.

Table 4-4: Scoping assessment of risk to physico-chemical quality elements

Risk	Requires Impact Assessment	Impact Assessment Not Required	Water Quality Risk Issue(s)
Could affect water clarity, temperature, salinity, oxygen levels, nutrients or microbial patterns continuously for longer than a spring neap tidal cycle (about 14 days)		✓	Impacts from surface water runoff containing contaminants or as a result of accidental spillages. However, with the mitigation outlined in Section 5 no impact assessment is required.
Is in a water body with a phytoplankton status of moderate, poor or bad		✓	Phytoplankton is at Good Status
Is in a water body with a history of harmful algae		✓	There is no monitoring of harmful algae, which it is assumed to indicate that this is not a particular risk for this water body. As such, further consideration of phytoplankton and harmful algae has been scoped out from further consideration in the WFD impact assessment.

Water Quality – Chemical Status

- 4.2.9 As for chemical status, there is potential for chemical spillages and runoff containing contaminants from construction activities on both the Gravesend and Tilbury Sites. If contaminants enter the small unnamed watercourses on the sites, this could pose as risk to transport contaminants to the Thames.
- 4.2.10 The scoping assessment for chemical status is summarised in Table 4-5.

Table 4-5: Scoping assessment of risk to chemical status

Risk	Requires Impact Assessment	Impact Assessment Not Required	Water Quality risk issue(s)
The chemicals are on the Environmental Quality Standards Directive (EQSD) list		✓	Potential for a range of chemicals to be discharged to Thames water body indirectly from 'spill over' into the estuary. However, with the mitigation outlined in Section 5 no impact assessment is required.
It disturbs sediment with contaminants above CEFAS Action Level 1		✓	No direct works to the River Thames or upstream tributaries, and so no disturbance of sediment anticipated

Biology - Habitats

- 4.2.11 A number of habitats have been highlighted in the Environment Agency Clearing the Waters for All Guidance (Ref 17) as being of higher and lower sensitivity based on their resistance to, and recovery rate, from human pressures. Table 4-6 outlines the higher and lower sensitivity habitats associated with the Thames Coastal waterbody (based on the Environment Agency WFD waterbody summary table), which have the potential to be impacted during construction by direct habitat loss, physical disturbance and changes in water quality (e.g. a sediment plume relating to outfall construction), or during operation by discharges from the outfall causing thermal plumes or chemical changes in water quality including nutrient enrichment (which may also include deposition via gaseous emissions from the Proposed Development).

Table 4-6: Higher and Lower Sensitivity Habitats

Higher Sensitivity Habitats	Area (ha)	Lower Sensitivity Habitats	Area (ha)
Saltmarsh	130.06	Intertidal soft sediment	838.78

- 4.2.12 Habitats should be included as part of the WFD impact assessment if the footprint of the activity meets any of the following (Environment Agency, 2016) (Ref 5), noting that this also includes the footprint of thermal, sediment or effluent plumes:
- 0.5 km² or larger in area within the estuarine or coastal water body;
 - 1% or more of the water body's area; and
 - Within 500 m of any higher sensitivity habitat or covering 1% or more of any lower sensitivity habitat area.
- 4.2.13 Magic Map (DEFRA) (Ref 8) has been used to confirm the proximity of the noted sensitive habitats to the proposed works. The Gravesend and Tilbury sites both have Lower Sensitivity Habitat (Intertidal Soft Sediment) and High Sensitivity Habitat (Saltmarsh) situated on the edges of the Thames.

Table 4-7: Scoping Assessment of risks to biological habitat

Footprint is:	Requires Impact Assessment	Impact Assessment Not Required	Biological habitat risk issue(s)
0.5 km ² or larger		✓	Footprint does not cross habitat on both the Gravesend and Tilbury sites
1% or more of the waterbody's area		✓	Footprint does not cross habitat on both the Gravesend and Tilbury sites
Within 500 m of any higher sensitivity habitat	✓		Saltmarsh and Intertidal soft sediment are situated within 500m of the activity footprint.

Fish

- 4.2.14 The Thames supports a number of fish populations including the list outlined in Section 3.7. There are no direct works in the Thames or its tributaries. Release of a pollutants from runoff or spillages during construction could affect fish population health. The scoping assessment of risk to fish is provided in Table 4-8.

