

Thames Water
Draft Water Resources
Management Plan 2019

Technical Appendices

**Appendix C: Habitats regulations
assessment – Stage 1 screening**



Ricardo
Energy & Environment

Thames Water Draft Water Resources Management Plan 2019

Habitats Regulations Assessment

Report for Thames Water

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Thames Water Utilities Ltd

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Non-Technical Summary

A Habitats Regulations Assessment (HRA) has been undertaken of Thames Water's draft Water Resources Management Plan 2019 (WRMP19) in parallel with Strategic Environmental Assessment (SEA) and Water Framework Directive (WFD) assessments to ensure an integrated approach to environmental assessment and to ensure its overall compliance with international and national environmental legislation.

The HRA Screening assessment of the draft WRMP19 has concluded that the options included within preferred programme, both individually and in-combination, are not likely to have any significant adverse effect on any European site, thereby meeting the "no likely significant effect (LSE)" on site integrity HRA test. No further HRA stages (i.e. Appropriate Assessment) are required of the Thames Water draft WRMP19.

A comprehensive mitigation strategy has been proposed for those schemes included in the preferred programme where initial assessments highlighted the need for inclusion of mitigation measures as part of the scheme development. These mitigation strategies will subject to discussion and agreement with Natural England during the draft WRMP19 consultation process. With the inclusion of these mitigation strategies, Thames Water's draft WRMP19 has been assessed to have no adverse effects on the integrity of any European site, either alone or in-combination with other plans or projects.

In developing the preferred programme, Thames Water carried out HRA screening of four short-listed reasonable alternative programmes to help inform decision-making:

- the least cost programme;
- programme favouring the minimisation of environmental dis-benefit;
- programme favouring resilience; and
- sustainability and intergenerational equity-focused programme.

HRA screening indicated that each of these reasonable alternative programmes would not have any LSEs on the integrity of any European site, either alone or in-combination with other programmes, plans or projects.

HRA will still need to be carried out as and when each of the schemes included in the preferred programme is brought forward by Thames Water for promotion and applications are made for planning permission and environmental permits. At that stage, the HRA will need to be revisited to take account of any changes to scheme design, construction and operational arrangements, as well as the final package of mitigation measures proposed to ensure at least the same level of protection to European sites as defined in the draft WRMP19. In-combination effects will also need to be re-assessed to take account of prevailing, updated information on other projects, programmes and plans.

This HRA report is being issued to the statutory environmental bodies, stakeholders and the public as part of the consultation on the draft WRMP19. Thames Water will be discussing the findings of this HRA with Natural England, Environment Agency, and (where relevant) Natural Resources Wales, during the consultation period.

1 Introduction

1.1 Background and purpose of report

1.1.1 Requirement for Habitats Regulations Assessment

Water companies in England and Wales are required to produce a Water Resources Management Plan (WRMP) every five years. The Plan sets out how the company intends to maintain the balance between supply and demand for water over the 25 year planning horizon in order to ensure security of supply in each of the water resource zones making up its supply area.

A water company must ensure its WRMP meets the requirements of the EU Habitats Directive (Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora, hereby referred to as the 'Habitats Directive', in Articles 6(3) and 6(4) as transposed into national legislation by the Conservation of Habitats and Species Regulations 2010 (as amended)¹. The Habitats Regulations require that a Habitats Regulations Assessment (HRA) is carried out. Under Regulations 61 and 102, any plan or project which is likely to have a significant effect on a European site (either alone or in-combination with other plans or projects) and is not directly connected with, or necessary for the management of the site, must be subject to an HRA to determine the implications for the site in view of its conservation objectives.

Regulation 62 of the Habitats Regulations states:

62.— (1) If the competent authority are satisfied that, there being no alternative solutions, the plan or project must be carried out for imperative reasons of overriding public interest (which, subject to paragraph (2), may be of a social or economic nature), they may agree to the plan or project notwithstanding a negative assessment of the implications for the European site or the European offshore marine site (as the case may be).

(2) Where the site concerned hosts a natural habitat type or a priority species, the reasons referred to in paragraph (1) must be either—(a) reasons relating to human health, public safety or beneficial consequences of primary importance to the environment; or

(b) any other reasons which the competent authority, having due regard to the opinion of the European Commission, consider to be imperative reasons of overriding public interest.

Regulation 102 of the Habitats Regulations states:

102.— (1) Where a land use plan—

(a) is likely to have a significant effect on a European site or a European offshore marine site (either alone or in combination with other plans or projects), and

(b) is not directly connected with or necessary to the management of the site,

the plan-making authority for that plan must, before the plan is given effect, make an appropriate assessment of the implications for the site in view of that site's conservation objectives.

(2) The plan-making authority must for the purposes of the assessment consult the appropriate nature conservation body and have regard to any representations made by that body within such reasonable time as the authority specify.

(3) They must also, if they consider it appropriate, take the opinion of the general public, and if they do so, they must take such steps for that purpose as they consider appropriate.

(4) In the light of the conclusions of the assessment, and subject to regulation 103 (considerations of overriding public interest), the plan-making authority or, in the case of a regional strategy, the Secretary of State must give effect to the land use plan only after having ascertained that it will not adversely affect the integrity of the European site or the European offshore marine site (as the case may be).

(5) A plan-making authority must provide such information as the appropriate authority may reasonably require for the purposes of the discharge of the obligations of the appropriate authority under this Chapter.

¹ Including The Conservation of Habitats and Species (Amendment) Regulations 2011 and the Conservation of Habitats and Species (Amendment) Regulations 2012. These regulations will change on 30 November with the commencement of the 2017 Regulations.

(6) This regulation does not apply in relation to a site which is—
(a) a European site by reason of regulation 8(1)(c), or
(b) a European offshore marine site by reason of regulation 15(c) of the 2007 Regulations (site protected in accordance with Article 5(4) of the Habitats Directive).

Both the 'Strategic Environmental Assessment and Habitats Regulations Assessment - Guidance for Water Resources Management Plans and Drought Plans'² and 'Water Resources Planning Guideline'³ recommend that all WRMPs should be subject to the first stage of HRA, i.e. screening for likely significant effects (LSE).

The responsibility for undertaking the Habitats Regulations Assessment lies with Thames Water as the Plan-making authority. Regulation 61(5) states that the Plan-making authority shall adopt, or otherwise give effect to, the Plan only after having ascertained that it will not adversely affect the integrity of a European site, subject to Regulation 62 or 102 of the Habitats Regulations.

This report documents the HRA of the Thames Water Utilities Ltd (Thames Water) draft WRMP19. The report sets out the findings of the HRA screening of options and preferred programme, both individually and in-combination, for each of Thames Water's Water Resources Zones.

1.2 Consultation

Natural England (NE) and the Environment Agency (EA), along with other stakeholders, were consulted on the proposed HRA methodology in summer 2016 and feedback on the methodology was used to finalise the assessment approach. Additionally, a series of consultation meetings have been held with the Environment Agency and Natural England during 2016 and 2017 to discuss the development of Thames Water's draft WRMP19 and the options being considered, including identified potential risks to European sites either from proposed construction and/or operational activities. Regular stakeholder meetings have been held over the period 2015 to 2017 which have provided the opportunity to discuss emerging findings from the HRA process with a wide range of stakeholders and regulatory bodies. Further details of consultation activities and outcomes can be found within the WRMP.

During the summer of 2017, draft HRA Stage 1 screening assessments were shared with Natural England and the Environment Agency for informal consultation; the feedback on the draft assessments has informed the final screening assessments presented in this report. A summary of the HRA screening consultation comments and responses is presented in Appendix B.

In addition to the overall draft WRMP19 HRA assessments, Thames Water has also held a series of regulatory consultation meetings over the last two years on specific potential options, including HRA issues. Meetings have been held on the Severn to Thames Transfer option involving Natural England and Environment Agency, on the Vyrnwy river regulation support option with Environment Agency and Natural Resources Wales and the Teddington Direct River Abstraction option with Environment Agency and Natural England (amongst others). Comments and feedback from the regulatory bodies on the HRA issues for each of these options have been used to inform the assessments presented in this report.

This HRA report supports part of the wider consultation by Thames Water on its draft WRMP19 and comments are invited on this report alongside those on the draft WRMP19.

² UKWIR (2012) Strategic Environmental Assessment and Habitats Regulations Assessments - Guidance for Water Resources Management Plans and Drought Plans (WR/02/A).

³ EA, Ofwat, Defra and the Welsh Government (June 2012) Water resources planning guideline: The guiding principles for developing a Water Resources Management Plan.

1.3 Structure of the report

The report is divided into the following sections:

Non-technical summary

Section 1: Introduction

Section 2: Thames Water's draft WRMP 2019

Section 3: Methodology

Section 4: HRA findings for potential new resource options, option elements and preferred programme

Section 5: Potential in-combination effects with other plans and projects

Section 6: HRA findings for alternative programmes

Section 7: Conclusions

2 Thames Water's draft WRMP 2019

2.1 Thames Water's supply system

The Thames Water supply area extends from Cirencester in the west to Dartford in the east and from Banbury in the north to Guildford in the south and covers over 5,000 square miles. Every day, Thames Water supply around 2,600 million litres of water to around 10 million people and 215,000 businesses⁴. Water supplies are derived from a mixture of surface water sources (mostly from large storage reservoirs supplied from the River Thames and River Lee) and groundwater sources. Thames Water also have a desalination water treatment works on the River Thames (Tideway) that can supplement water supplies at times of high demand and/or during drought conditions.

For water resource planning purposes, Thames Water's supply area is divided into six Water Resource Zones (WRZ). The London WRZ is the largest of the six zones and covers much of the Greater London area. The next largest is the Swindon and Oxfordshire WRZ (SWOX). The water resources for both of these zones are primarily reliant on abstraction of water from the River Thames for storage in large reservoirs. The other WRZs to the west of London are Kennet Valley (which includes Reading and Newbury); Henley; Slough, Wycombe and Aylesbury (SWA); and Guildford. These four WRZs are largely reliant on groundwater abstraction, although there are some significant abstractions directly from local rivers: the River Kennet in Reading and the River Wey and Tillingbourne near Guildford.

Several other water companies provide water supply services to those areas of the River Thames catchment area not covered by the Thames Water WRZs. Each of these other companies will also be preparing a WRMP and consultation is ongoing with these companies, primarily through the Water Resources in the South East planning group.

Further details about the Thames Water supply system and the management of existing water resources are provided on the Thames Water website (www.thameswater.co.uk).

2.2 Draft WRMP19

Water resources management planning is undertaken by all water companies in England and Wales in order to ensure reliable, resilient water supplies over the long term planning horizon. The minimum planning horizon is at least 25 years, but in view of the water supply-demand challenges in its supply area, Thames Water has adopted a much longer 80 year planning horizon to 2100. This particularly reflects the high anticipated population growth in many of its WRZs over this period as described in detail in the draft WRMP19. The planning process includes calculating and forecasting how much water customers will need over the planning period (assessing future demand) and how best to provide it (assessing options to reduce or constrain demand growth and/or augment reliable supplies of water) in an efficient, timely manner (programme appraisal). Companies seek to identify the preferred, 'best value' programme of demand management and water supply options to maintain a balance between reliable supply and demand in each WRZ and for their supply area as whole (the WRMP).

Water companies in England and Wales have a statutory requirement to prepare a WRMP every five years. The draft WRMP19 must be submitted to Defra on 1 December 2017 and, subject to Defra approval, be published for consultation in early 2018. The final WRMP19 must be submitted for approval to the Secretary of State in 2019. The WRMP also informs the regulatory water company business planning 'Periodic Review' process through which the Water Services Regulation Authority (Ofwat) sets the price that water companies can charge their customers for water (and wastewater) services. The next Periodic Review will be in 2019 ('PR19').

⁴ In April 2017 a competitive retail market for water services for business customers was introduced. This means that business customers can choose which retailer they buy their water and wastewater services from. The retailer provides billing, customer service and efficiency advice to the business customer, while Thames Water, as a wholesale water provider, still has an obligation to supply the water and sewerage services and manage the infrastructure.

Engagement with government, regulators, other licensed water suppliers and water companies, customers and a wide range of stakeholders is key to the WRMP process. Thames Water's draft WRMP19 consultation programme began in 2015 and includes a Water Resources Forum where a wide range of stakeholders and the regulators meet to discuss Thames Water's emerging plans for water resources management. Information and consultation documents are also provided on Thames Water's website. Consultation will continue throughout the next 12 months as the Final WRMP is developed.

Following comments on the draft WRMP19 and this HRA Report, a Statement of Response will be prepared by Thames Water setting out how it intends to take account of the comments in finalising the WRMP19 for submission to the Secretary of State. Depending on the comments received, a revised draft WRMP19 may be published along with an updated HRA Report for further consultation prior to developing the final WRMP19.

In developing its draft WRMP19, Thames Water has examined the supply/demand balance for each WRZ and determine how any deficits between forecast demand and reliable water supplies should be addressed for the selected planning period. The planning process has considered key issues which affect future water supply reliability and demand for water, such as:

- population and housing growth
- water consumption behaviour and how these may change in the future
- climate change implications for reliability of water supplies
- reductions to the availability of water supplies due to environmental impact of existing water source abstractions ('sustainability reductions')
- raw water quality deterioration due to land use and/or climate change

A wide range of alternative options has been considered by Thames Water to address any forecast supply shortfalls, including:

- alternative water tariffs to encourage water efficiency (linked to Thames Water's strategy to continue extending water metering to the majority of its customers)
- promotion of water efficiency measures
- reducing water leakage from the water supply network or at customers' properties
- water transfers from other water companies or other owners of water sources
- desalination
- indirect water reuse
- river or groundwater abstraction
- new reservoirs
- increased transfer of water between WRZs

Each of these options has been assessed to understand the costs, the benefits to the supply-demand balance, the effect on carbon emissions and the environmental and social effects (including the HRA process as well as the parallel Strategic Environmental Assessment (SEA) process and associated Water Framework Directive (WFD) assessments). The options have been subsequently compared through a comprehensive programme appraisal process (including use of an optimisation model to examine reasonable alternative programmes) to determine the 'best value' programme of options to maintain a supply-demand balance over the planning period for each WRZ. Decisions on the best value programme have taken account of a range of factors, such as the implications for water bills, the resilience to future risks and uncertainties (e.g. climate change), deliverability considerations and the environmental and social effects of the programme (adverse and beneficial, as informed by the HRA and parallel SEA and WFD assessments). The resulting preferred programme developed for each WRZ collectively form the draft WRMP19.

3 Methodology

The objective of the HRA is to establish whether options considered for inclusion in the draft WRMP19 are likely to have a significant effect on European sites (alone or in-combination with other supply schemes in the plan, or with other plans and projects), and where a significant effect is likely, to determine through Appropriate Assessment, whether the option would adversely affect the integrity of the European site(s).

HRA screening was therefore completed for the Feasible Options list considered in the development of the Thames Water draft WRMP19, a range of reasonable alternative programmes and the preferred programme developed by Thames Water. The HRA has been undertaken in parallel with the SEA and WFD assessments to ensure an integrated approach to environmental assessment and ensure overall compliance of the draft WRMP19 with relevant legislation.

3.1 HRA approach within the WRMP

3.1.1 Introduction

Thames Water consulted Natural England, the Environment Agency, Natural Resources Wales and wider stakeholders on the HRA methodology in summer 2016. The HRA has been undertaken in accordance with available guidance for England^{5,6,7,8,9,10} and has been based on a precautionary approach as required under the Habitats Regulations. It follows the staged HRA approach (as discussed below), commencing with the HRA Stage 1 screening of all the option 'elements' included within the Feasible Options list within the draft WRMP19: the option 'elements' comprised items such as water treatment works (WTWs), water conveyance systems (pipelines or tunnels), raw water abstraction intakes and discharges, pumping stations, reservoirs and groundwater sources.

Following modelling work by Thames Water to assess the costs and benefits associated with combinations of these option elements, a series of options were determined for inclusion in a wide range of reasonable alternative programmes that would address forecast supply deficits in each WRZ. A short-list of four reasonable alternative programmes were then assessed through HRA screening, both individually and in-combination with other programmes, plans and projects. Finally, HRA screening has been applied to the preferred programme that makes up the draft WRMP19, including in-combination assessment with other programmes, plans and projects.

3.1.2 HRA process

For each draft WRMP19 WRZ programme, option and Feasible List option element, HRA Stage 1 screening has considered whether there are any Likely Significant Effects (LSEs) arising from construction or implementation activities and/or operation of the option on one or more European sites, including Special Protection Areas (SPAs) and Special Areas of Conservation (SACs) (also known as Natura 2000 sites).

⁵ European Commission Environment DG (2001) Assessment of plans and projects significantly affecting European Sites. Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC.

⁶ Department for Communities and Local Government (DCLG) (2006) Planning for the Protection of European Sites. Guidance for Regional Spatial Strategies and Local Development Documents.

⁷ English Nature (1997) The Appropriate Assessment (Regulation 48) The Conservation (Natural Habitats &c) Regulations, 1994. Guidance Note HRGN1.

⁸ English Nature (1997) The Determination of Likely Significant Effect under The Conservation (Natural Habitats &c.) Regulations 1994. Guidance Note HRGN3.

⁹ Defra (2012) The Habitats and Wild Birds Directives in England and its seas: Core guidance for developers, regulators & land/marine managers

¹⁰ Tyldesley, D. & Chapman, C. (2015) The Habitats Regulations Assessment Handbook. DTA Publications. Version 4.

- SPAs are classified under the European Council Directive 'on the conservation of wild birds' (2009/147/EC; 'Birds Directive') for the protection of **wild birds and their habitats** (including particularly rare and vulnerable species listed in Annex 1 of the Birds Directive, and migratory species).
- SACs are designated under the Habitats Directive (92/43/EEC) and target particular **habitats** (Annex 1) **and/or species** (Annex II) identified as being of European importance.

