# Teddington Direct River Abstraction

## Preliminary Environmental Information Report
## Chapter 3 – Consideration of Alternatives

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# Table of Contents

# List of Plates

# 3. Consideration of Alternatives

## 3.1 Introduction

3.1.1 This chapter outlines the development of the Teddington Direct River Abstraction (TDRA) Project (hereafter referred to as 'the Project') and details the reasonable alternatives considered by Thames Water (the 'Applicant'). It highlights how environmental considerations have informed the decision-making process and provides the main reasons for the chosen option (in the context of the reasonable alternative options), taking account of likely potential effects of the Project on the environment. It also describes how design alternatives within the Project have been considered and developed in order to meet Project environmental and sustainability objectives.

3.1.2 The Applicant submitted an Environmental Impact Assessment (EIA) Scoping Report for the Project to the Planning Inspectorate (PINS) on 10 October 2024, which included a summary of the consideration of alternatives that had been undertaken for the Project at that stage (Thames Water, 2024d). An EIA Scoping Opinion was adopted by PINS on behalf of the Secretary of State (SoS) on 20 November 2024 (PINS, 2024).

3.1.3 PINS requested that the Environmental Statement (ES) include a separate section outlining the reasonable alternatives considered, the rationale for the chosen option(s), and a comparison of the environmental effects. A further consideration of alternatives for the Project will be outlined in the ES and form part of the Applicant's Development Consent Order (DCO) submission.

## 3.2 Legislation, policy and guidance

3.2.1 Regulation 14(2)(d) of The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the 'EIA Regulations') requires that an ES must include '*a description of the reasonable alternatives studied by the applicant, which are relevant to the proposed development and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the development on the environment*'. Paragraph 2 of Schedule 4 to the EIA Regulations provides examples of 'reasonable alternatives', including development design, technology, location, size and scale.

3.2.2 The National Policy Statement (NPS) for Water Resources Infrastructure (Defra, 2023) also advises that applicants should comply with all legal and policy obligations on the assessment of alternatives including the requirements of the EIA Regulations as specifically addressed in this chapter. Other legal and policy requirements in relation to alternatives are set out in the NPS (for example through The Conservation of Habitats and Species Regulations 2017, The Water Environment (Water Framework Directive) Regulations 2017 (as amended), and polices relating to National Parks, flood risk and landscape designations). These will be addressed in detail elsewhere in the DCO

submission but have informed the overarching approach as described in this chapter.

3.2.3 Paragraph 3.5.2 of the NPS also advises that: '*information from the water resources management plan options appraisal process (and associated statutory assessments) will be relevant to demonstrate how alternative options have been considered*'. Consequently, this chapter contains summary details of the Water Resources Management Plan (WRMP) options appraisal process leading to the selection of the Project. In addition, details relating to development design, technology, location, size and scale are provided, with the Project evolving as a result of assessments undertaken and feedback received.

3.2.4 PINS Advice Note Seven: EIA: Process, Preliminary Environmental Information and ES, (PINS, 2020) states that PINS considers a good ES is one that: '*explains the reasonable alternatives considered and the reasons for the chosen option taking into account the effects of the Proposed Development on the environment*'. This chapter sets out a summary of the reasonable alternatives considered up to this stage. The ES will include an updated description, having regard to any relevant responses to consultation and ongoing engagement, and the decision making process, having specific regard to likely environmental effects.

## 3.3 Background and need for the Project

3.3.1 The south-east of England continues to face substantial pressure on its water resources and is designated as being seriously water stressed by the Environment Agency. All water companies in England and Wales have a statutory requirement to produce a WRMP, in line with sections 37A–D of the Water Industry Act 1991 and The Water Resources Management Plan Regulations 2007. The overall aim of the WRMP is to demonstrate how companies will ensure a resilient and efficient supply of water, considering in particular challenges associated with ensuring resilience during drought periods in the face of climate change and population growth.

3.3.2 London and the Thames Valley is already one of the most densely populated parts of the country with over 10 million people living and working in the area, and which is forecast to grow significantly. By 2050, it is forecast there will be around two million more people living in the area supplied by the Applicant, and by 2075, this population is forecast to rise to over 13 million.

3.3.3 As the climate changes, there are likely to be more severe and frequent droughts. To help address this risk and following recommendations from the National Infrastructure Commission, the government requires water companies to ensure water supplies are more resilient to severe drought. Water companies are to increase the level of resilience in water supplies to ensure customers are protected against '1-in-200 year' droughts (compared to current levels which are around '1-in-100 year' resilience) as soon as practicable. Water companies are also to provide a '1-in-500 year' level of resilience by 2040.

3.3.4 The Applicant currently supplies its customers with around 2.6 billion litres of water a day. The Applicant's WRMP 2024 (WRMP24) (Thames Water, 2024a) forecasts that without action, there will be a deficit of over 375Ml/d additional water in 2035 and an extra 1,000Ml/d of water every day by 2050, including an extra 320Ml/d of water to reinforce water supplies to a 1-in-500 year drought. Within these wider forecasts London's supply demand balance also indicates a substantial deficit forecast in London in the 2030s. Assuming that the Applicant will continue to impose hosepipe bans during a drought, a deficit of around 260Ml/d is forecast.

3.3.5 Demand management measures, including reducing leakage and consumption, included in the Applicant's WRMP24 (Thames Water, 2024a) are forecast to meet most of the forecast deficit. This, however, still leaves a significant water supply deficit in the London area in the 2030s. It is this deficit in water supply during times of drought which the Project is looking to address.

3.3.6 The NPS sets out that a water company's WRMP will identify the need for water resources and determine the specific technology solutions required to meet that identified water resources need. Paragraph 2.5.2 of the NPS states that '*if a water company identifies a future deficit in supply, it will need to assess the water resources and demand management options to eliminate the deficit and justify its preferred option in its* [WRMP]*'*. This emphasises the role of the statutory duty to prepare, publish and maintain a WRMP to set out the plan for how water companies will manage and develop water resources so that they can meet their supply obligations in considering and identifying the preferred solution type for meeting that need.

3.3.7 Paragraph 1.4.5 of the NPS states:

'*If a nationally significant infrastructure project is included in a published final water resources management plan, the 'need' for that scheme will have been demonstrated in line with government policy. The applicable statutory requirements, and 'need' would not be expected to be revisited as part of the application for development consent. The Examining Authority and the Secretary of State would then start their assessment of applications for infrastructure covered by the National Policy Statement on that basis'*.

