Thames to Affinity Transfer

Technical Supporting Document B2

Habitats Regulations Assessment

Notice

Position Statement

- This document has been produced as the part of the process set out by RAPID for the development of the Strategic Resource Options (SROs). This is a regulatory gated process allowing there to be control and appropriate scrutiny on the activities that are undertaken by the water companies to investigate and develop efficient solutions on behalf of customers to meet future drought resilience challenges.
- This report forms part of suite of documents that make up the 'Gate 2 submission.' That submission details all the work undertaken by Thames Water and Affinity Water in the ongoing development of the proposed SROs. The intention of this stage is to provide RAPID with an update on the concept design, feasibility, cost estimates and programme for the schemes, allowing decisions to be made on their progress and future funding requirements.
- Should a scheme be selected and confirmed in the companies' final Water Resources Management Plan, in most cases it would need to enter a separate process to gain permission to build and run the final solution. That could be through either the Town and Country Planning Act 1990 or the Planning Act 2008 development consent order process. Both options require the designs to be fully appraised and in most cases an environmental statement to be produced. Where required that statement sets out the likely environmental impacts and what mitigation is required.
- Community and stakeholder engagement is crucial to the development of the SROs. Some high level activity has been undertaken to date. Much more detailed community engagement and formal consultation is required on all the schemes at the appropriate point. Before applying for permission Thames Water and Affinity Water will need to demonstrate that they have presented information about the proposals to the community, gathered feedback and considered the views of stakeholders. We will have regard to that feedback and, where possible, make changes to the designs as a result.
- The SROs are at a very early stage of development, despite some options having been considered for several years. The details set out in the Gate 2 documents are still at a formative stage and consideration should be given to that when reviewing the proposals. They are for the purposes of allocating further funding not seeking permission.

Disclaimer

This document had been written in line with the requirements of the RAPID Gate 2 Guidance and to comply with the regulatory process pursuant to Thames Water's and Affinity Water's statutory duties. The information presented relates to material or data which is still in the course of completion. Should the solution presented in this document be taken forward, Thames Water and Affinity Water will be subject to the statutory duties pursuant to the necessary consenting process, including environmental assessment and consultation as required. This document should be read with those duties in mind.

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Glossary

Term	Definition
Construction	Any activity involved with the provision of a new structure (or structures), its modification or refurbishment. A structure will include a residential dwelling, office building, retail outlet, road, etc.
Construction Environmental Management Plan (CEMP)	A document which sets out site-specific procedures and mitigation measures to monitor and control environmental impacts throughout the construction phase of the project.
Demolition	Any activity involved with the removal of an existing structure (or structures). This may also be referred to as de-construction, specifically when a building is to be removed a small part at a time.
European Site	Refers to European Sites in the UK's National Site Network including Special Protection Areas (SPAs) and Special Areas of Conservation (SACs), proposed and candidate SPAs and SACs (pSPAs and cSACs)
Habitat	A place where an organism or community of organisms normally live.
Ramsar	Wetland sites of international importance.
Risk	The likelihood of an adverse event occurring.
Site of Special Scientific Interest (SSSI)	Sites of Special Scientific Interest represent the best examples of habitats present within the UK, and the designation provides statutory protection and a duty for the landowner to maintain the habitats
Special Area of Conservation (SAC)	Special Areas of Conservation are strictly protected sites designated under the EC Habitats Directive.
Special Protection Areas (SPA)	Special Protection Areas are protected areas for birds in the UK classified under: • the Wildlife & Countryside Act 1981 (as amended) and the Conservation (Natural Habitats, & c.) Regulations 2010 (as amended) in England, Scotland and Wales, • the Wildlife (Northern Ireland) Order 1985; the Nature Conservation and Amenity Lands (Northern Ireland) Order 1985; the Conservation (Natural Habitats, &c.) (Northern Ireland) Regulations 1995 (as amended) in Northern Ireland, • the Conservation of Offshore Marine Habitats and Species Regulations 2017 (as amended) in the UK offshore area, and • other legislation related to the uses of land and sea.

Abbreviations

Abbreviation	Full term
AA	Appropriate Assessment
BRI	Beckton Reuse Indirect
CEMP	Construction Environmental Management Plan
cSAC	Candidate Special Area of Conservation
DCO	Development Consent Order
DRA	Direct River Abstraction
EAR	Environmental Appraisal Report
ECJ	European Court of Justice
EMS	Environmental Management System
EU	European Union
HRA	Habitats Regulations Assessment
INNS	Invasive non-native species
IROPI	Imperative reasons of overriding public interest
LSE	Likely Significant Effects
LTR	Lower Thames Reservoir
NAU	National Appraisal Unit
pSPA	Proposed Special Protected Area
RAPID	Regulators' Alliance for Progressing Infrastructure Development
SAC	Special Area of Conservation
SESRO	South East Strategic Reservoir Option
SNCB	Statutory Nature Conservation Body
SPA	Special Protection Area
SRO	Strategic Resource Option
SSSI	Site of Special Scientific Interest
STT	Severn Thames Transfer
STW	Sewage Treatment Works

Abbreviation	Full term
T2AT	Thames to Affinity Transfer
UK	United Kingdom
UKWIR	UK Water Industry Research
WFD	Water Framework Directive
WRSE	Water Resources South East
WTW	Water Treatment Works
ZoI	Zone of Influence

Executive summary

This report presents the results of the informal Habitats Regulations Assessment (HRA) undertaken for the Thames to Affinity Transfer (T2AT) Strategic Resource Option (SRO). The HRA assesses the potential impact of the option on European Sites including Special Protection Areas (SPAs) and Special Areas of Conservation (SACs), proposed and candidate SPAs and SACs (pSPAs and cSACs). This network also extends to wetland sites of international importance (Ramsar sites). This report supports the Gate 2 submission to the Regulators' Alliance for Progressing Infrastructure Development (RAPID) for the T2AT SRO.

No statutory requirement to undertake an HRA exists for Gate 2, However, in accordance with RAPID Gate 2 guidance[1], an informal HRA has been undertaken. A formal HRA will be undertaken for the consenting process, which will be completed in light of design development and more detailed biological data, which can include data collected on site.

The aim of the T2AT SRO is to transfer available water from Thames Water and conveyance into the Affinity Water network, where it is treated and stored for distribution. Following an initial screening exercise where a long list of potential options for this scheme was reduced to a short-list, eight distinct T2AT options were identified. These options include raw water pipelines, Water Treatment Works (WTW) facilities and drinking water transfer pipelines.

The options for the Thames to Affinity Transfer were subject to a HRA Stage 1 assessment, which was completed by Water Resources South East. Subsequently, a HRA Stage 2 Appropriate Assessment (AA) (plan stage) was undertaken for the purpose of the Gate 1 submission. The Gate 1 HRA Stage 2 AA did not identify any options that, if implemented (alone) for T2AT, would result in any residual effects on European Sites.

Following Gate 1, the short list of possible options was reduced to two preferred options: Lower Thames Reservoir Option and Beckton Reuse Indirect Option.

The Gate 1 HRA Stage 1 Screening undertaken for the Lower Thames Reservoir Option was reviewed in light of design development. Potential LSE were identified for the South West London Waterbodies SPA and Ramsar site. Consequently, only these two sites are subject to a HRA Stage 2 AA.

[1] Regulators' Alliance for Progressing Infrastructure Development (RAPID) Strategic Regional Water Resource Solutions Guidance for Gate Two. Available at: https://www.ofwat.gov.uk/wp-content/uploads/2022/02/Strategic-regional-water-resource-solutions-guidance-for-gate-two_Feb_2022.pdf [last accessed October 2022]

The HRA Stage 2 AA undertaken for the Lower Thames Reservoir Option did not identify adverse effects on the integrity of the South West London Waterbodies SPA and Ramsar.

Following the application of best practice measures, no adverse effects on the integrity of European Sites were identified for the Lower Thames Reservoir Option during construction or operation. It should be noted however that the assessment for the Lower Thames Reservoir Option is based on the conclusion that there would be no change to the current abstraction regime at Wraysbury Reservoir. This assessment must be revised if further investigations lead to a different conclusion in relation to possible impacts to surface water levels and flows at the reservoir, and a formal HRA would need to be completed pursuant to the consenting stage.

As no residual effects are expected from the implementation of this option, an in-combination assessment is not required for the Lower Thames Reservoir Option. As the option progresses, this should be reviewed and if residual effects are identified, the option should go through an in-combination effects assessment as part of a formal HRA to be completed pursuant to the consenting stage.

The Gate 1 HRA Stage 1 Screening undertaken for the Beckton Reuse Indirect Option was reviewed as a result of changes to the option. LSE were concluded from the revised HRA Stage 1 Screening on the Lee Valley Ramsar, Lee Valley SPA and Wormley Hoddesdonpark Woods SAC due to potential hydrological connection and risk of pollution events during construction.

The HRA Stage 2 AA for these sites concluded that with the use of best practice control measures there would be no adverse effects on the integrity of these sites.

This assessment must be revised if further design iterations result in changes to potential impact pathways and potential effects upon European Sites, as part of a formal HRA to be completed pursuant to the consenting stage.

As no residual effects are expected from the implementation of this option, an in-combination assessment is not required for the Beckton Reuse Indirect Option. As the option progresses, this should be reviewed and if residual effects are identified, the option should go through an in-combination effects assessment as part of a formal HRA to be completed pursuant to the consenting stage.

It is recommended that Thames Water and Affinity Water work closely with Natural England and the European Sites owners/managers to agree the specific mitigation measures to be included at the project stage HRA. The agreed mitigation measures would be expected to form part of planning conditions and/or conditions of relevant environmental permits, and

their implementation managed through contractual obligations with supervision from an Environmental Clerk of Works.

This assessment should be reviewed at subsequent project stages as the T2AT options are developed further, as part of a formal HRA to be completed pursuant to the consenting stage.

1. Introduction

1.1 Purpose of this report

1.1. This report is a technical supporting document prepared for the Gate 2 submission to the Regulators' Alliance for Progressing Infrastructure Development (RAPID) for the Thames to Affinity Transfer (T2AT) Strategic Resource Option (SRO).

1.2. This report presents the results of an informal Habitats Regulations Assessment (HRA) undertaken for the T2AT SRO, in order to assess the potential impact of the options on European Sites in the UK's National Site Network, including Special Protection Areas (SPAs) and Special Areas of Conservation (SACs), proposed and candidate SPAs, and SACs (pSPAs and cSACs). This network also extends to wetland sites of international importance (Ramsar sites).

1.3. There is no statutory requirement for a HRA for the T2AT SRO until a planning and/or permit application (or its equivalent, e.g. a Development Consent Order (DCO)) is submitted. However, in accordance with the RAPID Gate 2 guidance[2], this informal HRA has been undertaken following the principles of an HRA, to inform the development of the scheme and identify and reduce risk of non-compliance at a later stage of the SRO. This HRA assessment is therefore intended as a guide in developing the design of the options and their environmental assessments. A formal HRA will be undertaken pursuant to the consenting process, which will be completed in light of design development and more detailed biological data, which can include data collected on site.

1.4. If, following screening, the options are likely to have significant effects on a European Site then an 'appropriate assessment' (AA) must be undertaken to ascertain whether the proposal will adversely affect the integrity of the site. If it is assessed that the project would adversely affect the integrity of the site then consideration must be given to alternative solutions, and if there are no alternative solutions, whether an IROPI case can be made. Consideration is therefore usually given to HRA matters at the options appraisal stage of a project, as well as at the consenting stage. Section 2.2 outlines the options appraisal process for T2AT and describes how HRA matters have been taken into account.

[2] Regulators' Alliance for Progressing Infrastructure Development (RAPID) Strategic Regional Water Resource Solutions Guidance for Gate Two. Available at: https://www.ofwat.gov.uk/wp-content/uploads/2022/02/Strategic-regional-water-resource-solutions-guidance-for-gate-two_Feb_2022.pdf [last accessed October 2022]

1.2 Thames to Affinity Transfer options

1.5. The Options Appraisal Methodology Report (Technical Supporting Document A4) identified two preferred options for transferring water from the Thames Water region to the Affinity Water region:

- Lower Thames Reservoir Option
- Beckton Reuse Indirect Option

1.6. These options include raw water pipelines, Water Treatment Works (WTW) facilities and drinking water pipelines as outlined in Chapter 2, Summary scheme description. Further information on the two preferred options is provided in Chapter 2, Summary scheme description.

1.3 The purpose of Habitats Regulations Assessment

1.7. This informal HRA has been undertaken at Gate 2, in order to inform any likely impediments to the practicality or deliverability of the T2AT SRO. It looks at the options with regard to ensuring that the proposals comply with the requirements of Conservation of Habitats and Species Regulations 2017 (as amended) ('the 2017 Regulations'), by ensuring that the potential effects of the scheme are fully considered at each Gate.

1.8. This document presents the outcomes of the initial Stage 1 and Stage 2 of the HRA.

1.9. At subsequent project stages, further consultation with the relevant competent authority and Statutory Nature Conservation Body (SNCB – Natural England) will be required and this report would form the basis of future iterations of the assessment.

1.10. At the consenting stage, the competent authority[3] will be required to determine whether the scheme will adversely affect the integrity of the European Site(s). The integrity of a European Site is the *'coherence of its ecological structure and function, across its whole area, that enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was designated'* (UK Government, 2019[4]) including functionally linked land which may not form part of the designated site but is relied upon by the qualifying species for foraging.

[3] For a DCO consenting route, this would be the Secretary of State. For a Town and Country Planning consenting route, this would be the relevant Local Planning Authority. For the Lower Thames Reservoir Option, the relevant Local Planning Authorities are Buckinghamshire Council and London Borough of Hillingdon. For the Beckton Reuse Indirect Option, the relevant Local Planning Authorities are Epping Forest District Council, London Borough of Enfield, Broxbourne District Council and Welwyn and Hatfield District Council.
[4] UK Government (2019). Guidance on the use of Habitats Regulations Assessment. Available at: https://www.gov.uk/guidance/appropriate-assessment [last accessed October 2022]

1.4 Assumptions and limitations

1.11. Information provided by third parties, including publicly available information and databases, is considered correct at the time of publication. Due to the dynamic nature of the environment, conditions may change in the period between the preparation of this report, and the undertaking of the proposed works.

1.12. Any uncertainties surrounding, and limitations of, the assessment process are acknowledged and highlighted. Recommendations for avoidance and mitigation measures to address the potential adverse effects on the integrity of the European Sites identified by this report are also based on the information available at the time of the assessment. It is acknowledged that the requirement for mitigation may change as the design of the SRO progresses. This is expected to be through increasing the level of detail available during later stages of option development for subsequent gateways if the relevant options are progressed.

At this stage in the process, the HRA is based on currently available desk-based information and no specific surveys have been undertaken. This is appropriate for the current stage of the process, and the HRA will be updated for the consenting process when further design detail on the options and more detailed biological data, which can include data collected on site, is available.

1.5 Stakeholder engagement

1.13. Regular engagement has been undertaken with the National Appraisal Unit (NAU) (comprising Environment Agency and Natural England) through a series of Technical Liaison Forums during Gate 2. The NAU has had opportunity to comment on development of the design and the outcomes of the environmental appraisals, including the informal HRA.

1.14. Initial engagement has also been undertaken with Local Planning Authorities, as set out in Technical Supporting Document A4, Options Appraisal Methodology Report, with a focus on introducing the options appraisal process, including the selection of two preferred options, and providing an overview of the T2AT Options.

