Draft Water Resources Management Plan 2024

Technical Appendix C – Habitats Regulations Assessment

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Acronyms List

Acronym	Definition
AESI	Adverse Effect on the Site Integrity
CEMP	Construction and Environmental Management Plan
CTMP	Construction Traffic Management Plan
DAF	Dissolved Air Floatation
DO	Deployable Output
INNS	Invasive Non-Native Species
GAC	Granular Activated Carbon
LSE	Likely Significant Effects
Ml/d	Megalitres per day
NNSS	Non-native Species Secretariat
NLSE	No Likely Significant Effects
NSN	National Site Network
POM	Programme Of Measures [WFD measures required to improve waterbody status]
PS	Pumping station
RAPID	Regulators' Alliance for Progressing Infrastructure Development
RGF	Rapid Gravity Filter
SESRO	South East Strategic Reservoir Option
SIP	Site Improvement Plan
SNCB	Statutory Nature Conservation Body
SR	Service Reservoir
SRO	Strategic Resource Option
SSSI	Site of Special Scientific Interest
STT	Severn to Thames transfer

ToLS	Test of Likely Significance
UKWIR	UK Water Industry Research
WFD	Water Framework Directive
WRMP19	Water Resources Management Plan 2019
WRMP24	Water Resources Management Plan 2024
WSR	Water Supply Reservoir
WRSE	Water Resources South East
WRC	Water Recycling Centre
WRZ	Water Resource Zone
WSW	Water Supply Works
WTW	Water Treatment Works
ZoI	Zone of Influence

Executive summary

This report presents the results of the Habitats Regulations Assessment (HRA) Stage 2 Appropriate Assessment (AA) undertaken for Thames Water's Water Resources Management Plan 2024 (WRMP24) options. It assesses the potential effects of nine options on Designated Sites, including Special Protection Areas (SPAs), Special Conservation Areas (SACs) and Ramsar Sites. Mott MacDonald Ltd undertook this HRA and AA following the methodology in the *Environmental Assessment Guidance for Water Resources Management Plans and Drought Plans (21/WR/02/15)*.

As part of the environmental assessment process to support the development of the Thames WRMP24 Plan, a HRA Test of Likely Significance (ToLS) was undertaken on the constrained list of water resource options to identify options with potential Likely Significant Effects (LSE) on Designated Sites. Whenever LSE during the ToLS were identified, the option proceeded to screening review and when LSE persisted, the option progressed to the HRA Stage 2 Appropriate Assessment (AA).

The current Best Value Plan (BVP) for Thames Water includes 33 supply options that were selected pre-2050. Of these 33 options, 15 options have been subject to a HRA level 1 screening and assessed as having No Likely Significant Effects (NLSE). As NLSE have been identified for all these options no further stages of HRA are required. The remaining 16 options required a HRA Stage 2 AA after LSE were identified during the respective Stage 1 screenings. These are:

- South East Water to Guildford transfer option
- T2ST Culham to Speen transfer Option
- River Thames to Fobney transfer Option
- Thames Water Rings Main (TWRM) extension - Hampton to Battersea Option
- Kempton 150Ml/d WTW Option
- Datchet Increase Deployable Output (DO)
- SWOX to SWA Option
- Moulsford Option
- Abingdon to Farmoor Reservoir pipeline
- Three options composing our Abingdon options, including South East Strategic Reservoir Option (SESRO)
- Four options belonging to the Severn to Thames Transfer (STT) Strategic Resource Option (SRO) (N.B. these options have since changed in configuration as a result of the Regulators' Alliance for Progressing Infrastructure Development (RAPID) Gate 2 investigations, details available in the Gate 2 submission for this SRO.)

However, five options mentioned above did not progress to Stage 2 AA as no pathways were identified during this HRA screening review:

- River Thames to Fobney Transfer Option
- Datchet Increase DO
- Three options composing our Abingdon options, including SESRO

This HRA Stage 2 AA aims to identify any Adverse Effect on the Site Integrity (AESI) of the Designated Sites screened as having potential LSE as well as to propose mitigation measures to prevent or minimise these effects.

The AA will result in one of three potential outcomes:

- Evidence is sufficient and demonstrates there will be no adverse effects
- Evidence is sufficient but indicates that there will be an adverse effect
- Insufficient evidence to determine the effects

All of the 16 BVP options evaluated in this report are unlikely to result in adverse effects on the integrity of the Designated Sites (alone) after mitigation has been implemented. However, further investigation on the use of functionally linked habitat by qualifying species to assess potential adverse effects in more detail and determine more targeted mitigation measures is recommended for two of the BVP options:

- South East Water to Guildford Option - Further investigation on the use of functionally linked habitat by qualifying features within Thames Basin Heaths SPA and Thursley, Ash, Pirbright and Chobham SAC is suggested to minimize uncertainty.
- STT SRO - Further investigation to reduce uncertainty with regards to the current condition of some of the features of the Severn Estuary SAC, as well as the use of functionally linked habitat by the Severn Estuary SPA and Ramsar are required. Fish surveys were also recommended to determine the use of functionally linked habitat and habitat suitability for migratory species and lampreys.