## 3.4 Identification of the Project

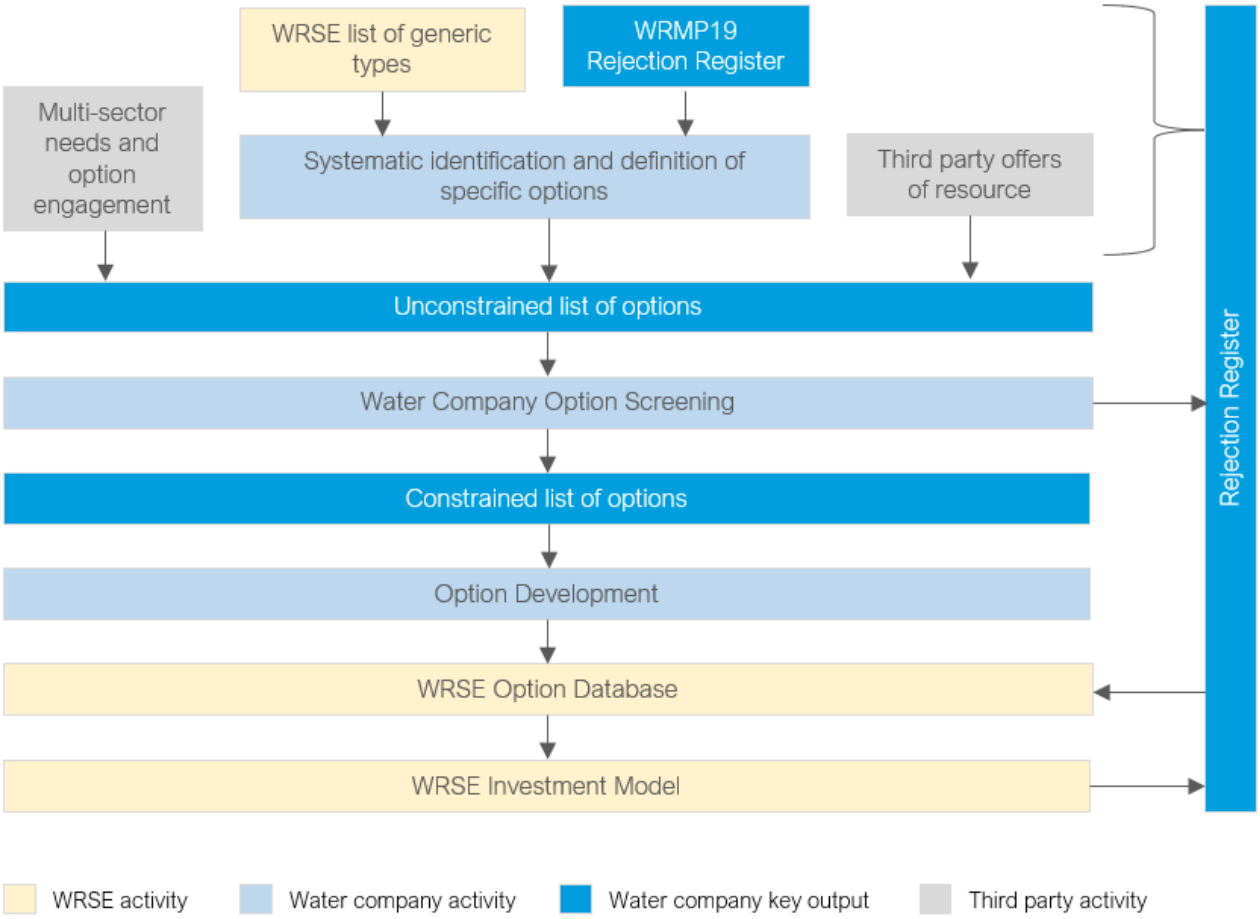
3.4.1 As part of the process of drafting, consulting on and preparing the WRMP, the Applicant has considered many hundreds of options that might facilitate delivery of the objectives of the WRMP.

3.4.2 As part of this, the Project has progressed through a process which has considered alternative strategic water resource infrastructure solutions, including reservoirs, desalination, groundwater storage, water transfers and water recycling options, as well as different configurations of these solutions. The solutions went through a number of stages of detailed review as part of the

development of the Applicant's WRMP24 (Thames Water, 2024a) considering a range of technical, environmental, planning, social and economic criteria.

3.4.3 The process undertaken during WRMP24 that led to identification of the Project as the preferred option is summarised in Plate 3.1.

Plate 3.1 WRMP24 options appraisal process



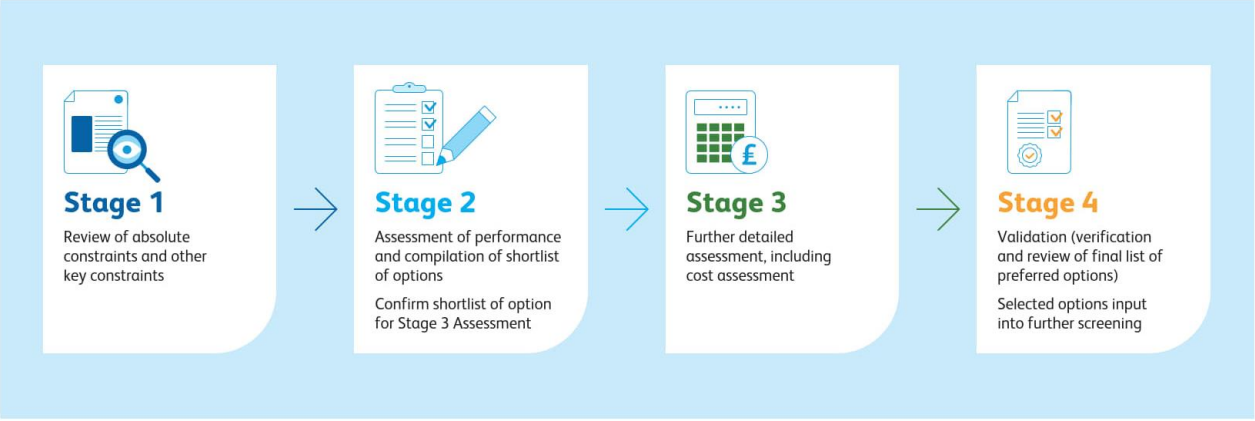

3.4.4 Following the principles of the Water Resources Planning Guideline (WRPG) (Environment Agency, Natural Resources Wales and The Water Services Regulation Authority, 2023), a phased approach to developing water resource options for WRMP24 (Thames Water, 2024a) was undertaken. The starting point for water resource option development was the generic list of resource option types (e.g. reservoirs, water transfers) as defined by Water Resources South East (WRSE) (WRSE is an alliance of the six water companies in South East England – more information can be found at www.wrse.org.uk) based on the UK Water Industry Research (UKWIR) Water Resources Planning Tools report (UKWIR, 2012). For WRMP24, the list was reviewed to identify option types that have potential for providing feasible specific water resource options for the Thames Water supply area. The output of this stage was the Unconstrained List of options.