Table 4-8: Scoping assessment of risk to biological fish

Risk	Requires Impact Assessment	Impact Assessment Not Required	Biological fish risk issue(s)
Could impact on normal fish behaviour like movement, migration, or spawning (e.g. creating a physical barrier, noise, chemical change or change in depth or flow)		✓	Any impact is not considered sufficient in scale to have such an effect given that no direct works are planned to watercourses that would mobilise large amounts of fine sediment.
Could cause entrainment or impingement of fish		✓	There will be no obstructions to fish or direct works in the River Thames or estuary

WFD Protected Areas

- 4.2.15 The location of the Proposed Development in relation to the following WFD Protected Areas has been considered:
- Special Areas of Conservation (SAC);
 - Special Protection Area (SPA);
 - Shellfish waters;
 - Bathing waters; and
 - Nutrient sensitive areas.

- 4.2.16 The outcome of the scoping assessment for WFD protected areas is shown in Table 4-9.

Table 4-9: Scoping assessment of WFD Protected Areas

Risk	Requires Impact Assessment	Impact Assessment Not Required	WFD Protected Areas
Activity is within 2 km of any WFD protected area	✓		The Thames Estuary and Marshes is a SPA

Invasive non-native species

4.2.17 Invasive non-native species (INNS) harm the environment. They can be small and hard to spot so are easily spread on damp equipment and clothing. If the Proposed Development risks introducing or spreading invasive non-native species this should be included in the WFD impact assessment. The risks of introducing or spreading INNS includes marine vessels, marine plant, construction materials or equipment being used that have come from, have been used in or have travelled through other water bodies and activities that help spread existing INNS either within the immediate water body or to other waterbodies.

4.2.18 The scoping assessment of risks from INNS is summarised in Table 4-10.

Table 4-10: Scoping assessment of risks from INNS

Risk	Requires Impact Assessment	Impact Assessment Not Required	Biological fish risk issue(s)
Activity may introduce or spread INNS to a water body		✓	Transport of spoil material will be via barge, utilising either the existing jetty or via a berth at the Port of Tilbury.

Summary

4.2.19 A summary of the receptors and relevant WFD quality elements that have been scoped into the WFD impact assessment for the Thames is shown in Table 4-11.

Table 4-11: Scoping outcome

Receptor	Relevant WFD quality element(s)	Potential risk to receptor
Hydromorphology	Hydromorphological elements	No risk. <u>No further assessment required.</u>
Water Quality	Physico-chemical and chemical water quality elements	The potential risk from fine sediment and chemical spillages in construction runoff, and diffuse urban pollution from surface water runoff during operation, could impact fish in the Thames Estuary. However, this risk will be managed by the implementation of a CEMP and drainage strategy. <u>No further assessment required.</u>
Biology: Habitats	Habitats and benthic invertebrates	Saltmarsh and Intertidal soft sediment are situated within 500m of the activity footprint. <u>Further assessment required.</u>
Biology: Fish	Fish	The potential risk from fine sediment and chemical spillages in construction runoff, and diffuse urban pollution from surface water runoff during operation,

Receptor	Relevant WFD quality element(s)	Potential risk to receptor
		could impact fish in the Thames Estuary. However, this risk will be managed by the implementation of a CEMP and drainage strategy. No further assessment required.
Protected areas	N/A	Activity is within 500m of the WFD Protected Area (Thames Estuary and Marshes SPA). <u>Further assessment required.</u>

4.3 WFD Scoping – Groundwater Bodies

- 4.3.1 Table 4-12 and Table 4-13 outline the scoping carried out for South Essex Thurrock Chalk water body and North Kent Medway Chalk water body.