2. Summary scheme description

2.1 Scheme overview

2.1. This section provides an overview of the T2AT Options. Further detail is provided in Technical Supporting Document A1a, Concept Design Report (Lower Thames Reservoir Option) and Technical Supporting Document A1b, Concept Design Report (Beckton Reuse Indirect Option).

2.2. Two alternative capacities have been considered for the T2AT Options which are sized to provide an increase of 50Ml/d and 100Ml/d of average deployable output to Affinity Water respectively.

2.1.1 Lower Thames Reservoir Option

2.3. The source of water for the Lower Thames Reservoir Option is the River Thames. The natural flow in the river would need to be supported, especially during drought years, by the South East Strategic Reservoir Option (SESRO) SRO and possibly the Severn Thames Transfer (STT) SRO. SESRO is a pre-requisite for the Lower Thames Reservoir Option because without SESRO the Lower Thames Reservoir Option would leave Thames Water with a reduced volume of strategic storage.

2.4. Raw water for the Lower Thames Reservoir Option would be abstracted using the existing Thames water intake to the Queen Mother and Wraysbury bankside storage reservoirs. These are part of the Lower Thames Reservoir system, hence the name of this option.

2.5. There is an existing tunnel which allows the aforementioned reservoirs to provide an alternative source of water to Affinity Water's existing Iver WTW in abnormal circumstances. Under the Lower Thames Reservoir Option, it is proposed that a new connection is made into this tunnel, with a raw water pumping station in an adjacent shaft within the boundary of the existing Iver WTW site.

2.6. The raw water would be conveyed in a new buried transfer main to a new WTW. An indicative route corridor has been identified through an options refinement process (see Section 2.2).

2.7. Drinking water produced by the new WTW would pass through a storage tank before entering a high-lift pumping station from where it would be conveyed via a buried drinking water transfer main to an existing service reservoir in the vicinity of Harefield.

2.8. The drinking water transfer main would be routed to the side of the Colne Valley, crossing it in the vicinity of the A40 corridor. There are several major crossings along the route including the A40 dual carriageway, the HS2 railway, the Chiltern line railway and the Grand Union Canal and other major watercourses that follow the Colne Valley. An indicative route corridor has been identified through an options refinement process (see Section 2.2).

2.9. The delivery point for the Lower Thames Reservoir Option is an existing service reservoir in the vicinity of Harefield, which is a distribution hub within the Affinity Water network. The Lower Thames Reservoir Option would make use of existing, unused service reservoir capacity to provide the necessary strategic storage. Modifications to the network downstream from the service reservoir to distribute the increased inflow are currently being determined by Affinity Water and would form part of their wider water resources planning and investment programme.

2.10. The key components of the Lower Thames Reservoir Option are summarised below.

- A connection into the existing Wraysbury tunnel at the existing Iver WTW, and raw water pumping station (within this report referred to as the 'Wraysbury Tunnel Connection').
- A raw water transfer pipeline from the existing Iver WTW to a new WTW (within this report referred to as the 'LTR Raw Water Transfer Main'). The indicative route corridor identified for the LTR Raw Water Transfer Main is referred to as the 'LTR Raw Water Transfer Main Route Corridor'.
- A new WTW (within this report referred to as the 'new LTR WTW') to the north of the existing Iver WTW (within this report referred to as the 'LTR Indicative WTW Site').
- A drinking water transfer pipeline from the new LTR WTW to an existing service reservoir in the vicinity of Harefield (within this report referred to as 'LTR Drinking Water Transfer Main'). The indicative route corridor identified for the LTR Drinking Water Transfer Main is referred to as the 'LTR Drinking Water Transfer Main Route Corridor'.
- A connection into an existing service reservoir in the vicinity of Harefield (within this report referred to as the 'Harefield Service Reservoir Connection').

2.1.2 Beckton Reuse Indirect Option

2.11. Raw water for the Beckton Reuse Indirect Option would be abstracted from the River Lee flood relief channel. As the natural flow in the river is insufficient, the operation of the scheme would be dependent on recycled water being fed into the river from the Beckton Water Recycling option of the London Effluent Reuse SRO. Implementation of this option is therefore a pre-requisite for the Beckton Reuse Indirect Option, hence the name of this T2AT Option.

2.12. The Beckton Water Recycling option of the London Effluent Reuse SRO entails the construction of an advanced water recycling plant at Thames Water's Beckton Sewage Treatment Plant. The recycled water would be conveyed to the existing Lockwood Shaft which currently receives flow from the Thames Lee tunnel. Water from the Lockwood shaft would be pumped into the River Lee at a point upstream of the abstraction point for the Beckton Reuse Indirect Option.

2.13. At the River Lee flood relief channel intake, the concept design proposes a passive wedge wire screen located in the riverbed. The necessary equipment for backflushing or 'airburst' would be housed away from the riverbank to ensure that there is a minimum of visible intrusion at the intake site. However, it is anticipated that at the minimum an access track and kiosk would be required on the riverbank. The passive screens and connecting pipework would be configured such that half of the screens can be taken out of service for maintenance when required.

2.14. Water would flow by gravity within buried pipes to a new raw water pumping station set back from the riverbank.

2.15. The raw water would be conveyed in a new buried transfer main to a new WTW. Drinking water produced by the WTW would pass through a storage tank before entering a high-lift pumping station from where it would be conveyed via a buried drinking water transfer main to an existing service reservoir in the vicinity of Brookmans Park.

2.16. A proportion of the water would then be able to flow under gravity to the existing booster pumping station in the vicinity of North Mymms.

2.17. There are several major crossings along the route of the drinking water pipelines including the M25 motorway, four railway lines and three major watercourses within the Lee Valley.

2.18. The main delivery point for the Beckton Reuse Indirect Option is an existing service reservoir in the vicinity of Brookmans Park, which is a distribution hub within the Affinity Water network. Modifications to the network downstream from the reservoir, which would be required to distribute the additional water to customers, are currently being determined by Affinity Water and form part of their wider water resources planning and investment programme.

2.19. The key components of the Beckton Reuse Indirect (BRI) Option are summarised below.

- An intake and raw water pumping station (within this report referred to as 'River Lee Intake' and 'Raw Water Pumping Station'). The indicative location identified for the River Lee Intake is referred to as 'Indicative Intake Location' and the indicative site identified for the Raw Water Pumping Station is referred to as the 'Indicative Raw Water Pumping Station Site.'
- A raw water transfer pipeline to a new WTW (within this report referred to as the 'BRI Raw Water Transfer Main'). The indicative route corridor identified for the

BRI Raw Water Transfer Main is referred to as the 'BRI Raw Water Transfer Main Route Corridor'.

- A new WTW (within this report referred to as the 'new BRI WTW') to the north of the River Lee Intake (within this report referred to as the 'Indicative BRI WTW Site').
- A drinking water transfer pipeline from the new WTW to an existing service reservoir in the vicinity of Brookmans Park (within this report referred to as the 'BRI Drinking Water Transfer Main'). The indicative route corridor identified for the BRI Drinking Water Transfer Main is referred to as the 'BRI Drinking Water Transfer Main Route Corridor'.
- A connection to an existing reservoir within the vicinity of Brookmans Park (within this report referred to as the 'Brookmans Park Service Reservoir Connection').
- A drinking water transfer pipeline from the Brookmans Park Service Reservoir Connection to a booster pumping station in the vicinity of North Mymms (within this report referred to as the 'Drinking Water Transfer Main to North Mymms'). The indicative route corridor identified for the Drinking Water Transfer Main to North Mymms is referred to as the 'Drinking Water Transfer Main to North Mymms Route Corridor').
- A connection to an existing booster pumping station in the vicinity of North Mymms (within this report referred to as the 'North Mymms Booster Station Connection').

2.2 Alternatives considered

2.20. Technical Supporting Document A4, Options Appraisal Methodology Report provides a description of the options identification, appraisal and screening process that has been undertaken to identify the preferred options for the T2AT SRO.

2.21. An unconstrainted list of 33 options was compiled in consultation with Affinity Water and Thames Water and screened against a set of initial screening criteria, which included consideration of impacts on statutory designated sites. Options which passed the initial screening stage were then screened against secondary screening criteria, which included consideration of impact on European Sites.

2.22. Eight options remaining after screening:

- Maidenhead: abstraction of raw water at a new Maidenhead intake, conveyance to a new WTW at an existing service reservoir in the vicinity of Harefield, and utilisation of available storage capacity at the existing service reservoir.
- Sunnymeads 1: abstraction of raw water at the existing Affinity Water Sunnymeads intake, conveyance to a new WTW at an existing service reservoir

in the vicinity of Harefield, and utilisation of the available storage capacity at the existing service reservoir.

- Teddington Direct River Abstraction (DRA): Abstraction of raw water at a new intake at Teddington, upstream of Teddington weir and upstream of the proposed London Effluent Reuse SRO Teddington DRA option outfall (treated effluent from Mogden Sewage Treatment Works (STW)); conveyance to a new WTW in the vicinity of Harefield; and utilisation of the available storage capacity at an existing service reservoir in the vicinity of Harefield.
- Sunnymeads 2a: abstraction of raw water at the existing Affinity Water Sunnymeads intake and conveyance to a new WTW at Iver (Iver 2), near to the existing Iver WTW. The drinking water is then conveyed to an existing service reservoir in the vicinity of Harefield to utilise the available storage capacity at the existing service reservoir.
- Walton 2b: abstraction of raw water via an extension to the existing Affinity Water Walton intake and conveyance to the proposed Iver 2 WTW. The drinking water is then conveyed to an existing service reservoir in the vicinity of Harefield to utilise the available storage capacity at the existing service reservoir.
- Mogden Reuse Indirect 3: this option comprises the same infrastructure as Walton 2b but utilises water from the proposed London Effluent Reuse SRO Mogden effluent reuse option. For the Mogden Reuse Indirect 3 option in T2AT, an extension of the London Effluent Reuse SRO Mogden effluent reuse option outfall pipeline is required from the reach containing the Thames Water Walton intake, to the reach containing the Affinity Water Walton intake i.e. to a point upstream of Sunbury weirs.
- Lower Thames Reservoir 2a: Water from Thames Water's Wraysbury and Queen Mother reservoirs is abstracted via a proposed connection into Affinity Water's existing Wraysbury (100" inch) tunnel at the existing Iver WTW site. This raw water is then diverted to the proposed Iver 2 WTW. The drinking water is subsequently conveyed to an existing service reservoir in the vicinity of Harefield to utilise the available storage capacity at the existing service reservoir.
- Beckton Reuse Indirect: Indirect transfer of recycled water from Beckton STW to a new WTW and new service reservoir near North Mymms. The proposed abstraction point would be located on the River Lee, downstream of the outfall from the proposed Beckton Water Recycling option (including extension from Lockwood shaft), within the London Effluent Reuse SRO. Another potential source for this option is water abstracted as part of the London Effluent Reuse SRO Teddington DRA option, which abstracts river water upstream of the recycled water discharge from Mogden STW and utilises the existing Thames-Lee Tunnel (with an extension), which would discharge in a similar location to the proposed Beckton Water Recycling option (London Effluent Reuse SRO). N.B. In the period since option selection, modelling by both WRSE and Affinity Water has identified a constraint in the distribution network between the proposed import point at North Mymms and a service reservoir in the vicinity of Brookmans Park in WRZ3. This option has therefore been extended to include a drinking water

conveyance component from North Mymms to Brookmans Park. Furthermore, since Gate 1, the Beckton Reuse Indirect Option has been extended to feed an existing service reservoir in the vicinity of Brookmans Park due to the limited existing transfer capacity from North Mymms to Brookmans Park.

2.23. The eight options were assessed by WRSE in January 2021, in-line with the methodology in the WRSE guidance[5]. This included HRA Stage 1: Test of Likely Significance (Screening Assessment)

2.24. Environmental assessments carried out prior to the Gate 1 submission, which followed further refinement of infrastructure siting and pipeline route optimisation included an updated HRA Stage 1 Screening and HRA Stage 2 AA, if required, in accordance with the WRSE guidance.

2.25. Technical Supporting Document A4, Options Appraisal Methodology Report provides a comparison of the eight options taken forward against the following themes: technical challenge, carbon footprint, environment and community, and planning complexity.

2.26. Maidenhead, Teddington DRA and Walton 2b / Mogden Reuse Indirect 3 did not perform as well under the environment and community theme due to WFD risks and in the case of Teddington DRA and Walton 2b / Mogden Reuse Indirect 3, higher loss of ecosystem services and biodiversity than other options, potentially due to the length of pipeline, which was longer than other options, also resulting in higher carbon emissions. Maidenhead also performed poorly due to proximity of the Chilterns AONB to construction work and the pipeline intersecting with two historic parks and gardens.

2.27. The Lower Thames Reservoir Option compared well under all the themes considered within the options appraisal, including environment and community, and hence would be a favourable option for development to Gate 2. The Beckton Reuse Indirect Option also compared well to the other transfer options, and in particular the other two options which rely on reuse water. This is the most favourable reuse option for development to Gate 2 and is the only T2AT option which feeds directly into the eastern side of Affinity Water's supply area.

2.28. Which, if any, of the T2AT options are carried past Gate 2 will be determined by the further outputs of the WRSE regional modelling, the best value plan which it informs, and the outcomes of the resultant public consultation processes on the emerging and draft plans. The process will consider and compare the merits of whole solutions, of which the transfer scheme would be just one component in a system which ensures continuity of supply to customers. Of particular relevance is the choice of option (or other SRO) to provide the source of new raw water for the T2AT scheme, whether linked to additional effluent reuse, new raw water storage or an inter-regional transfer. The optimisation of the whole system relies on the WRSE best

[5] Mott MacDonald (2020) Water Resources South East (WRSE) Regional Plan Environmental Assessment Methodology Guidance. Available at: https://www.wrse.org.uk/media/lb0g0tsr/wrse_file_1347_wrse-regional-plan-environmental-assessment-methodology-guidance.pdf [last accessed October 2022]

value planning and modelling process, but the choice will also be informed by the relative merits of the different options. The model also considers consequential benefits such as reductions in groundwater abstraction and additional water discharges into the environment. The assessments of the T2AT options are therefore to be considered within the larger context of the overall solutions which constitute the best value plan.

2.29. The preferred options for the T2AT SRO are the Lower Thames Reservoir Option and the Beckton Reuse Indirect Option (hereafter referred to as the 'T2AT SRO Options').

2.30. Technical Supporting Document A5, Options Refinement Report provides a description of how the preferred options for the T2AT SRO have been developed since Gate 1, including the options appraisal process that has been undertaken to select indicative route corridors and sites for above ground infrastructure. The environmental criteria considered European Sites.

2.31. This HRA presents the assessment of the indicative route corridors and indicative sites for above ground infrastructure for the purpose of the Gate 2 submission. Those alternatives discounted through the options appraisal process are not considered within this HRA; Technical Supporting Document A5, Options Refinement Report should be referred to for further information on these alternatives and the reasons for discounting them at this stage. It should be noted that the indicative route corridors and sites for above ground infrastructure, along with the alternatives considered, would be subject to stakeholder engagement and a public consultation exercise.

2.3 Key assumptions

2.32. The following key assumptions have been used within the assessment. In accordance with the Sweetman ruling, April 2018[6], mitigation measures are considered at the AA stage only.