3.4.5 The Applicant adopted a two-stage approach to water company option screening: feasibility assessment by option type, followed by further option screening of all feasible options. Further information on this is available in Section 7: Appraisal of Resource Options, paragraphs 7.4 to 7.17 in the WRMP24 (Thames Water, 2024a).

3.4.6 The WRMP24 option appraisal process included a review and updating of the feasibility reports produced during the WRMP 2019 (WRMP19) for each option type (raw water transfers, reservoirs, water recycling, direct river abstraction, desalination, inter zonal transfers and groundwater). This feasibility process determined those options to be taken forward for more detailed assessment and those which should be rejected as potential water resource options.

3.4.7 The feasibility assessment process incorporated a suite of property, legal, planning, environmental and engineering assessment criteria. The feasibility assessment methodology used a four-stage assessment approach (see Plate 3.2) that progressively helped determine the best sites or options for each option type based on a suite of assessment criteria.

Plate 3.2 Feasibility assessment methodology




3.4.8 The water resource elements that passed the validation stage of the feasibility assessments formed the Feasible List. The screening process then used the WRSE investment model to further screen options, with those options which performed well being selected for inclusion in the Constrained list of options.

3.4.9 For the water resource options included on the Constrained list, additional and more detailed assessments were undertaken including assessments of costs and risks, Strategic Environmental Assessment and resilience.

3.4.10 The Constrained list of options were then developed as options for inclusion in the investment model and WRMP24 documentation (Thames Water, 2024a). The Option Development process involved preparing conceptual designs for the Constrained list of options and undertaking cost, carbon emissions and environmental assessments based on these designs. More information on the investment model can be found in Section 10: Programme Appraisal and

Scenario Testing, Stage 4, paragraphs 10.121 to 10.126 in the WRMP24 (Thames Water, 2024a).

3.4.11 There is a substantial water supply deficit forecast in London in the 2030s, and the WRMP concluded that the water recycling or similar schemes were the only options that could meet the demand in time.

3.4.12 Of the potential water recycling options which were large enough and were found to be feasible (TDRA, Mogden Recycling and Beckton Recycling), the Project was identified as the preferred strategic water resources infrastructure solution to move to 1-in-200 year resilience by the early to mid 2030s.

3.4.13 The Project was identified as the preferred option as it provides a more operationally simple solution than either the Mogden or the Beckton effluent recycling projects, and would also be the least expensive for its customers and least carbon intensive by a substantial margin.

3.4.14 A key factor to its better operational and financial performance is the inclusion as part of the Project of tertiary treatment for the final effluent to be recycled, as opposed to advanced water treatment works processes such as reverse osmosis treatment which are included for the Mogden and Beckton projects. This is because the latter two projects either have the discharge directly upstream of the abstraction point or are discharged directly into raw water storage facilities and regulations require the more stringent processes.

3.4.15 In addition, the ability of the Project to make use of land at Mogden Sewage Treatment Works (STW) and to also be able to incorporate a connection into the existing Thames Lee Tunnel (TLT) means that it can be served by significantly shorter recycled water conveyance tunnels than the two alternative recycling schemes, with the discharge point for the recycled water on the river being closer to the initial source for the Project than the destinations for the other schemes. The environmental effects are therefore reduced due to construction of fewer shafts, less excavated tunnel arisings to handle, and a reduction in traffic when compared to the Mogden and Beckton projects.

3.4.16 Clear and robust reasoning for the screening decisions made during the options appraisal at WRMP24 are recorded in WRMP24 Technical Appendix Q: Scheme rejection register (Thames Water, 2024b).

3.4.17 Further to consideration of the selection of the Project the following sections of this chapter of the Preliminary Environmental Information (PEI) Report describe the alternative scale and sites, including consideration of alternative technologies and designs, that have been considered and adopted as part of the development and evolution of this Project. Before considering these further alternatives, the ‘Do-nothing’ scenario is first explored.

## 3.5 Do-nothing scenario

3.5.1 A ‘do-nothing’ scenario would not take forward any development and, therefore, benefits associated with the need for the Project as described above would not be realised. Failure to provide the Project would place businesses and the growing population of London under very significant risk of water shortage when the weather is dry.

3.5.2 The south-east is identified as an area of significant economic growth, making up around 37% of the national economy. As set out in the Applicant’s WRMP24 overview (Thames Water, 2024c), having insufficient water to support this level of growth would cost London’s economy alone around £500 million each day.

3.5.3 The requirement for water companies as set out in the NPS to ensure they provide adequate level of resilience in water supplies to ensure customers are protected against ‘1-in-200 year’ droughts means that the ‘do-nothing’ scenario is not viable.

## 3.6 Identification of the scale and location of the WRMP Project

3.6.1 As part of the development of water resources infrastructure, the Applicant is progressing the Project through the Regulators’ Alliance for Progressing Infrastructure Development (RAPID) gated process, which provides funding for investigations and development of water resources infrastructure. RAPID is made up of the Water Services Regulation Authority (Ofwat), the Environment Agency and the Drinking Water Inspectorate. The RAPID gated process runs alongside, but is separate to, the DCO consenting process.

3.6.2 Following reviews and assessments undertaken and building on feedback received from stakeholders and the local community, the Project has developed and evolved, including through consideration of alternatives in terms of the Project’s scale, location, technology and design.

### Scale of the Project

3.6.3 The Project was originally proposed as part of the Applicant’s WRMP19 at a size of 300Ml/d (Thames Water, 2019). Following consultation on the draft WRMP19, a Statement of Common Understanding between the Applicant and the Environment Agency was published stating that Water Framework Directive compliance of a 300Ml/d Project was uncertain primarily due to potential temperature impacts of discharging recycled water into the River Thames and therefore the Project was not environmentally promotable at that time. In the statement, the Applicant committed to undertake further research into the sensitivity of the Lower Thames ecosystem to smaller direct river abstraction discharges and viable mitigation approaches. Those smaller projects would still be classified as Strategic Resource Options (SROs) with a capacity of 150Ml/d or lower.

3.6.4 As part of RAPID SRO Gate 1 work and taking account of the draft WRMP19 findings and the Statement of Common Understanding, the Project was assessed in size increments of 50Ml/d and 75Ml/d up to a largest size of 150Ml/d. These assessments were reported in the Gate 1 submission to RAPID in July 2021 (Thames Water, 2025).

3.6.5 Based on further work completed and reported at Gate 2 in November 2022 (Thames Water, 2025), the Applicant investigated and rejected options greater than 100Ml/d due to the continued potential risk of not complying with the Water Framework Directive objectives and Environment Agency guidance. At the end of 2022, the Applicant issued its draft Water Resource Management Plan 2024 (dWRMP24) for consultation which included TDRA at 75Ml/d, which was identified as being environmentally promotable.