The Government also expects potential SPAs (pSPAs), candidate SACs (cSACs), compensation habitat and Ramsar sites to be included within the assessment. Ramsar sites support **internationally important wetland habitats** and are listed under the Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention, 1971).

For ease of reference in this HRA Report, these designations will be collectively referred to as “European sites”, despite Ramsar designations being made at the international level rather than EU level.

The first stage of the HRA process has been carried out for the draft WRMP19:

- **Stage 1 Screening:** A screening process has been undertaken to identify whether each option element and option in Thames Water's preferred programme for WRMP19 (either alone or in-combination with other plans or projects) is likely to have significant effects on European sites.

The purpose of the screening stage is to determine whether any part of the draft WRMP19 is likely to have a significant effect on any European sites (including areas of compensation habitat, areas of off-site functional habitat, and the ability for abstractions to occur for the management of designated wetland sites). This is judged in terms of the implications of the plan for a site's conservation objectives, which relate to its 'qualifying features' (i.e. those Annex I habitats, Annex II species, and Annex I bird populations for which it has been designated¹¹, and Ramsar criteria). Significantly, HRA is based on a rigorous application of the precautionary principle.

The screening stage must also conclude whether any in-combination LSEs would result from the option elements included within each option, the options within each programme and the plan as a whole, as well as in-combination with other programmes, plans or projects, and whether these would adversely affect the integrity of a European site.

Where LSE could not be ruled out at the screening stage of Feasible list option elements (noting the adoption of a precautionary principle), the option element was further reviewed by Thames Water to determine whether it should continue to be included in the WRMP19 process or be rejected. If the option element was retained, it was flagged as having a high environmental risk within the subsequent option and programme appraisal process (see the SEA Environmental Report for further details).

Mitigation measures have been set out in the conceptual designs for each option element and these have been taken into account in carrying out the assessments. In some cases, additional mitigation measures have been identified through the HRA process, as documented in this report.

3.1.3 HRA screening

To provide an indication of those option elements more likely to have a significant effect on a European site(s), option elements within 10km of a European site were identified. Additionally, European sites within 20km downstream of the option element were investigated. Consideration was also given to the relative locations of schemes and designated sites within the same surface and groundwater catchments to ensure that any connectivity over a longer distance than 20km that might affect water-dependent sites, qualifying features and designated mobile species was taken into

¹¹ Annexes are contained within the relevant EC Directive.

account. GIS data was used to map the locations and boundaries of each of the European sites in relation to the option elements. Where location information for surface and groundwater catchments was not available, the precautionary principle was applied taking into account specialist input from hydrologists and hydrogeologists to determine whether there was a possible risk to a European site.

The attributes of the European sites, which contribute to and define their integrity, were considered with reference to Standard Data forms for SACs and SPAs and Information Sheets for Ramsar sites. An analysis of these information sources enabled the identification of the site's qualifying features. This information, as well as Article 17 reporting¹², site conservation objectives, Site Improvement Plans (SIPs) and any supporting Site of Special Scientific Interest's favourable condition tables, was used to identify those features of each site which determine current conservation status, site integrity and the specific sensitivities of the site. Analysis of how potential impacts of the option elements may affect a European site for the Stage 1 screening assessment was undertaken using this information.

The qualifying habitats and species of European sites are vulnerable to a wide range of impacts such as physical loss or damage of habitat, disturbance from noise, light, human presence, changes in hydrology (e.g. changes in water levels/flow, flooding), changes in water or air quality and biological disturbance (e.g. direct mortality, introduction of disease or non-native species). The assessment considered both construction effects (where applicable) and operational effects of each option element/option. Post operational effects (decommissioning) were not considered as part of this HRA as the WRMP option elements/options are very long-life assets which are maintained over a long period and so are not planned with a specific decommissioning phase.

In determining the likelihood of significant effects on European sites from any draft WRMP19 option element/option, particular consideration has been given to the possible source-receptor pathways through which effects may be transmitted. Transmission of effects may occur from activities associated with the options contained within the WRMP, to features contributing to the integrity of the European sites (e.g. groundwater or surface water catchments, air, etc.). **Table 1** provides examples of the types of impacts the options might have on European site qualifying features.

Screening for LSEs was determined on a proximity basis for many of these types of impacts, based on the proximity of the potential location of each measure to each European site. However, there are many uncertainties associated with using threshold distances as there are very few standards available as a guide to how far impacts will extend. Different types of impacts can occur over different distances, and the assumptions and distances used in the HRA and justification for them are shown in **Table 1**.

Table 1 Potential impacts of WRMP option elements on European sites

Broad categories of potential impacts on European sites, with examples	Examples of operations responsible for impacts (<i>distance assumptions in italics</i>)
Physical habitat loss: <ul style="list-style-type: none"> • Removal (including offsite effects, e.g. foraging habitat) • Smothering 	Development of infrastructure associated with scheme, e.g. new or temporary pipelines, transport infrastructure, temporary weirs. Indirect effects from a reduction in flows e.g. drying out marginal habitat. <i>Physical loss is mostly 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 the species population for which a European site is designated).</i>
Physical damage: <ul style="list-style-type: none"> • Sedimentation / silting • Prevention of natural processes • Habitat degradation • Erosion 	Impacts of construction and maintenance activities e.g. trampling, vegetation clearance, sedimentation/siltation. <i>Physical damage is likely to be significant where the boundary of the scheme extends within or is directly adjacent to the</i>

¹² Every six years, Member States of the European Union are required (by Article 17 of the Directive) to report on implementation of the Habitats Directive to the European Commission.

Broad categories of potential impacts on European sites, with examples	Examples of operations responsible for impacts (<i>distance assumptions in italics</i>)
<ul style="list-style-type: none"> • Fragmentation • Severance/barrier effect • Edge effects 	<p><i>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 of a scheme, long shore drift along the coast, or the scheme impacts the linking habitat).</i></p>
<p>Non-physical disturbance:</p> <ul style="list-style-type: none"> • Noise • Visual presence • Human presence • Light pollution 	<p>Noise from temporary construction or temporary pumping activities. <i>Taking into consideration the noise level generated from general building activity (c. 122dB(A)) and considering the lowest noise level identified in appropriate guidance as likely to cause disturbance to bird species, it is concluded that noise impacts could be significant up to 1km from the boundary of the European site.</i></p> <p>Noise from vehicular traffic during operation of a scheme. <i>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.</i></p> <p>Plant and personnel involved in in operation of the scheme. <i>These effects (noise, visual/human presence) are only likely to be significant 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 the species population for which a European site is designated).</i></p> <p>Schemes which might include artificial lighting, e.g. for security around a temporary pumping station. <i>Effects from light pollution are only likely to be significant where the boundary of the scheme is within 500m of the boundary of the European site. From a review of Environment Agency internal guidance on HRA and various websites, it is considered that effects of vibration and noise and light are more likely to be significant if development is within 500m of a European site.</i></p>
<p>Water table/availability:</p> <ul style="list-style-type: none"> • Drying • Flooding / stormwater • Changes to surface water levels and flows • Changes in groundwater levels and flows • Changes to coastal water movement 	<p>Changes to water levels and flows due to increased water abstraction, reduced storage or reduced flow releases from reservoirs to river systems. <i>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.</i></p>
<p>Toxic contamination:</p> <ul style="list-style-type: none"> • Water pollution • Soil contamination • Air pollution 	<p>Reduced dilution in downstream or receiving waterbodies due to changes in abstraction or reduced compensation flow releases to river systems. <i>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.</i></p> <p>Air emissions associated with vehicular traffic during construction and operation of schemes. <i>This effect is only likely to be significant where the transport</i></p>

Broad categories of potential impacts on European sites, with examples	Examples of operations responsible for impacts (<i>distance assumptions in italics</i>)
	<i>route to and from the scheme is within or in proximity to the boundary of the European site^{13,14}. Without mitigation, dust and dirt from the construction site may be transported 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.</i>
Non-toxic contamination: <ul style="list-style-type: none"> • Nutrient enrichment (e.g. of soils and water) • Algal blooms • Changes in salinity • Changes in thermal regime • Changes in turbidity • Changes in sedimentation/silting 	Changes to water salinity, nutrient levels, turbidity, thermal regime due to increased water abstraction, storage, or reduced compensation flow releases to river systems. <i>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.</i>
Biological disturbance: <ul style="list-style-type: none"> • Direct mortality • Changes to habitat availability • Out-competition by non-native species • Selective extraction of species • Introduction of disease • Rapid population fluctuations • Natural succession 	Creation of new pathway of non-native invasive species. <i>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</i>

3.2 Habitats Regulations Review of Consents

The determination of the likely significant effects of continued utilisation of Thames Water's existing licensed abstraction sources (which underpins the draft WRMP19) on European sites was based on the 'Review of Consents' process undertaken by the Environment Agency. The Environment Agency is the 'competent authority' for the regulation of the impact of abstraction on the natural environment. The Environment Agency carried out the Review of Consents in accordance with requirements of the European Habitats Directive and the review was carried out over the period 2004 to 2008.

The Review of Consents for existing abstractions is also relevant to new resource schemes, because some involve increasing existing abstractions at licensed sites while still remaining within the existing licensed limit. Where these existing licences have been assessed by the Environment Agency's Review of Consents as not having an adverse effect on Natura 2000 sites, the additional increase in abstraction from the new resource scheme but which would remain within the existing licensed limit) has also been deemed not to have any LSEs on European sites as a result. Consideration has, however, been given to any construction elements (e.g. new pipelines or treatment works) and any potential in-combination effects with other options, projects or plans.

The Environment Agency's Review of Consents was undertaken by considering all European sites within Thames Water's supply area. The European sites were initially screened to identify all sites with water dependent habitat within the Thames Water's supply area. Those sites that contained water dependent habitat were then reviewed to assess whether Thames Water abstractions were located within the same groundwater or surface water catchment and therefore could have potential to affect the hydrogeological or hydrological regime of the sites. Any sites that were in the same catchment as a Thames Water licensed abstraction source were assessed in more detail to determine whether the abstraction would be likely to have a significant effect. The Environment Agency looked in more detail at the sensitivities of the European site to water supply, and at the local hydrology. For

¹³ Highways Agency (2003) Design Manual for Roads and Bridges (DMRB), Volume 11.

¹⁴ Institute of Air Quality Management (2014) Guidance on the assessment of dust from demolition and construction v1.1.

example, a European site may be fed by surface water and the abstraction may be downstream, or the abstraction may be from a confined aquifer which could not impact the water supply at the protected site. In addition, the Environment Agency was also able to use simple drawdown calculations to conclude that the impact would be insignificant.

The European sites for which the Environment Agency's Review of Consents included Thames Water licensed water abstraction sources, and for which an Appropriate Assessment was required as part of the review process (in 2008), are listed below in Table 2: "Habitats Directive Review of Consents Sustainability – sites requiring review of Thames Water licensed sources". The 'definitive' column in Table 2 shows those abstraction licences where the Environment Agency indicated that a sustainability reduction was definitely required in order to avoid a significant effect on European sites. For these sources, solutions to enable the reduction were included in the Final Business Plan and were funded for delivery during Asset Management Period (AMP) 5 (2010-2015).

The findings of the Review of Consents process have been used, where appropriate, to inform the HRA screening.

Table 2 Habitats Directive Review of Consents (2008) – Sites Requiring Review of Thames Water Licensed Sources¹⁵

Thames Water Utilities				Date: August 2008	
Site Name	Driver	Priority	Licence Number	Definitive	Indicative
Lee Valley Waterbodies SPA	HD	Medium	29/38/07/0034 29/38/07/0035 29/38/07/0036	Licence reduction 0MI/d	
South West London Waterbodies SPA	HD	Low	N/A	N/A	N/A
Kennet and Lambourn Floodplain SAC	HD	Medium	28/39/22/47 28/39/22/394	Speen: Reduction of daily peak licence by 5MI/d and annual average by 4MI/d. Thatcham Reedbeds SSSI – requirement to install augmentation from the River Kennet for use in severe drought to counter potential impact of WBGWS operation. No licence reduction of WBGWS required.	
River Lambourn SAC	HD	Medium	28/39/22/390 28/39/22/391 28/39/22/392		The Environment Agency is reviewing the West Berkshire Groundwater Scheme (WBGWS) Operating Agreement and has indicated that any changes they propose will not have any impact on the deployable output of the scheme
North Meadow & Clattinger Farm SAC	HD	Medium	28/39/1/9 28/39/2/63 28/39/2/18 25/39/2/10	Licence reduction 0MI/d	
Oxford Meadows SAC	HD	Medium	28/39/16/78	Licence reduction 0MI/d	
Kennet Valley Alderwoods SAC	HD	Low	28/39/22/47	Speen: Reduction of daily peak licence by 5MI/d and annual average by 4MI/d	
Thursley Common SAC	HD		Mousehill & Rodborough	Licence reduction 0MI/d	

Reference: Environment Agency (August 2008): Sustainability Reductions, 080829/SR

¹⁵ The table includes status of requirement for sustainability reductions as provided by the Environment Agency August 2008

The European sites for which the Environment Agency's Review of Consents process required Appropriate Assessment in relation to Thames Water's licensed sources are considered in more detail below.

Lee Valley Waterbodies SPA

The Lee Valley Waterbodies SPA consists of a series of waterbodies in the Middle/Lower Lee Valley to the south of Ware. The existence of the waterbodies is predominantly as a result of old gravel workings. These waterbodies have become important locations for significant numbers of waterfowl that rely on the various lakes for roosting at certain times of the year. The Review of Consents identified a number of Thames Water's licensed sources that needed to be assessed to determine whether they had the potential to adversely affect the groundwater regime around the designated waterbodies so that the integrity of the sites was compromised. This Appropriate Assessment has been carried out by the Environment Agency and the Thames Water licensed sources have been concluded to have no adverse impact on the sites.

Thames Water was notified of this conclusion through a letter from the Environment Agency dated 7 May 2009.

South West London Waterbodies SPA

The South West London Waterbodies SPA consists of a series of waterbodies in the Lower Thames Valley. The existence of the waterbodies is as a result of development of reservoir storage for public water supply. These waterbodies have become important locations for significant numbers of waterfowl that rely on the various reservoirs for roosting at certain times of the year. The Review of Consents identified a number of Thames Water's water resource management activities that needed to be assessed to determine whether they had the potential to adversely affect the designated waterbodies so that the integrity of the sites was compromised. This Appropriate Assessment has been carried out by the Environment Agency and the sources have been concluded to have no adverse impact on the sites.

Thames Water was notified of this conclusion through a letter from the Environment Agency dated 7 May 2009.

Kennet and Lambourn Floodplain SAC

The Appropriate Assessment for the Kennet and Lambourn Floodplain SAC was required to assess the impact of the groundwater abstraction from the Chalk aquifer at Speen. The Environment Agency's Appropriate Assessment concluded that the groundwater abstraction posed a risk to the integrity of the site and so on the basis of the precautionary principle the Environment Agency required a reduction of the licensed abstraction at Speen. Thames Water was notified of this conclusion through a letter from the Environment Agency dated 28 November 2008 which included the final National Environment Programme.

The reduction required was from an average of 11.396MI/d and a peak of 13.638MI/d to an average of 7.396 MI/d (reduction of 4MI/d) and a peak of 8.638 MI/d (reduction of 5MI/d). This licence reduction reduced the deployable output of the source although it did not result in the Supply/Demand balance for the WRZ going into deficit. However, in order to maintain security of supply in the local area a scheme to improve the distribution network in and around Newbury was required. This scheme was implemented during 2010-2015. With the completion of this scheme, abstraction at Speen does not have any adverse impact on the integrity of the designated site or present a risk to the integrity of the site.

The Appropriate Assessment also covered the Thatcham Reedbeds SSSI which is a component part of the Kennet and Lambourn Floodplain SAC. The Appropriate Assessment for the Kennet and Lambourn Floodplain SAC was required to assess the potential impact of groundwater abstraction from the Chalk aquifer under the West Berkshire Groundwater Scheme (WBGWS). The WBGWS is a strategic drought scheme for which the licences are held by the Environment Agency. The scheme

would be operated in drought conditions only and the use of the scheme is triggered through the Lower Thames Operating Agreement. The scheme is designed to operate only one year in twenty on average.

The conclusion of the Environment Agency's Appropriate Assessment was that the potential operation of the WBGWS in a prolonged drought could lead to lowering of groundwater levels under the Thatcham Reedbeds, with the potential for adverse impact on the surface water regime on which the habitat assemblage in the Reedbeds is dependent. Thames Water was notified of this conclusion through a letter from the Environment Agency dated 28 November 2008.

In view of the strategic nature of the WBGWS and the associated infrequency of its use, the requirement for a significant reduction in the licensed abstraction associated with the scheme was not deemed the most appropriate solution. The solution required by the Environment Agency was the development of a facility to enable augmentation of the Thatcham Reedbeds site in the event of a prolonged drought and operation of the WBGWS for a significant period. This scheme was included in Thames Water's Business Plan for 2010-2015. Completion of this scheme enables the abstraction under the WBGWS to be undertaken without any adverse impact on the integrity of the designated site.

River Lambourn SAC

The Appropriate Assessment for the River Lambourn SAC was required to assess the potential impact of groundwater abstraction from the Chalk aquifer under the West Berkshire Groundwater Scheme (WBGWS). The WBGWS is a strategic drought scheme for which the licences are held by the Environment Agency. The scheme would be operated in drought conditions only and the use of the scheme is triggered through the Lower Thames Operating Agreement. The scheme is designed to operate only one year in twenty on average.