2.3.1 Assumptions common to both options

2.33. As stated in Section 2.2, Paragraph 2.31, the HRA is based upon the indicative transfer main route corridors, as shown in Figure 2.1: Lower Thames Reservoir Option – key components and Figure 2.2: Beckton Reuse Indirect Option – key components. These corridors are up to 500m wide in unconstrained locations and it has been assumed for the purpose of the HRA that pipeline construction works could

[6] Sweetman et al v An Bord Pleanala, European Court of Justice, Case C-258/11 'Sweetman 2011'. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:62011CJ0258 [last accessed October 2022]

be undertaken anywhere within the indicative route corridors.

2.34. At this stage, it is assumed that construction would require a maximum 50m working width in unconstrained locations along the transfer main pipeline routes and topsoil would be stripped to accommodate for excavations, site haul roads and other construction features.

2.35. It is assumed that temporary construction compounds would be required approximately every 2km within the indicative route corridors.

2.36. As stated in Section 2.2, Paragraph 2.31, indicative sites for above ground infrastructure have been identified following an options appraisal process. The HRA is based upon these indicative locations.

2.37. The following assumptions have been made in relation to construction methodology:

- Below ground structures would be constructed such that they would not form a preferential pathway for pollution to groundwater or cause alterations in groundwater flow or levels.
- Risk assessments would be undertaken for excavation works and dewatering to ensure no adverse impact on watercourses, wetland habitats or abstractions. Dewatering discharge would be treated before discharge.
- Water extracted from the ground during construction would be treated to a standard agreed with the regulatory authority before discharging at less than the agreed maximum rate to the water environment.
- Any discharge from the new WTW would be to the Water Framework Directive (WFD) waterbody which the new WTW is situated in and would be treated to a standard agreed with the regulatory authority at less than the agreed maximum rate, so as to not cause any potential impacts to water quality of the receiving water body.
- Any discharge from commissioning lagoons would be treated to a standard agreed with the regulatory authority at less than the agreed maximum rate so as to not cause any potential impacts to water quality of the receiving water body.
- Watercourse crossings including main rivers would occur via micro-tunnel. Where watercourses would not be micro-tunnelled, it is assumed they would be flumed during construction. This would be a short-term construction activity (i.e. less than seven days), which would ensure the watercourse is returned to its natural function following installation of the pile section.

2.38. It is assumed that a Construction Environmental Management Plan (CEMP) would be developed at an appropriate stage to ensure that environmental risks such as uncontrolled discharges from construction are minimised and that Emergency Response Plans are in place in the event of an incident. Good practice pollution prevention would be followed for all construction works with reference to:

- CIRIA C741 Environmental Good Practice on Site Guide (Charles and Edwards, 2015)[7].
- CIRIA C532 Control of water pollution from construction sites (Masters-Williams *et al.* 2001)[8].
- Environment Agency's Pollution Prevention Guidance Notes[9] including PPG1: General Guide to Prevention of Pollution (July 2013); PPG5: Works and maintenance in or near water (October 2007), PPG6: Pollution prevention guidance for working at construction and demolition sites (April 2010); PPG21: Pollution incident response planning (March 2009); PPG22: Dealing with spillages on highways (April 2011).

2.39. Thames Water and Affinity Water have Environmental Management Systems (EMS) in place for their assets. The EMS aims to identify and implement the necessary actions to avoid adverse effects to the environment during the operational phase. For example, the EMS would include standard measures relating to pollution control and control of disturbance from light or noise. As such, it is expected that these would be updated to incorporate the requirements of new assets commissioned as part of the Lower Thames Reservoir Option, and it is assumed that the appropriate EMS would be followed in order to avoid adverse effects to the environment.

2.3.2 Assumptions specific to the Lower Thames Reservoir Option

2.40. Abstraction from the Queen Mother Reservoir and Wraysbury Reservoirs would be in line with licence agreements from the Environment Agency, which are dependent on the additional volumes being provided by the STT and SESRO Schemes.

2.41. A construction period of 2035 – 2039 has been assumed based the Water Resources South East (WRSE) emerging draft plan that was issued for consultation in January 2022[10]. The Lower Thames Reservoir Option is anticipated to be operational from 2039.

2.42. The pipe network would not be buried any deeper than 8m below existing ground level. The exceptions to this are transitions into micro-tunnelled crossings and the shaft required for Wraysbury Tunnel Connection, which is expected to be approximately 14 m below existing ground level. Water extracted from the ground during construction would be discharged to Iver WTW and treated before

[7] Charles P. and Edwards P (2015) *Environmental good practice on site guide.* CIRIA C741, 260p.
[8] Masters-Williams H., Heap A., Kitts H. *et al.* (2001) *Control of water pollution from construction sites*. CIRIA C532, 27p.
[9] Note, the Environment Agency Pollution Prevention Guidance Notes have been withdrawn by the Government, although the principles within them are robust and still form a reasonable basis for pollution prevention measures.
[10] Water Resources South East (2022) Our Regional Plan. Available at: https://wrse.uk.engagementhq.com/our-regional-plan [last accessed October 2022]

discharging to the water environment.

2.3.3 Assumptions specific to the Beckton Reuse Indirect Option

2.43. Abstraction from the River Lee would be in line with licence agreements from the Environment Agency, which are dependent on the additional volumes being provided by the London Effluent Reuse SRO Scheme.

2.44. A construction period of 2030 – 2034 has been assumed based the WRSE emerging draft plan that was issued for consultation in January 2022[10]. The Beckton Reuse Indirect Option is anticipated to be operational from 2034.

2.45. The pipe network would not be buried any deeper than 8m below existing ground level. The exceptions to this are transitions into micro-tunnelled crossings, the gravity pipe from the River Lee Intake to the BRI Raw Water Pumping Station and the BRI Raw Water Pumping Station, which is expected to be approximately 10 m below existing ground level.

3. HRA process for Gate 2 submission

3.1 HRA process

3.1. There is a requirement under the 2017 Regulations to determine if a plan or project may have an adverse effect on the integrity of a site designated under the same (or preceding Regulations) prior to any consent or permission being determined. The process of undertaking this assessment is known as HRA. The Conservation of Habitats and Species Regulations 2017 (as amended) ('the Habitats Regulations') transpose the Habitats Directive and Wild Birds Directives into English and Welsh law. Regulations 63(1)-(9), 64 and 68 of the Habitats Regulations set out the requirements for assessment of impacts on National Network Sites.

3.2. The 2017 Regulations include measures to establish and maintain a network of sites, protecting habitats which in themselves are valuable as well as for the species they support. These sites form a network that across Europe is known as Natura 2000, and domestically now known as the National Site Network. Within the UK, this network consists of SPAs and SACs, proposed and candidate SPAs and SACs (pSPAs and cSACs). This network also extends to marine environments, with Ramsar sites also treated equally within this assessment framework. These sites are collectively referred to in this report as 'European Sites'.

3.3. The Regulations are set out in Parts, with Part 2 including provisions for the selection and designation of sites, and Part 6 providing provisions to ensure that assessment of plans and projects are fully considered before being granted consent or permission. The Regulations also define the nature of and roles of statutory bodies, competent authorities and the appropriate nature conservation body, and the requirements for information to be submitted to these bodies to enable them to undertake the required assessments.

3.4. Although the 2017 Regulations have been amended by The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019, due to the UK's withdrawal from the EU. The effect of these amendments is largely related to wording and requirements and processes remain the same, as protection levels remain unchanged. As such existing EU guidance[11] and preceding case law from the

[11] Managing Natura 2000 Sites - The provisions of Article 6 of the 'Habitats' Directive 92/43/CEE (European Communities 2020). Available at: https://ec.europa.eu/environment/nature/natura2000/management/docs/art6/EN_art_6_guide_jun_2019.pdf [last accessed October 2022]

European Court of Justice (ECJ)[12,13,14] remains valid as a source of direction and interpretation of the requirements of the legislation, although it should be noted that much case law has now been incorporated into guidance and/or best practice.

3.5. The HRA process consists of four stages, each stage being informed by the one preceding, to ensure an iterative and objective assessment. If the conclusion of Stage HRA 1 Screening is that there will be no Likely Significant Effects (LSE) on any qualifying features of a European Site, there is no requirement to undertake further stages. Similarly, if the HRA Stage 2 AA concludes there will be no adverse effect on integrity of the European Site, then the assessment is concluded. The HRA stages are summarised within Table 3.1.

Table 3.1: HRA stages

Stage	Description
Screening (Stage One)	This is the process which identifies the potential effects upon the European Sites and considers if these are likely to be significant (see definitions below). Screening is an iterative process and before moving to Stage Two it can be repeated if required. Proposals to mitigate any likely significant effects cannot be considered at the screening stage. If the Screening (Stage 1) identifies that the project or plan, alone or in combination, may have likely significant effects on a European Site and/or its features of interest, or if there is uncertainty, the competent authority must undertake an AA (Stage 2) of the implications for that site in view of that site's conservation objectives.

[12] Landelijke Vereniging tot Behoud van de Waddenzeecase/ Nederlandse Vereniging tot Bescherming van Vogels, European Court of Justice, Case C-127/02 'Waddenzee 2002'. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?isOldUri=true&uri=CELEX:62002CJ0127 [last accessed October 2022]

[13] Sweetman et al v An Bord Pleanala, European Court of Justice, Case C-258/11 'Sweetman 2011'. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:62011CJ0258 [last accessed October 2022]

[14] People over Wind/Sweetman v Coiltte Teorante, European Court of Justice Case C-323/17 'People over Wind 2017'. Available at: https://www.algoodbody.com/insights-publications/people-over-wind-and-peter-sweetman-v-coillte [last accessed October 2022]

Stage	Description
Appropriate Assessment (Stage Two)	This stage involves the consideration of the predicted adverse effects of the project or plan either alone, or in combination with other projects or plans, on the integrity of the European Site with respect to the site's structure, function and conservation objective. Additionally, where mitigation has been proposed to avoid or minimise likely significant effects, this stage includes assessment of the likely effectiveness of any mitigation applied. A key outcome of the AA is to identify whether the integrity of the European Site(s) is likely to be adversely affected by the plan/project.
Assessment of Alternative Solutions (Stage Three)	If the mitigation measures applied and assessed during AA cannot avoid adverse effects on the integrity of a European Site, this stage examines alternative ways of achieving the objectives of the project or plan that avoid adverse impacts on the integrity of the European Site.
Assessment where no alternative solutions exist and where adverse impacts remain (Stage Four)	If no suitable alternative solutions are available, an assessment of compensatory measures where, in the light of an assessment of Imperative Reasons of Overriding Public Interest ("IROPI"), it is considered that the project or plan should proceed. In making this assessment, it is important to recognise that it will be appropriate to the likely scale, importance and impact of the proposed project. If it is impossible to avoid or mitigate the adverse impact, it must be demonstrated that there is IROPI.

Source: Mott MacDonald, 2022

3.6. This assessment has been undertaken in an iterative and objective manner following the above stages, with reference to best practice guidance and relevant case law, notably that provided by the Waddenzee case (ECJ, 2002) and Sweetman (ECJ, 2011) to inform the interpretation and therefore correct application of the terms 'likelihood, 'significance' and 'in combination'.

3.2 HRA stage 1: screening

3.2.1 HRA stage 1: screening principles

3.7. In undertaking this HRA, a number of steps were undertaken to identify the relevant information to inform the assessment. Information gathered to inform the screening included the identification of the following.

- Any SPA/SAC/pSPA/cSAC/Ramsar sites ('European Sites'), including any marine or marine elements of these sites within the potential Zone of Influence (ZoI), and any known areas of land outside the site boundary itself, which plays an important role in supporting the site and its features of interest (functionally linked land).
- Potential effects resulting from the plan or project.
- The ZoI of these effects, noting this may extend some distance from the site itself; it is not confined to activities on or adjacent to the site.
- Any viable pathways for the project (or plan) to the receptor (European Site itself or functionally linked land).
- The features of interest of the European Site(s) in question.
- The conservation objectives of the European Site, including any site sensitivities given within any supplementary advice, site improvement plan, or equivalent document published by the relevant nature conservation body.

3.8. The above information was reviewed in respect of each feature of interest and potential development effect / impact pathway to inform an assessment of any LSE. Key aspects and terms used in this assessment are defined below.

- Likelihood: Where an effect was considered to be potentially significant, then the assessment of its occurrence was based on the likelihood of it occurring and not certainty that it would occur. Effects are scoped in unless there was evidence to the contrary demonstrating that they would not occur, e.g. there being no valid pathway, or the absence of the species in that area, at that time.
- Significance: The significance of any effect is considered objectively, against the scale and nature of the impact in relation to those of that particular feature or condition, and in relation to the extent of that feature or condition over the entire designated site. A significant effect within this assessment is one which, if it occurred, would lead to a decline in the quality or status of the habitats or distribution, abundance, etc. of feature(s) of interest.
- In combination: The assessment of in-combination effects considers those projects or plans which are:
  - Currently in operation.

- Actually proposed – defined by being a valid live planning application, or any referenced with a local plan where there is a strong likelihood of them being undertaken within a reasonable time period, specified within that plan.

3.9. In line with relevant case law, this assessment is undertaken in the absence of mitigation (including measures embedded into the scheme where these are intended for the avoidance of effects).

3.10. Where LSE were identified, the assessment has taken these effects through to HRA Stage 2 AA.

3.3 HRA Stage 2: Appropriate Assessment approach and methodology

3.3.1 Approach to the Appropriate Assessment

3.11. Where a plan or project is likely to give rise to LSE upon a European Site(s), an assessment must be made of the implications on the integrity of that site in view of that site's structure, function and conservation objectives and taking into account any site-specific supplementary advice or site improvement plan.

3.12. Where mitigation measures are to be applied to eliminate or reduce any effects identified in screening, these may be considered within the HRA Stage 2 AA.

3.13. Potential impacts may be direct or indirect and are dependent on the relationship between the source (proposed options' actions) and the receptor (the qualifying features of the European Sites). The significance of an impact is relative to the sensitivity, existing condition and conservation status of the qualifying features of the site and the scale of the impact in space and time.

3.14. Potential effects on the qualifying features of the European Sites are evaluated with respect to the scale, extent and nature of the impact, e.g. the area of habitat affected, changes in hydrodynamics, potential changes in species distribution, and the duration of the impact. Given the high-level nature of the assessment at this plan stage it is not always possible to determine the exact scale and extent of the impact, when this is the case a precautionary approach is taken when evaluating the significance of the impact.

3.3.2 HRA methodology

3.15. This HRA Stage 2 AA has been undertaken using the following approach.

- Review the European Sites identified at HRA Stage 1 Screening.
- HRA Stage 2 AA of the potential effects of the construction and operational phases of the SRO, including an assessment of each potential effect on the integrity of the European Sites' characteristics and conservation objectives[15].

3.16. This assessment has been undertaken in accordance with the following guidance:

- GOV.UK (2019) Appropriate Assessment – Guidance on the use of Habitats Regulations Assessment. Published 22 July 2019[16]
- UK Water Industry Research (UKWIR, 2021). Strategic Environmental Assessment and Habitats Regulations Assessment – Guidance for Water Resources Management Plans and Drought Plans (21/WR/02/15)[17]
- European Commission (EU, 2018) Managing Natura 2000 sites – The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC
- Planning Inspectorate Advice Note Ten Habitats Regulations Assessment relevant to nationally significant infrastructure projects[18]

3.3.3 Consultation

3.17. It is a statutory requirement of the HRA process that the competent authority must consult Natural England at the AA stage[4]. Natural England has been engaged in the consultation phase during Gate 1 and Gate 2 for the SRO and Natural England are expected to review Gate 2 submissions to RAPID.