3.6.6 The Applicant's WRMP24 was approved on 4 September 2024 by the SoS for Environment, Food and Rural Affairs. On reaching the decision to approve the Applicant's plan, the SoS concluded that there is a strategic need for the major projects in the WRMP including the Project.

## Project sites

3.6.7 The Project, adopted within the WRMP and accepted as an SRO under the RAPID Gated process, comprises a proportion of Mogden STW final effluent being subject to an additional 'tertiary' stage of treatment at a new plant on the STW site. The recycled water is transferred to a discharge location, on the River Thames to directly compensate the flows taken from the new abstraction in the freshwater River Thames, found upstream from the discharge. The abstracted water is pumped into the TLT and transferred to the Lee Valley reservoirs.

3.6.8 In addition to appraisal of the alternative sites considered, this section also has regard to the alternative technologies and designs that have been considered in the development of the Project.

### *Mogden STW*

3.6.9 Development must start at Mogden STW where treated effluent is to be intercepted for further treatment via a new tertiary treatment plant (TTP) within the STW, prior to conveyance off site.

3.6.10 As the TTP relies on using final effluent from Mogden STW, locating the TTP as close as possible to the final effluent channel would reduce the length of pipe needed to the TTP and the associated works and space requirements in constructing this pipe. Locating the TTP close to the final effluent channel would also reduce the carbon and cost associated with pumping final effluent over greater distances. Locating the TTP on the Mogden STW site was identified as being preferable not only in terms of proximity to the final effluent channel but also in that this solution would avoid the additional environmental, social and economic costs of developing a new operating site.

3.6.11 With regard to the current Mogden STW operations, development of the TTP requires the final effluent from the channel in the south-eastern corner of the Mogden STW site. In addition, siting the TTP over some of the existing storm water tanks reduces the footprint of works within the constrained Mogden STW site.

3.6.12 Location of the TTP in the eastern part of the site also minimises the length of the other aspect of the permanent works – the waste water return pipeline. This pipe is required as part of the development to return waste water from the TTP to the existing inlet works or primary settlement tank inlet culvert. In locating the TTP in the south-eastern part of the Mogden STW site this waste return pipe can be routed along the existing site perimeter road from the new TTP.

3.6.13 The location of the start of the conveyance tunnel is determined by:

a. The availability of locations within the Mogden STW from which a Tunnel Boring Machine (TBM) can be launched

b. The location of the TTP which will provide the recycled water to be put into the conveyance tunnel

c. The route that the conveyance tunnel must follow when leaving the Mogden STW site

3.6.14 To construct the conveyance tunnel using a TBM, an appropriately sized shaft and sufficient space for construction materials and spoil storage are required. Some of the reasons for the adoption of the TBM construction method included the reduction in the number of above ground sites to construct the shafts and the increased speed of construction when compared to the option presented at the autumn 2023 non-statutory consultation. The western side of Mogden STW was chosen for the TBM drive shaft due to its ability to meet these demands as opposed to the Eastern Work Area which was compromised for space. This area can also store materials for the TTP and associated infrastructure, reducing congestion on the eastern side of the site. As a consequence, the conveyance tunnel will first need to travel from its western construction site for a distance of approximately 700m beneath Mogden STW to reach a suitable point at which it can intercept the recycled water flows that will be generated by the TTP.

3.6.15 With the TTP located in the south-eastern corner of the Mogden STW site, locating the recycled water interception shaft in this south-east corner alongside the TTP reduces the length of the connecting pipe between the TTP, the interception shaft and the conveyance tunnel. This in turn reduces construction impacts by requiring fewer traffic movements and less excavated material to handle. It also reduces the carbon and financial costs associated with pumping recycled water over greater distances to an alternative point of interception within Mogden STW.

3.6.16 In addition, the location of the permanent infrastructure, including the TTP and start point of the conveyance of the recycled water within the Mogden STW, minimises off-site development; takes advantage of existing infrastructure; and,

through careful use of limited space, ensures operations at the site remain unaffected. The use of the Mogden STW site to accommodate the TTP also allows construction works to make use of its existing road links and internal access routes.

3.6.17 There is a need for the recycled water conveyance tunnel to arrive at the identified outfall site on the freshwater River Thames, upstream of Teddington Weir and via an intermediate shaft site located on Ham Playing Fields. With this and the above factors taken into consideration, the location of the interception shaft in the south-east of Mogden STW continues to enable the tunnel to exit Mogden STW and begin the process of adjusting the alignment from west–east to south-east–south/south-west efficiently.

### *Direct discharge to TLT option*

3.6.18 The potential option of a direct discharge of recycled water from Mogden STW periodically into the existing TLT, which currently transfers abstracted raw water from Hampton to the Lee Valley reservoirs, would temporarily mix two different water sources (raw and recycled water). This approach would not be supported by existing regulatory practice. To enable direct discharge of recycled water from Mogden STW into the TLT (direct potable recycled), that recycled water would need to undergo further advanced water recycling treatment (e.g. reverse osmosis) before it would be able to comply with drinking water standards, as opposed to complying with environmental standards as is required for tertiary treated recycled water.

3.6.19 To be able to subject final effluent from Mogden STW to full advanced water recycling and treatment and therefore enable direct discharge to the TLT, it would be necessary for an advanced water recycling plant to be built. Such facilities are considerably larger than tertiary treatment facilities and would involve greater energy and resource-intensive processes, thereby increasing the carbon footprint compared to developing a TTP at Mogden STW.

3.6.20 As an advanced water treatment facility would require a much greater site area than associated with the proposed Mogden TTP, it is not considered feasible for that facility to be accommodated within the Mogden STW site area, necessitating delivery of such a facility on a new site outside of the STW. Following this approach would, in turn, significantly increase the environmental impacts of the Project through the need for additional land, with secondary effects of removing that land from existing or future planned uses, along with a significant increase in the financial cost of the Project.

3.6.21 The WRSE assessment indicated that this option would not provide the best value to customers compared to the proposed Project. Therefore, the draft Regional Plan (WRSE, 2023) and also the Applicant's WRMP identified that the preferred approach to delivering a vital drought resilience project that produces recycled water from final effluent sourced from Mogden STW would be via the Project, and for that project to be comprised of a TTP at Mogden STW and combined with measures to enable raw water abstraction from the River

Thames supported by recycled water discharge to balance the abstracted reach of river.

3.6.22 Through this process Mogden STW was confirmed as the location for the TTP and the direct discharge to the TLT was not adopted for this Project.

### *Outfall, intake and TLT connection options*

3.6.23 There are a number of key principles governing the potential locations for the abstraction and discharge points for the Project. These have continued to inform the Project and the appraisal of alternatives. These principles include ensuring that the flow being abstracted is freshwater rather than saline water as it is going to be transferred to freshwater reservoirs.