The Environment Agency considered that the prolonged operation of the WBGWS in the event of a significant drought had the potential to result in adverse environmental impact on the River Lambourn SAC. The Environment Agency considered that the basis for the operation of the WBGWS could be modified, through amendment to the WBGWS Operating Agreement such that the risk of adverse impact on the SAC is eliminated. In view of the Environment Agency's conclusions on the requirements for the WBGWS Operating Agreement, Thames Water was not required to implement a scheme to ensure the integrity of the River Lambourn SAC.

North Meadow and Clattinger Farm SAC

The North Meadow and Clattinger Farm SAC was designated for its grassland/flood meadow habitat and supports an important assemblage of flora and fauna. The Appropriate Assessment was required to determine whether the groundwater abstractions at Latton, Baunton and Ashton Keynes had the potential to adversely affect the groundwater regime supporting the designated sites. The Appropriate Assessment was carried out by the Environment Agency and concluded that there was no adverse impact of the licensed abstraction on the integrity of the designated site.

Thames Water was notified of this conclusion through a letter from the Environment Agency dated 18 June 2007.

Oxford Meadows SAC

The Oxford Meadows SAC is designated in view of the flood meadow habitat which is home to the important species *Apium repens* which requires a habitat with shallow groundwater and periodic inundation. The Appropriate Assessment was required to assess the impact of the abstraction at Farmoor from the River Thames on the flows in the River Thames and the potential for the abstraction to affect the pattern of inundation of the Oxford Meadows site. The Appropriate Assessment was carried out by the Environment Agency and concluded that there was no adverse impact of the licensed abstraction on the integrity of the designated site.

Thames Water was notified of this conclusion through a letter from the Environment Agency dated 18 June 2007.

Kennet Valley Alderwoods SAC

The Appropriate Assessment for the Kennet Valley Alderwoods was required to assess the impact of the groundwater abstraction from the Chalk aquifer at Speen. The Environment Agency's Appropriate Assessment concluded that the groundwater abstraction posed a risk to the integrity of the site and so on the basis of the precautionary principle the Environment Agency required a reduction of the licensed abstraction at Speen. Thames Water was notified of this conclusion through a letter from the Environment Agency dated 28 November 2008.

The reduction required was from an average of 11.396MI/d and a peak of 13.638MI/d to an average of 4 MI/d and a peak of 5 MI/d. This licence reduction affected the deployable output of the source although it did not result in the Supply/Demand balance for the WRZ going into deficit. However, in order to maintain security of supply in the local area a scheme to improve the distribution network in and around Newbury was required. This scheme was included in Thames Water's Business Plan for 2010-2015. Completion of this scheme enabled abstraction to take place at Speen such that it does not have any adverse impact on the integrity of the designated site.

Thursley Common SAC

The Thursley Common SAC is designated for its heathland habitat and supports an important assemblage of flora and fauna. The Appropriate Assessment was carried out to determine the impact of abstraction from Thames Water's source at Mousehill and Rodborough on the groundwater levels below the site. The Appropriate Assessment in relation to Thames Water's sites alone considered that there was no adverse impact on the integrity of the sites and the licences were affirmed. However further work was required to assess the impact of Thames Water's abstractions when considered in conjunction with other abstractions and so an 'In-Combination Assessment' of the aggregate impact of a series of abstractions was required including the Mousehill and Rodborough abstraction. This 'In-Combination Assessment' was undertaken by the Environment Agency and concluded that there was no adverse impact of the Mousehill and Rodborough source on the integrity of Thursley Common SAC.

Thames Water was notified of this conclusion through a letter from the Environment Agency dated 19 November 2007.

3.3 Review of potential in-combination effects

Article 6(3) of the Habitats Directive requires an Appropriate Assessment of 'Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives'.

The HRA therefore considers the in-combination effects of the elements, options and programmes with other options/programmes within the WRMP, and the in-combination effects with other programmes, plans and projects, that could have an impact on the European sites identified within the HRA. These include schemes identified in other Thames Water plans, neighbouring water company WRMPs and drought plans, major projects being brought forward by Thames Water and other neighbouring land users, and in other land use and infrastructure plans. In-combination effects can only occur on the same qualifying features within a given designated site, i.e. in-combination effects cannot operate on the same qualifying features in different designated sites or different qualifying features within the same designated site.

The approach to the in-combination assessment is described as a series of questions below:

- **STEP 1** – Does the option/plan/project have no discernible adverse effect, whatsoever, on the European Site? If not, then there's no need for in-combination assessment, as logic dictates it can't have in-combination effects.
- **STEP 2** – Does this option/plan/project have a discernible effect, but one which is not significant alone (i.e. 'de minimus' effect)? If so, then an in-combination assessment is required. (Effects that are adverse alone do not require in-combination assessment.)
- **STEP 3** – Identify the other options/plans/projects that also have discernible effects that (1) aren't an adverse effect alone but (2) might act in combination with effects of your option/plan/project. It is normal practice to agree this list of potential in-combination plans/projects with the Competent Authority before doing the assessment.
- **Step 4** – Assess these other options/plans/projects in combination with this plan/project.

The above steps recognise that significant effects acting alone are already dealt with for that option/plan/project and should not form part of an in-combination assessment. It is only those otherwise-insignificant (*de minimus*) effects that may *become significant when acting in combination* that are included.

3.4 Consultation comments and responses

Formal consultation was carried out with Natural England and the Environment Agency on the proposed HRA methodology in summer 2016 (see Section 1.3). A number of general issues were raised by Natural England regarding the proposed approach, these are identified in Table 2 below. A full log of the further informal HRA screening consultation comments and responses is presented in Appendix B, including those made on specific detailed assessment reports (for example, in relation to the series of Severn to Thames Transfer option reports prepared between 2015 to 2017).

Table 3 Summary of key comments on the HRA Methodology consultation and Thames Water response

Comment	Thames Water Response
The HRA should consider all applicable Site Improvement Plans affiliated with the relevant internationally designated sites, and should clearly illustrate how the information within the Site Improvement Plans (SIP) has been	The SIPs for each designated European site have been considered and the components that could be affected by each element have been identified and considered in the screening assessment.

applied.	
There are no details on how potential impacts on SSSIs will be reviewed.	HRA is an assessment of impacts to European Sites, whereas SSSIs are designated at the national level and do not fall under the European Habitats Directive. Where SSSIs are relevant to a European Site qualifying features and potentially impacted these will be discussed in the HRA assessment. A separate SSSI assessment has been provided in the SEA Environmental Report.
The HRA should be amended to include assessment of options likely to have effects on functional habitat (habitat outside the designated boundary used by mobile species for feeding and other activities).	The potential for impacts to the relevant mobile qualifying feature species (birds, stag beetles, otters and fish) whilst using potential off-site functional habitat has been undertaken and the assessments updated accordingly. Potential functional habitat for birds (the main requirement) was searched for within 1km of each option element as this is the maximum distance at which significant disturbance is likely to occur. ¹⁶
Assessment of options with significant construction traffic should consider air quality impacts, particularly on vulnerable habitats such as chalk grasslands, acid grassland and low heathland.	The potential for air quality impacts has been considered in full. The threshold for impact applied was 1000AADT or 200 HGVs daily within 200m of a designated site with qualifying features sensitive to air quality.
The HRA should consider any opportunities for enhancements to designated sites within the screening process	Enhancement is not required under HRA, further consideration of opportunities to be considered by Thames Water.
Non-bird Ramsar features are often missing from the list of site features and the list of water dependant features.	We will review and include screening assessment of such features for Ramsar sites.

¹⁶ Environment Agency (2013) Bird Disturbance from Flood and Coastal Risk Management Construction Activities. Overarching Interpretive Summary Report. Prepared by Cascade Consulting and Institute of Estuarine and Coastal Studies.

4 HRA findings

4.1 Potentially affected European sites

The HRA of the draft WRMP19 initially considered all of the option elements within the Feasible Options list. A total of 86 option elements were subject to this screening, with 81 of these elements identified as potentially impacting one or more European designated sites. Table 4 below sets out the European sites that might potentially be affected by construction and / or operation of each of these 81 option elements.

Table 4 European designated sites potentially impacted by option elements

European designated site	Relevant option elements
Aston Rowant SAC	Henley to SWOX transfer pipeline A Henley to SWOX transfer pipeline B River abstraction in South SWA
Berwyn and South Clywd Mountains SAC	Raw Water Transfer Upper Severn Vyrnwy 180 ML/D (Lon only)
Berwyn SPA	Raw Water Transfer Upper Severn Vyrnwy 180 ML/D (Lon only)
Bredon Hill SAC	Raw Water Transfer Deerhurst to Culham 300 ML/D Raw Water Transfer Deerhurst to Culham 400 ML/D Raw Water Transfer Deerhurst to Culham 500 ML/D Raw Water Transfer Mythe 15 ML/D (Lon only)
Burnham Beeches SAC	Groundwater Datchet 5.7 ML/d RC Datchet Main Replacement - 9.3 ML/D Eton removal of constraints to DO - 1.3 ML/D Datchet intake capacity increase
Chilterns Beechwood SAC	Henley to SWOX 2.46 ML/D Henley to SWOX Henley to SWA 4.1 ML/D Henley to SWA 2.37 ML/D River abstraction in South SWA SWA south: Medmenham Raw water intake and transfer SWA south Medmenham WTW
Cothill Fen SAC	Abingdon WTW new 24 ML/D (SWOX) New Reservoir Abingdon 150Mm3 New Reservoir Abingdon 125Mm3 New Reservoir Abingdon 100Mm3 New Reservoir Abingdon 75Mm3 Abingdon Reservoir Phased 30+100Mm3 Phase 1 Abingdon Reservoir Phased 30+100Mm3 Phase 2 Abingdon Reservoir Phased 80+42Mm3 Phase 1 Abingdon Reservoir Phased 80+42Mm3 Phase 2 Raw Water Transfer Deerhurst to Culham 300 ML/D Raw Water Transfer Deerhurst to Culham 400 ML/D Raw Water Transfer Deerhurst to Culham 500 ML/D Abingdon WTW Treated transfer to North SWA Oxford Canal 15 ML/D (SWOX option)
Dixton Wood SAC	Raw Water Transfer Deerhurst to Culham 300 ML/D Raw Water Transfer Deerhurst to Culham 400 ML/D Raw Water Transfer Deerhurst to Culham 500 ML/D Raw Water Transfer Mythe 15 ML/D (Lon only)
Ensors Pool SAC	Oxford Canal 15 ML/D (London option)
Epping Forest SAC	Desalination North Beckton to Coppermills 150 ML/D Desalination South Crossness to Beckton 300 ML/D Desalination North Beckton RO Treatment Plant 150 ML/D Groundwater Arla Foods Licence Trading/Transfer - 2 ML/D TWRM extension - Coppermills to Honor Oak Reuse Beckton to Lockwood 300 ML/D Reuse Deephams to KGV Intake 60 ML/D Reuse Deephams to new TLT Extension Reuse Deephams 60 ML/D Reuse Beckton Phase 1, 2 & 3 300 ML/D KGV to BPT south of William Girling - 300ML/D TLT capacity enhancement – up to 450ML/D TLT extension from Lockwood to KGV - 800ML/D KGV Res intake capacity increase

	<p>TWRM extension - Coppermills New Header tank TWRM extension - Riverhead Pump Replacement Coppermills WTW extension 100 ML/D Coppermills WTW extension 150 ML/D Break Tank to Coppermills via Res 5 - Spine 2 Chingford South intake capacity increase</p>
Hackpen Hill SAC	<p>New Reservoir Abingdon 150Mm3 New Reservoir Abingdon 125Mm3 New Reservoir Abingdon 100Mm3 New Reservoir Abingdon 75Mm3 Reservoir Phased Abingdon 30+100Mm3 Phase 1 Reservoir Phased Abingdon 30+100Mm3 Phase 2 Reservoir Phased Abingdon 80+42Mm3 Phase 1 Reservoir Phased Abingdon 80+42Mm3 Phase 2</p>
Hartslock Wood SAC	<p>Groundwater - Moulsoford 1 - 3.5 ML/D Kennet Valley to SWOX 11 ML/D Kennet Valley to SWOX 15.5 ML/D Kennet Valley to SWOX</p>
Kennet and Lambourn Floodplain SAC	RC East Woodhay borehole pumps - 2.1 ML/D
Kennet Valley Alderwoods SAC	RC East Woodhay borehole pumps - 2.1 ML/D
Lee Valley SPA and Ramsar	<p>Groundwater Arla Foods Licence Trading/Transfer - 2 ML/D TWRM extension - Coppermills to Honor Oak TWRM extension - Barrow Hill Pump Replacement Reuse Beckton to Lockwood 300 ML/D Reuse Deephams to KGV Intake 60 ML/D Reuse Deephams to new TLT Extension Reuse Deephams 60 ML/D KGV to BPT south of William Girling – 300ML/D TLT capacity enhancement – up to 450ML/D TLT extension from Lockwood to KGV – 800ML/D KGV Res intake capacity increase TWRM extension - Coppermills New Header tank TWRM extension - Riverhead Pump Replacement Coppermills WTW extension 100 ML/D Coppermills WTW extension 150 ML/D Break Tank to Coppermills via Res 5 - Spine 2 Chingford South intake capacity increase</p>
Little Wittenham SAC	<p>Abingdon WTW new 24 ML/D (SWOX) Abingdon WTW New Reservoir Abingdon 150Mm3 New Reservoir Abingdon 125Mm3 New Reservoir Abingdon 100Mm3 New Reservoir Abingdon 75Mm3 Reservoir Phased Abingdon 30+100Mm3 Phase 1 Reservoir Phased Abingdon 30+100Mm3 Phase 1 Reservoir Phased Abingdon 80+42Mm3 Phase 1 Reservoir Phased Abingdon 80+42Mm3 Phase 2 Raw Water Transfer Deerhurst to Culham 300 ML/D Raw Water Transfer Deerhurst to Culham 400 ML/D Raw Water Transfer Deerhurst to Culham 500 ML/D Treated transfer to North SWA</p>
Medway Estuary and Marshes SPA and Ramsar	Groundwater Southfleet/Greenhithe (new WTW) - 8 ML/D
North Meadow and Clattinger Farm SAC	<p>Radcot WTW new 24 ML/D (SWOX) RC Ashton Keynes borehole pumps - 2.5 ML/D Inter Zonal Transfer - WESSEX to SWOX 2.9 ML/D (Flaxlands) Inter Zonal Transfer - WESSEX to SWOX</p>
Oxford Meadows SAC	<p>Abingdon WTW new 24 ML/D (SWOX) Treated transfer to North SWA Oxford Canal 15 ML/D (SWOX option)</p>
Richmond Park SAC	<p>Kempton WTW new 100 ML/D Kempton WTW new 150 ML/D Kempton WTW new 300 ML/D New Kempton Shaft Direct River Abstraction Teddington to Thames Lee Valley Shaft 300 ML/D Direct River Abstraction - Teddington Weir (Mogden Effluent Transfer) - 300 ML/D TWRM extension - Hampton to Battersea link Groundwater London confined Chalk (north) - 2 ML/D AR Merton (SLARS3) - 5 ML/D AR Streatham (SLARS2) - 4 ML/D Surbiton intake capacity increase Queen Mary Res to Kempton WTW – 800 ML/D</p>

	Mogden to Teddington 300 ML/D
River Lambourn SAC	RC East Woodhay borehole pumps - 2.1 ML/D
River Mease SAC	Oxford Canal 15 ML/D (London option)
Severn Estuary SAC, SPA and Ramsar	Raw Water Transfer Deerhurst to Culham 300 ML/D Raw Water Transfer Deerhurst to Culham 400 ML/D Raw Water Transfer Deerhurst to Culham 500 ML/D
South West London Waterbodies SPA and Ramsar	Kempton WTW new 100 ML/D Kempton WTW new 150 ML/D Kempton WTW new 300 ML/D New Kempton Shaft Direct River Abstraction Teddington to Thames Lee Valley Shaft 300 ML/D Direct River Abstraction - Teddington Weir (Mogden Effluent Transfer) - 300 ML/D TWRM extension - Hampton to Battersea link ASR Thames Valley/Thames Central - 1 ML/D Groundwater Datchet 5.7 ML/D RC Datchet Main Replacement - 9.3 ML/D Eton removal of constraints to DO - 1.3 ML/D Surbiton intake capacity increase Queen Mary Res to Kempton WTW – 800ML/D Littleton Intake Capacity increase transfers to Queen Mary Datchet intake capacity increase
Thames Basin Heaths SPA	Groundwater Dapdune Licence Disaggregation - 2.2 ML/D Groundwater Mortimer disused source (recommission) - 4.5 ML/D RC Dapdune removal of constraints to DO - 3.2 ML/D Ladymead WTW removal of constraints to DO - 7.8 ML/D SEW to GUI 10 ML/D (Hogsback-Mount) SEW to Guildford Queen Mary Res to Kempton WTW - 800ML/D Littleton Intake Capacity increase transfers to Queen Mary
Thames Estuary and Marshes SPA and Ramsar	Desalination South Crossness to Beckton 300 ML/D Groundwater Southfleet/Greenhithe (new WTW) - 8 ML/D
Thursley and Ockley Bogs Ramsar	SEW to GUI 10 ML/D (Hogsback-Mount) SEW to Guildford
Thursley Hankley Frenshaw Common SPA	Groundwater Dapdune Licence Disaggregation - 2.2 ML/D RC Dapdune removal of constraints to DO - 3.2 ML/D SEW to GUI 10 ML/D (Hogsback-Mount) SEW to Guildford
Thursley, Ash, Pirbright, and Chobham SAC	Groundwater Dapdune Licence Disaggregation - 2.2 ML/D RC Dapdune removal of constraints to DO - 3.2 ML/D Ladymead WTW removal of constraints to DO - 7.8 ML/D SEW to GUI 10 ML/D (Hogsback-Mount) SEW to Guildford Queen Mary Res to Kempton WTW – 800ML/D Littleton Intake Capacity increase transfers to Queen Mary
Wimbledon Common SAC	Kempton WTW new 100 ML/D Kempton WTW new 150 ML/D Kempton WTW new 300 ML/D Direct River Abstraction Teddington to Thames Lee Valley Shaft 300 ML/D Direct River Abstraction - Teddington Weir (Mogden Effluent Transfer) - 300 ML/D TWRM extension - Hampton to Battersea link AR Merton (SLARS3) - 5 ML/D AR Streatham (SLARS2) - 4 ML/D Surbiton intake capacity increase Mogden to Teddington 300 ML/D
Windsor Forest and Great Park SAC	Groundwater Datchet 5.7 ML/D RC Datchet Main Replacement - 9.3 ML/D Eton removal of constraints to DO - 1.3 ML/D Queen Mary Res to Kempton WTW - 800ML/D Littleton Intake Capacity increase transfers to Queen Mary Datchet intake capacity increase
Wormley and Hoddesdon Park Wood SAC	TLT extension from Lockwood to KGV - 800ML/D KGV Res intake capacity increase

4.2 Assessment of WRMP option elements

The HRA screening was carried out for all the option elements in Thames Water's Feasible List for the draft WRMP 2019. The full screening assessment findings for each of the European sites identified in Section 4.1 in relation to each option element is presented in Appendix A. At the time of the element-level assessment, details of the mitigation strategies were based on the initial conceptual designs. These were subsequently refined further in light of the screening findings, where applicable, when option elements were brought together to form options for each alternative programme and the preferred programme.