Quantitative Status

- 4.3.2 The shafts and tunnels may require dewatering during construction. As indicated from boreholes found on BGS GeoIndex groundwater levels appear to be shallow between 0.5 mbgl and 10 mbgl on the Tilbury Site and 2-14mbgl on the Gravesend Site. The shaft and tunnel are expected to be approximately 35 m deep and so the shafts and tunnel will intercept the water table.
- 4.3.3 Depending on the construction method, the only dewatering required would be for the construction of the shafts. This would only be temporary and with good practice measures controlled by the CEMP and Construction Groundwater Control Strategy (as described in more detail in ES Volume III Chapter 13: Water Environment – Tilbury and ES Volume IV Chapter 21: Water Environment – Gravesend) no changes to the quantitative status are predicted. A summary of possible mitigation measures are included in Section 5.2.4. Therefore, **no further assessment of construction phase quantitative impacts has been undertaken.**

Qualitative Status

- 4.3.4 The qualitative status of South Essex Thurrock Chalk water body and North Kent Medway Chalk water body could potentially be impacted from the construction of the tunnel and shafts. Deposition or spillage of soils, sediments, oils, fuels, or other construction chemicals, or through mobilisation of contamination following disturbance of contaminated ground or groundwater could all have the potential to impact the quality of the aquifer.
- 4.3.5 The shafts may provide a direct pathway for contaminated runoff to enter the aquifer. However, with the application of the good practice mitigation measures set out in ES Volume III Chapter 13: Water Environment – Tilbury and ES Volume IV Chapter 21: Water Environment – Gravesend, CEMP and Construction Groundwater Control Strategy, temporary and permanent risk of pollution and damage will be adequately mitigated. A summary of possible mitigation measures are included in Section 5.2.4. Therefore, with these mitigation measures, **no further assessment of the qualitative impacts during the construction phase is required.**

Table 4-12: Scoping for South Essex Thurrock Chalk

WFD Parameter	Current Status	Tunnel Construction	Shaft Construction	Impact Assessment required?
Quantitative	Poor	The tunnel will be lined with precast concrete blocks as the TBM moves through the bedrock. There will be no dewatering required and so no changes to the quantitative status for the South Essex Thurrock Chalk water body	The shafts will be constructed by incrementally pushing steel casings down using a hydraulic jack. Depending on the specifics for shaft construction, dewatering may or may not be required. If not required, there will be no changes to the quantitative status for the South Essex Thurrock Chalk. If required, it would only be required for a temporary period until the shaft has been fully constructed and lined. Therefore, there would be no long-term changes to the quantitative states for the South Essex Thurrock Chalk water body and North Kent Medway Chalk water body.	No Impact Assessment Required.
Quantitative Status element	Poor			
Quantitative Dependent Surface Water Body Status	Good			
Quantitative GWDTEs test	Good			
Quantitative Saline Intrusion	Good			
Quantitative Water Balance	Poor			
Chemical (GW)	Poor	Depending on the TBM selected there could be contamination associated to any lubricants or fluids from the machine. However, the quantities of this would be very minor and would not change the overall chemical status.	The construction of the shaft could pose as a potential pathway for surface contaminants to enter the aquifer. However, using the appropriate mitigation measures outlined in CEMP and Construction Groundwater Control Strategy there won't be any changes to the overall chemical status.	No Impact Assessment Required
Chemical Status element	Poor			
Chemical Dependent Surface Water Body Status	Good			
Chemical Drinking Water Protected Area	Good			
Chemical GWDTEs test	Good			
Chemical Saline Intrusion	Good			
General Chemical Test	Poor			

Table 4-13: Scoping for North Kent Medway Chalk

WFD Parameter	Current Status	Tunnel Construction	Shaft Construction	Impact Assessment required?
Quantitative	Poor	The tunnel will be lined with precast concrete blocks as the TBM moves through the bedrock. There will be no dewatering required and so no changes to the quantitative status for the North Kent Medway Chalk	The shafts will be constructed by incrementally pushing steel casings down using a hydraulic jack. Depending on the specifics for shaft construction, dewatering may or may not be required. If not required, there will be no changes to the quantitative status for the North Kent Medway Chalk. If required, it would only be required for a temporary period until the shaft has been fully constructed and lined. Therefore, there would be no long-term changes to the quantitative states for the North Kent Medway Chalk water body.	No Impact Assessment Required
Quantitative Status element	Poor			
Quantitative Dependent Surface Water Body Status	Poor			
Quantitative GWDTEs test	Good			
Quantitative Saline Intrusion	Good			
Quantitative Water Balance	Poor			
Chemical (GW)	Poor	Depending on the TBM selected there could be contamination associated to any lubricants or fluids from the machine. However, the quantities of this would be very minor and would not change the overall chemical status.	The construction of the shaft could pose as a potential pathway for surface contaminants to enter the aquifer. However, using the appropriate mitigation measures outlined in CEMP and Construction Groundwater Control Strategy there won't be any changes to the overall chemical status.	No Impact Assessment Required
Chemical Status element	Poor			
Chemical Dependent Surface Water Body Status	Good			
Chemical Drinking Water Protected Area	Poor			
Chemical GWDTEs test	Good			
Chemical Saline Intrusion	Good			
General Chemical Test	Poor			