3.6.24 To abstract water from the tidal River Thames, a desalinisation plant would be required to treat the water. To construct a desalinisation plant, there would be a need for additional land take resulting in additional environmental impacts (e.g. biodiversity loss and construction impacts). As a result of this and other factors, it was decided that the intake would be located above the tidal limit of the River Thames (Teddington Weir).

3.6.25 A further principle that underpins the design of the Project is to minimise the overall construction demands of the Project by locating the intake as close as possible to the existing TLT, to both reduce the associated land use and environmental impacts and make use of existing infrastructure. Accordingly, the search for abstraction and connection sites has been guided by the location of both the freshwater River Thames and the TLT.

3.6.26 In particular, regard has been given to where these two features converge, and where there is potentially available land that is suitably sized, level, open and accessible to facilitate construction of intake, outfall and TLT connection infrastructure. There are only two points at which the TLT and the freshwater River Thames converge: at the start of the TLT at Hampton and approximately 400m upstream of Teddington Weir.

3.6.27 Both these potential locations for siting the required infrastructure have been considered.

3.6.28 Another principle that underpins the design of the Project is to seek to locate the intake and outfall structures in close proximity to one another. This will facilitate prompt balancing of flow in the river and minimise potential environmental effects associated with abstraction and discharge from the River Thames. Locating the discharge of recycled water within an area of the river where there is sufficient space to allow the mixing of water has also been an important principle related to the location of the outfall.

3.6.29 The Hampton site option does not offer sufficient distance for any recycled water discharged at this location to mix fully with river water before reaching an existing raw water intake site downstream. The site to the south of Burnell Avenue, however, allows for the intake structure to be developed in close proximity and upstream of the discharge of recycled water for the balancing of

flow in the river whilst also being located in a stretch of the river where mixing with the river water can be achieved prior to the water flowing over Teddington Weir.

3.6.30 For this key reason the Burnell Avenue site was preferred over the potential use of land at or close to Hampton Waterworks.

3.6.31 It is also the case that, whilst recognising the need to assess and manage impacts from the Project upon the open space and residential characteristics of the receiving environment at Burnell Avenue, the land proposed to locate the intake, outfall and connection to the TLT has been judged as being able to meet the important principles set out above in paragraphs 3.6.23 to 3.6.29, and so is the preferred site for development of each item.

3.6.32 With the key locational principles of accommodating the intake, outfall and TLT connection identified, the positional separation between each was then able to be confirmed.

3.6.33 The location of the intake has been determined on the basis of the abstraction of river water requiring to be above Teddington Weir, close to the TLT and on land potentially available which is suitably sized, level, open and accessible to facilitate construction of the intake.

3.6.34 With the Project identifying the preferred site for the intake on the stretch of the river to the south of Burnell Avenue, further consideration was given to alternative options related to the outfall and TLT connection.

3.6.35 A further provision for the Project is to achieve a degree of separation between the outfall and the intake points whilst still ensuring both are located in close general proximity to achieve the necessary balance in water levels at the site of abstraction. In addition, the outfall needs to be downstream of the intake location.

3.6.36 In order to ensure that the river level in proximity to the intake is maintained to required levels during drought conditions it is necessary that the discharge of recycled water enters the river above Teddington Weir. Discharge below the weir would not enable this balancing effect to be achieved because this would lead to a potential lowering of the river level above Teddington Weir when abstraction takes place, increasing stress on the environment and in the worst case impacting the existing fish passes on Teddington Weir. Consequently, locations for the outfall downstream of the intake and above Teddington Weir have not been considered.

3.6.37 Both sides of the river between Teddington Weir and the intake location have been considered for installation of an outfall as part of the development of the Project. As part of the RAPID Gate 1 work an outfall location on the north bank of the River Thames within the grounds of The Lensbury and Watersports Centre approximately 200m upstream of Teddington Weir was identified. An alternative location for the outfall on the same side of the river as the intake was also identified.

3.6.38 A limitation for any development within The Lensbury and Watersports Centre site is the inability to locate both the recycled water discharge outfall and the raw water abstraction intake on the same site: The Lensbury site could only host one of these, the outfall, which would result in a larger construction footprint with greater associated impacts. Accordingly, with the area above Teddington Weir representing the preferred general location for the outfall and intake, and connection to TLT in as close proximity as possible, use of The Lensbury on the north bank of the River Thames would also necessitate use of Burnell Avenue open space on the south bank of the river too.

3.6.39 This approach was not considered consistent with the approach to seeking to minimise construction impacts from the Project and with both The Lensbury and Watersports Centre site and Burnell Avenue site sharing a number of similar characteristics use of both sites was judged to represent an unnecessary increase in overall Project impact.

3.6.40 Further, whilst use of both sites would lead to changes to the river frontage during construction through loss of existing vegetation, this was considered to represent a higher impact on The Lensbury and Watersports Centre site due to the permanent loss of existing mature tree growth.

3.6.41 The Burnell Avenue site was therefore selected as the preferred location for the outfall. Locating the outfall on the south bank of the River Thames also enables a single construction area to be developed and avoids a further tunnel crossing of the River Thames, wider environmental effects on additional receptors and additional construction traffic routes.

3.6.42 In-river and bankside design options for the outfall have been considered during the development of the Project. At the EIA Scoping stage a mid-channel outfall was considered. The mid-channel outfall option has been discounted, following engagement with the Environment Agency, to minimise the impact on the river during construction, reduce operational and maintenance requirements, and avoid potential environmental effects on the river and its users as a result of the extended encroachment into the river.

3.6.43 There are currently two options under consideration for the outfall design: a bankside outfall and a near-bank outfall. Initially, a bankside option was explored, consulting on this during the non-statutory consultation in autumn 2023. However, to address environmental concerns raised by the Environment Agency, the development of a near bankside in-river structure solution that moves the outfall away from the river edge and marginal habitat is also being explored. Both options are being consulted on to ensure that the views of communities and stakeholders form part of the decision-making process.

3.6.44 The bankside and a near bankside in-river discharge have been assessed as part of the PEI Report. Details of these options are provided in Chapter 2 in paragraphs 2.6.24 to 2.6.26.