LSEs were identified for 14 option elements as detailed in Table 5 with initial mitigation measures only in place. For these elements, an "uncertain" conclusion was reached about the likelihood of significant impacts, as consideration of mitigation strategies had not been detailed in full, or confirmed as being deliverable at that time. **All other option elements were assessed in the screening assessment as having no LSEs.**

Table 5 Option elements with uncertain LSE outcomes prior to consideration of additional mitigation measures

Site	Option element ¹⁷	Option reference	LSEs with initial mitigation only
Lee Valley SPA and Ramsar	Net_Coppermills New Header tank	NET-TWRM-COP-HEA	Potential disturbance impact of construction on wintering birds.
Lee Valley SPA and Ramsar	Coppermills WTW extension 100 ML/D	WTW-LON-COP-100	Potential disturbance impact of construction on wintering birds.
Lee Valley SPA and Ramsar	Coppermills WTW extension 150 ML/D	WTW-LON-COP-150	
Lee Valley SPA and Ramsar	Break Tank to Coppermills via Res 5 – Spine 2	CON-RWS-BT-COP-800	Potential disturbance impact of construction on wintering birds.
Richmond Park SAC	TWRM extension - Hampton to Battersea link	NET-TWRM-HAM-BAT	Potential mortality impact of construction on stag beetle population.
South West London Waterbodies SPA and Ramsar	Kempton WTW new 100 ML/D	WTW-LON-KEM-100	Potential disturbance impact of construction on wintering birds.
South West London Waterbodies SPA and Ramsar	Kempton WTW new 150 ML/D	WTW-LON-KEM-150	
South West London Waterbodies SPA and Ramsar	Kempton WTW new 300 ML/D	WTW-LON-KEM-300	
South West London Waterbodies SPA and Ramsar	New Kempton Shaft	NET-TWRM-KEM	Potential disturbance impact of construction on wintering birds including off-site functional habitat.
Cothill Fen SAC	Abingdon WTW new 24 ML/D (SWOX)	WTW-SWOX-ABI	Potential impact of construction on groundwater flow regime.
Cothill Fen SAC	Treated transfer to North SWA		Potential impact of construction on groundwater flow regime.
Severn Estuary SAC,	Raw Water Transfer	CON-RWT-DEH-	Impact on migratory

¹⁷ For full description of options and option elements see the draft WRMP.

SPA and Ramsar	Deerhurst to Culham 300 ML/D	CLM-300	fish species due to potential for reduced flows and in-channel barriers. Spread of invasive species between catchments.
Severn Estuary SAC, SPA and Ramsar	Raw Water Transfer Deerhurst to Culham 400 ML/D	CON-RWT-DEH-CLM-400	
Severn Estuary SAC, SPA and Ramsar	Raw Water Transfer Deerhurst to Culham 500 ML/D, 400 ML/D, 500 ML/D	CON-RWT-DEH-CLM-500	

4.3 Assessment of draft WRMP19 options in Preferred Programme

Table 7 summarises the screening assessments for each of the options included in the draft WRMP19 preferred programme.

No LSEs have been identified at the option level, subject to the delivery of the stated mitigation measures. Where LSEs were identified prior to the development of detailed mitigation measures, these are highlighted in the table and the mitigation measures advocated to remove LSEs are explained.

This assessment includes some changes to the initial option element assessments due to further consideration of mitigation measures as the option designs were progressed through the WRMP development. The following option elements included in the alternative programmes have been changed from a conclusion of “pre-mitigation LSE” to “No LSE” as key mitigation measures have been committed to by Thames Water:

- Coppermills New Header Tank and WTW extension – construction re-programmed to avoid the winter period to protect designated bird species.
- Kempton WTW new 150 Ml/d and New Kempton Shaft - mitigation to avoid or reduce visual and noise impacts of construction during the winter period on designated bird species.
- TWRM extension - Hampton to Battersea link – shaft locations to be located to avoid suitable stag beetle habitat and timed to avoid the typical period when adult beetles are active (May-August).

Option assessment outcomes and further mitigation details are included in Table 7.

Changes from Feasible Options stage

As part of the programme appraisal process, some option elements from the Feasible list were modified and one new option element was added – these were then subject to additional HRA screening. These modified and new option elements are set out in Table 6 below along with the HRA screening conclusions.

Table 6 New and modified option elements

Option	Relevant European Site(s)	Element(s)	Change	HRA Screening Assessment outcome
Beckton Reuse Phase 1 (100)	Lee Valley SPA and Ramsar Epping Forest SAC	NET_Pumping Station to New Header tank at Coppermills WTW NET-TWRM-COP-PS	New option element	No LSEs (post mitigation) This element is similar to TWRM extension - Coppermills New Header tank (assessed in Appendix A). Although the pipeline is slightly closer (90m) to the Lee Valley SPA and Ramsar

				site than the header tank (160m), the effects and required mitigation are the same for both elements.
Oxford Canal	River Mease SAC Ensors Pool SAC	RWP_15ML/D Oxford Canal to Cropredy Resource CRT-RES-RCHR- CRO-15	Previously assessed as; Oxford Canal 15 ML/D London (name change only)	No LSEs (no change)
Merton Recommissioning	Richmond Park SAC Wimbledon Common SAC	RES-RC-MTN	New element	No LSEs (post mitigation) This element is similar to the Merton SLARS option. The closest point to Wimbledon Common SAC is 3.2km and Richmond Park 5.8km. This is beyond the maximum dispersal distance for stag beetle and there is no functional habitat between the sites and Merton WTW. The London Clay underlying the SAC sites hydrogeologically separates them from the abstraction site. Therefore operation of the scheme is unlikely to have any significant effects on either site's qualifying features.

Table 7 Option level HRA screening assessment for Preferred Programme

Option name	Designated sites assessed (pre-final mitigation LSEs ¹⁸)	Option elements (pre-final mitigation LSEs?)	Element reference	Key impacts (pre-option level mitigation)	Key option level mitigation required	In-combination effects?	Post-mitigation assessment	
Beckton reuse Phase 1 (100)	Lee Valley SPA/Ramsar (LSE) Epping Forest SAC Richmond Park SAC (LSE) Wimbledon Common SAC South West London Waterbodies SPA Wormley and Hoddesdon Park Woods SAC	CON_Beckton to Lockwood 300 ML/D	CON-RU-BEC-LCK	The Coppermills Water Treatment Works lies immediately adjacent to Walthamstow Reservoirs SSSI which forms a constituent part of the Lee Valley SPA/Ramsar Site. It is also only approximately 80m away from Walthamstow Marshes SSSI, which forms the other constituent part of the SPA/Ramsar Site. As such, the proposals carry a risk of impacting upon the designated sites and/or their qualifying features (particularly wintering birds). Any construction works that take place within 1 kilometre could potentially disturb the wintering bird population (bittern, gadwall and shoveler) that forms a qualifying feature of both the SPA and Ramsar Sites. One intermediate tunnel shaft (no. 4) of the Hampton to Battersea link is located just within the boundary of Richmond Park SAC in the vicinity of Roehampton Gate near the park's northern boundary. This shaft will have a 10.5m internal diameter (ID). Given the current shaft design shows the location within the SAC there is a possibility that stag beetles that form part of the population of the qualifying feature for the SAC could be directly fatally impacted by the works; as such, there is the potential for likely significant effects to occur as a result of this option. However, the shaft has currently been located wholly within a car park devoid of vegetation and therefore no suitable stag beetle habitat (particularly egg-laying habitat) appears to be available. The closest part of the new raw water conveyance pipeline construction corridor lies approximately 660m to the west of the Epping Forest SAC. This lies within the maximum ~1km dispersal distance for female stag beetles such that, in theory, egg laying females could reach the pipeline site (and potentially be followed there by males which can disperse up to 3km) – however, in practice, this risk is considered unlikely because there is a lack of trees along the pipeline route that would attract stag beetles to that location (aerial imagery indicates the pipeline corridor route appears to be managed grassland habitat). A small area of potential functional habitat for stag beetles (broadleaved trees and scrub) exists to the west/south west of the current WTW that will be lost to the planned extension. However, given the significant urban expanse between the WTW and Epping Forest SAC it is thought highly unlikely that stag beetles could disperse sufficiently to colonise it. The closest part of this option lies approximately 550m to the north of Wimbledon Common SAC at the location of intermediate shaft no. 6 of the Hampton to Battersea link. No impacts to the North Atlantic wet or European dry heaths are considered likely at this distance. However, as stag beetles (egg laying females) can disperse a maximum of 1km any above ground works that take place within this distance of the SAC have the potential to impact upon this qualifying feature. Aerial imagery of the shaft site location suggests the shaft site avoids mature trees and the overall construction area is sufficiently small that if the above construction mitigation actions are applied then no likely significant effect to this qualifying feature would occur.	RES-RU-BEC-100	Construction within 1km of SPA/Ramsar or functional habitat to avoid winter period (October-March inclusive) or use of plant with a noise rating <50dB(A), visual screening, and Environmental Clerk of Works (EnvCoW) to ensure compliance. Recreational disturbance impact to be reduced by sensitive routing of footpath diversions, screening and explanatory boards to explain risk of noise disturbance and how to prevent it. Prevent damage to sensitive vegetation where possible, particularly woody vegetation (especially decaying timber, stumps and root stocks where larvae may be present). Avoid construction works during May-August to avoid the period when adults emerge and are active to prevent killing individuals that may fly/crawl in to the works area. Liaise with Richmond Park SAC's ecology team to ensure they are satisfied with the mitigation proposed and whether they wish to supervise it. Prevent damage to sensitive vegetation where possible, particularly woody vegetation (especially decaying timber, stumps and root stocks where larvae may be present). Avoid construction works during May-August to avoid the period when adults emerge and are active to prevent killing individuals that may fly/crawl in to the works area. Survey for the presence of male and female stag beetles in advance of any construction work. Liaise with Epping Forest SAC's ecology team to ensure they are satisfied with the mitigation proposed and whether they wish to supervise it. Prevent damage to sensitive vegetation where possible, particularly woody vegetation (especially decaying timber, stumps and root stocks where larvae may be present). Avoid construction works during May-August to avoid the period when adults emerge and are active to prevent killing individuals that may fly/crawl in to the works area. Survey for the presence of mating pairs of stag beetles or egg laying in advance of any construction work. Liaise with Wimbledon Common SAC's ecology team to ensure they are satisfied with the mitigation proposed and whether they wish to supervise it.	No	No LSEs
		IPR_Reuse Beckton 100 ML/D	NET-TWRM-COP-HEA					
		NET_TWRM extension - Coppermills to Honor Oak	NET-TWRM-COP-HON					
		NET_TWRM extension - Hampton to Battersea	NET-TWRM-HAM-BAT					
	RWS_KGV Res intake capacity increase	CON-RWS-KGV-360						
	RWS_KGV to BPT south of William Girling - 300ML/D	CON-RWS-KGV-BPT-300						
	NET_Pumping Station to New Header tank at Coppermills WTW	NET-TWRM-COP-PS						
	RWS_Conveyance from Break Tank to Coppermills WTW	CON-RWS-BT-COP-800						
	WTW Coppermills WTW extension 100 ML/D	WTW-LON-COP-100						

¹⁸ Some mitigation measures had already been advocated at the element level, but they were not always sufficient to prevent LSEs. The mitigation measures discussed in this table are additional measures to prevent LSEs at the option level.

				There are <i>de minimus</i> (not significant alone) air quality impacts on Epping Forest SAC related to emissions from construction and operation traffic, however these are not expected to cause significant effects.	Minimise air quality impacts by ensuring all construction/operation traffic is routed at least 200m away from any site with qualifying features sensitive to air quality. Avoid traffic movements amounting to >1000 AADT or 200HGV movements daily where possible.		
Beckton reuse Phase 2 (100)	Epping Forest SPA	IPR_Reuse Beckton 100 ML/D	RES-RU-BEC-100	No significant impacts identified	No additional mitigation required	No	No LSEs
Beckton reuse Phase 3 (100)	Epping Forest SPA	IPR_Reuse Beckton 100 ML/D	RES-RU-BEC-100	No significant impacts identified	No additional mitigation required	No	No LSEs
Teddington DRA 1	<p>Lee Valley SPA/Ramsar (LSE)</p> <p>Epping Forest SAC</p> <p>Richmond Park SAC</p> <p>Wimbledon Common SAC</p> <p>South West London Waterbodies SPA (LSE)</p> <p>Wormley and Hoddesdon Park Woods SAC</p>	<p>CON_Mogden to Teddington 300 ML/D</p> <p>CON_Teddington to Thames Lee Tunnel Shaft 300 ML/D</p> <p>DRA_Direct River Abstraction - Teddington Weir (Mogden Effluent Transfer) - 300 ML/D</p> <p>RWS_Chingford South intake capacity increase</p> <p>RWS_TLT extension from Lockwood to KGV - 800ML/D</p> <p>WTW Coppermills WTW extension 150 ML/D</p> <p>NET_Riverhead Pump Replacement</p> <p>WTW Kempton WTW extension 150 ML/D</p> <p>RWS_Surbiton intake capacity increase</p> <p>New TWRM shaft at Kempton</p>	<p>CON-RA-MOG-TED</p> <p>CON-RA-TED-TLT</p> <p>RES-DRA-TED</p> <p>CON-RWS-CHS-PS-100</p> <p>CON-RWS-LCK-KGV-800</p> <p>WTW-LON-COP-150</p> <p>NET-TWRM-NRV-PUM</p> <p>WTW-LON-KEM-150</p> <p>CON-RWS-SRB</p> <p>NET-TWRM-KEM</p>	<p>The Coppermills Water Treatment Works lies immediately adjacent to Walthamstow Reservoirs SSSI which forms a constituent part of the Lee Valley SPA/Ramsar Site. It is also only approximately 80m away from Walthamstow Marshes SSSI, which forms the other constituent part of the SPA/Ramsar Site. As such, the proposals carry a risk of impacting upon the designated sites and/or their qualifying features (particularly wintering birds). Any construction works that take place within 1 kilometre could potentially disturb the wintering bird population (bittern, gadwall and shoveler) that forms a qualifying feature of both the SPA and Ramsar Site. It is understood that the WTW expansion works would be located approximately 105m from the SPA/Ramsar Site to the east.</p> <p>As the Kempton WTW site is located within 1km of a SSSI that forms a constituent part of the South West London Waterbodies SPA and Ramsar Site (Kempton Park Reservoirs SSSI), there is the possibility that noise from construction activities and construction traffic could cause significant disturbance to the qualifying features of the SPA/Ramsar Site, namely over-wintering gadwall and shoveler. The closest part of the works is approximately 520m from the SPA/Ramsar Site, which is well within the accepted potential noise disturbance distance for birds. Such a disturbance impact could occur as a result of works conducted during October-March inclusive. In addition, there is a non-designated waterbody at Kempton racecourse to the south that could be used as off-site functional habitat by the qualifying feature bird species of the SPA/Ramsar Site. As this lies approximately 255m to the south east of the 150 ML/D option element it could be subject to significant noise/visual disturbance as a result of works.</p> <p>The intermediate shaft for the direct river abstraction is located approximately 1.2km to the west of Richmond Park SAC. With the maximum dispersal distance for female stag beetles being ~1km, <i>de minimus</i> effects are possible although there is no likely significant effect alone.</p>	<p>Construction within 1km of SPA/Ramsar or functional habitat to avoid winter period (October-March inclusive) or use of plant with a noise rating <50dB(A), visual screening, and Environmental Clerk of Works EnvCoW to ensure compliance. Recreational disturbance impact to be reduced by sensitive routing of footpath diversions, screening and explanatory boards to explain risk of noise disturbance and how to prevent it.</p> <p>Construction within 1km of SPA/Ramsar or functional habitat to avoid winter period (October-March inclusive) or use of plant with a noise rating <50dB(A), visual screening, and Environmental Clerk of Works EnvCoW to ensure compliance. Recreational disturbance impact to be reduced by sensitive routing of footpath diversions, screening and explanatory boards to explain risk of noise disturbance and how to prevent it.</p> <p>Prevent damage to sensitive vegetation where possible, particularly woody vegetation (especially decaying timber, stumps and root stocks where larvae may be present). Avoid construction works during May-August to avoid the period when adults emerge and are active to prevent killing individuals that may fly/crawl in to the works area. Survey for the presence of male and female stag beetles in advance of any construction work.</p>	No	No LSEs