For the 14 options where proposed mitigation measures are deemed sufficient to avoid significant adverse effects on Designated Site integrity, assuming that all proposed mitigation measures are implemented, it is considered that there will not be a significant change in:

- The extent and distribution of qualifying species.
- The structure and function of the habitats of qualifying species.
- The supporting processes on which habitats of qualifying species rely for three out of the four options evaluated.

The recommended mitigation measures detailed within this document assume a worst-case scenario at this stage in the absence of detailed survey data or local records. As such, they are appropriate to avoid adverse effects on the Designated Sites. The receipt of additional data may provide evidence that there will be no adverse effects on Designated Sites even in the absence of mitigation; in this scenario this document should be revised accordingly.

The final two options that make up the 33 BVP options considered within this assessment for Thames Water's WRMP24 are two drought plan options. These two options underwent a Strategic Environmental Assessment (SEA) which concluded that a HRA is not required. Therefore, both options will not be evaluated in this report.

In relation to the in-combination effects of options included in the Thames Water WRMP24, the assessment shows that only Cothill Fen SAC (UK0012889) is likely to be affected by two or more options within Thames Water BVP. These options are:

- SWOX to SWA (ID: TWU_SWA_HI-TFR_SWX_ALL_swoxswa48); and
- Abingdon to Farmoor Reservoir pipeline (ID: TWU_SWX_HI-TFR_STR_ALL_abing-farmoor pipe) during the construction phase only.

The in-combination assessment of the Least Cost (LC) and Best Environment and Society (BES) plans shows that only Oxford Meadows SAC is likely to be affected by two or more options within these plans. These options are:

- SWOX to SWA (BVP option ID: TWU_SWA_HI-TFR_SWX_ALL_swoxswa48); and
- Dukes Cut to Farmoor (not a BVP option ID: TWU _SWX_HI-TFR_SWX_ALL_dukescut-farmoor) during the construction phase only.

In relation to the Inter-Plan cumulative effects, a list of developments and plans that may lead to cumulative effects has been compiled. These plans and projects will need to be considered at projects level when a HRA will need to be undertaken in light of detailed design.

This report will be sent for consultation with the relevant nature conservation authorities and the public. If the competent authority considers that residual adverse effects remain, the next stage of the HRA (Assessment of Alternative Solutions) would be required. Further design iterations will require revisions to this document and may result in changes to the current conclusion.

1 Introduction

1.1 Overview

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 long-term planning horizon to ensure security of supply in each of the water resource zones making up its supply area.

Thames Water is currently developing its Water Resources Management Plan 2024 (WRMP24) which is being driven through the regional planning process. Thames Water is within the Water Resources South East (WRSE) regional planning area. In the development of a WRMP, companies in England and Wales must follow the Environment Agency (EA) Water Resources Planning Guideline[1] and consider broader government policy objectives. The guideline highlights that, where required, companies must carry out a Strategic Environmental Assessment (SEA) for their WRMP.

The objective of a SEA, in accordance with Article I of the SEA Directive (European Directive 2001/42/EC)[2], is 'to provide for a high level of protection of the environment and to contribute to the integration of environmental considerations into the preparation and adoption of plans and programmes with a view to promoting sustainable development…'.

As part of the environmental assessment process to support the development of the WRSE Regional Plan and Thames Water's WRMP24, a Habitats Regulations Assessment (HRA) Test of Likely Significance (ToLS) was undertaken on the constrained list of water resource options (that is those that were considered suitable for inclusion into the plan), to identify options with potential likely significant effects (LSE) on Designated Sites. Preferred options were grouped to form a 'Best Value Plan' (BVP) and the ones identified as having potential for LSE during the ToLS were taken forward for the next stage of the HRA process, the Appropriate Assessment (AA).

1.2 The purpose of the Habitats Regulations Assessment

This HRA has been undertaken for Thames Water's WRMP24, to inform any likely impediments to the practicality or deliverability of the options being taken forward. It delivers the duties upon Statutory Undertakers (in this case water utilities) with regard to ensuring that their works comply with the requirements of the Habitats Regulations, by ensuring that the potential effects of the options are fully considered.

Further consultation between the relevant competent authority (Thames Water) and Statutory Nature Conservation Body (SNCB), Natural England, will be required and this report will form the basis of future iterations of the assessment.