5 Mitigation

5.1 Embedded Mitigation

- 5.1.1 More information on embedded mitigation can be found in ES Volume III Chapter 13: Water Environment – Tilbury and ES Volume IV Chapter 21: Water Environment - Gravesend.

Construction

- 5.1.2 The excavated material from construction of the tunnel would be approximately 72,700 m³ and the excavated material from the construction of the Tilbury shaft would be approximately 13,000 m³. The excavated material from construction of the tunnel would be approximately 12,850 m³ for the Gravesend shaft. The composition of the spoil is currently being investigated which will determine its suitability for reuse. However, a review of existing local data suggests tunnel arisings are likely to be chalk. Spoil material would be sent via the River Thames to Brett Aggregates, who neighbour Cliffe Pools and would be able to accept the tunnel spoil to infill and restore saline lagoons. This would provide benefits to aquatic invertebrates and is located approximately 5.5km east of the Proposed Development on the south side of the River Thames. The existing and working jetty to the south-east of the Proposed Development on the Tilbury side, delivering the tunnel spoil to the jetty via HGV and transferring to barge. There is an existing road extending to the jetty. On the Gravesend site, spoil material from the shaft will be transported by HGV.

Operation

- 5.1.3 The Drainage Management Strategy is included with the Planning Applications. The strategy aims to direct surface water from the road, headhouse roof water and tunnel seepage to “French Drain” style filtration trenches which will collect and convey the water to a traditional piped drainage system before entering the watercourse.
- 5.1.4 The headhouse roof water will be captured by a ‘Green Roof’ system which will reduce the flow from the building in reality and treat any windblown contaminants that may fall on the roof. Filter Strips and pipework will supply other runoff from roofs and hardstanding areas through a Vortex Flow Separator and then through a flow control system to restrict the flow to an agreed rate. The proposed systems will be restricted back to greenfield run-off rates for each site, which have been calculated to be 0.4l/s. The Low discharge is due to the low amount of hardstanding areas.
- 5.1.5 The filter strips and the downstream defender, have been integrated into the design to minimise any contamination risk to the water environment. This site is restricted in SUDS options as no components can be outside of the site boundary. Therefore, the drainage design is limited by the size of the site area.
- 5.1.6 The preferable options would be to discharge foul water to an existing sewer with a backup option to provide a 9000L cess pit. However, there are no available public sewers to connect to so a 9000L underground cess pit will be provided. It will be located adjacent to a road to allow access for maintenance/emptying. It will not discharge to ground or to a surface watercourse.

5.2 Standard Mitigation

- 5.2.1 Construction would be managed using a Construction Environmental Management Plan (CEMP), which would be developed by the Contractor and be based on the Outline CEMP (ES Volume VI Appendix 3.1). It would include a Water Management Plan (WMP) as a technical appendix that would provide site specific information of how the risks to the water environment from potential pollution and the risk of physical damage will be managed. These measures require Contractor input and thus

the WMP would not be developed until during the detailed design phase and pre-construction planning period.

5.2.2 Works would be carried out in accordance with established best practice and the CEMP, which would include information on:

- Permissions and consents;
- Management of construction site runoff;
- Management of construction site spillage risk; and
- Management of flood risks.