				<p>The closest part of the new raw water conveyance pumping station and associated channel lies approximately 720m to the west of the Epping Forest SAC. This lies within the maximum ~1km dispersal distance for female stag beetles such that, in theory, egg laying females could reach the construction site (and potentially be followed there by males which can disperse up to 3km) – however, in practice, this risk is considered unlikely because there are minimal trees that are in the vicinity of the existing infrastructure that would attract stag beetles to that location and there are much more significant wooded areas between the European Site and construction area that stag beetles would be likely to favour.</p> <p>There are <i>de minimus</i> air quality impacts on Epping Forest SAC related to emissions from construction and operation traffic, however these are not expected to cause significant effects alone.</p>	<p>Prevent damage to sensitive vegetation where possible, particularly woody vegetation (especially decaying timber, stumps and root stocks where larvae may be present). Avoid construction works during May-August to avoid the period when adults emerge and are active to prevent killing individuals that may fly/crawl in to the works area. Survey for the presence of male and female stag beetles in advance of any construction work.</p> <p>Minimise air quality impacts by ensuring all construction/operation traffic is routed at least 200m away from any site with qualifying features sensitive to air quality. Avoid traffic movements amounting to >1000 AADT or 200HGV movements daily where possible.</p>		
GW_Groundwater Addington	No sites affected	GW_Groundwater Addington	RES-GW-ADD	No impacts identified	No mitigation required	No	No LSEs
GW_Groundwater Southfleet / Greenhithe (disaggregation)	Thames Estuary SPA/Ramsar Medway Estuary SPA/Ramsar	GW_Groundwater Southfleet/Greenhithe (disaggregation)	RES-GW-SOU	No significant impacts identified	No additional mitigation required	No	No LSEs
Oxford Canal	River Mease SAC Ensors Pool SAC	RWP_15ML/D Oxford Canal to Cropredy Resource	CRT-RES-RCHR-CRO-15	No significant impacts identified	No additional mitigation required	No	No LSEs
Abingdon A	Cothill Fen SAC Hackpen Hill SAC Little Wittenham SAC	RES_New Reservoir Abingdon 150 Mm3	RES-RRR-ABI-150Mm3	There are possible <i>de minimus</i> air quality impacts on Cothill Fen SAC related to emissions from construction traffic, however these are not expected to cause significant effects.	Dust and particulate emissions during construction of the reservoir would be carefully controlled through good practice dust suppression measures to avoid adverse effects on neighbouring environmental features and this, together with the distance from the construction site to Cothill Fen SAC (>4km), should ensure no significant adverse effects.	No	No LSEs
Ladymead WTW removal of constraints to DO	Thames Basin Heaths SPA Thursley, Ash, Pirbright and Chobham SAC	NTC_Ladymead Release of constraints	RES-RC-LAD	No significant impacts identified	No additional mitigation required	No	No LSEs
East Woodhay borehole pumps	River Lambourn SAC Kennet Valley Alderwoods SAC Kennet and Lambourn Floodplain SAC	NTC_East Woodhay Release of constraints	RES-RC-EWO	No significant impacts identified	No additional mitigation required	No	No LSEs
Medmenham	Chiltern Beechwoods SAC	Medmenham Intake – 80 ML/D Medmenham WTW –	CON-RWS-SWA-MMM WTW-SWA-	No impacts identified	No mitigation required	No	No LSEs

		24 ML/D	MMM				
Moulsford 1	Hartslock Wood SAC	GW Moulsford	RES-GW-MOU	No significant impacts identified	No additional mitigation required	No	No LSEs
London confined Chalk (north)	Richmond Park SAC	GW_London confined chalk	RES-GW-LCC	No significant impacts identified	No additional mitigation required	No	No LSEs
Mortimer disused source (recommissioning)	Thames Basin Heaths SPA	GW – Mortimer 1 recommissioning	RES-GW-MOR	No significant impacts identified	No additional mitigation required	No	No LSEs
Merton recommissioning	Richmond Park SAC Wimbledon Common SAC	Merton recommissioning	RES-RC-MTN	No significant impacts identified	No additional mitigation required	No	No LSEs
Ashton Keynes release of constraints	North Meadow and Clattinger Farm SAC	Ashton Keynes release of constraints	RES-RC-ASH	No significant impacts identified		No	No LSEs
Datchet Release of constraints	South West London Waterbodies SPA and Ramsar Burnham Beeches SAC Windsor Forest and Great Park SAC	Datchet Release of constraints	RES-RC-DAT	There are possible <i>de minimus</i> air quality impacts on Windsor Forest and Great Park SAC related to emissions from construction traffic, however these are not expected to cause significant effects.	Dust and particulate emissions during construction would be carefully controlled through good practice dust suppression measures to avoid adverse effects on neighbouring environmental features and this, together with the distance from the construction site to Windsor Forest and Great Park SAC (1.3km), should ensure no significant adverse effects.	No	No LSEs
Groundwater Datchet	South West London Waterbodies SPA and Ramsar Burnham Beeches SAC Windsor Forest and Great Park SAC	Groundwater Datchet	RES-GW-DAT	No significant impacts identified	No additional mitigation required	No	No LSEs
ASR_South East London (Addington)	<i>No sites affected</i>	ASR_South East London (Addington)	RES-ASR-SEL	No impacts identified	No mitigation required	No	No LSEs
IZT_Henley to SWX 2.46 ML/D	Aston Rowant SAC Chilterns Beechwood SAC	IZT_Henley to SWX 2.46 ML/D	RES-IZT-HEN-SWOX-NET-2.5	No significant impacts identified	No additional mitigation required	No	No LSEs
RWP_Wessex Water to SWX 2.9 ML/D (Flaxlands)	North Meadow and Clattinger Farm SAC	RWP_Wessex Water to SWX 2.9 ML/D (Flaxlands)	RES-ICT-WSX-FLX	No significant impacts identified	No additional mitigation required	No	No LSEs

4.4 Assessment of the draft WRMP19 preferred programme

No individual options that form part of the preferred programme has any LSE on a European site(s) subject to application of mitigation measures. However, as part of the Stage 1 Screening, the draft WRMP19 preferred programme was also assessed to determine if the individual options comprising the programme may have any LSEs when implemented in-combination. Options which have some *de minimus* effects that are not significant alone may still have an overall LSE at the programme level. This may be a result of the in-combination effects of construction or operation, for example if construction dates overlap or if multiple options have minor effects on the same European site(s).

Figure 1 shows the timeline of planned construction and activation of the options included in the preferred programme. This has been used to identify programme-level LSEs during construction.

Construction period assessment:

Despite the 3-year overlap in construction between the Addington and Southfleet/Greenhithe Groundwater options, no in-combination effects have been identified on any European Sites.

Similarly, although there is a 1-year overlap in construction between the Teddington DRA and Southfleet/Greenhithe Groundwater options, no in-combination effects have been identified on any European Sites.

There is also a 1-year overlap in construction between the Teddington DRA and Groundwater Addington options, however as there are no European sites affected by the Addington option there are no possible in-combination effects during construction.

Likewise, although there is a 5-year overlap in construction between the Beckton Reuse Phase 1 and Oxford Canal options, no in-combination effects have been identified on any European Sites.

There is also a 4-year overlap between Beckton Reuse Phase 2 and Oxford Canal options but again no in-combination effects have been identified on any European Sites.

Despite the 1-year overlap in construction between the Beckton Reuse Phase 2 / Phase 3 and Datchet release of constraints, no in-combination effects have been identified on any European Sites.

There is a 6-year overlap in construction between the Beckton Reuse Phase 1 and Beckton Reuse Phase 2, and a 4-year overlap between Beckton Reuse Phase 2 and Beckton Reuse Phase 3. There is also an overlap of 2 years between all three phases of the Beckton Reuse option. However, the only *de minimus* effects that remain after application of the mitigation measures for this option that could act in combination relate to the following:

Lee Valley SPA and Ramsar – disturbance to wintering birds

- RWS_Conveyance from Break Tank to Coppermills WTW (Spine 2)
- WTW Coppermills WTW extension 100 MLD

Epping Forest SAC – impacts to stag beetles and air quality

- CON_Beckton to Lockwood 300 MLD
- RWS_KGV Res intake capacity increase
- RWS_KGV to BPT south of William Girling - 300MI/d

No significant in-combination effects on wintering birds are deemed likely to occur due to the type of mitigation to be implemented, meaning a *de minimus* effect is unlikely to persist. If *de minimus* disturbance effects do persist even after application of the mitigation measures, the fact that the majority of the works for the raw water system conveyance will be underground and the closest part of the above ground works will be the shaft at Coppermills WTW where works will be taking place

already (as opposed to impacting on another part of the designated site simultaneously), means it is highly unlikely that these effects would combine to a significant level. In addition, it is expected that due to the highly urban surroundings of this designated site, the qualifying feature bird populations would be habituated to a reasonably high degree of disturbance already.

With mitigation, the potential *de minimus* effects on stag beetles and air quality are not deemed sufficient to act in combination to lead to a significant effect on the qualifying features of Epping Forest SAC. This is due to the considerable distance of the option from the designated site compared to the typical dispersal ability of stag beetles (and the urban surroundings which they would have to cross) and the distance at which significant air quality impacts can be incurred.

The following options have no *de minimus* effects and therefore cannot act in-combination, despite overlapping construction dates:

- Ladymead WTW removal of constraints to DO
- East Woodhay borehole pumps
- Moulsoford 1
- London confined chalk (north)
- Mortimer disused source (recommissioning)
- Ashton Keynes release of constraints
- Groundwater Datchet
- ASR_South East London (Addington)
- IZR_Henley to SWX 2.46 ML/D
- RWP_Wessex Water to SWX 2.9 ML/D (Flaxlands)

The construction programme for the other options do not overlap at all and therefore in-combination effects can be excluded during construction.

In summary, no likely significant effects, either alone or in-combination, were identified in respect of the preferred programme during the construction phase.

With the application of mitigation measures, potential *de minimus* effects (insignificant alone) were only identified with regard to disturbance of wintering birds using the Lee Valley SPA/Ramsar and air quality impacts on Epping Forest SAC and Wormley and Hoddesdon Park Woods SAC and the potential for direct mortality of stag beetles associated with Epping Forest SAC. These potential construction effects were also considered in terms of in-combination effects with other plans/projects, as set out in Section 5 of this Report.

Operational assessment:

Potential sources of operational impacts include routine deliveries of chemicals or other materials by road, chemical spills and pollution risks, disturbance from maintenance activities and changes in water quality, water levels or river flows that might affect sensitive receptors. Given the long-life span of the schemes included in the preferred programme, there is significant overlap of options in the operational phase when compared to the construction phase.

Reference to the parallel WFD assessment confirmed that there would be no significant impact on either water quality or water levels within the King George V reservoirs as a result of the Beckton reuse, Deephams reuse or Teddington DRA options. This is because, as part of the proposed options, reuse water will be treated to a high standard during operation by Thames Water prior to being released in to the River Lee/King George V reservoirs. Compliance with the WFD is a prerequisite to obtain the required Environment Agency discharge permit. Although there will be some increases in water levels as a result of operation, these are expected to be within the normal range for these reservoirs and, as such, will not lead to a significant effect on the qualifying bird species.

Mitigation measures are required in order to prevent a significant impact to qualifying features of European Sites in the vicinity during any routine maintenance and site deliveries. In summary this would comprise:

Wintering birds:

- Avoid carrying out major maintenance duties during the winter period (October-March inclusive) where such work would likely lead to disturbance to the qualifying wintering bird species. This would avoid all disturbance impacts on the wintering bird qualifying features of the relevant SPA/Ramsar Sites. This is the preferred option.
- Where this is not possible, all maintenance plant used within 1km of the SPA/Ramsar and any potential functional habitat between October to March inclusive must be rated at 50dB(A) or lower, or noise modelling must be undertaken to ensure by the point it reaches the European Site it has been attenuated to below the 50dB(A) threshold.
- Any works that take place within 250m of the European Site and potential functional habitat, and which would be visible from the European Site/functional habitat and occur during October to March would require secure, continuous, wind-resistant hoarding, tall enough to screen all major maintenance from the European Site so as to minimise any potential visual impact to wintering birds to an acceptable, non-significant, level.

Air quality:

- Significant air quality impacts would be avoided by ensuring, where feasible, that maintenance traffic is not routed within 200m of any designated site with qualifying features sensitive to air quality and, where this isn't feasible, by minimising vehicle movements as much as practicable (ensuring they remain well below the critical threshold of 1000 AADT movements or 200 HGV movements daily).

Water quality

- Thames Water will adhere to strict protocols to ensure water quality is protected during maintenance activities. This will include compliance with pollution prevention guidelines such as the use of secure bunded chemical stores and the provision of appropriate spill kits and training in how to use them safely and effectively.

To ensure that the above measures are complied with in full, an Environmental Clerk of Works (or similar responsible person), will conduct regular environmental mitigation toolbox talks and compliance audits and will stop work until any breaches are rectified.

In summary, therefore, no likely significant effects were identified at the draft WRMP19 WRZ programme level during operation.

5 Potential in-combination effects with other plans and projects

The term 'in-combination effects' is adopted as the collective term to include additive or synergistic (i.e. cumulative) effects. The in-combination effects include consideration of other plans, programmes and projects in the context of spatial and/or temporal proximity, including the following:

- Thames Water's draft Drought Plan 2016
- Neighbouring water companies' WRMPs and Drought Plans
- Environment Agency Drought Plans
- River Basin Management Plans
- Local development and land use plans
- Other major infrastructure projects and plans

An assessment of in-combination effects of these plans specific to European Sites was carried out as part of the Habitat Regulations Assessment as presented below.

5.1 Thames Water's Draft Drought Plan

Thames Water's draft Drought Plan 2016¹⁹ sets out the range of demand management and supply augmentation measures that the company may need to implement during drought conditions to maintain essential water supplies to its customers.

There are a number of possible in-combination effects with the draft WRMP19 supply augmentation schemes and/or drought order/drought permit options identified in the SEA Environmental Report; however, none of these will have any LSE on European Sites. Therefore, there are no in-combination LSEs on any European Sites related to the Drought Plan.

5.2 Neighbouring Water Companies' Draft 2019 WRMPs and Drought Plans

Draft 2019 WRMPs

Collaborative work with some of Thames Water's neighbouring water companies has taken place during the development of the draft 2019 WRMPs through the Water Resources South East (WRSE) group. Environmental assessment of the range of feasible supply options in the draft WRMPs of these companies has indicated that there is unlikely to be any in-combination adverse effects with the supply schemes included in the Thames Water draft WRMP 2019.

No in-combination LSEs are currently anticipated in relation to other water companies outside of the WRSE group with the draft WRMP 2019.

All of the draft 2019 WRMPs for water companies neighbouring the Thames Water supply area were still being finalised at the time of carrying out the HRA and therefore the in-combination effects assessment will need to be updated once these other WRMPs are published for consultation and the specific supply and demand management measures are confirmed.

¹⁹ Thames Water (2016). Draft Drought Plan. Consultation document issued January 2017.

Drought Plans

No in-combination LSEs between the draft WRMP 2019 and other water company current published Drought Plans on European Sites are anticipated.

Drought Plans are required to be updated every five years by water companies. The in-combination effects assessments will need to be updated over time to reflect any changes to the Drought Plans.

5.3 Environment Agency Drought Plan and Canal & River Trust Drought Plan

Environment Agency National Drought Plan

Part of the Environment Agency's role is to reduce the impact of drought on the natural environment by taking specific actions. The Environment Agency can apply for environmental drought orders if the environment is suffering serious damage because of abstraction during a drought. The plan says that the Environment Agency would work with stakeholders including water companies to identify where and when it would be necessary and its potential effects on any essential public supplies or infrastructure.

Given that the Environment Agency drought actions will have a positive effect on river flows and lake levels and, therefore, the natural environment and ecology, there will be no in-combination LSEs with the draft WRMP19.

Canal & River Trust Drought Plan

No in-combination LSEs are anticipated in respect of the Canal & River Trust's (CRT) drought management plan.

The information used to carry out these in-combination assessments is considered to be the most up to date information available at the time of writing, but the assessments may need to be reviewed at the time of drought option implementation.

5.4 River Basin Management Plans

The draft WRMP19 may have in-combination effects with the Thames River Basin Management Plan (RBMP) 2015²⁰ only. The RBMP acknowledges that, to support economic growth and development, significant or large scale infrastructure projects will occasionally take place within the river basin district.

In accordance with the RBMP, the draft WRMP 2019 includes measures to maintain a supply-demand balance while addressing the need to deliver sustainable abstraction from water bodies. Increased abstraction should be offset by demand management measures and therefore there will not be a significant decrease in water levels in the reservoirs that form European Sites or their off-site functional habitat (i.e. Lee Valley SPA/Ramsar and South West London Waterbodies SPA/Ramsar). There are therefore no in-combination LSEs in respect of the Thames RBMP.

5.5 Local Development and Land Use Plans

Opportunity areas identified in the London Plan are described as major pools of brownfield land with capacity to accommodate new housing, commercial and other developments. All the draft WRMP19 schemes located within Greater London are within 10km of at least one Opportunity Area and therefore any remaining *de minimus* effects on European Sites have the potential to act in-combination with those developments. In particular, the Beckton reuse scheme is located within or in close proximity to several Opportunity Areas. Areas for Intensification can support redevelopment at high densities but at a level below that of Opportunity Areas. As with Opportunity Areas, all of the draft WRMP 2019 schemes within Greater London are located with 10km of one or more of these Areas for Intensification. With careful planning and dialogue with the GLA and relevant London Boroughs

²⁰ Defra and Environment Agency (2016). Water for life and livelihoods: Thames river basin district River Basin Management Plan 2015. Updated December 2015.