[15] This is the Appropriate Assessment provided in Section 4.
[16] UK Government (2019). Guidance on the use of Habitats Regulations Assessment [online]. Available at: https://www.gov.uk/guidance/appropriate-assessment [last accessed October 2022]
[17] UKWIR (2021). Environmental Assessment Guidance for Water Resources Management Plans and Drought Plans (21/WR/02/15), 287p. Available at:
[18] https://infrastructure.planninginspectorate.gov.uk/legislation-and-advice/advice-notes/advice-note-ten/ [last accessed October 2022]

3.3.4 Potential impacts considered as part of the HRA

3.18. Following UKWIR (2021) guidance[17] and given the nature of the SRO, the potential impacts considered in this assessment are summarised in Table 3.2. Proposed distances are also provided following the same guidance to ascertain if, where a pathway has been identified, the impact is likely to affect the habitats or species for which the European Site has been qualified. It should be noted that, in some cases, it was appropriate to use a larger Zone of Influence (ZoI) than defined in Table 3.2, e.g. where a new pipeline crosses a watercourse that runs into a European Site, and where changes in water quality and quantity could affect habitats that are hydrologically connected.

Table 3.2: Potential effects and proposed Zone of Influence

Broad categories of potential impacts on European Sites (with examples)	Examples of activities resulting in impacts and proposed ZoI
Physical loss Destruction (including offsite effects) e.g. removal of foraging habitat, smothering	Development of built infrastructure associated with the pipelines, access routes. Indirect effects from a reduction in flows, e.g. drying out marginal habitat. Physical loss is only likely to be significant where the boundary of the scheme extends within the boundary of the European Site, or within an offsite area of known foraging, roosting, breeding habitat (that supports species for which a European Site is designated) or where natural processes link the scheme to the site, such as through hydrological connectivity downstream, or the scheme impacts the linking habitat).
Physical damage Habitat degradation Erosion Trampling Fragmentation Severance/barrier effects Edge effects	Development of built infrastructure associated with the scheme, e.g. water treatment works, pipelines, pumping stations, access routes. Physical loss is only likely to be significant where the boundary of the scheme extends within the boundary of the European Site, or within/adjacent to an offsite area of known foraging, roosting, breeding habitat (that supports species for which a European Site is designated) or where natural processes link the scheme to the site, such as through hydrological connectivity downstream, or the scheme impacts the linking habitat).

Broad categories of potential impacts on European Sites (with examples)	Examples of activities resulting in impacts and proposed ZoI
Non-physical disturbance Noise Visual presence Light pollution Vibration	Noise from temporary construction or temporary pumping activities. Taking into consideration the noise level generated from general building activity (c. 122dB(A)), and considering the lowest noise level identified in guidance as likely to cause disturbance to waterbird species (although this guidance is designed primarily for estuarine birds it was considered appropriate to use for this plan), it is concluded that noise effects could be significant up to 1km from the boundary of the European Site. Noise from vehicular traffic during construction Noise from construction traffic is only likely to be significant where the transport route to and from the scheme is within 3-5Km of the boundary of the European Site. Plant and personnel involved in operation of the scheme These effects (noise, visual/human presence) are only likely to be significant where the boundary of the scheme extends within or is adjacent to an offsite area of known foraging, roosting, breeding habitat that support species for which a European Site is designated. Options that might include artificial lighting, e.g. for security around a temporary pumping station Effects from light pollution are more likely to be significant where the boundary of the scheme is within 500m of the boundary of the European Site.
Water table/ availability Drying Flooding/storm water Changes to surface water levels and flows Changes to groundwater level and flows	Change to water levels and flows due to water abstraction, storage and drainage interception. These effects are only likely to be significant where the boundary of the option extends within the same ground or surface water catchment as the European Site. However, these effects are dependent on hydrological continuity between the option and the European Site and sometimes whether the scheme is up or downstream from the European Site.

Broad categories of potential impacts on European Sites (with examples)	Examples of activities resulting in impacts and proposed ZoI
Toxic contamination Water pollution Soil contamination Air pollution	Reduced dilution in downstream or receiving waterbodies due to changes in abstraction or reduced compensation flow releases to river systems. These effects are only likely to be significant where the boundary of the scheme extends within the same ground or surface water catchment as the European Site. However, these effects are dependent on hydrological continuity between the scheme and the European Site, and sometimes whether the scheme is up or down stream from the European Site. Air emissions associated with vehicular traffic during construction and operation of the scheme The effect of dust is only likely to be significant where site is within or in close proximity to the boundary of the European Site. Without mitigation, dust onto the public road network and then deposited/ spread by vehicles on roads up to 500m from large sites, 200m from medium sites, and 50m from small sites as measured from the site exit. Effects of road traffic emissions from the transport route to be taken by the scheme traffic are only likely to be significant where the protected site falls within 200m[19,20] of the edge of a road affected.
Biological disturbances Direct mortality Changes to habitat availability Out-competition by non-native species Introduction of disease Introduction of invasive species	Killing or injury due to construction activity Likely to be a risk where the boundary of the scheme extends within or is directly adjacent to the boundary of the European Site, or within/adjacent to an offsite area of known foraging, roosting, breeding habitat (that supports species for which a European Site is designated). Creation of new pathway for spread of non-native invasive species This effect is only likely to be significant where the scheme is situated within the European Site or an upstream tributary of the European Site, but also for inter-catchment water transfers.

Source: Adapted from: UK Water Industry Research (2021)[21].

[19] Institute of Air Quality Management (IAQM), 2020, A Guide to the assessment of air quality impacts on designated nature conservation sites. V1.1.
[20] Natural England's approach to advising competent authorities on the assessment of road traffic emissions under the Habitats Regulations - NEA001. Available at: http://publications.naturalengland.org.uk/publication/4720542048845824 [last accessed October 2022]
[21] UK WIR (2021). *Environmental Assessment* Guidance for Water Resources Management Plans and Drought Plans (21/WR/02/15).

3.3.5 Standard best practice mitigation measures

3.19. The following standard best practice mitigation measures have been considered at the AA stage.

3.3.5.1 Best practice during construction

3.20. The assumptions made on the mitigation good practice measures for the scheme design, pollution control, biosecurity and disturbance are outlined below. As set out in Section 2.3.1, these are expected to be contained within a CEMP. This plan must be prepared for all works and include measures listed below and any additional ones identified during the project HRA.

Scheme design

3.21. Should the design be altered, every opportunity for avoiding potential effects on European Sites and flight paths of European Sites interest features (e.g. through alternative pipeline routes, micro siting, etc.) should be taken.

3.22. Construction of new pipelines at watercourse crossings, where the watercourse is in hydrological continuity with a European Site would be carried out using trenchless techniques such as micro-tunnelling to avoid direct impacts on riverbed and permanent habitat loss.

3.23. Pipeline routes would be sufficiently distant to watercourses and designated sites boundaries to offer a buffer limiting pathways through disturbance and pollution runoff.

Pollution control

3.24. Indirect construction-related pollution is identified as one key pathway through which designated sites may be affected. There is numerous guidance on environment good practice measures during construction which can be relied on (at this level) to prevent significant adverse effects on a designated site occurring including good-practice procedures detailed in the documents set out in Section 2.3.1, Paragraph 2.38 should be followed for all construction works as a minimum standard.

3.25. The installation of sediment traps near or in watercourses, or the use of cofferdams, should be specified at the project stage.

Biosecurity

3.26. Biosecurity measures would be in place to ensure the management of invasive non-native species (INNS) on construction sites and during controlled activities. The following considerations would be given pre-construction.

- INNS risk assessment undertaken at Gate 2, to be reviewed as the design develops to account for any changes that may introduce INNS risk.
- Where INNS are identified, legal requirements and a mitigation plan would be developed at an early planning stage.
- INNS to be included on all site method statements including the CEMP (to be developed at the appropriate stage in the development of the T2AT options) and any Ecological Protection Plans. INNS risk to be managed by a Clerk of Works and an INNS brief given to all site contractors.
- Where a species requires long-term management (such as Japanese knotweed, *Fallopia japonica*), a specific INNS management plan would be developed.

3.27. The best-practice procedures detailed in the following documents should be followed to reduce the spread of INNS for all construction works derived from these options, as a minimum standard:

- CIRIA Manual C679 'Invasive species management for infrastructure managers and the construction industry'[22].
- 'The Knotweed Code of Practice – managing Japanese Knotweed on development sites[23].

3.3.5.2 Disturbance – noise

3.28. Construction activities would be conducted in accordance with noise limits to avoid disturbance.

3.29. Construction related noise disturbance can be further minimised by implementing best practice such as BS 5228-1:2009+A1:2014 (The British Standards Institute, 2008)[24].

[22] CIRIA (2008), Invasive species management for infrastructure managers and the construction industry (C679). Authors Wade, M, Booy, O, and White, V.
[23] Environment Agency (2013), Managing Japanese knotweed on development sites (version 3) – The Knotweed Code of Practice. Withdrawn in 2016, but still outlines best practice.
[24] The British Standards Institute, 2008. BS 5228-1:2009+A1:2014. *Code of practice for noise and vibration control on construction and open sites. Noise*. BSI Standards Limited, London.

3.3.5.3 Disturbance – light

3.30. Lighting would be kept to a minimum to reduce disturbance. Should the works be undertaken at night and flood lighting required, lighting should be kept to a minimum, and hooded spotlights directed away from potential suitable habitat, to reduce disturbance while ensuring standards for health and safety.

3.31. The potential impact of artificial light may be minimised through the implementation of best practice such as '*Guidance Notes for the Reduction of Obtrusive Light*' (Institute of Lighting Professionals, 2011)[25].

3.3.5.4 Assumptions during operation

3.32. New raw water intakes are assumed to be undertaken under licenced limits.

3.33. Thames Water and Affinity Water have Environmental Management Systems (EMS) in place for their assets. The EMS aims to identify and implement the necessary actions to avoid adverse effects to the environment during the operation phase. For example, the EMS would include standard measures relating to pollution control and control of disturbance from light or noise. As such, it is expected that these would be updated to incorporate the requirements of new assets commissioned as part of the T2AT SRO, and it is assumed that the appropriate EMS would be followed in order to avoid adverse effects to the environment.

3.34. The water treatment level would need to be appropriate to avoid the risk of spreading INNS and pathogens, this would be identified at the project stage informed by a baseline study. Refer to Chapter 14, Invasive non-native species risk assessment in Technical Supporting Document B1a, Environmental Appraisal Report (Lower Thames Reservoir Option) and Technical Supporting Document B1b, Environmental Appraisal Report (Beckton Reuse Indirect Option).

[25] Institution of Lighting Professionals (2020) Guidance note for the reduction of obtrusive light. Guidance Note1/20.

4. Appropriate Assessment of the T2AT SRO Options

4.1 Lower Thames Reservoir Option

4.1.1 HRA Stage 1 Screening of European Sites

4.1. A HRA Stage 1 Screening exercise was undertaken by WRSE in January 2021 in accordance with the methodology outlined in the WRSE Regional Plan Environmental Assessment Methodology Guidance, July 2020. Following the WRSE submission, a route optimisation process was undertaken to enhance the design of the options such as abstraction locations and sources, pipe routes, etc. This resulted in adjusted pipeline routes for most options. The optimised options were reassessed at HRA Stage 1 Screening, and these screening results were presented in the Gate 1 submission.

4.2. The Gate 1 HRA Stage 1 Screening output has been reviewed in light of design development (as described in Section 2.2) and the updated Gate 2 screening results for the Lower Thames Reservoir Option are presented in Table 4.1 below. The European Sites are shown on Figure 4.1: Lower Thames Reservoir Option – European Sites.

Table 4.1: Lower Thames Reservoir Option HRA Stage 1 Screening output (based on Gate 2 submission option)

European Site	Distance from the option	Potential for LSE
South West London Waterbodies Ramsar site Criterion 6: regularly supports internationally important populations of Gadwall *Anas strepera* and Shoveler *Anas clypeata* South West London Waterbodies SPA Wintering Gadwall *Anas strepera* Wintering *Shoveler Anas clypeata*	Abstraction is from the Wraysbury Reservoir SPA/Ramsar site waterbody. Wraysbury Tunnel Connection and the indicative temporary construction compound for the Indicative WTW Site are 4.7km and 4.3km north of the Ramsar and SPA boundary, respectively.	Construction phase – Yes There is potential for LSE on these designations as they are hydrologically connected to the construction route. They are located downstream of the works. LSE as a result of construction-related disturbance (noise/light/dust pollution/ sediment discharge/pollution events) on qualifying species should be considered. Based on the Water Framework Directive (WFD) undertaken for this option (Technical

European Site	Distance from the option	Potential for LSE
		Supporting Document B3), groundwater bodies are not considered to be significantly affected by the different scheme components and therefore no LSE are expected for changes to groundwater bodies. Operation phase – Yes Potential effects due to hydrological connectivity and abstraction from the SPA, including changes in water levels.
Windsor Forest & Great Park SAC Annex I habitats Old acidophilous oak woodland with *Quercus robur* and Atlantic acidophilous beech forests with *Ilex* and *Taxus* Annex II species Violet click beetle *Limoniscus violaceus*	9.1km south west of Wraysbury Tunnel Connection	Construction and operation phases – No This SAC is suitably removed from the pipeline corridor so that construction-related impacts are considered unlikely. The option does not affect groundwater and so the groundwater dependent habitats at this location are not likely to be affected by the scheme. No pathways have been identified and therefore no effects are anticipated as a result of the option on this European Site or any species for which it is designated.
Burnham Beeches SAC Annex I habitats: Atlantic acidophilous beech forest with *Ilex* and *Taxus*	7.9km west of the LTR Drinking Water Transfer Main Route Corridor	Construction and operation phases – No This SAC is suitably removed from the pipeline corridor so that construction-related impacts are considered unlikely. The option does not affect groundwater and so the groundwater dependent

European Site	Distance from the option	Potential for LSE
		habitats at this location are not likely to be affected by the scheme. No pathways have been identified and therefore no effects are anticipated as a result of the option on this European Site.

4.3. Potential LSE were identified for the South West London Waterbodies SPA and Ramsar site. Consequently, only these two sites are subject to a HRA Stage 2 AA.

4.4. No pathways have been identified through which the Lower Thames Reservoir Option can affect either the Burnham Beeches SAC and Windsor Forest and Great Park SAC. Consequently, no in-combination assessment is required for this option in relation to these sites.

4.1.2 Appropriate Assessment – likely impact pathways and potential effects

4.5. Considering the type, size and scale of the Lower Thames Reservoir Option, the potential effects (of construction and operational phases) that could affect achieving the conservation objectives set for the South West London Waterbodies Ramsar and SPA are described below. Conservation objectives are listed in Appendix B.

4.1.2.1 Construction effects

4.6. The new infrastructure required for this option to join the Wraysbury Tunnel Connection to an existing service reservoir in the vicinity of Harefield is located at a significant distance from the European Sites identified in the HRA Stage 1 Screening process, the closest being the South West London Waterbodies SPA and Ramsar site approximately 4.3km away. Construction-related disturbances such as noise, vibration and visual impacts are not considered likely at this distance, including air emissions and dust associated with construction works and vehicular traffic. Contamination from construction-related activities is also not considered at this distance. Furthermore, the implementation of best practice measures would ensure that there would be no adverse on the integrity of the European Sites from this impact pathway. These have been identified in Section 3.3.5 of this report.