Management of Sediment and runoff

5.2.3 The management of sediment and site runoff will include the following actions which at minimum the Principal Contractor will adhere:

- Site clearance will be kept to a minimum and there will be a 10 m buffer around all water feature. (e.g., using temporary exclusion fencing, fabric silt fences, straw bales, maintaining vegetation etc.) other than at crossings or where there are specific tasks that need to be undertaken close to a water features (in which case see the section later entitled 'Working in, over, under and adjacent to water features');
- Avoidance of wet weather working where practical, especially site clearance, earthworks and works to water features;
- Appropriate separate storage of topsoil/subsoil and materials, and at least 20 m from water Features on flat ground;
- Any earth bund/ stockpile to be present for longer than two weeks will be either seeded, covered using geotextiles, or other pressures provided to ensure it is not a source of excessive fine sediment in runoff to water features;
- The implementation of a temporary drainage system and other measures to manage pollution risk during construction (e.g., fabric silt fences, lagoons, bunds, straw bales, sandbags, lamella clarifiers or other proprietary measures as may be required) etc.;
- Any dewatering of excavations will include measures where necessary to filter the water prior to discharge to a watercourse or ground (there shall be no discharge of any construction site runoff to existing ponds); and
- The control of mud deposits at entry and exits to the Site using wheel washing facilities and/ or road sweepers operating during earthworks or other times as considered necessary.

Dewatering and Groundwater

5.2.4 To minimise the impact of any groundwater control activities during construction on the water receptors, a Construction Groundwater Control Strategy will need to be prepared by the Contractor at the detailed design stage. Furthermore, best practice mitigation measures will be followed to avoid and or minimise impact on groundwater and will be included in the Final CEMP. As a minimum the Principal Contractor will adhere to the following mitigation measures to reduce impacts to groundwater aquifers:

- A Development of groundwater control would be implemented to ensure water levels in adjacent water features are maintained and any discharge is of a suitable quality.
- A programme of water monitoring of the dewatering discharges.
- If discharging water to a nearby watercourse, the rate of discharge will need to be agreed with the relevant authority to ensure that there is no unacceptable increase in flood risk or risk of scour. Any discharge will need to be undertaken with the agreement of the relevant statutory

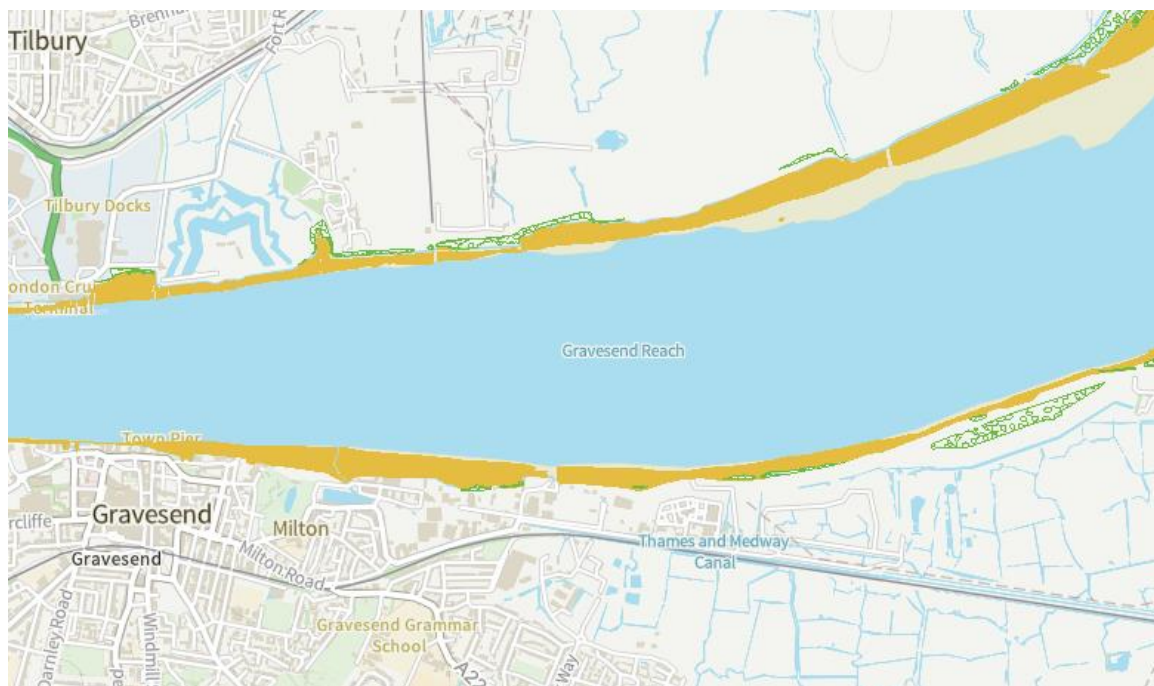
regulator and will need to comply with the pollution prevention requirements set out in the future CEMP.