(particularly with regard to the potential for in-combination effects on wintering birds, stag beetles and air quality and appropriate mitigation to offset any such effects to applicable European Sites), no in-combination effects are anticipated on European Sites as a result of future development of these Opportunity or Intensification Areas. It should be noted that some schemes (such as Beckton reuse) will not be developed for many decades and therefore the in-combination effects assessment will need to be updated in the future to take account of the prevailing London Plan or equivalent strategic plan. Outside of Greater London, no specific in-combination effects with land use and development plans have been identified.

5.6 Other Major Infrastructure Projects and Plans

Most of the confirmed or well-developed plans for significant infrastructure schemes are scheduled to be constructed and commissioned within the next 5-10 years. Relevant schemes have been reviewed in relation to spatial and temporal proximity to the draft WRMP19 schemes to assess whether any in-combination effects might arise. Key schemes reviewed included:

- River Thames Flood Alleviation Scheme (Datchet to Teddington)
- Oxford Flood Alleviation Scheme
- Abingdon Flood Alleviation Scheme
- Thames Tideway Tunnel Project
- Crossrail 1: construction (2013-2020) and the westerly extension (post-2020)
- Crossrail 2
- London Underground Northern Line Extension
- High Speed Two Rail Network (HS2): Construction of Phase 1 of the HS2 network from Euston station to Birmingham.
- North London Heat and Power Project.
- North London (Electricity Line) Reinforcement.
- A2 Bean and Ebbsfleet Junction Improvements

Of these schemes the following can be excluded from the in-combination effects assessment:

- HS2 – this scheme has no spatial proximity to any of the options within the preferred programme (or their applicable designated sites) and therefore cannot act in-combination with them.
- Northern Line extension – this scheme has no temporal overlap with the construction of any of the options within the preferred programme. With mitigation, no *de minimus* impacts were identified at the operation phase and therefore no operational in-combination effects could occur.
- Crossrail 1 – although parts of the conveyance for Beckton Reuse are in proximity to Crossrail 1, this option would not be constructed until 2056 and therefore construction overlap with Crossrail 1 is considered unlikely. With mitigation, no *de minimus* impacts were identified at the operation phase and therefore no operational in-combination effects could occur.

Some temporary in-combination effects are possible in relation to the flood alleviation schemes for the main River Thames referenced above during construction depending on the precise timing of the construction. Thames Water will liaise closely with the Environment Agency on these schemes over the next few years as they are progressed to ensure no significant in-combination effects on European Sites occur.

No in-combination adverse construction effects will arise in connection with the Thames Tideway project (construction due to be completed by 2021). No in-combination adverse operational effects are anticipated.

Crossrail 2 has been developed to the stage of an outline strategy with an indicative route and stations, but no firm decisions have yet been reached on the funding of the line. Should Crossrail 2 gain approval in the next few years, there is a possible risk of some temporal and spatial overlaps of construction activities with some of the new conveyance routes in south-west London associated with the Teddington DRA and Kempton water treatment works expansion options and Merton groundwater is in a similar area. To the north of London there are potential overlaps with parts of the Beckton reuse and Teddington DRA schemes. No operational in-combination effects are anticipated. Thames Water will liaise closely with the Department for Transport and Transport for London to assess the potential risks of construction in-combination effects on European Sites as the Teddington DRA scheme, Kempton water treatment works and Merton options are brought forward for development.

There are no likely in-combination construction effects associated with Beckton Reuse together with the North London Heat and Power Project and the North London (Electricity Line) Reinforcement as both are anticipated to be operational before Beckton Reuse is constructed. However, there are potential in-combination construction effects from these two projects with Teddington DRA due to a potential cross over of construction durations. Thames Water will need to take account of the new infrastructure of the North London Heat and Power Project and North London (Electricity Line) Reinforcement where these overlap with the proposed draft WRMP19 new water conveyance routes. *De minimus* effects (which could act in-combination with those from other plans/projects) for this option were identified for the Lee Valley SPA/Ramsar, Epping Forest SAC, Richmond Park SAC and Wormley and Hoddesdon Park Woods SAC. These relate to potential disturbance impacts (deemed insignificant alone) on wintering birds, direct mortality of stag beetles and air quality impacts.

Given the considerable mitigation proposed to avoid impacts to wintering birds associated with the Lee Valley SPA/Ramsar no significant in-combination effects are anticipated with the North London Heat and Power Project; especially as this project is being constructed largely in existing industrial land with an existing high disturbance baseline meaning that birds should already be habituated to such disturbance. The works are located well in excess of the 200m zone within which significant air quality impacts can occur. Negligible potential stag beetle habitat would be impacted and the works are located at a sufficient distance from Epping Forest SAC (and Richmond Park SAC) that dispersal of members of the qualifying feature population in to the works area is considered highly unlikely. As such, no in-combination effects are expected in relation to the North London Heat and Power Project.

As the North London (Electricity Line) Reinforcement runs adjacent to the Chingford and Banbury Reservoirs and passes in close proximity to the Lee Valley SPA and Ramsar at Waltham Cross and Tottenham substations it carries with it a clear potential to impact upon the wintering bird qualifying features of the site and therefore act in-combination with the Coppermills WTW expansion option element (the only part of the Teddington DRA option where *de minimus* disturbance effects could persist with mitigation). However, if the wintering period is avoided in full, as advocated, then there would be no *de minimus* effect at all as a result of WRMP19 that could act in-combination. The scheme is understood to be a sufficient distance from Epping Forest SAC that no adverse impacts on air quality or stag beetles would be experienced with mitigation. No impact pathway with Richmond Park SAC or Wormley and Hoddesdon Park Woods SAC has been identified. National Grid would be required to mitigate any potential impacts on the same designated sites impacted by the Teddington DRA option as part of their Development Consent Order and therefore no significant in-combination effects are expected.

Whilst there is potential construction overlap between the A2 Bean and Ebbsfleet Junction Improvements and the Southfleet/Greenhithe GW option, in-combination effects are considered unlikely as the *de minimus* disturbance effect to qualifying bird species using functional habitat within 1km of the option are too minor to lead to a significant effect in-combination (given the significant distance of the European Sites from the option meaning major use of that functional habitat is unlikely and the fact that the functional habitat is near the maximum distance at which disturbance impacts could occur in any case). Similarly, if future extensions to Crossrail south-eastwards from the current terminus at Abbey Wood to the Gravesend area were to take place then no in-combination effects would occur. There are, however, no definitive plans at present to construct any such extension.

There are no known other confirmed or well-developed plans for significant infrastructure schemes, and particularly none beyond 2030, although a number of significant developments are probable (for

example, further expansion of Heathrow airport). The in-combination effects assessment will therefore need to be updated in the future to take account of the prevailing plans for such schemes as Thames Water brings forward its WRMP 2019 schemes for development over the coming decades.

6 HRA findings for alternative programmes

Thames Water identified a number of reasonable alternative programmes for HRA screening prior to reaching its decision on the final preferred programme for draft WRMP19. The HRA screening assessments (including in-combination effects) for these alternative programmes are presented in Table 8. Options included in these alternative programmes but which were not included in the final preferred programme are shown in bold in the Table 8 and full option-level assessments for these options are in Appendix C.

No in-combination effects with other water company plans or projects are anticipated based on the information currently available (November 2017), but this conclusion will need to be confirmed once the draft WRMPs are published during 2018.

Table 8 Screening assessment of alternative programmes

Programme	Options	Assessment
Programme favouring resilience	<ul style="list-style-type: none"> • Beckton Desalination (150 ML/D) • Beckton reuse (300 ML/D) + Coppermills • Deephams Reuse A • Teddington DRA 1 • GW_Groundwater Addington • GW_Groundwater Southfleet/Greenhithe (disaggregation) • Oxford Canal • Abingdon A • Didcot • Severn Thames Transfer 	<p>No LSEs subject to application of mitigation detailed in assessment and Appendix C.</p> <p>There is some overlap in the construction dates for Beckton Desalination and Beckton Reuse option which may have in combination effects on wintering birds at Lee Valley SPA and Ramsar. However, it is unlikely that active construction that could lead to disturbance will overlap in reality as construction dates include the planning phase. Additionally, mitigation to avoid construction over the winter period or reduce its disturbance impact through plant silencers and screening will be sufficient to avoid significant in-combination effects of these two options.</p>
Programme favouring the minimisation of environmental dis-benefit	<ul style="list-style-type: none"> • Beckton Desalination (150 ML/D) • Teddington DRA 1 + Kempton WTW • GW_Groundwater Addington • GW_Groundwater Southfleet/Greenhithe (disaggregation) • Abingdon A • Medmenham • Didcot • Severn Thames Transfer 	<p>No LSEs subject to application of mitigation detailed in Table 5 Option level HRA screening assessment and Appendix C.</p>
Least cost programme	<ul style="list-style-type: none"> • Beckton reuse Phase 1, 2 and 3 (300) • Deephams Reuse A • Teddington DRA 	<p>No LSEs subject to application of mitigation detailed in assessment and Appendix C.</p>

	<ul style="list-style-type: none"> • GW_Groundwater Addington • GW_Groundwater Southfleet/Greenhithe (disaggregation) • Oxford Canal • Abingdon A • Medmenham • Didcot • Ladymead Release of constraints • East Woodhay • GW_Mortimer 	
<p>Sustainability and intergenerational equity focused programme</p>	<ul style="list-style-type: none"> • Beckton reuse Phase 1, 2 and 3 (300) • Teddington DRA 1 • GW_Groundwater Addington • Oxford Canal • Abingdon A • Medmenham • Didcot • GW_Groundwater Southfleet/Greenhithe 	<p>No LSEs subject to application of mitigation detailed in assessment and Appendix C.</p>

7 Conclusions

The HRA has been undertaken in parallel with the Strategic Environmental Assessment (SEA) and Water Framework Directive (WFD) assessment to ensure an integrated approach to environmental assessment and to ensure its overall compliance with international and national environmental legislation.

The HRA Screening assessment has concluded that the options included within the preferred programme of the draft WRMP19, both individually and in-combination, are not likely to have any significant adverse effect on any European site, thereby meeting the “no likely significant effect (LSE)” on site integrity HRA test. No further HRA stages (i.e. Appropriate Assessment) are considered necessary for the Thames Water draft WRMP19. The draft WRMP19 is therefore compliant with HRA requirements.

A comprehensive mitigation strategy has been proposed for those options where the HRA screening identified the need for suitable mitigation measures, subject to agreement with Natural England during the consultation process. As a result, Thames Water’s draft WRMP19 is not expected to have any adverse effects on the integrity of any European site, either alone or in-combination with other plans or projects.

The HRA screening of alternative programmes considered by Thames Water as part of its decision-making process concluded that none of the programmes would lead to LSEs on the integrity of any European site.

HRA will need to be carried out as and when each of the options is brought forward by Thames Water for promotion and applications for planning permission and environmental permits. At this stage, the HRA will need to be revisited to take account of any changes to scheme design, construction and operational arrangements, as well as the final package of mitigation measures proposed at that stage. In-combination effects will also need to be re-assessed to take account of prevailing, updated information on other projects, programmes and plans.

This HRA report is being issued to the statutory environmental bodies, stakeholders and the public as part of the consultation on the draft WRMP19. Thames Water will be discussing the findings of this HRA with Natural England, Environment Agency, and (where relevant) Natural Resources Wales, during the consultation period.

Appendix A

HRA screening assessment of WRMP19 Feasible Option Elements

The following tables report the Stage 1 screening assessments for each of the European sites identified (set out in geographical order from east to west) in relation to each relevant option element. These option element assessments were carried out prior to the determination of the combination of option elements selected to form the alternative WRMP programmes or the preferred programme.

[Assessment tables in separate files – to be appended here in PDF version]

Appendix B

HRA consultation comments and responses

Below are the comments on the proposed HRA methodology received from Natural England on 26th June 2017 and the Thames Water responses to these comments.

Comment (Natural England)	Thames Water Response
<p>This advice is being provided as part of Natural England's Discretionary Advice Service. Thames Water has asked Natural England to advise upon the constrained options list development taking into consideration the following excel spreadsheets (versions as available on 26th May 2017) and other documents:</p> <ul style="list-style-type: none"> <input type="checkbox"/> TWUL Water Resources Management Plan 2019 HRA Stage 1 Screening of Option Elements DAS/2597/217329 <input type="checkbox"/> Reuse at Deephams SEA matrices DAS/2597/216772 <input type="checkbox"/> Deephams Water Reuse Conceptual Design Report DAS/2597/216772 <input type="checkbox"/> Reuse at Beckton SEA Matrices DAS/2597/216658 <input type="checkbox"/> Beckton Water Reuse Conceptual Design Report (CDR) DAS/2597/216658 <input type="checkbox"/> King George V Reservoirs intake SEA Matrices DAS/2597/216134 	<p>No action was required.</p>
<p>Annex 1</p> <p>European Protected Species</p> <p>A licence is required in order to carry out any works that involve certain activities such as capturing the animals, disturbance, or damaging or destroying their resting or breeding places. Note that damage or destruction of a breeding site or resting place is an absolute offence and unless the offences can be avoided (e.g. by timing the works appropriately), it should be licensed. In the first instance it is for the developer to decide whether a species licence will be needed. The developer may need to engage specialist advice in making this decision. A licence may be needed to carry out mitigation work as well as for impacts directly connected with a development. Further information can be found in Natural England's 'How to get a licence' publication.</p> <p>If the application requires planning permission, it is for the local planning authority to consider whether the permission would offend against Article 12(1) of the Habitats Directive, and if so, whether the application would be likely to receive a licence. This should be based on the advice Natural England provides at formal consultation on the likely impacts on favourable</p>	<p>Noted – this was standard advice and not directly relevant to the HRA screening.</p>

<p>conservation status and Natural England’s guidance on how the three tests (no alternative solutions, imperative reasons of overriding public interest and maintenance of favourable conservation status) are applied when considering licence applications.</p> <p>Natural England’s pre-submission Screening Service can screen application drafts prior to formal submission, whether or not the relevant planning permission is already in place. Screening will help applicants by making an assessment of whether the draft application is likely to meet licensing requirements, and, if necessary, provide specific guidance on how to address any shortfalls. The advice should help developers and ecological consultants to better manage the risks or costs they may face in having to wait until the formal submission stage after planning permission is secured, or in responding to requests for further information following an initial formal application.</p> <p>The service will be available for new applications, resubmissions or modifications – depending on customer requirements. More information can be found on Natural England’s website.</p>	
<p>1) TWUL HRA Stage 1 Screening of option Elements (TWUL dWRMP19)</p> <p>Please note that due to the high volume of consultations and the constrained timetable I have been unable to obtain comments from the responsible officers so all comments should be treated as provisional at this stage.</p> <p>I welcome the inclusion of pressures and threats from the Site Improvement Plans (SIPS) in your HRA screen, however it is not clear how this has been used to inform your screening assessment if at all. I welcome the reference to baseline condition of the underpinning Sites of Special Scientific Interest (SSSI) but it is not clear how this information has been used to inform your screening assessment if at all .</p>	<p>We have made clear which elements (if any) of the SIPS are potentially relevant to the proposed option and how we’ve considered these in our assessment.</p> <p>We have made clear which elements (if any) of the condition assessments for the underpinning SSSI are relevant to the European Site qualifying features potentially impacted by the option.</p>
<p>1a) General point – Offsite use by Birds (Functional Habitat)</p> <p>Mobile species such as bats and in particular Special Protection Area (SPA) and Ramsar site bird features use habitat for feeding and other activities that is often outside the designated site boundary. The generic term for this land is functional habitat. In many cases this functional habitat has been mapped. The Habitats Regulation Assessment (HRA) should be amended to include assessment of options likely to have effects on functional habitat. I note consideration of off-site use by stag beetles is included within the HRA for relevant sites.</p>	<p>We have reviewed potential impacts to mapped functional habitats for mobile species and amended the HRA accordingly.</p>
<p>1b) General point - Construction Traffic</p>	<p>We have undertaken air quality assessments for all</p>

<p>The recent Wealden District Council judgement on air quality has resulted in a review of the way in-combination air quality impacts on European sites are assessed. I recommend that you review your assessment of the options with significant construction traffic in the light of this case and assess if they are likely to generate traffic within 200m of a European site. Habitats on low nutrient soils such as chalk grassland, some woodlands, acid grassland, in particular lowland heathland, are susceptible to impacts from air pollution the latter two including acidification impacts.</p>	<p>elements associated with European Sites with qualifying habitat features susceptible to airborne nutrients or acidification.</p>
<p>1c) General point – Opportunities There is no mention of whether there are any opportunities for enhancements related to SPA, Ramsar or SAC features within the HRA screening process. Though not the main focus of an HRA it is entirely appropriate to note if a site may provide opportunities for enhancements; for example for creation of habitats for stag beetle within the likely dispersion distance of existing sites.</p>	<p>Enhancement is not required under HRA, further consideration of opportunities to be considered by TW as a separate undertaking.</p>
<p>1d) General point – Ramsar features Non-bird Ramsar features are often missing from the list of site features. Where they are included they are missing from the list of water dependant features. Ramsar site features are all water dependant .</p>	<p>Comment noted - We have reviewed and included screening assessments of such features for Ramsar sites.</p>
<p>1e) Medway Estuary and Marshes Special Protection Area (SPA) and Ramsar Site See General point 1a on offsite (functional habitat) use by birds which applies to this screening site. The non-bird Ramsar site features are missing from the list of Ramsar site features. As well as its assemblage of water birds the Ramsar site is listed for its diverse assemblage of wetlands plants and invertebrates. The underpinning habitat of saltmarsh and grazing marsh are also features. The listed features are included on the Ramsar Site Information sheet. These species and habitats should be added for completion. Given the distance from the sites and the small scale of the abstraction I do not believe that adding these features will materially alter the conclusions of the screening tables. Please note that there is a Marine Conservation Zone that overlaps with the Medway Estuary and Marshes (Medway MCZ). This should be listed in the overarching designated sites screening for the SEA (as opposed to HRA) for completeness. There does not appear to be a pathway for the small groundwater abstraction at Southfleet/ Greenhithe to impact the MCZ . I will shortly be sending a separate note on the assessment of your statutory plan impacts on marine sites focussing on Marine Conservation Zones .</p>	<p>Ramsar features and functional habitats have been addressed as per comment above.</p>
<p>1f) Lee Valley SPA and Ramsar Site</p>	<p>Ramsar features have been addressed as per</p>