4.7. Although the Wraysbury Tunnel currently abstracts water from waterbodies that belong to the South West London Waterbodies SPA and Ramsar site, no new infrastructure is required to bring water into the tunnel and therefore its proximity to this site is not considered a constraint during construction.

4.8. Regarding the construction of the new LTR WTW, the Indicative LTR WTW Site is currently on an industrial estate, bounded by the M25, Grand Union Canal and the existing Iver WTW. The indicative site for the temporary construction compound is on a greenfield site. Both sites are sufficiently removed from any European Site (~4.3km) or watercourses to consider impacts from excavation works. No functionally linked habitats are expected to be affected by the Lower Thames Reservoir Option.

4.9. No adverse effects on the integrity of the European Sites are expected as a result of the construction of the Lower Thames Reservoir Option. No residual effects are expected.

4.1.2.2 Operational effects

4.10. The Lower Thames Reservoir Option is not expected to require a new licence or an increase to peak abstraction from the Wraysbury Reservoir, but the required licence conditions would remain under investigation as this option progresses. The current operational assumptions do not have the potential to result in adverse effects to surface water levels or water quantity in the reservoir. This should be revised as part of the HRA undertaken for the consenting stage, if further investigations disagree with this assessment. No adverse effects on the integrity of the European Sites are expected as a result of the operation of the Lower Thames Reservoir Option.

4.11. Raw water transfers between different waterbodies always introduces a risk of spreading invasive species, but the INNS risk assessment reported on in the EAR[26] suggests that there would not be any significant increase in the risk of INNS transfer as a result of the operation of any of the Lower Thames Reservoir Option, due in part to the effectiveness of treatment at WTWs such as the new LTR WTW. Furthermore, the new LTR WTW at the Indicative LTR WTW Site does not have any planned discharges to any receptors that are hydrologically linked to any European Sites. Therefore, there is confidence that the risk of INNS spread to European Sites as a result of operation of the Lower Thames Reservoir Option would not result in adverse effects on the South West London Waterbodies Ramsar and SPA.

4.12. No adverse effects on the integrity of the European Sites are expected as a result of the operation of the Lower Thames Reservoir Option. No residual effects are expected.

[26] Thames to Affinity Transfer, Technical Supporting Document B1a, Environmental Appraisal Report (Lower Thames Reservoir Option)

4.1.3 Likely impact pathways and potential effects – in-combination

4.13. An in-combination assessment is required when LSE and/or low level effects that would not result in significant effects alone are identified (UKWIR, 2021[17]). As no residual effects are expected from the implementation of this option, an in-combination assessment is not required for the Lower Thames Reservoir Option.

4.14. As the option progresses, this should be reviewed and if residual effects are identified, the option should go through an in-combination effects assessment.

4.15. The plans and projects within 2km of the Lower Thames Reservoir Option (and within 3km from designated sites) that may affect the European Sites are listed in Table 4.2. These buffers were identified based on professional judgement and the potential effects that may arise from the option.

Table 4.2: Lower Thames Reservoir Option list of plans and projects

Application reference	Planning Authority	Applicant and brief description	Closest distance from scheme boundary and orientation	Planning status	Overlap in temporal scope?
New Local Plan - Sites for Potential Allocation	Three Rivers District Council	Batchworth Golf Course – 618 houses.	Approx. 1km to the north	Not allocated	Y – Phasing of 6-15 years if allocated
Buckinghamshire Minerals and Waste Local Plan	Buckingham-shire County Council	M3; New Denham Quarry Extension, Allocated Site for Sand and Gravel Provision	0km	Allocated	Plan period to 2036
Buckinghamshire Minerals and Waste Local Plan	Buckingham-shire County Council	M4; New Denham Quarry North West Extension, Allocated Site for Sand and Gravel Provision	0km	Allocated	Plan period to 2036

Application reference	Planning Authority	Applicant and brief description	Closest distance from scheme boundary and orientation	Planning status	Overlap in temporal scope?
CM/0049/21	Buckingham-shire County Council	Phased extraction of an allocated sand and gravel deposit	Approx. 1km to south west	Awaiting Decision	N – estimated period of operation of 7-8 years
HS2 Phase One Hybrid Bill	UK Government	HS2 Phase One	0km	Approved	N – Phase One finished between 2029 and 2033
Western Rail Link to Heathrow	Planning Inspectorate	Network Rail - The Western Rail Access to Heathrow project will create a new connection with the nearby Great Western Mainline (GWML), providing a more direct rail route for passengers travelling to and from Reading, Oxford, South Wales, Bristol, Midlands and beyond.	1km to the south west	DCO Pre-Application	N – development is likely to be fully built out before construction of the Lower Thames Reservoir Option commences.

Application reference	Planning Authority	Applicant and brief description	Closest distance from scheme boundary and orientation	Planning status	Overlap in temporal scope?
2019/0215	Surrey County Council	Extraction of sand and gravel from King George VI reservoir	Within 3km of South West London Waterbodies SPA and South West London Waterbodies Ramsar	Pending decision	Y – if approved, would operate over a period of 14 years.
Pre-Submission Spelthorne Local Plan 2022-2037	Spelthorne Borough Council	Site Allocation - ST4/009 (Elmsleigh Centre and Adjoining Land, South Street). 850 residential units and retail/ commercial town centre uses.	Within 3km of South West London Waterbodies SPA and South West London Waterbodies Ramsar	Pre-Submission Local Plan Site Allocation	Y - Delivery Timeframe 2033-2037 (years 11-15 of the plan)

4.1.4 Summary of Lower Thames Reservoir Option Appropriate Assessment

4.16. No adverse effects on the integrity of the following European Sites in the ZoI are considered as a result of the Lower Thames Reservoir Option (either alone or in-combination):

- South West London Waterbodies SPA, the option is not expected to affect achieving the conservation objectives which aim to maintain or restore:
  - The extent and distribution of the habitats of the qualifying features
  - The structure and function of the habitats of the qualifying feature

- The supporting processes on which the habitats of the qualifying features rely
- The population of each of the qualifying features
- The distribution of the qualifying features within the site

- South West London Waterbodies Ramsar site

4.17. This assessment must be revised if further investigations lead to a different conclusion in relation to possible impacts from abstraction to reservoirs that are part of the South West London Waterbodies SPA and Ramsar site. A formal HRA would be completed pursuant to the consenting process.

4.2 Beckton Reuse Indirect Option

4.2.1 HRA Stage 1 Screening of European Sites

4.18. As discussed in Section 4.1.1, HRA Stage 1 Screening was undertaken by WRSE in January 2021 and updated HRA Stage 1 Screening results were presented in the Gate 1 submission.

4.19. The Gate 1 HRA Stage 1 Screening output has been reviewed in light of design development and the updated Gate 2 screening results for the Beckton Reuse Indirect Option are presented in Table 4.3 below. The European Sites are shown on Figure 4.2: Beckton Reuse Indirect Option – European Sites.

Table 4.3: Beckton Reuse Indirect Use Option HRA Stage 1 Screening assessment (based on Gate 2 submission option)

European Site	Distance from the option	Potential for Likely Significant Effects
Lee Valley Ramsar Criterion 6: over winter the site regularly supports internationally important populations of gadwall *Anas strepera*	Approximately 1.1km north of the BRI Drinking Water Transfer Main Route Corridor; approximately 3.7km upstream of the River Lee Intake.	Yes – construction The closest distance of the pipeline corridor to the European Sites' boundaries (1.1km) would not result in disturbance to the qualifying features from construction activities or associated pollution.

European Site	Distance from the option	Potential for Likely Significant Effects
and shoveler *Anas clypeata*		Part of the European Sites' boundaries (Walthamstow Reservoirs SSSI and Walthamstow Marshes SSSI) are downstream of the River Lee Intake. Although it is unlikely, there is a pathway through which the sites could be affected due to hydrological connection, and there is potential for the sites to be affected due to pollution events during construction. Construction-related effects on upstream areas of the European Sites are considered unlikely. Yes – operation A pathway exists through abstraction and risk of invasive species spread.
Lee Valley SPA • Bittern *Botaurus stellaris* • Shoveler *Anas clypeata* • Gadwall *Anas strepera*		
Epping Forest SAC Annex I habitats: Atlantic acidophilous beech forests, Northern Atlantic wet heaths and European dry heaths Annex II species: stag beetle *Lucanus cervus*	Approximately 1.2km southeast of the Indicative Intake Location and 1.1km south of the Indicative Raw Water Pumping Station Site.	No – construction Due to the distance of this site from the scheme, construction-related impact pathways including noise, visual impacts, air pollution and any biological disturbances are considered to have no effects. The European Site is not hydrologically connected to the scheme via the River Lee. Due to the distance of the SAC from the scheme, effects from air pollution are not anticipated. No other impact pathways are considered to have LSE on the qualifying features. No – operation No pathways exist during operation that could affect this site.

European Site	Distance from the option	Potential for Likely Significant Effects
Wormley Hoddesdonpark Woods SAC Annex I habitats: sub-Atlantic and medio-European oak or oak-hornbeam forests	Approximately 50m north of the BRI Drinking Water Transfer Main Route Corridor at its closest point.	Yes – construction Although part of the SAC is hydrologically connected to the pipeline route, it is located upstream of the scheme. As such, construction-related effects are considered unlikely. The SAC is within 200m of BRI Drinking Water Transfer Main Route Corridor therefore there are potential effects from air pollution. No – operation No impact pathways were identified.

4.20. LSE were identified for Lee Valley Ramsar and SPA and Wormley Hoddesdonpark Woods SAC. These effects are discussed below.

4.21. No further assessment is required for Epping Forest SAC as the Beckton Reuse Indirect Option is expected to result in no effects for this European Site as a result of construction or operation. Consequently, an in-combination effects assessment is not required.

4.2.2 Appropriate Assessment – likely impact pathways and potential effects

4.22. Considering the type, size and scale of the Beckton Reuse Indirect Option, the potential effects (of construction and operational phases) that could affect achieving the conservation objectives set for the European Sites are described below. Conservation objectives are listed in Appendix B.

4.2.2.1 Lee Valley Ramsar and SPA

Construction

4.23. The abstraction would require construction of a new intake from the River Lee to the east of the King George V Reservoir. Construction of the new intake has the potential to result in water pollution contamination from runoff from accidental pollution events or dust emissions from construction-related activities. The Walthamstow Reservoirs SSSI and Walthamstow Marshes SSSI are components of the Lee Valley SPA and Ramsar sites and are located approximately 7.2km downstream of the Indicative Intake Location. There is potential for construction of the intake to result in temporary habitat degradation of the European Sites through pollution events, such as runoff or dust emissions from construction-related activities. There is also potential for increased sedimentation and silting during construction. However, provided that best practice control measures are implemented, adverse effects on the European Sites downstream are not anticipated. Details of CIRIA guidance to ensure water-pollution control is given in Paragraph 2.38. Due to the distance of these sites from the scheme, other construction-related impact pathways including noise, visual impacts, air pollution and disturbance to qualifying species are not anticipated. No other impact pathways are considered and no adverse effects as a result of construction are anticipated on Lee Valley SPA and Ramsar. Land use between the European Sites and the option components is urban land and therefore not suitable to constitute functionally linked habitat.

4.24. Regarding the construction of the new WTW, the Indicative BRI WTW Site is a mixed urban/rural setting with no surface waterbodies adjacent and is sufficiently removed from any European Site (>1.8km) to consider impacts from excavation works affecting groundwater bodies to be not relevant to this HRA.

4.25. The key risks identified during construction are as follows:

- Toxic contamination – water pollution due to accidental pollution events during construction of the River Lee Intake may result in habitat degradation or biological disturbance to the qualifying bird species of the Lee Valley SPA/Ramsar site at the Walthamstow reservoirs. The implementation of best practice measures would ensure that there would be no adverse effects on the European Sites from this impact pathway. No residual effects are anticipated.

Operation

4.26. The Beckton Reuse Indirect Option would require a new abstraction licence of 50Ml/d or 100Ml/d of raw water from the River Lee but assumes that this water is essentially reuse water from the Beckton Water Recycling option of the London Effluent Reuse SRO, which outfalls directly upstream of the River Lee Intake. The Beckton Reuse Indirect Option would not require abstraction beyond licenced limits

at times of low flow and is not currently subject to sustainability reductions. Therefore, no reduction in surface water levels and flows as a result of the abstraction are considered for this option and no indirect impacts on downstream European Sites are considered likely.

4.27. Operation of the new WTW at the Indicative BRI WTW Site would treat the raw water and convey it to a service reservoir for storage. Raw water transfers always introduce a risk of spreading invasive species and the risk would depend on the presence of pathogens in the River Lee at the abstraction and the effectiveness of water treatment carried out at the new WTW. The INNS risk assessment tool reported on in the EAR[27] suggest that there a low risk of INNS transfer as a result of the operation of Beckton Reuse Indirect Option. Furthermore, there are currently no planned discharges from the new WTW to waterbodies that are designated as European Sites or are in hydrological continuity with a European Site. Therefore, the risk posed by the spread of INNS as a result of operation of this option is not considered to result in adverse effects on European Sites at this stage.

4.28. There is no functionally linked land between the components of the Beckton Reuse Indirect Option and the Lee Valley Ramsar and SPA.

4.29. No adverse effects have been identified on Lee Valley SPA and Ramsar sites integrity as a result of the operation of the Beckton Reuse Indirect Option. No residual effects are anticipated.

4.2.2.2 Wormley Hoddesdonpark Woods SAC

Construction

4.30. Wormley Hoddesdonpark Woods SAC is approximately 50m north of the BRI Drinking Water Transfer Main Route Corridor. The qualifying features of this site are not vulnerable to construction-related disturbances such as noise and visual impacts, therefore these impacts pathways have not been considered. Approximately 1% of the site area is within 200m of the pipeline corridor and consequently there is a pathway for air emissions and dust associated with construction works and vehicular traffic. Given that it is only a small proportion of the site within 200m, changes to air quality and/or dust are not anticipated to affect the integrity of the site. Mitigation and best practice measures as described in Section 3.3.5.1 would mitigate potential effects from changes in air quality including increase in dust. No adverse effects on the European Site integrity from this impact pathway are anticipated.

[27] Thames to Affinity Transfer, Technical Supporting Document B1b, Environmental Appraisal Report (Beckton Reuse Indirect Option).

4.31. No adverse effects have been identified on the integrity of Wormley Hoddesdonpark Woods SAC as a result of the construction of the Beckton Reuse Indirect Option. No residual effects are anticipated.

Operation

4.32. No effects are anticipated as no impact pathways were identified.

4.2.3 Likely impact pathways and potential effects – in-combination

4.33. An in-combination assessment is required when LSE and/or low level effects that would not result in significant effects alone are identified (UKWIR, 2021[17]). As no residual effects are expected from the implementation of the Beckton Reuse Indirect Option, an in-combination assessment is not required.

4.34. As the option progresses, this should be reviewed and if residual effects are identified, the option should go through an in-combination effects assessment.

4.35. The plans and projects within 2km of the Beckton Reuse Indirect Option (and within 3km from designated sites) that may affect the European Sites are listed in Table 4.4. These buffers were identified based on professional judgement and the potential effects that may arise from the option.