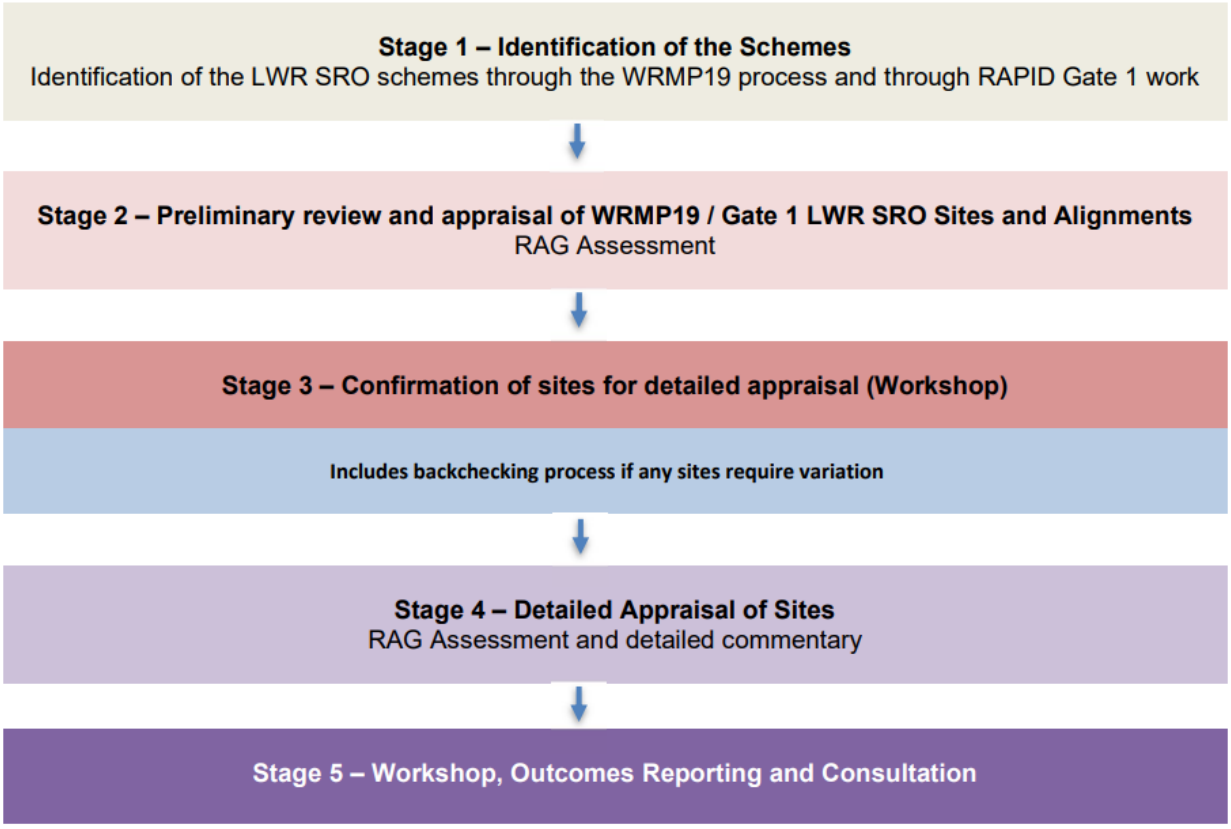
3.6.45 Further details on the alternative TLT connection options are provided under the next section which provides more information on the site and conveyance

appraisal process that has been undertaken to inform the development of the Project.

### *Recycled water conveyance*

3.6.46 A site and conveyance route appraisal was undertaken through a five-stage appraisal methodology, and was consulted on through the autumn 2023 non-statutory consultation. The process used professional judgment and expertise of a multi-disciplinary team comprised of engineers, environmental assessors, town planners and land experts and followed a systematic process of appraisal covering the steps shown in Plate 3.3.

Plate 3.3 Options appraisal process




3.6.47 Stage 1 of the site options appraisal process involved identification of the initial concept design for the potential Project as set out in the RAPID Gate 1 submission. It examined the key design principles and start and end points of the Project (Mogden STW and Burnell Avenue) as described in the section above. In addition, during this stage consideration was given to establishing a general alignment and associated site areas likely to be necessary between the point of water recycling, the point of discharge of recycled water and the location of raw water abstraction for the Project.

3.6.48 Stage 2 of the appraisals subjected all initial sites identified under Stage 1 to a site level preliminary appraisal to indicate whether potential site areas identified at Stage 1 should be retained, revised or removed, and whether the interconnecting conveyance route should be retained, revised or removed.

3.6.49 An appraisal team consisting of engineers, environmental assessors, town planning and land experts compiled appropriate criteria against which each site was appraised.

3.6.50 Stage 2 of the appraisal process focused on criteria drawn from overarching national policy objectives or derived from engineering requirements and known environmental or land use limitations that could inform the design and deliverability of the Project.

3.6.51 A Red-Amber-Green (RAG) grading was assigned to each criterion, and a brief commentary documented the key issues that were identified. This provided an initial view on the performance of each site, the key opportunities and constraints relevant to each site and an indication as to whether the site should be retained, revised or removed from further consideration.

3.6.52 The outcomes of Stage 2 were then considered through multi-disciplinary testing and review (Stage 3) before subjecting the sites remaining from Stages 2 and 3 to further in depth appraisal using an expanded range of multi-disciplinary appraisal criteria and issues (Stage 4). Stage 3 also allowed for the identification of particular areas of concern at each site that would need mitigation and the introduction of any new sites not previously appraised.

3.6.53 Stage 4 involved undertaking a detailed qualitative appraisal of the identified site options, applying a more detailed set of criteria topics and objectives, and considered the likelihood of securing necessary mitigation for impacts. A RAG grading was used again to grade outcomes. The outcomes of Stage 4 were then further reviewed with recommendations put forward for sites identified that could support the scheme being appraised, alongside sites considered unsuitable for further inclusion.

3.6.54 Stage 5 of the process comprised a further workshop to consider the detailed appraisal generated during Stage 4 and identify key outcomes for each site appraised, including identifying, where possible, a preferred combination of sites for the Project.

3.6.55 The outcomes of the sites appraisal process for the Project are reported in the LWR Sites Appraisal Report Teddington (Thames Water, 2023), which informed the Project's non-statutory consultation process.

3.6.56 The non-statutory consultation presented an appraisal of 23 potential above ground sites including construction compounds. This included one location for the TTP at Mogden STW, one location for the intake and outfall structures just upstream of Teddington Weir off Burnell Avenue and five intermediate shaft sites and associated construction compounds between Mogden STW and the outfall location near Burnell Avenue. In addition, two alternative TLT connection locations were appraised.

3.6.57 For each of the intermediate shaft locations multiple options were appraised. The gap between each potential shaft location was limited to approximately

1,000m, based on industry good practice and the recycled water conveyance tunnel being delivered through pipejacking technology.

3.6.58 The design of the proposed recycled water conveyance route has been amended in light of feedback received during the non-statutory consultation in autumn 2023 and reviewed against the assessment criteria (Thames Water, 2023). The recycled water conveyance tunnelling methodology changed from pipejacking to the use of a TBM. This change adjusted the size of the conveyance pipeline between Mogden STW and the River Thames from an initial 1.8m internal diameter (ID) pipe to a 3.5mID tunnel.