<p>General points 1a and 1d apply to this site. The underpinning valley bottom wetland habitat is a feature of the site as are rare plant and invertebrates. The listed features are included on the Ramsar Site Information Sheet. A number of options have potential to impact this site. Several of them are mutually exclusive as they are different versions of the same scheme but there is potential for cumulative and in-combination impacts. The conclusions of no likely significant effect for most options rely heavily on the mitigation proposed. However the mitigation must be able to remove significant disturbance affects from all the activities in combination and cumulatively. I recommend that it would be helpful if clarification can be provided on the noise of operation as well as construction and further details on the proposed mitigation measures to fully understand the conclusions reached. Much further information on the construction and the use function of the intermediate and end shafts is required in order for the conclusions to be supported (see below) for the effluent reuse schemes. Consideration could be given to the phasing of different options that could affect the site by, for example, staggering construction over consecutive years in addition to the mitigation proposed. The multiple options that could come forward close to this site make it particularly important that impacts on any functional habitat are also assessed. The Coppermills WTW extension options suggest further mitigation is required. I concur with this conclusion and I recommend that more extensive and detailed mitigation is required than that which is currently proposed.</p>	<p>comments above. Further discussion between TW and regulators will be undertaken to further develop mitigation measures related to potential disturbance impacts.</p> <p>Mitigation measures have been discussed and a mitigation plan has been developed to include: avoiding construction within 1km of SPA/Ramsar or functional habitat during winter period (October-March inclusive) or using a plant with a noise rating <50dB(A)²¹, visual screening, and Environmental Clerk of Works (EnvCoW) to ensure compliance. Recreational disturbance impact will be reduced by sensitive routing of footpath diversions, screening and explanatory boards to explain risk of noise disturbance and how to prevent it.</p> <p>Functional offsite habitat has been addressed as per comments above.</p> <p>Additional mitigation has been advocated following consultation that, once implemented, would remove any identified likely significant effects associated with these options.</p>
<p>1g) Epping Forest Special Area of Conservation (SAC) Generic point 1c applies to all options affecting this site with respect to creating habitat for stag beetle.</p>	<p>Enhancement is not required under HRA, further consideration of opportunities will be considered by TW as part of any detailed design.</p>
<p>1h) Richmond Park SAC</p> <p>I note there is the potential for an appropriate assessment to be required for the TWRM extension Hampton to Battersea link as one intermediate tunnel shaft is within the boundary of the SAC. I note this is proposed to be sited in the car park. I would like to see further information on this option including any appropriate assessment. I recommend you provide further information on the option and mitigation proposed including any appropriate assessment. General point 1c applies to this option.</p>	<p>The mitigation/avoidance advocated (subsequent to receipt of this comment) is considered sufficient to offset the identified impact. Further discussion between TW and regulators will be undertaken as part of the further development of the scheme. The mitigation advocated is sufficient to prevent any LSEs and therefore no appropriate assessment is required.</p> <p>The following mitigation will be implemented:</p> <ul style="list-style-type: none"> - Prevent damage to sensitive vegetation where possible, particularly woody vegetation (especially decaying timber, stumps and root stocks where larvae may be present). - Avoid construction works during May-August to avoid the period when adults emerge

²¹ Environment Agency (2013) Bird Disturbance from Flood and Coastal Risk Management Construction Activities. Overarching Interpretive Summary Report. Prepared by Cascade Consulting and Institute of Estuarine and Coastal Studies.

	<p>and are active to prevent killing individuals that may fly/crawl in to the works area.</p> <ul style="list-style-type: none"> - Liaise with Richmond Park SAC's ecology team to ensure they are satisfied with the mitigation proposed and whether they wish to supervise it. <p>Enhancement is not required under HRA, further consideration of measures to be considered by TW as part of a separate undertaking.</p>
<p>1i) South West London Waterbodies SPA and Ramsar</p> <p>See General point 1a on offsite use by birds which applies to the screening of the site. I note the various Kempton WTW options are all either requiring additional mitigation or/and an appropriate assessment. I concur with this conclusion and I would like to see further details on this option with any appropriate assessment. I recommend that more extensive and detailed mitigation is required than that which is currently proposed. General point 1c also applies to this option.</p>	<p>Offsite functional habitat impacts have been considered as per the comments above. Additional mitigation has been advocated for this European Site to remove any LSEs. Enhancement is not required under HRA, further consideration of opportunities to be considered by TW as part of a separate undertaking.</p>
<p>1j) Hartslock Wood SAC</p> <p>The Kennet valley to SWoX option is comparatively close to this site (175m) and crucially within the 200m zone of influence where air quality impacts are considered likely to occur. The site SIP already notes that air pollution is an issue for the site. This site should be re-screened with regards to construction traffic, see general point 1 b above .</p>	<p>We have re-screened with consideration of air quality impacts, being cognisant of any construction traffic within 200m.</p>
<p>1k) Oxford Meadows SAC</p> <p>Confirmation that the nearest construction traffic location for the very large reservoir is further than 200m (or considerably further) from this designated site is required to support the conclusions for Abingdon WTW (part of Abingdon Reservoir option).</p>	<p>Comment noted and assessment updated with a consideration of the potential for air quality impacts.</p>
<p>1l) Cothill Fen SAC</p> <p>The pipeline for the new WTW associated with the Abingdon reservoir is within 50m of this site. Groundwater is described as flowing towards the SAC but the proposal is to backfill around the pipe with gravel. This is assumed within the HRA not to affect the inflow towards the site. I recommend that further information to confirm this assumption is required. I also recommend that further information on the effects of the large bunds of the proposed reservoir on the aquifer is required to confirm the draft conclusions. In addition I recommend that further information on the in combination impacts of various schemes on the aquifer is required to support the conclusions for this site (e.g. reservoir bunds and pipeline for raw water transfer, local gravel abstraction pressure). Confirmation that the nearest construction traffic location for the very large reservoir is further than 200m (or considerably further) from this designated site is required to support the conclusions.</p>	<p>Comment noted and a further review was undertaken and the assessment updated accordingly. This included an assessment of the potential for air quality impacts. .</p>

<p>1m) Severn Estuary SAC, SPA and Ramsar Site (European Marine Site)</p> <p>I refer you to the comments of my colleague Russ Money dated 30 September 2016 which noted a number of recommendations. Note that this response was limited to the water quality and ecology assessment and does not make reference to an appropriate assessment nor is it referred to as an HRA screening assessment. In addition there does not appear to be sufficient assessment of the Minworth scheme impacts of the discharge in the River Severn. I am not aware that the HRA screen has looked at the supplementary advice tables (being renamed the supplementary advice to the Conservation Objectives) for the European sites on flows and water quality. I recommend that, as presented, there is insufficient information to concur with the HRA assessment for the transfer option.</p> <p>I recommend that significant further information is provided on the transfer options and that the screening of all relevant sites with respect to these options is repeated on the scheme as a whole as opposed to the options elements. Screening of options elements for the transfer scheme is particularly disjointed more so than for any other option. I note that the options for discharge and abstraction into the River Severn have significantly changed since the appropriate assessment referred to in table 2-1. I recommend that all the screening is redone on the combined options elements. I recommend if the transfer option progresses to the final plan that all the information from relevant documents is pulled together in a HRA screening and appropriate assessment report to make the impacts of the scheme as a whole clear and transparent. This further information is necessary to support the screening of the transfer scheme as a whole.</p>	<ul style="list-style-type: none"> - The Severn Thames Transfer option is not included in the preferred programme, although it forms part of the WRSE FP high resilience programme and the WRSE_Multi-obj_ENVC environmentally driven programme. It has been assessed and found to have no LSEs subject to appropriate mitigation (see Appendix C). - - Mitigations required should this option form part of the final WRMP include: - Best practice construction measures will guard against pollution and erosion that could otherwise adversely affect these species whilst utilising off-site functional habitat. - Inclusion of hands-off flow conditions in the abstraction licence to protect the migration of designated fish species. - Mitigation in the form of intake screens will guard against potential mortality of fish through abstraction - The EA abstraction permit will be established in full knowledge of the flow requirements of the various habitats and species in the lower Severn, which will therefore deal with the potential flow issues regarding lamprey and their passage over weirs. The detailed design of abstractions will ensure that they do not act as attractant flows for salmonids (this approach is now widespread). For these reasons there are not likely to be significant effects at the abstraction point on the European Site's integrity.
<p>1n) I refer Thames Water to Natural Resources Wales for their view on the screening assessment against the following sites: Berwyn SPA, Berwyn and South Clwyd Mountains SAC</p>	<p>Regard has been given to the comments from NRW in the SEA assessment and further information and assessments have been included in the HRA and WFD reports in response.</p>

Appendix C

HRA screening assessment of alternative programmes

The following options do not appear in the preferred programme but were contained in one or more of the alternative programmes that were subject to HRA screening as part of the development of the draft WRMP19:

- Beckton Desalination (150 ML/D)
- Beckton reuse (300 ML/D) + Coppermills WTW extension
- Beckton reuse Phase 1, 2 and 3 (300)
- Teddington DRA + Kempton WTW (100 ML/D)
- Severn Thames Transfer
- Deephams Reuse A

The screening assessments are presented in Table C.1 below. No LSEs have been identified for these options, subject to the delivery of the stated mitigation measures. Where potential LSEs were identified prior to the development of specific, detailed mitigation measures, these are highlighted in the table and the mitigation measures advocated to remove LSEs are outlined.

Table C.1 HRA screening assessment of options included in the four alternative programmes (and which have not been also included in the preferred programme)

Option name	Designated sites assessed (pre-final mitigation LSEs ²² ?)	Option elements (pre-final mitigation LSEs?)	Element reference	Key impacts (pre-option level mitigation)	Key option level mitigation required	In-combination effects?	Post-mitigation assessment
Beckton Desalination (150)	<p>Lee Valley SPA/Ramsar (LSE)</p> <p>Epping Forest SAC</p> <p>Richmond Park SAC (LSE)</p> <p>Wimbledon Common SAC</p> <p>South West London Waterbodies SPA</p>	<p>Beckton to Coppermills 450 MLD</p> <p>Beckton RO Treatment Plant 150 MLD</p> <p>NET_Coppermills New Header tank</p> <p>NET_TWRM extension - Coppermills to Honor Oak</p> <p>NET_TWRM extension - Hampton to Battersea</p> <p>NET_Pumping Station to New</p>	<p>NET-DES-BEC-COP</p> <p>RES-DES-BEC-150</p> <p>NET-TWRM-COP-HEA</p> <p>NET-TWRM-COP-HON</p> <p>NET-TWRM-HAM-BAT</p> <p>NET-TWRM-</p>	<p>The Coppermills Water Treatment Works lies immediately adjacent to Walthamstow Reservoirs SSSI which forms a constituent part of the Lee Valley SPA/Ramsar Site. It is also only approximately 80m away from Walthamstow Marshes SSSI, which forms the other constituent part of the SPA/Ramsar Site. As such, the proposals carry a risk of impacting upon the designated sites and/or their qualifying features (particularly wintering birds). Any construction works that take place within 1 kilometre could potentially disturb the wintering bird population (bittern, gadwall and shoveler) that forms a qualifying feature of both the SPA and Ramsar Sites.</p>	<p>Construction within 1km of SPA/Ramsar or functional habitat to avoid winter period (October-March inclusive) or use of plant with a noise rating <50dB(A), visual screening, and Environmental Clerk of Works (EnvCoW) to ensure compliance. Recreational disturbance impact to be reduced by sensitive routing of footpath diversions, screening and explanatory boards to explain risk of noise disturbance and how to prevent it.</p>	No	No LSEs

²² Some mitigation measures have already been advocated at the element level, but they were not always sufficient to prevent LSEs. The mitigation measures discussed in this table are additional measures to prevent LSEs at the option level.

		Header tank at Coppermills WTW	COP-PS	<p>One intermediate tunnel shaft (no. 4) of the Hampton to Battersea link is located just within the boundary of Richmond Park SAC in the vicinity of Roehampton Gate near the park's northern boundary. This shaft will have a 10.5m internal diameter (ID). Given the current shaft design shows the location within the SAC there is a possibility that stag beetles that form part of the population of the qualifying feature for the SAC could be directly fatally impacted by the works; as such, there is the potential for likely significant effects to occur as a result of this option. However, the shaft has currently been located wholly within a car park devoid of vegetation and therefore no suitable stag beetle habitat (particularly egg-laying habitat) appears to be available.</p>	<p>Avoid impacts to all vegetation, particularly woody vegetation (especially decaying timber, stumps and root stocks where larvae may be present). Avoid construction works during May-August to avoid the period when adults emerge and are active to prevent killing individuals that may fly/crawl in to the works area. Liaise with Richmond Park SAC's ecology team to ensure they are satisfied with the mitigation proposed and whether they wish to supervise it.</p>		
				<p>The closest part of this option lies approximately 550m to the north of Wimbledon Common SAC at the location of intermediate shaft no. 6 of the Hampton to Battersea link. No impacts to the North Atlantic wet or European dry heaths are considered likely at this distance. However, as stag beetles (egg laying females) can disperse a</p>	<p>Avoid impacts to all vegetation, particularly woody vegetation (especially decaying timber, stumps and root stocks where larvae may be present). Avoid construction works during May-August to avoid the period when adults emerge and are active to prevent killing individuals that may fly/crawl in to the works area. Survey for the presence of mating pairs of stag beetles or egg laying in advance of any construction work.</p>		

				<p>maximum of 1km any above ground works that take place within this distance of the SAC have the potential to impact upon this qualifying feature. Aerial imagery of the shaft site location suggests the shaft site avoids mature trees and the overall construction area is sufficiently small that if the above construction mitigation actions are applied then no likely significant effect to this qualifying feature would occur.</p>	<p>Liaise with Wimbledon Common SAC's ecology team to ensure they are satisfied with the mitigation proposed and whether they wish to supervise it.</p>		
				<p>The closest part of this option to Epping Forest SAC is approximately 1.56km to the south - this is for the main underground transfer tunnel which will be a minimum of 21m deep. This is beyond the maximum dispersal distance for female stag beetles (~1km) so no LSEs are expected although there may be a discernible impact.</p>	<p>Avoid impacts to all vegetation, particularly woody vegetation (especially decaying timber, stumps and root stocks where larvae may be present). Avoid construction works during May-August to avoid the period when adults emerge and are active to prevent killing individuals that may fly/crawl in to the works area. Survey for the presence of mating pairs of stag beetles or egg laying in advance of any construction work.</p>		
				<p>There are discernible air quality impacts on Epping Forest SAC related to emissions from construction and operation traffic, however these are not expected to cause significant effects.</p>	<p>Minimise air quality impacts by ensuring all construction/operation traffic is routed at least 200m away from any site with qualifying features sensitive to air quality. Avoid traffic movements amounting to >1000 AADT or 200HGV movements daily where possible.</p>		