Table 4.4: Beckton Reuse Indirect Use Option list of plans and projects

Application reference	Planning Authority	Applicant and brief description	Closest distance from scheme boundary and orientation	Planning status	Overlap in temporal scope?
N/A	N/A	London Effluent Reuse SRO	Approx. 1km upstream of Indicative Intake Location	N/A (RAPID Gate 2)	Y

Application reference	Planning Authority	Applicant and brief description	Closest distance from scheme boundary and orientation	Planning status	Overlap in temporal scope?
Policy WAL E8 – Epping Forest Local Plan (2011-2033) Submission Version	Epping Forest District Council	Land North of the A121 is a 40,000m2 employment allocation site.	Approx. 200m to the north	Site Allocation	Y – Local Plan to 2033
Waltham Abbey North Masterplan – Policies WAL T1, R1, R2 & R3 – Epping Forest Local plan (2011-2033) Submission Version	Epping Forest District Council	Waltham Abbey North Masterplan Area is allocated to accommodate 612 homes.	Approx. 2km to the north	Site allocation	Y– Local Plan to 2033
Policy CH1 – Local Plan 2018-2033	Broxbourne District Council	Chestnut Lakeside will be developed as a new mixed use urban village to accommodate 1750 homes.	Approx. 1km to the north	Site allocation	Y– Local Plan to 2033
Policy CH2 – Local Plan 2018-2033	Broxbourne District Council	Rosedale Park will be developed as a series of interlinked new suburban parkland communities to accommodate 800 homes.	Approx. 1km to the north	Site allocation	Y– Local Plan to 2033
Policy PB2 – Draft Local Plan	Hertsmere Borough Council	The former Potters Bar Golf Course is proposed for development. The new development will provide a sustainable new	Approx. 1km to the south	Draft site allocation	Y – Plan period is up to 2038

Application reference	Planning Authority	Applicant and brief description	Closest distance from scheme boundary and orientation	Planning status	Overlap in temporal scope?
		neighbourhood delivering around 500 new homes			
Policy PB3 – Draft Local Plan	Hertsmere Borough Council	Land to the south of Potters Bar is proposed for development. The new development will provide a sustainable new neighbourhood delivering around 900 new homes.	Approx. 2km to the south	Draft site allocation	Y – Plan period is up to 2038
Policy NS1 – Draft Local Plan	Hertsmere Borough Council	Land at Coursers Road is proposed for the delivery of a new settlement. The new development will provide for a total of approximately 6,000 new homes, with around 2,400 homes to be delivered within this plan period	Approx. 2km to the west	Draft Site allocation	Y – Plan period is up to 2038
2013/3223	London Borough Hackney	Outline planning permission (all matters reserved) for demolition of existing buildings and structures at Woodberry Down Estate to provide up to 275,604sqm	Within 3km of Lee Valley Ramsar/ SPA	Approved	Y – the final phase of work will not be completed by 2033

Application reference	Planning Authority	Applicant and brief description	Closest distance from scheme boundary and orientation	Planning status	Overlap in temporal scope?
		floorspace GEA (excluding car parking); comprising up to 3,242 residential units and a maximum of 10,921sqm non-residential floorspace			
HGY/2021/3175	London Borough Haringey	Hybrid Planning application seeking permission for 1) Outline component comprising demolition of existing buildings and creation of new mixed-use development including residential (up to 2,869 new homes), commercial, business & service, leisure, community uses.	Within 3km of Lee Valley Ramsar/ SPA	Pending decision	Y – assumed opening year is 2035.
Policy SA13 – Draft Local Plan	London Borough Enfield	Edmonton Green Shopping Centre, Mixed-use development comprising 1,173 homes	Within 3km of Lee Valley Ramsar/ SPA	Draft Site Allocation	Y – Draft Local Plan period up to 2039

Application reference	Planning Authority	Applicant and brief description	Closest distance from scheme boundary and orientation	Planning status	Overlap in temporal scope?
Policy SA15 – Draft Local Plan	London Borough Enfield	Joyce Avenue and Snells Park Estate, Housing development comprising 1,217 homes	Within 3km of Lee Valley Ramsar/ SPA	Draft Site Allocation	Y – Draft Local Plan period up to 2039
Policy SA19 – Draft Local Plan	London Borough Enfield	IKEA store; Tesco Extra, 1 Glover Drive; Meridian Water Willoughby Lane and Meridian Way, Mixed-use development comprising 5,000 homes	Within 3km of Lee Valley Ramsar/ SPA	Draft Site Allocation	Y – Draft Local Plan period up to 2039
Policy SA01 – Proposed Submission Waltham Forest Local Plan Part 2	London Borough Waltham Forest	Leyton Mills Retail Park, Comprehensive redevelopment to provide new residential (1,950 homes), retail and commercial development, a new primary school, nursery, and public connectivity improvements including links to Ruckholt Road Station.	Within 3km of Lee Valley Ramsar/ SPA	Draft Site Allocation	Y – Draft Local Plan period up to 2037

Application reference	Planning Authority	Applicant and brief description	Closest distance from scheme boundary and orientation	Planning status	Overlap in temporal scope?
Policy SA02 - Proposed Submission Waltham Forest Local Plan Part 2	London Borough Waltham Forest	New Spitalfields Market, Comprehensive redevelopment to provide a new neighbourhood, including cultural, industrial, residential (2,750 homes), nursery and complementary uses, and new public transport infrastructure including links to Ruckholt Road station.	Within 3km of Lee Valley Ramsar/ SPA	Draft Site Allocation	Y – Draft Local Plan period up to 2037
Policy SA03 - Proposed Submission Waltham Forest Local Plan Part 2	London Borough Waltham Forest	Auckland Road LSIS, Comprehensive redevelopment to provide mixed use development comprising residential (1250 homes) and commercial uses subject to the two-stage industrial masterplan process. Development proposals will be required to demonstrate	Within 3km of Lee Valley Ramsar/ SPA	Draft Site Allocation	Y – Draft Local Plan period up to 2037

Application reference	Planning Authority	Applicant and brief description	Closest distance from scheme boundary and orientation	Planning status	Overlap in temporal scope?
		compensatory capacity within North London in line with Policy 1 of the North London Waste Plan.			
Policy SA16 - Proposed Submission Waltham Forest Local Plan Part 2	London Borough Waltham Forest	Whipps Cross University Hospital, Comprehensive redevelopment of site to provide a new state -of -the -art modern hospital facility and new homes (1,500), as well as reprovision of social care facilities on and off-site. There will also be a provision of other cultural and commercial uses to support the new residential community, health based uses and associated workforce.	Within 3km of Lee Valley Ramsar/SPA	Draft Site Allocation	Y – Draft Local Plan period up to 2037

Application reference	Planning Authority	Applicant and brief description	Closest distance from scheme boundary and orientation	Planning status	Overlap in temporal scope?
Policy SA19 - Proposed Submission Waltham Forest Local Plan Part 2	London Borough Waltham Forest	Tesco and adjoining sites, Leytonstone, Comprehensive phased re-development of a supermarket and adjoining sites including the McDonalds Restaurant, former Gainsborough Road substation, the Moreia Welsh Presbyterian Church and other smaller adjoining sites to deliver new homes (1,100), non-residential floorspace including new green space, retail and nursery provision with enhanced links to Leytonstone Town Centre.	Within 3km of Lee Valley Ramsar/SPA	Draft Site Allocation	Y – Draft Local Plan period up to 2037

Application reference	Planning Authority	Applicant and brief description	Closest distance from scheme boundary and orientation	Planning status	Overlap in temporal scope?
Policy SA38 - Proposed Submission Waltham Forest Local Plan Part 2	London Borough Waltham Forest	Sterling House, Willow, House and Homebase, Redevelopment of existing office and retail warehouse space to provide new homes (695), non-residential floorspace, workspace, community uses and new public realm.	Within 3km of Lee Valley Ramsar/SPA	Draft Site Allocation	Y – Draft Local Plan period up to 2037

4.2.4 Summary of Beckton Reuse Indirect Option Appropriate Assessment

4.36. The Beckton Reuse Indirect Option is not expected to result in adverse effects on the integrity of the Lee Valley SPA and Ramsar Habitat Sites or the Wormley Hoddesdonpark Woods SAC (either alone or in-combination).

4.37. This assessment must be revised if further design iterations result in changes to potential impact pathways and potential significant effects upon European Sites as part of a formal HRA pursuant to the consenting stage.

5. Summary

5.1. The options for the Thames to Affinity Transfer have been subject to a HRA Stage 1 assessment, which was completed by WRSE. Subsequently, a HRA Stage 2 AA (plan stage) was undertaken for the purpose of the Gate 1 submission. The Gate 1 HRA Stage 2 AA did not identify any options that, if implemented (alone) for T2AT, would result in any residual effects on European Sites.

5.2. An informal HRA has been undertaken for the purpose of Gate 2 for the Lower Thames Reservoir Option and Beckton Reuse Indirect Option.

5.2 Lower Thames Reservoir Option

5.3. The Gate 1 HRA Stage 1 Screening undertaken for the Lower Thames Reservoir Option was reviewed in light of design development. Potential LSE were identified for the South West London Waterbodies SPA and Ramsar site. Consequently, only these two sites are subject to a HRA Stage 2 AA.

5.4. The HRA Stage 2 AA undertaken for the Lower Thames Reservoir Option did not identify adverse effects on the integrity of the South West London Waterbodies SPA and Ramsar.

5.5. Following the application of best practice measures, no adverse effects on the integrity of European Sites were identified for the Lower Thames Reservoir Option during construction or operation. It should be noted however that the assessment for the Lower Thames Reservoir Option is based on the conclusion that there would be no change to the current abstraction regime at Wraysbury Reservoir. This assessment must be revised if further investigations lead to a different conclusion in relation to possible impacts to surface water levels and flows at the reservoir and a formal HRA would be completed pursuant to the consenting stage.

5.6. As no residual effects are expected from the implementation of this option, an in-combination assessment is not required for the Lower Thames Reservoir Option. As the option progresses, this should be reviewed and if residual effects are identified, the option should go through an in-combination effects assessment as part of a formal HRA to be completed pursuant to the consenting stage.

5.3 Beckton Reuse Indirect Option

5.7. The Gate 1 HRA Stage 1 Screening undertaken for the Beckton Reuse Indirect Option was reviewed as a result of changes to the option. LSE were concluded from the revised HRA Stage 1 Screening on Lee Valley Ramsar, Lee Valley SPA and Wormley Hoddesdonpark Woods SAC due to potential hydrological connection and risk of pollutions events during construction.

5.8. The HRA Stage 2 AA for these sites concluded that with the use of best practice control measures there would be no adverse effects on the integrity of these sites.

5.9. This assessment must be revised if further design iterations result in changes to potential impact pathways and potential effects upon European Sites as part of a formal HRA to be completed pursuant to the consenting stage.

5.10. As no residual effects are expected from the implementation of this option, an in-combination assessment is not required for the Beckton Reuse Indirect Option. As the option progresses, this should be reviewed and if residual effects are identified, the option should go through an in-combination effects assessment as part of a formal HRA to be completed pursuant to the consenting stage.

5.4 Recommendations for subsequent project stages

5.11. It is recommended that Thames Water and Affinity Water work closely with Natural England and the European Sites owners/managers to agree the specific mitigation measures to be included at the project stage HRA. The agreed mitigation measures would be expected to form part of planning conditions and/or conditions of relevant environmental permits, and their implementation managed through contractual obligations with supervision from an Environmental Clerk of Works.

5.12. This assessment should be reviewed at subsequent project stages as the T2AT options are developed further, as part of a formal HRA to be completed pursuant to the consenting stage.

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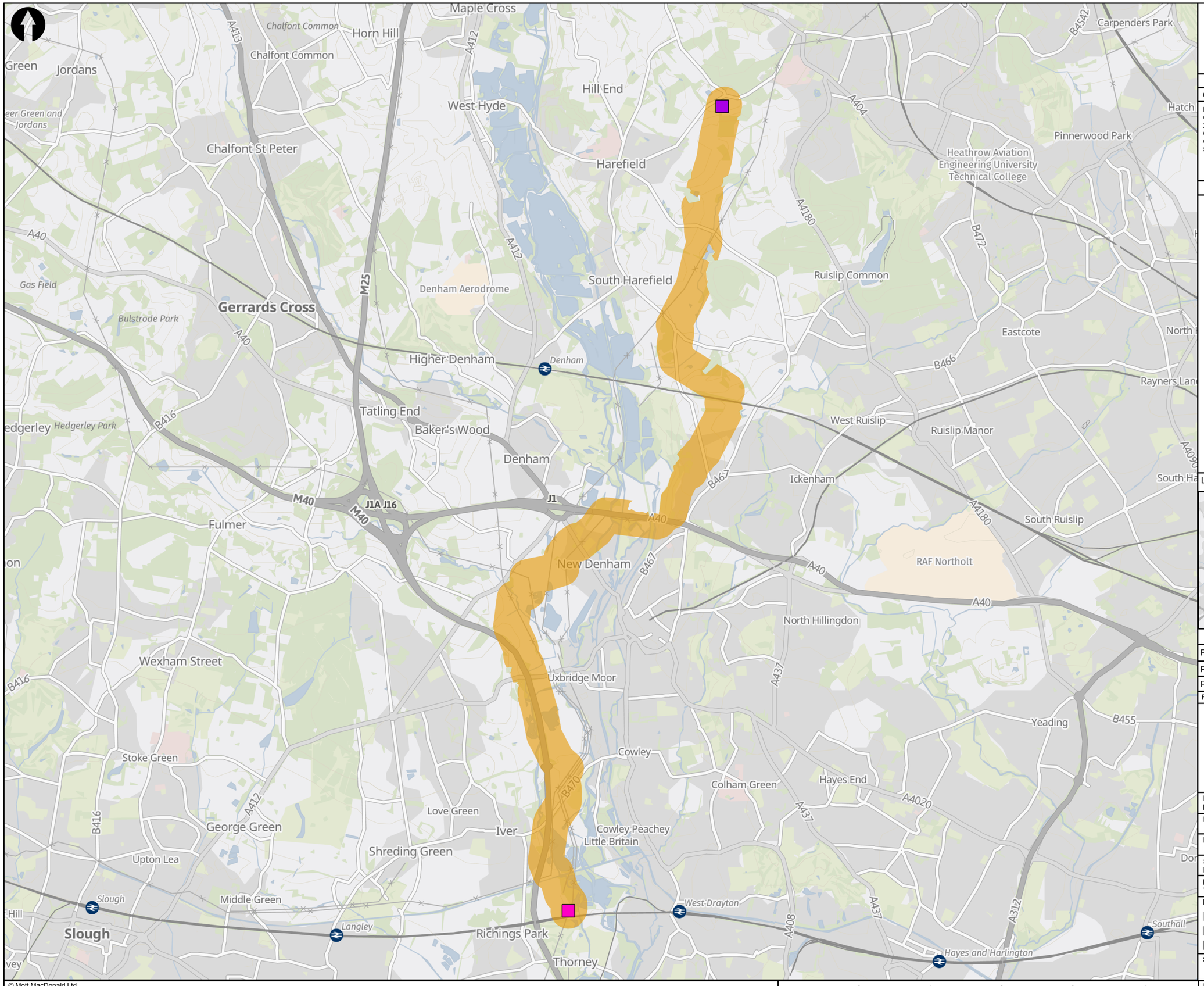
Appendix A Maps



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Legend

Lower Thames Reservoir Option components

- Indicative Transfer Main Route Corridor
- Connection into Affinity Water distribution network
- Connection into raw water network