3.6.59 Adoption of this change resulted in removal of the requirement for an intermediate shaft to be constructed at least every 1,000m, with the spacing between shafts for the larger bore 3.5mID tunnel being guided as approximately one shaft for every 2,500m of tunnel constructed.

3.6.60 As a consequence of this change it was possible for a total of four of the five originally proposed intermediate shafts to be removed from the Project.

3.6.61 In addition to this, the change in construction technique provided the opportunity for all of the tunnel spoil to be removed from Mogden STW rather than from each shaft location, thereby reducing the potential construction impacts within local communities.

3.6.62 Whilst the changes listed above were realised as a result of the change in recycled water conveyance tunnel construction, the following key parameters remained and continue to guide the alignment of the 3.5mID tunnel in the same way as they previously guided the alignment of the 1.8mID pipeline:

a. Interception of the recycled water produced by the new TTP at Mogden STW to take place in proximity to the TTP in the south-east of the STW to minimise the permanent infrastructure required to transfer the recycled water from the TTP to the conveyance tunnel.

b. The route of the recycled water conveyance tunnel would continue to need to pass beneath the Twickenham to Virgina Water railway line at an angle perpendicular to the railway.

c. An intermediate shaft would continue to be needed for health and safety, maintenance, and ventilation during construction, as well as inspection during operation at the appropriate distance spacing along the conveyance route.

d. Development works including the use of piled foundations associated with the redevelopment of housing at Ham Green would need to be avoided.

e. The conveyance route would need to terminate at a reception shaft located at Burnell Avenue.

3.6.63 Recognising the location of the 3.5mID tunnel bore drive shaft on the west side of Mogden STW and the recycled water interception shaft in the south-east of the STW, a tunnel alignment design curvature that provides space for the TBM to change course from west–east through to south as it exits the STW was developed. This included sufficient room for the tunnel to intercept the recycled

water within a site area in close proximity to the proposed TTP, rather than at one single location, reflecting the need for design flexibility.

3.6.64 Building on the exit alignment described above, the alignment was adjusted both for the increased size of the tunnel's ID and construction method to approach the railway line at a perpendicular angle whilst also avoiding important railway infrastructure such as points and signals, and at a location that would support its progression towards an appropriate intermediate shaft location.

3.6.65 The intermediate shaft locations considered were drawn from the options considered as part of the non-statutory consultation process, not least as the size of intermediate shaft and construction compound requirements would remain broadly the same as had previously been appraised for the smaller 1.8mID pipeline construction method. A key change, however, was the ability for all recycled water conveyance tunnel construction spoil to be transported within the constructed tunnel back to the drive shaft at Mogden STW for removal.

3.6.66 Using the 2,500m spacing parameter as measured from the Mogden STW recycled water interception shaft, the suitable shaft locations from the non-statutory site appraisal outcomes were as follows:

a. Ham Street Car Park – identified as a preferred intermediate shaft site for the intermediate shaft requirement in the Ham and River Thames location area for the 1.8mID pipeline, recognising in particular the opportunity the site affords to make use of water freight for the transportation of pipeline spoil.

b. Ham Playing Fields – identified as a reserve site for the intermediate shaft requirement in the Ham and River Thames location area for the 1.8mID pipeline, retained for non-statutory consultation should the preferred site at Ham Street Car Park prove unviable.

3.6.67 With the design change to a 3.5mID tunnel presenting the ability to remove all tunnel spoil at Mogden STW, the review of the two potential intermediate shaft site options reconsidered the merits of the preferred and reserve outcomes identified above. With there being no need for water freight to be promoted to serve shaft construction, or to manage tunnel spoil, combined with the loss of the car park during construction necessitating the provision of replacement car parking close by on a separate unidentified site, it was concluded that the Ham Playing Fields site represented the most appropriate location at which to site the 3.5mID tunnel's intermediate shaft. The potential need to use some or all of the car park site was also recognised and so both sites were retained for EIA Scoping purposes.

3.6.68 Further appraisal work following the submission of the EIA Scoping Report has refined the area of these sites as described in Chapter 2: Project Description. This refinement has confirmed the use of the Ham Playing Fields site as the preferred area for shaft construction and the location of the main construction compound and has enabled a reduction in the area of Ham Street Car Park

identified for use as part of the above ground work site area, allowing it to remain accessible to the public during the construction of the Project.

3.6.69 From Ham Playing Fields the recycled water conveyance tunnel alignment returns to following as direct a route as is possible to the reception shaft area within Burnell Avenue open space, taking into account the need to avoid passing beneath the work and development area located at Ham Green.

3.6.70 Following the appraisal of TLT connection options, two potential locations were identified in both the non-statutory consultation in autumn 2023 and the EIA Scoping Report. These locations, south of Northweald Lane and Tudor Drive, represent areas of open land above the existing TLT and are in proximity to the intake. Considering feedback received during the non-statutory consultation and further assessments of the land around the proposed shaft at Northweald Lane, an alternative design for the TLT connection close to the intake structure was identified.

3.6.71 This design would eliminate the need for the previously proposed shaft at Northweald Lane. The revised TLT connection option, as described in Chapter 2: Project Description, involves creating an underground adit to connect the existing shaft to the TLT. This approach would avoid potential environmental and social impacts of developing a shaft at Northweald Lane, including noise, vibration, light, and the removal of habitat and trees, some of which have Tree Preservation Orders.

3.6.72 The potential connection to the TLT at Tudor Drive remains an alternative option to the adit from Burnell Drive. Further assessment results, including Ground Investigation results, are still awaited.

## 3.7 Transport Options

### Review of modal options

3.7.1 A review of the modal transport options for the import of materials, plant and equipment for construction, the export of excavation arisings and construction waste, and removal of plant and equipment on completion was conducted. This review considered the movement of construction freight by river, rail and road, but excluded any options for operational freight due to the low number of freight movements. The operational assessment of traffic and transport was scoped out of the ES for this reason (Ref 3.13.2 of the Scoping Opinion (PINS, 2024)).

3.7.2 The text below provides a summary of the modal transport review. Further information and detail of this review is provided in Chapter 12: Traffic and Transport. This is supported by Figures 12.1 to 12.6 in Volume 2 PEI Report Figures.

### River

3.7.3 The use of river freight has been considered for the works associated with the Project to understand if there is the opportunity to minimise the impacts on the

road network and align with government targets to increase the use of alternative freight modes to road (National Policy Statement for Water Resources Infrastructure, paragraph 4.14.13 (Defra, 2023)).