- Managing the risk from groundwater flooding through appropriate working practices (during excavations) and with adequate plans and equipment in place for de-watering to ensure safe dry working environments.

6 Impact Assessment

- 6.1.1 Site-specific impacts of the Proposed Development on the scoped-in WFD quality elements, and the proposed mitigation measures to neutralise those impacts, are provided in Table 6-1.
- 6.1.2 The saltmarsh is located along the banks of the Thames as shown in Plate 1. Intertidal soft sediment locations are unknown but are assumed to be along the Thames (Ref. 8).

Plate 1: Saltmarshes along the banks of the Thames



Source: Magic Maps (Ref 8)

Table 6-1: WFD Impact Assessment - Thames Middle water body (GB530603911402)

WFD Quality Elements	Description of proposed works	Description of Impact	WFD compliance
Habitats (Tilbury) - saltmarsh and intertidal soft sediment	Spoil Storage and Removal - the required area is based on the type of TBM selected, i.e. EPB = stockpiled prior to removal and slurry machine = processing plant is required to separate the arisings and then stockpiled. Spoil Removal – approximately 72,700m³ of spoil material from the tunnel and 13,000m³ of spoil material from the Tilbury Shaft spoil will be transported to a receptor site via an existing jetty at the Tilbury site, or via a berth at Tilbury Docks. The composition of the spoil from the tunnel will be chalk. The composition of the shaft spoil will be a mix of chalk, made ground, alluvium and river terrace deposits. Bored Cable Tunnel and Shaft Construction - The tunnel construction will commence from the Tilbury side and drive south underneath the River Thames. A main compound would be required at Tilbury to facilitate the construction of the drive shaft for the TBM. Main Compound – 62,339 m² area comprising of project offices, welfare facilities, spoil storage, shaft rung and tunnel ring storage, workshop maintain equipment and parking. Drive Shaft Construction – shaft depth 41m with a 11,800m² working area. Tunnel Construction – this will occur straight after shaft construction. Tunnel segments will require a storage area of 1500m².	Sources - Spoil material. - Contaminants from the compound could include fuels, oils, solvents and other construction chemicals. Potential Pathways - Pathways to the saltmarsh and intertidal soft sediment could include surface runoff via an Ordinary Watercourse located at TQ 66354 75566 and then transportation to the Thames, although this watercourse is believed to initially flow northwards and it is more likely sediment will be deposited in the channel. However, spoil will be stored within enclosed 18m x 12m bins only overnight and over weekends before being transported to Brett Aggregates or to Tilbury Docks. If to Brett Aggregates, existing roads and jetty will be used that crosses the saltmarsh and intertidal habitat areas but no direct physical works are required. Therefore, with runoff mitigation measures outlined in CEMP and summarised in Section 5.2.3, pathways are eliminated. - Spoil material could come into contact with saltmarsh and intertidal soft sediment when being transported to the Brett Aggregates jetty from minor spills on the existing road / jetty surfaces and surface water runoff. However, the jetty is currently active and so impacts from spoil transport will likely be similar to those of the current works being carried out. Therefore, it is unlikely any degradation of status will take place.	All scheme components are WFD compliant with mitigation