Location Map

Rev	Status	Suitability description	Author	Ch'k'd	App'd	Date
P03	S2	FOR INFORMATION	CD	CLB	CLB	18/10/22
P02	S2	FOR INFORMATION	CD	CLB	CLB	21/09/22
P01	S2	FOR INFORMATION	KL	CLB	CLB	27/05/22

Thames Water | Affinity Water

Location Code: N/A	OS Reference:	Security Reference: STD
Project Group: N/A	Sub Process: N/A	
Location/Town: N/A		
Site Name: Lower Thames Reservoir		
Project Name: T2AT SRO Gate 2 Environmental Assessments		
Drawing Title: Figure 2.1: Lower Thames Reservoir Option – key components		
Scale: 1:50,000	Sheet Size: A3	Status: S2
Drawing Number: 100383187-023-MMD-00-XX-GIS-Y-0058		Revision: P03

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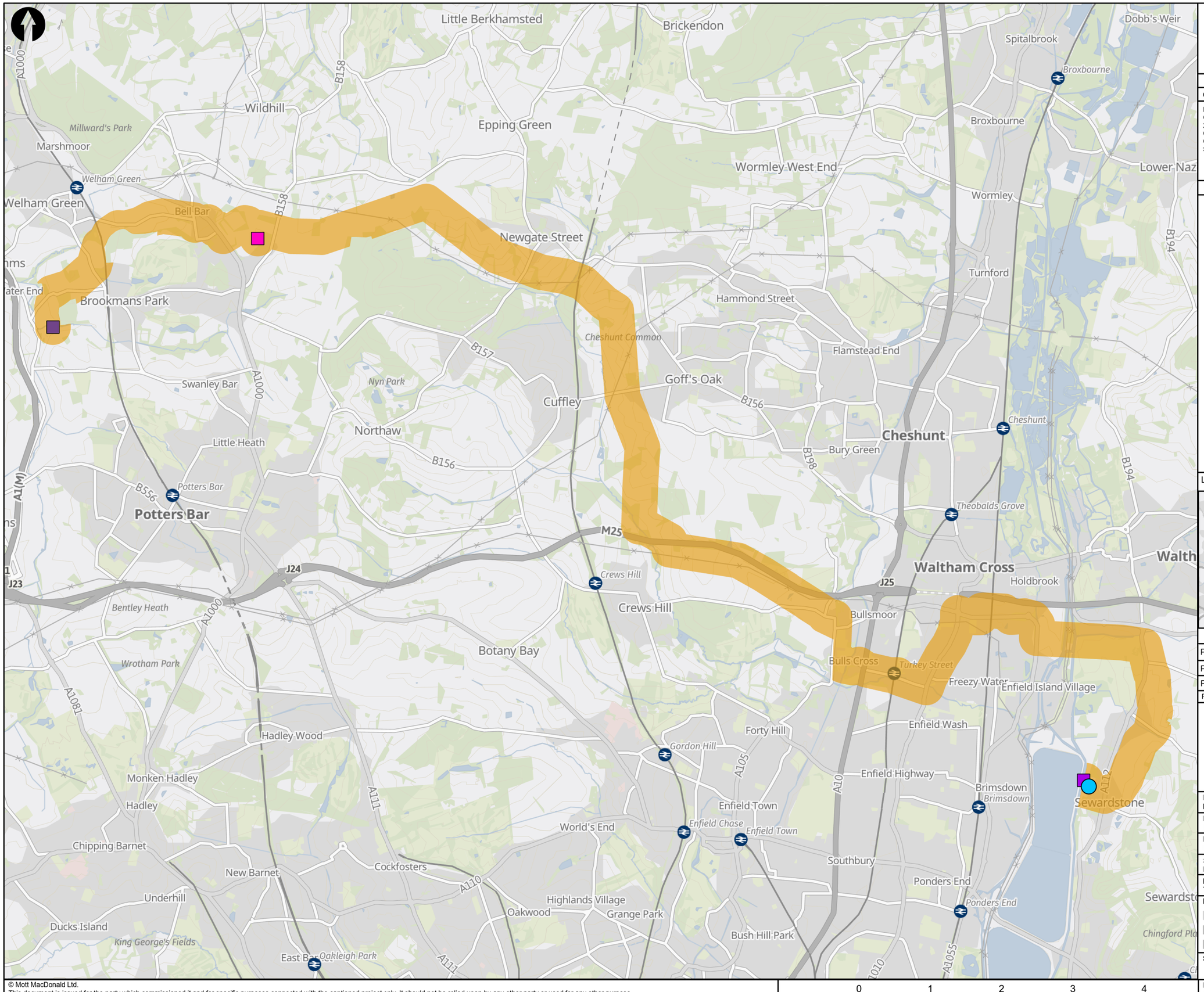

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Legend

Beckton Reuse Indirect Option components
- Indicative Transfer Main Route Corridor
- Indicative Raw Water Pumping Station Site
- River Lee Intake
- Connection into the Affinity Water distribution network 1
- Connection into the Affinity Water distribution network 2

Location Map

Rev	Status	Suitability description	Author	Ch'k'd	App'd	Date
P03	S2	FOR INFORMATION	CD	CLB	CLB	18/10/22
P02	S2	FOR INFORMATION	CD	CLB	CLB	21/09/22
P01	S2	FOR INFORMATION	KL	CLB	CLB	20/06/22

Thames Water

Affinity Water

Location Code: N/A	OS Reference:	Security Reference: STD
Project Group: N/A	Sub Process: N/A	
Location/Town: N/A		
Site Name: Beckton Reuse Indirect		
Project Name: T2AT SRO Gate 2 Environmental Assessments		
Drawing Title: Figure 2.2: Beckton Reuse Indirect Option – Key Components		
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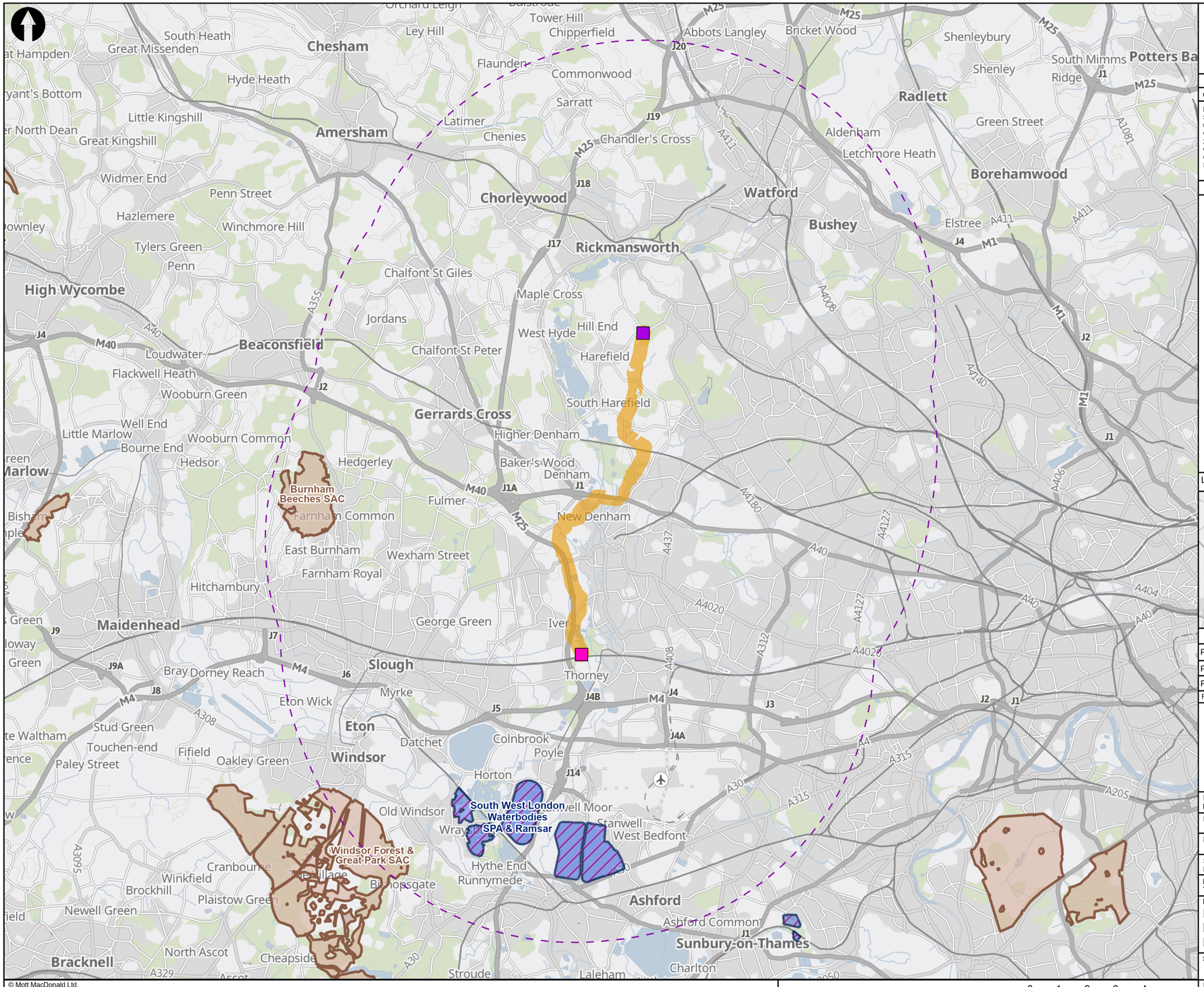

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P02	S2	FOR INFORMATION	CD	CLB	CLB	21/09/22
P01	S2	FOR INFORMATION	KL	CF	CLB	28/06/22
Rev	Status	Suitability description	Author	Ch'k'd	App'd	Date

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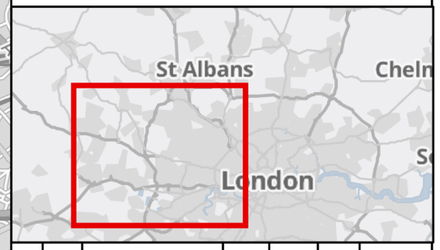
Legend

- Lower Thames Reservoir Option components
- Indicative Transfer Main Route Corridor
- Transfer Main Route Corridor (10km buffer)
- Connection into Affinity Water distribution network
- Connection into raw water network
- Special Area of Conservation (SAC)
- Special Protection Area (SPA)
- Ramsar

Location Map



Thames Water
Affinity Water

Location Code: N/A	OS Reference:	Security Reference: STD
Project Group: N/A	Sub Process: N/A	
Location/Town: N/A		
Site Name: Lower Thames Reservoir		
Project Name: T2AT SRO Gate 2 Environmental Assessments		
Drawing Title: Figure 4.1: Lower Thames Reservoir Option – European Sites		
Scale: 1:125,000	Sheet Size: A3	Status: S2
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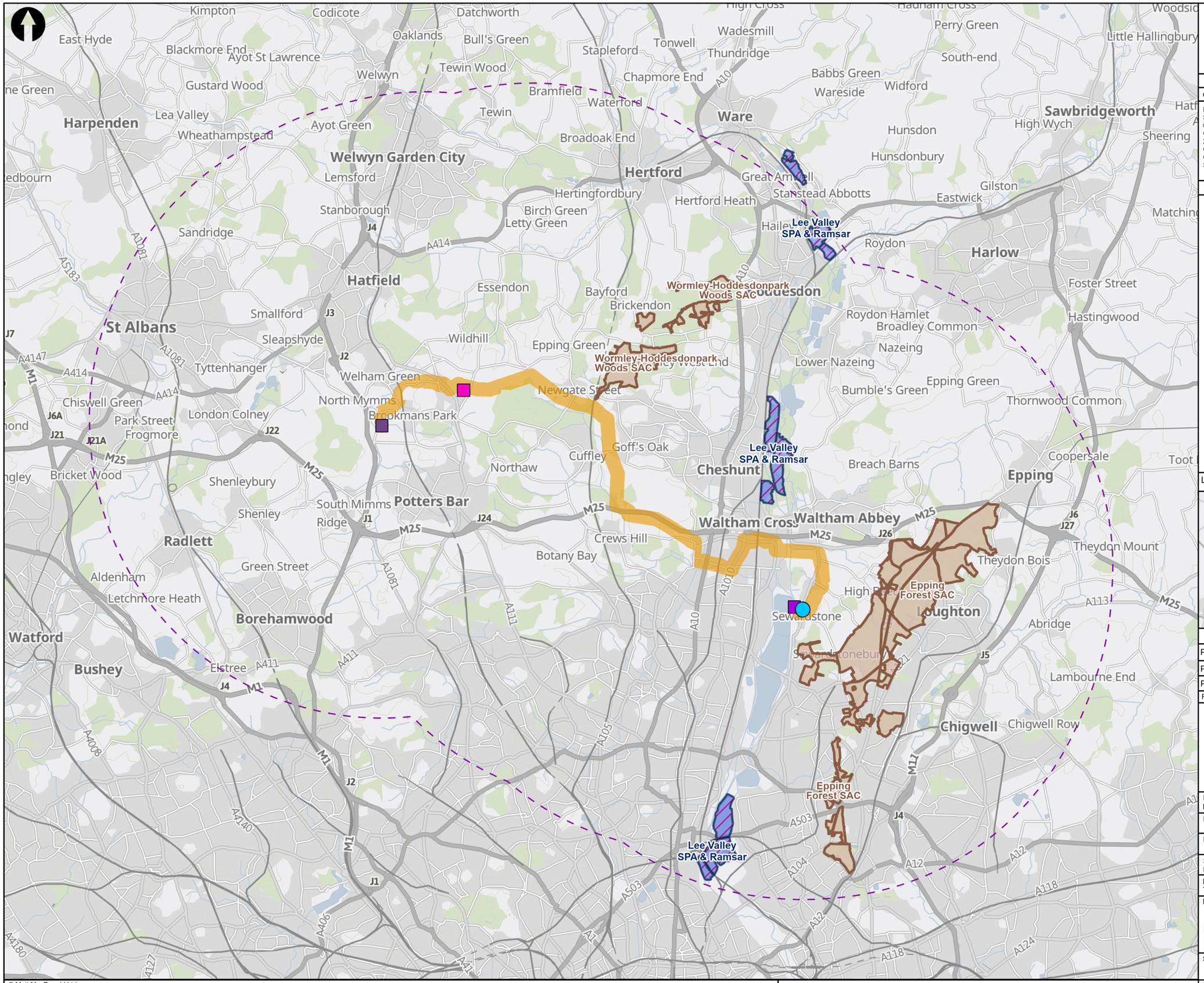

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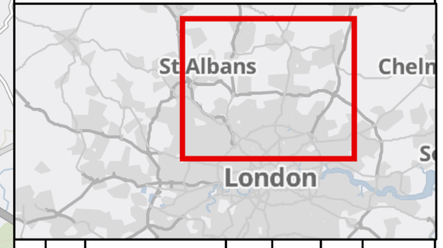
Legend

Beckton Reuse Indirect Option components
- Indicative Transfer Main Route Corridor
- Transfer Main Route Corridor (10km buffer)
- Indicative Raw Water Pumping Station Site
- River Lee Intake
- Connection into the Affinity Water distribution network 1
- Connection into the Affinity Water distribution network 2
- Special Area of Conservation (SAC)
- Special Protection Area (SPA)
- Ramsar

Location Map



Rev	Status	Suitability description	Author	Ch'k'd	App'd	Date
P03	S2	FOR INFORMATION	CD	CLB	CLB	18/10/22
P02	S2	FOR INFORMATION	CD	CLB	CLB	21/09/22
P01	S2	FOR INFORMATION	KL	CF	CLB	28/06/22