<p>Beckton reuse (300) + Coppermills</p>	<p>Lee Valley SPA/Ramsar (LSE) Epping Forest SAC South West London Waterbodies SPA Wormley and Hoddesdon Park Woods SAC</p>	<p>CON_Beckton to Lockwood 300 MLD IPR_Reuse Beckton 150 MLD (Phase 1) RWS_KGV Res intake capacity increase RWS_KGV to BPT south of William Girling - 300Ml/d RWS_Conveyance from Break Tank to Coppermills WTW (Spine 2) WTW Coppermills WTW extension 100 MLD IPR_Reuse Beckton 150 MLD (Phase 2)</p>	<p>CON-RU-BEC-LCK RES-RU-BEC-100 CON-RWS-KGV-360 CON-RWS-KGV-BPT-300 CON-RWS-BT-COP-800 WTW-LON-COP-100 RES-RU-BEC-150</p>	<p>The Coppermills Water Treatment Works lies immediately adjacent to Walthamstow Reservoirs SSSI which forms a constituent part of the Lee Valley SPA/Ramsar Site. It is also only approximately 80m away from Walthamstow Marshes SSSI, which forms the other constituent part of the SPA/Ramsar Site. In addition, the 4.4m diameter water conveyance tunnel passes directly beneath the Lee Valley SPA/Ramsar Site and it also terminates within a 10x 20m reception shaft located within the SPA/Ramsar Site. The underground pipeline runs tight alongside the eastern perimeter of the European Site and there is also an intermediate shaft located approximately 122m to the north of the European Site. As such, the proposals carry a risk of impacting upon the designated sites and/or their qualifying features (particularly wintering birds). Any construction works that take place within 1 kilometre could potentially disturb the wintering bird population (bittern, gadwall and shoveler) that forms a qualifying feature of both the SPA and Ramsar Sites.</p>	<p>Construction within 1km of SPA/Ramsar or functional habitat to avoid winter period (October-March inclusive) or use of plant with a noise rating <50dB(A), visual screening, and Environmental Clerk of Works (EnvCoW) to ensure compliance. Recreational disturbance impact to be reduced by sensitive routing of footpath diversions, screening and explanatory boards to explain risk of noise disturbance and how to prevent it.</p>	<p>No</p>	<p>No LSEs</p>
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			<p>The spine 2 pipeline route will be constructed immediately adjacent to William Girling and the southern tip of King Georges Reservoir which collectively form the Chingford Reservoirs SSSI. These are in part designated for their importance to overwintering wildfowl. As such, these reservoirs have clear potential to be used as off-site functional habitat for the bird qualifying features of the SPA/Ramsar Site. The close proximity of this option element to the reservoirs means that construction could lead to disturbance of the bird qualifying features of the European Sites. Similarly, the pipeline route passes close to the western edge of Banbury reservoir which is equidistant between the SPA/Ramsar Site and Chingford Reservoirs SSSI and could equally be used as off-site functional habitat by members of the qualifying feature bird populations. This fact increases the possibility of significant disturbance being experienced by the bird qualifying features as a result of construction.</p>			
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			<p>The closest part of the new raw water conveyance pipeline construction corridor lies approximately 660m to the west of the Epping Forest SAC. This lies within the maximum ~1km dispersal distance for female stag beetles such that, in theory, egg laying females could reach the pipeline site (and potentially be followed there by males which can disperse up to 3km) – however, in practice, this risk is considered unlikely because there is a lack of trees along the pipeline route that would attract stag beetles to that location (aerial imagery indicates the pipeline corridor route appears to be managed grassland habitat). A small area of potential functional habitat for stag beetles (broadleaved trees and scrub) exists to the west/south west of the current WTW that will be lost to the planned extension. However, given the significant urban expanse between the WTW and Epping Forest SAC it is thought highly unlikely that stag beetles could disperse sufficiently to colonise it.</p>	<p>Avoid impacts to all vegetation, particularly woody vegetation (especially decaying timber, stumps and root stocks where larvae may be present). Avoid construction works during May-August to avoid the period when adults emerge and are active to prevent killing individuals that may fly/crawl in to the works area. Survey for the presence of male and female stag beetles in advance of any construction work. Liaise with Epping Forest SAC’s ecology team to ensure they are satisfied with the mitigation proposed and whether they wish to supervise it.</p>		
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				There are discernible air quality impacts on Epping Forest SAC related to emissions from construction and operation traffic, however these are not expected to cause significant effects.	Minimise air quality impacts by ensuring all construction/operation traffic is routed at least 200m away from any site with qualifying features sensitive to air quality. Avoid traffic movements amounting to >1000 AADT or 200HGV movements daily where possible.		
Beckton reuse Phase 1, 2 and 3 (300)	<p>Lee Valley SPA/Ramsar (LSE)</p> <p>Epping Forest SAC</p> <p>Richmond Park SAC (LSE)</p> <p>Wimbledon Common SAC</p> <p>South West London Waterbodies SPA</p> <p>Wormley and Hoddesdon Park Woods SAC</p>	<p>CON_Beckton to Lockwood 300 ML/D</p> <p>IPR_Reuse Beckton 100 ML/D (3 phases – 300 ML/D)</p> <p>NET_Coppermills New Header tank</p> <p>NET_TWRM extension - Coppermills to Honor Oak</p> <p>NET_TWRM extension - Hampton to Battersea</p> <p>RWS_KGV Res intake capacity increase</p>	<p>CON-RU-BEC-LCK</p> <p>RES-RU-BEC-100</p> <p>NET-TWRM-COP-HEA</p> <p>NET-TWRM-COP-HON</p> <p>NET-TWRM-HAM-BAT</p> <p>CON-RWS-KGV-360</p>	The Coppermills Water Treatment Works lies immediately adjacent to Walthamstow Reservoirs SSSI which forms a constituent part of the Lee Valley SPA/Ramsar Site. It is also only approximately 80m away from Walthamstow Marshes SSSI, which forms the other constituent part of the SPA/Ramsar Site. As such, the proposals carry a risk of impacting upon the designated sites and/or their qualifying features (particularly wintering birds). Any construction works that take place within 1 kilometre could potentially disturb the wintering bird population (bittern, gadwall and shoveler) that forms a qualifying feature of both the SPA and Ramsar Sites.	Construction within 1km of SPA/Ramsar or functional habitat to avoid winter period (October-March inclusive) or use of plant with a noise rating <50dB(A), visual screening, and Environmental Clerk of Works (EnvCoW) to ensure compliance. Recreational disturbance impact to be reduced by sensitive routing of footpath diversions, screening and explanatory boards to explain risk of noise disturbance and how to prevent it.	No	No LSEs

		<p>RWS_KGV to BPT south of William Girling - 300M/d</p> <p>NET_Pumping Station to New Header tank at Coppermills WTW</p> <p>RWS_Conveyance from Break Tank to Coppermills WTW</p> <p>WTW Coppermills WTW extension 100 ML/D</p>	<p>CON-RWS-KGV-BPT-300</p> <p>NET-TWRM-COP-PS</p> <p>CON-RWS-BT-COP-800</p> <p>WTW-LON-COP-100</p>	<p>One intermediate tunnel shaft (no. 4) of the Hampton to Battersea link is located just within the boundary of Richmond Park SAC in the vicinity of Roehampton Gate near the park's northern boundary. This shaft will have a 10.5m internal diameter (ID). Given the current shaft design shows the location within the SAC there is a possibility that stag beetles that form part of the population of the qualifying feature for the SAC could be directly fatally impacted by the works; as such, there is the potential for likely significant effects to occur as a result of this option. However, the shaft has currently been located wholly within a car park devoid of vegetation and therefore no suitable stag beetle habitat (particularly egg-laying habitat) appears to be available.</p> <p>The closest part of the new raw water conveyance pipeline construction corridor lies approximately 660m to the west of the Epping Forest SAC. This lies within the maximum ~1km dispersal distance for female stag beetles such that, in theory, egg laying females could reach the pipeline site (and potentially be followed there by males</p>	<p>Avoid impacts to all vegetation, particularly woody vegetation (especially decaying timber, stumps and root stocks where larvae may be present). Avoid construction works during May-August to avoid the period when adults emerge and are active to prevent killing individuals that may fly/crawl in to the works area. Liaise with Richmond Park SAC's ecology team to ensure they are satisfied with the mitigation proposed and whether they wish to supervise it.</p> <p>Avoid impacts to all vegetation, particularly woody vegetation (especially decaying timber, stumps and root stocks where larvae may be present). Avoid construction works during May-August to avoid the period when adults emerge and are active to prevent killing individuals that may fly/crawl in to the works area. Survey for the presence of male and female stag beetles in advance of any construction work. Liaise with</p>		
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			<p>which can disperse up to 3km) – however, in practice, this risk is considered unlikely because there is a lack of trees along the pipeline route that would attract stag beetles to that location (aerial imagery indicates the pipeline corridor route appears to be managed grassland habitat). A small area of potential functional habitat for stag beetles (broadleaved trees and scrub) exists to the west/south west of the current WTW that will be lost to the planned extension. However, given the significant urban expanse between the WTW and Epping Forest SAC it is thought highly unlikely that stag beetles could disperse sufficiently to colonise it.</p>	<p>Epping Forest SAC’s ecology team to ensure they are satisfied with the mitigation proposed and whether they wish to supervise it.</p>		
			<p>The closest part of this option lies approximately 550m to the north of Wimbledon Common SAC at the location of intermediate shaft no. 6 of the Hampton to Battersea link. No impacts to the North Atlantic wet or European dry heaths are considered likely at this distance. However, as stag beetles (egg laying females) can disperse a maximum of 1km any above ground works that take place within this distance of the SAC have the potential</p>	<p>Avoid impacts to all vegetation, particularly woody vegetation (especially decaying timber, stumps and root stocks where larvae may be present). Avoid construction works during May-August to avoid the period when adults emerge and are active to prevent killing individuals that may fly/crawl in to the works area. Survey for the presence of mating pairs of stag beetles or egg laying in advance of any construction work. Liaise with Wimbledon Common SAC’s ecology team to ensure they are satisfied with the mitigation proposed and whether they wish to</p>		

				<p>to impact upon this qualifying feature. Aerial imagery of the shaft site location suggests the shaft site avoids mature trees and the overall construction area is sufficiently small that if the above construction mitigation actions are applied then no likely significant effect to this qualifying feature would occur.</p> <p>There are discernible air quality impacts on Epping Forest SAC related to emissions from construction and operation traffic, however these are not expected to cause significant effects.</p>	<p>supervise it.</p> <p>Minimise air quality impacts by ensuring all construction/operation traffic is routed at least 200m away from any site with qualifying features sensitive to air quality. Avoid traffic movements amounting to >1000 AADT or 200HGV movements daily where possible.</p>		
<p>Teddington DRA 1 + Kempton WTW</p>	<p>Lee Valley SPA/Ramsar (LSE)</p> <p>Epping Forest SAC</p> <p>Richmond Park SAC</p> <p>Wimbledon Common SAC</p> <p>South West London Waterbodies SPA (LSE)</p> <p>Wormley and</p>	<p>CON_Mogden to Teddington 300 ML/D</p> <p>CON_Teddington to Thames Lee Tunnel Shaft 300 ML/D</p> <p>DRA_Direct River Abstraction - Teddington Weir (Mogden Effluent Transfer) - 300 ML/D</p> <p>RWS_Chingford South intake capacity increase</p>	<p>CON-RA-MOG-TED</p> <p>CON-RA-TED-TLT</p> <p>RES-DRA-TED</p> <p>CON-RWS-CHS-PS-100</p>	<p>The Coppermills Water Treatment Works lies immediately adjacent to Walthamstow Reservoirs SSSI which forms a constituent part of the Lee Valley SPA/Ramsar Site. It is also only approximately 80m away from Walthamstow Marshes SSSI, which forms the other constituent part of the SPA/Ramsar Site. As such, the proposals carry a risk of impacting upon the designated sites and/or their qualifying features (particularly wintering birds). Any construction works that take place within 1 kilometre</p>	<p>Construction within 1km of SPA/Ramsar or functional habitat to avoid winter period (October-March inclusive) or use of plant with a noise rating <50dB(A), visual screening, and Environmental Clerk of Works EnvCoW to ensure compliance. Recreational disturbance impact to be reduced by sensitive routing of footpath diversions, screening and explanatory boards to explain risk of noise disturbance and how to prevent it.</p>		

	<p>Hoddesdon Park Woods SAC</p>	<p>RWS_TLT extension from Lockwood to KGV - 800ML/D</p> <p>WTW_Coppermills WTW extension 150 ML/D</p> <p>NET_Riverhead Pump Replacement</p> <p>WTW_Kempton WTW extension 150 ML/D</p> <p>RWS_Surbiton intake capacity increase</p> <p>New TWRM shaft at Kempton</p> <p>Kempton WTW new 100 ML/D</p>	<p>CON-RWS-LCK-KGV-800</p> <p>WTW-LON-COP-150</p> <p>NET-TWRM-NRV-PUM</p> <p>WTW-LON-KEM-150</p> <p>CON-RWS-SRB</p> <p>NET-TWRM-KEM</p> <p>WTW-LON-KEM-100</p>	<p>could potentially disturb the wintering bird population (bittern, gadwall and shoveler) that forms a qualifying feature of both the SPA and Ramsar Site. It is understood that the WTW expansion works would be located approximately 105m from the SPA/Ramsar Site to the east.</p> <p>As the Kempton WTW site is located within 1km of a SSSI that forms a constituent part of the South West London Waterbodies SPA and Ramsar Site (Kempton Park Reservoirs SSSI), there is the possibility that noise from construction activities and construction traffic could cause significant disturbance to the qualifying features of the SPA/Ramsar Site, namely over-wintering gadwall and shoveler. The closest part of the works is approximately 520m from the SPA/Ramsar Site, which is well within the accepted potential noise disturbance distance for birds. Such a disturbance impact could occur as a result of works conducted during October-March inclusive. In addition, there is a non-designated waterbody at Kempton racecourse to the south that could be used as off-site functional habitat by the</p>	<p>Construction within 1km of SPA/Ramsar or functional habitat to avoid winter period (October-March inclusive) or use of plant with a noise rating <50dB(A), visual screening, and Environmental Clerk of Works EnvCoW to ensure compliance. Recreational disturbance impact to be reduced by sensitive routing of footpath diversions, screening and explanatory boards to explain risk of noise disturbance and how to prevent it.</p>		
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			<p>qualifying feature bird species of the SPA/Ramsar Site. As this lies approximately 255m to the south east of the 150 ML/D option element it could be subject to significant noise/visual disturbance as a result of works.</p>			
			<p>The intermediate shaft for the direct river abstraction is located approximately 1.2km to the west of Richmond Park SAC. With the maximum dispersal distance for female stag beetles being ~1km, <i>de minimus</i> effects are possible although there is no likely significant effect alone.</p>	<p>Prevent damage to sensitive vegetation where possible, particularly woody vegetation (especially decaying timber, stumps and root stocks where larvae may be present). Avoid construction works during May-August to avoid the period when adults emerge and are active to prevent killing individuals that may fly/crawl in to the works area. Survey for the presence of male and female stag beetles in advance of any construction work.</p>		
			<p>The closest part of the new raw water conveyance pumping station and associated channel lies approximately 720m to the west of the Epping Forest SAC. This lies within the maximum ~1km dispersal distance for female stag beetles such that, in theory, egg laying females could reach the construction site (and potentially be followed there by males which can disperse up to 3km) – however, in practice, this risk is considered unlikely because there are minimal</p>	<p>Prevent damage to sensitive vegetation where possible, particularly woody vegetation (especially decaying timber, stumps and root stocks where larvae may be present). Avoid construction works during May-August to avoid the period when adults emerge and are active to prevent killing individuals that may fly/crawl in to the works area. Survey for the presence of male and female stag beetles in advance of any construction work.</p>		

				<p>trees that are in the vicinity of the existing infrastructure that would attract stag beetles to that location and there are much more significant wooded areas between the European Site and construction area that stag beetles would be likely to favour.</p> <p>There are <i>de minimus</i> air quality impacts on Epping Forest SAC related to emissions from construction and operation traffic, however these are not expected to cause significant effects alone.</p>			
					<p>Minimise air quality impacts by ensuring all construction/operation traffic is routed at least 200m away from any site with qualifying features sensitive to air quality. Avoid traffic movements amounting to >1000 AADT or 200HGV movements daily where possible.</p>		
<p>Severn Thames Transfer</p>	<p>Severn Estuary SAC, SPA and Ramsar</p> <p>Cothill Fen SAC</p> <p>Little Wittenham SAC</p> <p>Bredon Hill SAC</p> <p>Dixton Wood SAC</p> <p>Berwyn and South Clywd Mountains</p>	<p>CON_Deerhurst to Culham 300 MLD (Lon and SWOX)</p> <p>RWP_STT 163 Mld Mythe (15) _STT</p> <p>RWP_STT 163 Mld Vyrnwy (148)</p>	<p>CON-RWT-DEH-CLM-300</p> <p>RES-RWTS-MYT</p> <p>TBC</p>	<p>Off-site functional habitat for the three anadromous fish species (river lamprey, sea lamprey and twaite shad) that form qualifying features of the Severn Estuary SAC could potentially be affected along the Severn between the river intake at Deerhurst and the European Marine Site by both construction and operation.</p>	<p>Best practice construction measures will guard against pollution and erosion that could otherwise adversely affect these species whilst utilising off-site functional habitat. Inclusion of hands-off flow conditions in the abstraction licence to protect the migration of designated fish species.</p> <p>Mitigation in the form of intake screens will guard against potential mortality of fish through abstraction.</p> <p>The EA abstraction permit will be established in full knowledge of the flow requirements of the various habitats and species in the lower Severn, which will therefore deal with the potential flow issues regarding lamprey and their</p>	<p>No</p>	<p>No LSEs</p>

	SAC Berwyn SPA				passage over weirs. The detailed design of abstractions will ensure that they do not act as attractant flows for salmonids (this approach is now widespread).		
				There are possible short term air quality impacts on all sites related to emissions from construction and operation traffic, however these are not expected to cause significant effects.	Minimise air quality impacts by ensuring all construction/operation traffic is routed at least 200m away from any site with qualifying features sensitive to air quality. Avoid traffic movements amounting to >1000 AADT or 200HGV movements daily where possible.		
				There is a risk that the works or the raw water conveyance will encourage the spread of invasive non-native plant species, such as New Zealand pygmyweed, <i>Crassula helmsii</i> .	Best practice biosecurity measures during construction including recording any areas that are infested with non-native species within the construction management plan, isolating these areas and putting up restricted access signs, and maintaining good site hygiene. Specialist measures are also required to prevent transfer of potential invasive species via the raw water conveyance pipeline. Biosecurity measures must be compliant with the guidance provided by the GB Non-native Species Secretariat ²³ .		

²³ See <http://www.nonnativespecies.org/home/index.cfm>

<p>Deephams Reuse A</p>	<p>Lee Valley SPA/Ramsar (LSE – assessed previously as 60ML/D)</p> <p>Epping Forest SAC</p>	<p>CON_Reuse Deephams to TLT Extension</p> <p>IPR_Reuse Deephams 45 ML/D</p>	<p>CON-RU-DPH-TLT</p> <p>RES-RU-DPH</p>	<p>The closest part of the Deephams WTW site from the Lee Valley SPA/Ramsar Site is approximately 2.5km to the north. At this distance, no likely significant effects to any of the bird qualifying features for this site are anticipated during construction, as disturbance effects for wintering birds only extend a maximum of ~1 kilometre from the designated site. However, the adjacent William Girling Reservoir collectively forms part of the Chingford Reservoirs SSSI, which are in part designated for their importance to overwintering wildfowl. As such, this reservoir has clear potential to be used as functional habitat for the bird qualifying features of the SPA/Ramsar Site and therefore is at risk of disturbance.</p>	<p>Construction within 1km of SPA/Ramsar or off-site functional habitat to avoid winter period (October-March inclusive) or use of plant with a noise rating <50dB(A), visual screening, and Environmental Clerk of Works EnvCoW to ensure compliance. Recreational disturbance impact to be reduced by sensitive routing of footpath diversions, screening and explanatory boards to explain risk of noise disturbance and how to prevent it.</p>		<p>No LSEs</p>
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