WFD Quality Elements	Description of proposed works	Description of Impact	WFD compliance
		Additionally, with mitigation measures outlined in CEMP, pathways are eliminated.	
Habitats (Gravesend) - saltmarsh and intertidal soft sediment WFD Protected Area - The Thames Estuary and Marshes is a SPA	Spoil Storage and Removal - The Gravesend site will have a similar set up to the Tilbury site. However, spoil material from the shaft construction will be transported to a receptor site via HGV instead. Bored Cable Tunnel and Shaft Construction - At Gravesend, the satellite construction compound will require an area of approximately 12,146m² / 1.2ha to facilitate the construction works. The reception shaft at Gravesend would be the same diameter as the drive shaft at Tilbury. The reception shaft is only required for the removal of the TBM, once the tunnel drive has been completed. For this, a crane and fleet of lorries will be required. Their size is dependent on the TBM chosen and the size of the parts following disassembly. Typically, a TBM can be split in to three parts. Due to the weight of the TBM, it is possible that foundations or potential ground improvements are required to support the crane track.	Sources - Spoil Material - Contaminants from the compound could include fuels, oils, solvents and other construction chemicals. Pathways - Pathways to the saltmarsh and intertidal soft sediment could include surface runoff via an Ordinary Watercourse located at TQ 67489 74217 and then transportation to saltmarsh and intertidal soft sediment (runoff from the rest of the site is separated from saltmarsh and intertidal soft sediment by the existing flood embankment). With the short site storage time (overnight and over weekends before being transported to Brett Aggregates or Tilbury Dock) and runoff mitigation measures outlined in CEMP and summarised in Section 5.2.3, pathways are eliminated. - The Thames Estuary and Marshes SPA is situated 600m east of the Gravesend site. The only potential pathway to the SPA is from contaminated runoff entering the Thames and moving downstream to the SPA. However, this will be significantly limited by available dilution and dispersion of any potential contamination in the estuary. Additionally, as already stated, with runoff mitigation measures outlined in CEMP and summarised in Section 5.2.3, pathways are eliminated.	All scheme components are WFD compliant with mitigation

7 Conclusions

- 7.1.1 AECOM has undertaken a WFD Screening, Scoping and Impact Assessment process to support the planning application for the TKRE Cable Tunnel Replacement Project (the 'Proposed Development'). The main components of the Proposed Development with potential to impact the water environment include changes to runoff and drainage associated to Gravesend and Tilbury Sites during operation and impact from construction activity such as the tunnel and shafts construction, and spoil storage/handling.
- 7.1.2 Under the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 new developments must not cause the deterioration of or prevent the improvement of WFD water bodies. For this assessment, three water bodies were considered:
- South Essex Thurrock Chalk water body (GB40601G401100);
 - North Kent Medway Chalk water body (GB40601G500300); and
 - Thames Middle waterbody (GB530603911402).
- 7.1.3 This qualitative assessment has adopted a phased approach (i.e. screening and scoping). Potential operational impacts scoped out during the screening phase due to level of pollution risk, the scale of above ground development, and the implementation of a drainage strategy to mitigate any impacts from diffuse urban runoff or risk of chemical spillages. Construction activities such as spoil handling and storage and tunnel and shaft construction were identified during the screening process as potentially impacting the WFD water bodies. This would be through contamination from soils, sediments, oils, fuels, or other construction chemicals, or through mobilisation of contamination following disturbance of contaminated ground or groundwater.
- 7.1.4 The scoping stage and impact assessment found that with the implementation of CEMP, impacts to receptors associated to the Thames Middle water body would be minimal. Additionally with the high degree of dilution and dispersion potential risks of significant impacts from water pollution of the Thames are reduced. Implementation of CEMP and the Construction Groundwater Control Strategy will also mitigate any construction impacts to the South Essex Thurrock Chalk water body and North Kent Medway Chalk water body. **Therefore, the Proposed Development is considered to be compliant with all WFD Objectives for these water bodies and all three WFD water bodies identified in the screening have been scoped out from and further assessment.**

8 References

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- Ref 2 HM Government (2016). Water Framework Directive assessment: estuarine and coastal waters. Available at: <https://www.gov.uk/guidance/water-framework-directive-assessment-estuarine-and-coastal-waters>
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- Ref 6 Environment Agency (2016b). Protecting and improving the water environment. Water Framework Directive compliance of physical works in rivers.
- Ref 7 Environment Agency Catchment Data Explorer website (<https://environment.data.gov.uk/catchment-planning>)
- Ref 8 DEFRA'S Multi Agency Geographical Information for the Countryside website (<https://magic.defra.gov.uk/MAGICMAP.ASPX>)
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- Ref 18 Environment Agency (2019) Thames Middle Water Body. Available from: <https://environment.data.gov.uk/catchment-planning/WaterBody/GB530603911402> (accessed: August 2013).
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Ref 21 Department for Environmental, Flood and Rural Affairs (2020) Exempt Flood Risk Activities: Environmental Permits. Available from: [Exempt flood risk activities: environmental permits - GOV.UK \(www.gov.uk\)](https://www.gov.uk/guidance/exempt-flood-risk-activities-environmental-permits) (accessed: November 2023).