Thames Water
Affinity Water

Location Code: N/A	OS Reference:	Security Reference: STD
Project Group: N/A	Sub Process: N/A	

Location/Town: N/A

Site Name: Beckton Reuse Indirect

Project Name: T2AT SRO Gate 2 Environmental Assessments

Drawing Title:
Figure 4.2: Beckton Reuse Indirect Option – European Sites

Scale:	Sheet Size:	Status:
1:125,000	A3	S2

Drawing Number: 100383187-023-MMD-00-XX-GIS-Y-0057

Revision: P03

Appendix B European Sites

B.1 South West London Waterbodies SPA

B.1.1 Conservation objectives

Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring:

- The extent and distribution of the habitats of the qualifying features
- The structure and function of the habitats of the qualifying feature
- The supporting processes on which the habitats of the qualifying features rely
- The population of each of the qualifying features
- The distribution of the qualifying features within the site

B.1.2 Qualifying features

It is used regularly by 1% or more of the biogeographical populations of the following regularly occurring migratory species (other than those listed in Annex 1), in any season:

- Gadwall *Anas strepera* 710 individuals - wintering (5-year peak mean 1993/94 - 1997/98) 2.4 % NW Europe
- Shoveler *Anas clypeata* 853 individuals - wintering (5-year peak mean 1993/94 - 1997/98) 2.1 % NW/Central Europe

B.1.3 Vulnerabilities

The following are the prioritised issues for the site and the features they affect:

- Public access is a pressure/threat to A051(NB) gadwall and A056(NB) shoveler
- Changes in species distribution is a pressure/threat to A051(NB) gadwall and A056(NB) shoveler

- Invasive species (New Zealand Pigmyweed, *Crassula helmsii*) is a pressure/threat to A051(NB) gadwall, A056(NB) shoveler
- Natural change to site conditions is a pressure/threat to A051(NB) gadwall and A056(NB) shoveler
- Fisheries (fish stocking) is a pressure/threat to A051(NB) gadwall and A056(NB) shoveler
- Inappropriate weed control is a threat to A051(NB) gadwall and A056(NB) Shoveler
- Invasive species (Egyptian geese, *Alopochen aegyptiaca*) is a threat to A051(NB) gadwall and A056(NB) shoveler

B.2 South West London Waterbodies Ramsar site

B.2.1 Conservation objectives

No information available.

B.2.2 Qualifying features

Ramsar criterion 6: Species/population occurring at levels of international importance.
Qualifying Species/populations (as identified at designation):

- Species with peak counts in spring/autumn:
  - Northern shoveler, *Anas clypeata*, NW & C Europe 397 individuals, representing an average of 2.6% of the GB population (5-year peak mean 1998/9- 2002/3)
- Species with peak counts in winter:
  - Gadwall, Anas *strepera*, NW Europe 487 individuals, representing an average of 2.8% of the GB population (5-year peak mean 1998/9- 2002/3)

B.2.3 Vulnerabilities

Adverse factors affecting the ecological character of the site:

- Vegetation succession on and off-site
- Water diversion for irrigation/domestic/industrial use on-site
- Recreational/ tourism disturbance (unspecified) on and off-site
- General disturbance from human activities on and off-site
- Mining exploitation / exploration on-site
- Transport infrastructure development off-site
- Unspecified development (industry) off-site
- Unspecified development (urban use) off-site
- Other factors on and off-site

Site vulnerabilities are considered to be:

- The potential future decommissioning of reservoirs once they are no longer required for the purposes of water supply; as well as the potential impacts of maintenance works, which may require water draw-down of reservoirs.
- The threat from potential development pressures in this urbanised and urban-fringe area.
- Issues such as arresting (or locally reversing) vegetation succession.
- Levels of disturbance from recreational activities.

B.3 Windsor Forest & Great Park SAC

B.3.1 Conservation objectives

Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:

- The extent and distribution of qualifying natural habitats and habitats of qualifying species
- The structure and function (including typical species) of qualifying natural habitats
- The structure and function of the habitats of qualifying species

- The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely
- The populations of qualifying species
- The distribution of qualifying species within the site

B.3.2 Qualifying features

Annex I habitats that are a primary reason for selection of this site:

- 9190 Old acidophilous oak woods with *Quercus robur* on sandy plains

Windsor represents old acidophilous oak woods in the south-eastern part of its UK range. It has the largest number of veteran oaks *Quercus* spp. in Britain (and probably in Europe), a consequence of its management as wood-pasture. It is of importance for its range and diversity of saproxylic invertebrates, including many rare species (e.g. the beetle *Lacon querceus*), some known in the UK only from this site, and has recently been recognised as having rich fungal assemblages. Windsor Forest and Great Park has been identified as of potential international importance for its saproxylic invertebrate fauna by the Council of Europe (Speight 1989).

Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site:

- 9120 Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrub layer (*Quercion robori-petraeae* or *Ilici-Fagenion*)

Annex II species that are a primary reason for selection of this site:

- 1079 Violet click beetle *Limoniscus violaceus*

Violet click beetle *Limoniscus violaceus* was first recorded at Windsor Forest in 1937. The site is thought to support the largest of the known populations of this species in the UK. There is a large population of ancient trees on the site, which, combined with the historical continuity of woodland cover, has resulted in Windsor Forest being listed as the most important site in the UK for fauna associated with decaying timber on ancient trees (Fowles, Alexander & Key 1999). The site was also identified as of potential international importance for its saproxylic invertebrate fauna by the Council of Europe (Speight 1989).

Annex II species present as a qualifying feature, but not a primary reason for site selection:

- Not Applicable

B.3.3 Vulnerabilities

The following are the prioritised issues for the site and the features they affect:

- Forestry and woodland management are a pressure/ threat to H9120 Beech forests on acid soils and the S1079 Violet click beetle
- Forestry and woodland management are a pressure/ threat to H9190 Dry oak-dominated woodland
- Invasive species is a threat to H9190 Dry oak-dominated woodland and S1079 Violet click beetle
- Disease is a threat to H9190 Dry oak-dominated woodland
- Air pollution (impact of atmospheric nitrogen deposition) is a pressure on H9120 Beech forests on acid soils, H9190 Dry oak-dominated woodland

B.4 Burnham Beeches SAC

B.4.1 Conservation objectives

Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:

- The extent and distribution of qualifying natural habitats
- The structure and function (including typical species) of qualifying natural habitats
- The supporting processes on which qualifying natural habitats rely

B.4.2 Qualifying features

Annex I habitats that are a primary reason for selection of this site:

- 9120 Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrub layer (*Quercion robori-petraeae* or *Ilici-Fagenion*)

Burnham Beeches is an example of Atlantic acidophilous beech forests in central southern England. It is an extensive area of former beech wood-pasture with many old pollards and associated beech *Fagus sylvatica* and oak *Quercus* spp. high forest. Surveys have shown that it is one of the richest sites for saproxylic invertebrates in the UK, including 14 Red Data Book species. It also retains nationally important epiphytic communities, including the moss *Zygodon forsteri*.

Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site:

- Not Applicable

Annex II species that are a primary reason for selection of this site:

- Not Applicable

Annex II species present as a qualifying feature, but not a primary reason for site selection:

- Not Applicable

B.4.3 Vulnerabilities

The following are the prioritised issues for the site and the features they affect:

- Air pollution (risk of atmospheric nitrogen disposition) is a threat to H9120 Beech forests on acid soils
- Public access/ disturbance is a pressure/ threat to H9120 Beech forests on acid soils
- Habitat fragmentation is a pressure on H9120 Beech forests on acid soils
- Deer is a pressure/ threat to H9120 Beech forests on acid soils

- Species decline is a pressure/ threat to H9120 Beech forests on acid soils
- Invasive species is a threat to H9120 Beech forests on acid soils.

B.5 Lee Valley Ramsar

B.5.1 Conservation objectives

No information available.

B.5.2 Qualifying features

Ramsar Criterion 2:

- The site supports the nationally scarce plant species whorled water-milfoil *Myriophyllum verticillatum* and the rare or vulnerable invertebrate *Micronecta minutissima* (a water-boatman).

Ramsar Criterion 6: Species/populations occurring at levels of international importance.
Qualifying Species/populations (as identified at designation):

- Species with peak counts in spring/autumn:
  - Northern shoveler, *Anas clypeata*, NW & C Europe 287 individuals, representing an average of 1.9% of the GB population (5 year peak mean 1998/9- 2002/3)
- Species with peak counts in winter:
  - Gadwall, *Anas strepera strepera*, NW Europe 445 individuals, representing an average of 2.6% of the GB population (5 year peak mean 1998/9- 2002/3)

B.5.3 Vulnerabilities

Adverse factors affecting the ecological character of the site are:

- Vegetation succession on and off-site
- Water diversion for irrigation/ domestic/ industrial use off-site

- Eutrophication on and off-site
- Persistent drought off-site
- Introduction/invasion of exotic plant species on and off-site
- Recreational/tourism disturbance (unspecified) on and off-site
- General disturbance from human activities off-site
- Unspecified development (urban use) off-site

Site vulnerabilities are considered to be:

- The eutrophic condition of the water
- Over-abstraction of surface water for public supply, particularly during periods of drought
- Potential development pressures in this urbanised and urban-fringe area
- Vegetation succession
- Invasive plants including Himalayan balsam *Impatiens glandulifera* and Japanese knotweed *Reynoutria japonica*
- Recreational disturbance

B.6 Lee Valley SPA

B.6.1 Conservation objectives

Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring:

- The extent and distribution of the habitats of the qualifying features
- The structure and function of the habitats of the qualifying features
- The supporting processes on which the habitats of the qualifying features rely
- The population of each of the qualifying features
- The distribution of the qualifying features within the site

B.6.2 Qualifying features

It is used regularly by 1% or more of the Great Britain population of a species listed in Annex I, in any season:

- Bittern *Botaurus stellaris* 6 individuals - wintering 6% (5 year peak mean 1992/93 - 1996/97)

It is used regularly by 1% or more of the biogeographical populations of the following regularly occurring migratory species (other than those listed in Annex I), in any season:

- Shoveler *Anas clypeata* 406 individuals - wintering (5 year peak mean 1993/94 -1997/98) 1.0% NW/Central Europe
- Gadwall *Anas strepera* 456 individuals - wintering (5 year peak mean 1993/94 -1997/98) 1.5% NW Europe

B.6.3 Vulnerabilities

The following are the prioritised issues for the site and the features they affect:

- Water pollution is a threat to A021(NB) Bittern, A051(NB) Gadwall, A056(NB) Shoveler
- Hydrological changes is a threat to A021(NB) Bittern, A051(NB) Gadwall, A056(NB) Shoveler
- Public access/ disturbance is a threat to A021(NB) Bittern, A051(NB) Gadwall, A056(NB) Shoveler
- Inappropriate scrub control is a threat to A021(NB) Bittern, A051(NB) Gadwall, A056(NB) Shoveler
- Fisheries (fish stocking) is a threat to A021(NB) Bittern, A051(NB) Gadwall, A056(NB) Shoveler
- Invasive species is a threat to A021(NB) Bittern, A051(NB) Gadwall, A056(NB) Shoveler
- Inappropriate cutting/ mowing is a threat to A021(NB) Bittern
- Air pollution is a threat to A021(NB) Bittern

B.7 Epping Forest SAC

B.7.1 Conservation objectives

Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:

- The extent and distribution of qualifying natural habitats and habitats of qualifying species
- The structure and function (including typical species) of qualifying natural habitats
- The structure and function of the habitats of qualifying species
- The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely
- The populations of qualifying species
- The distribution of qualifying species within the site

B.7.2 Qualifying features

Annex I habitats that are a primary reason for selection of this site:

- 9120 Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrub layer (*Quercion robori-petraeae* or *Ilici-Fagenion*)

Epping Forest represents Atlantic acidophilous beech forests in the north-eastern part of the habitat's UK range. Although the epiphytes at this site have declined, largely as a result of air pollution, it remains important for a range of rare species, including the moss *Zygodon forsteri*. The long history of pollarding, and resultant large number of veteran trees, ensures that the site is also rich in fungi and dead-wood invertebrates.

Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site:

- 4010 Northern Atlantic wet heaths with *Erica tetralix*
- 4030 European dry heaths

Annex II species that are a primary reason for selection of this site:

- 1083 Stag beetle *Lucanus cervus*

Epping Forest is a large woodland area in which records of stag beetle Lucanus cervus are widespread and frequent; the site straddles the Essex and east London population centres. Epping Forest is a very important site for fauna associated with decaying timber, and supports many Red Data Book and Nationally Scarce invertebrate species.

Annex II species present as a qualifying feature, but not a primary reason for site selection:

- Not Applicable

B.7.3 Vulnerabilities

The following are the prioritised issues for the site and the features they affect:

- Air pollution (impact of atmospheric nitrogen deposition) is a pressure on H4010 Wet heathland with cross-leaved heath, H4030 European dry heaths, H9120 Beech forests on acid soils
- Undergrazing is a pressure on H4010 Wet heathland with cross-leaved heath, H4030 European dry heaths
- Public access/ disturbance is a pressure on H4010 Wet heathland with cross-leaved heath, H4030 European dry heaths, H9120 Beech forests on acid soils
- Changes in species distributions is a threat to H9120 Beech forests on acid soils
- Inappropriate water levels is a threat to H4010 Wet heathland with cross-leaved heath
- Water pollution is a threat to H4010 Wet heathland with cross-leaved heath
- Invasive species is a threat to H4010 Wet heathland with cross-leaved heath
- Disease is a threat to H9120 Beech forests on acid soils
- Invasive species are a pressure/ threat to H9120 Beech forests on acid soils

B.8 Wormley Hoddesdonpark Woods SAC

B.8.1 Conservation objectives

Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring;

- The extent and distribution of qualifying natural habitats
- The structure and function (including typical species) of qualifying natural habitats
- The supporting processes on which qualifying natural habitats rely

B.8.2 Qualifying features

Annex I habitats that are a primary reason for selection of this site:

- 9160 Sub-Atlantic and medio-European oak or oak-hornbeam forests of the *Carpinion betuli*

Wormley Hoddesdonpark Woods in south-east England has large stands of almost pure hornbeam *Carpinus betulus* (former coppice), with sessile oak *Quercus petraea* standards. Areas dominated by bluebell Hyacinthoides non-scripta do occur, but elsewhere there are stands of great wood-rush *Luzula sylvatica* with carpets of the mosses *Dicranum majus* and *Leucobryum glaucum*. Locally, a bryophyte community more typical of continental Europe occurs, including the mosses *Dicranum montanum, D. flagellare* and *D. tauricum*.

Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site:

- Not Applicable

Annex II species that are a primary reason for selection of this site:

- Not Applicable

Annex II species present as a qualifying feature, but not a primary reason for site selection:

- Not Applicable

B.8.3 Vulnerabilities

The following are the prioritised issues for the site and the features they affect:

- Disease is a threat to H9160 Oak-hornbeam forests
- Invasive species is a threat to H9160 Oak-hornbeam forests
- Air pollution (risk of atmospheric nitrogen deposition is a threat to H9160 Oak-hornbeam forests
- Deer is a threat to H9160 Oak-hornbeam forests
- Vehicles (illicit) is a pressure on H9160 Oak-hornbeam forests
- Forestry and woodland management is a threat to H9160 Oak-hornbeam forests
- Public access/ disturbance is a threat to H9160 Oak-hornbeam forests

Affinity Water

Thames Water