3.7.4 The use of the Thames Water Wharf at Carnwath Road was considered for the import of suitable construction materials, including concrete aggregates, reinforcing steel and other bulk materials, and for the export of excavation arisings by river to and from the Mogden STW construction site. The wharf is located in the London Borough of Hammersmith and Fulham and is the closest wharf on the tidal section of the River Thames to the Mogden STW. All last-mile (import)/first-mile trips (export) would then occur by heavy goods vehicles (HGVs) on the local road network connecting the wharf to the construction site. The most direct route using the London Lorry Control Scheme (LLCS) Permitted Routes for road freight is approximately nine miles, following the A217 over the Wandsworth Bridge, the A205 from Wandsworth to Richmond, and then the A316 from Richmond to B361 Whitton Road and Rugby Road. Please note that the A217 is not a permitted LLCS freight route.

3.7.5 However, the use of river freight does not reduce the overall number of HGVs travelling to and from the Mogden STW from suppliers and disposal sites, but displaces some of these HGV trips onto other road routes between the wharf and the Mogden STW. This increases the extent of the affected road network (ARN) and the corresponding number of receptors directly affected by the construction of the Project. These include other road users, residents, occupiers of commercial property, community facilities, and students and teachers at educational facilities. Furthermore, there are potential capacity constraints at Carnwath Road given that the facilities will be reduced in size upon completion of the Thames Tideway project.

3.7.6 Wharfs on the freshwater River Thames were not considered for the Mogden STW construction site due to the size constraints for any barge using the Richmond Lock and any other upstream locks, and the impact of the resulting number of barge movements traversing these locks on the water levels of the freshwater River Thames, and on other users of the river.

3.7.7 The use of the Thames Water Wharf at Wheatley’s Eyot located on the freshwater Thames in the London Borough of Spelthorne was considered for the import of suitable construction materials, including concrete aggregates, reinforcing steel and other bulk materials, and for the export of excavated arisings by river from the construction sites south of the river, Burnell Avenue and Ham Playing Fields.

3.7.8 Similarly, the use of wharfs downstream of these sites on the tidal Thames were considered for the import of suitable construction materials, including concrete aggregates, reinforcing steel and other bulk materials. The export of excavation arisings downstream by river was excluded due to the size constraints for any barge using the Teddington and Richmond Locks, and the impact of the resulting number of barge movements traversing the two locks on the water levels of the freshwater River Thames, and on other users of the river.

3.7.9 However, it should be noted that the volumes of concrete aggregates, reinforcing steel and other bulk materials required at the Burnell Avenue site is considered low.

3.7.10 Though the use of river freight reduces the number of HGV movements on Burnell Avenue, Beaufort Road, Dysart Avenue, Dukes Avenue and the A307 until the A243, a permitted LLCS route, it does not reduce the overall number of HGVs travelling to and from the construction sites from suppliers and disposal sites, but displaces these HGV trips onto the road route between Wheatley's Eyot and the Sunbury Cross Roundabout on the M3, the closest LLCS Permitted Route. This route includes 1.6 miles of residential roads, Fordbridge Road and Green Street, and the sensitive receptors located alongside.

3.7.11 This increases the extent of the ARN and correspondingly the number of receptors directly affected by the construction of the Project. These include other road users, residents, occupiers of commercial property, community facilities, a health facility, a nursing home, and students and teachers at two primary schools.

3.7.12 The use of the River Thames for freight access directly to the Ham Playing Fields site has not been found to be feasible or practicable. This is due to the level of environmental disruption associated with the initial construction, operation and decommissioning of a safe water-based load-out facility in the tidal Thames. This would include, for example, structural piling for the platform, dredging of the river bed and construction on and into the river bank, the diversion of existing high-voltage electric cables crossing the river, utilisation of the Ham Street Car Park area in addition to the Ham Playing Fields, diversion of the National Trail, and requirement for additional road traffic through residential areas to construct these facilities. These are activities and interactions deemed disproportionate to and are unlikely to be offset by the potential minor benefits that may be realised for the limited opportunity for movement of materials by river freight at this location.

3.7.13 A water-based load-out facility would be required at the Burnell Avenue site to enable the import and export of material by river. However, the feasibility of this facility cannot be confirmed at this stage. Furthermore, additional HGV movements would be generated by the construction and removal of this temporary loading facility, and the reinstatement of the site. This would increase the length of the construction programme and reduce the number of HGVs removed from the construction access routes to the Burnell Avenue site.

3.7.14 Overall, the review with ,further detail provided in Chapter 12: Traffic and Transport, has concluded that the use of river freight is not a suitable mode for the following reasons:

a. The extent of the ARN is increased when using wharfs located off-site as HGVs are dispersed onto additional routes from the wharfs to either the construction sites or the permitted LLCS road routes.

b. The number of receptors directly impacted by the construction traffic travelling to and from the Project is significantly increased. This includes sensitive receptors along residential roads.

c. To enable the use of river freight, a water-based load-out facility would have to be constructed at the Burnell Avenue site.

3.7.15 The import of construction materials from downstream wharfs on the tidal Thames would have an adverse impact on the water levels on the freshwater River Thames due to the number of barges traversing through the Teddington and Richmond Locks, and the adverse impact of this additional river traffic on other river users.

3.7.16 Furthermore, the volumes of concrete aggregates, reinforcing steel and other bulk materials required at the Burnell Avenue site is considered low.

3.7.17 However, the use of a jack-up barge has been considered for the cofferdam installation and excavation of spoil from activities occurring at the site. The feasibility of the use of a jack-up barge will be considered further for the ES.

3.7.18 The preliminary assessment in Chapter 12: Traffic and Transport does not incorporate the use of river freight. The assessment describes the worst-case scenario for traffic and transport impacts on the ARN but does not preclude the use of river transport should it be demonstrated to be viable.

### Rail

3.7.19 Direct rail freight is scoped out of the EIA due to the absence of suitable railway lines adjacent to the construction sites both north and south of the river. However, the use of railheads for the import of construction materials and export of excavation arisings is scoped in for consideration to source materials with last-mile/first-mile deliveries by HGVs.

3.7.20 The feasibility of using goods suppliers that use railhead facilities would be considered in accessible locations, including:

a. Brentford Rail Depot, Transport Avenue, Brentford (for the Mogden STW site, via Mogden Lane, A310 Twickenham Road, B454 Spur Road, B454 Syon Lane and A4 Great West Road)

b. Aggregates Depot, Kingston Road, Tolworth (via A307 south, A243 Brighton Road and A3 Kingston Bypass)

3.7.21 These examples are the closest locations to the Project which are accessible directly from the LLCS Permitted Routes. It is currently considered potentially appropriate to use these depots to import concrete-related materials and equipment such as aggregates, readymix and pre-cast segments. Subject to agreements with the suppliers and other relevant stakeholders, the depot accessed from Transport Avenue in Brentford may be feasible for supporting the exporting of tunnel excavation arisings from the Mogden STW site.

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