Natural England will be consulted to advise whether the options presented in this report will adversely affect the integrity of the Designated Site(s). The integrity of a site is defined as the coherence of its ecological structure and function, across its whole area, that enables it to

[1] Environment Agency, Natural Resources Wales, Office for Water Services (2022). Water resources planning guideline. Available at: Water resources planning guideline - GOV.UK (www.gov.uk).

[2] The European Parliament and the Council of the European Union (2001). Directive 2001/42/EC of the European Parliament and of the Council of 27 June 2001 on the assessment of the effects of certain plans and programmes on the environment. *Official Journal of the European Communities.* Available at: EUR-Lex - 32001L0042 - EN - EUR-Lex (europa.eu).

sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was designated[3].

1.3 Assumptions and limitations

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

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

Assessments have been carried out for options selected under Situation (or pathway) 4 of the adaptive planning process. This includes assessments of Best Value Plan options. The environmental assessment and the assessment of cumulative effects provided primarily focusses on schemes up to 2050, with schemes post-2050 considered on a lighter touch basis. This is because post-2050 there is less certainty regarding the status/condition of the environment and any assessments would be undertaken in an overly precautionary manner.

[3] UK Government (2019). Guidance on the use of Habitats Regulations Assessment [online] available at: Appropriate assessment - GOV.UK (www.gov.uk) (last accessed Aug 2022).

2 Options Description

2.1 Option description and site locations

As part of the WRMP process, a total of 33 supply options were selected from the constrained list by the WRSE investment model for inclusion in pathway 4 of the BVP for Thames Water's WRMP24. Within the BVP two drought plan options underwent a SEA. The SEA concluded that a HRA was not required, therefore, these options were not subject to HRA for the WRMP24. Within the remaining 31 BVP options, 23 were initially assessed through WRSE and eight are part of various Strategic Resource Options (SROs). Thames Water has adopted a planning approach that uses least-cost optimisation as well as broader criteria to develop a BVP (Preferred Plan) which takes account of 'best value' decision making criteria:

- Cost to build and operate the plan.
- Adaptability and flexibility of the plan to cope with uncertain future needs.
- Alignment to the WRSE regional strategy.
- Resilience of the plan to severe and extreme drought and other hazards, and the residual risks.
- Deliverability of the plan with timescales needed to manage risks.
- Alignment to customer preferences.
- Environmental and social impacts of the plan, including net environmental benefit.

The HRA and other environmental studies undertaken were used as part of the decision-making criteria on environmental and social impacts of the plan to develop the Preferred Plan.

Demand management is a priority for Thames Water. In developing the WRMP, Thames Water has first considered what risk could be offset from demand management, before seeking to develop supply-side options. Although the demand management strategy is ambitious it must also be deliverable and therefore carefully targeted investment in supply-side capacity is still required. The supply-side options considered for inclusion in the WRMP24 have been developed following industry and regulator guidance.

The Preferred Plan provides the best value for customers in the long term whilst considering environmental and social metrics such as SEA performance, embodied carbon, biodiversity net gain, and other aspects. Table 2.1 summarises all options selected in the BVP for Thames Water and identifies the ones that were subject to HRA. As part of the adaptive planning process, alternative plans were also modelled; these are the Least Cost (LC) and Best Environment and Society (BES) plans. Duke's Cut to Farmoor is the only additional option which has been selected in these plans and screened in for HRA.

Please note that the environmental assessments undertaken for the SROs as part of the Regulators' Alliance for Progressing Infrastructure Development (RAPID) gated process, including HRA (Screening and Appropriate Assessment) have been used to inform the Thames Water WRMP24 HRA further assessments. A summary of the findings of the RAPID Gate 2 assessments is provided hereon. For full outputs of these assessment please see the RAPID Gate 2 submission documents provided for the SROs, once these have been made publicly available.

Table 2.1: Options Overview

	Option	Option description	LSE	LSE - Screening Review	AA
1	South East Water to Guildford (ID: TWU_GUI_HI-TFR_RZ5_ALL_sewtogui)	This option proposes a 10Ml/d treated water transfer from South East Water (Hogsback) to Mount SR Guildford.	Yes	Yes	Yes
2	T2ST Culham to Speen transfer Option (ID: TWU_KVZ_HI-TFR_T2S_ALL_t2st cul to speen)	This option is part of the Thames to Southern Transfer SRO (T2ST) pipeline transferring water from River Thames to the south and is evaluated in this HRA Stage 2 AA. This option proposes a new pipeline to allow 10Ml/d spur connection water transfer from Culham T2ST to Speen WTW.	Yes	Yes	Yes
/3	River Thames to Fobney Transfer Option (ID: TWU_KVZ_HI-TFR_UTC_ALL_thamestofobney)	This option proposes to transfer water from the River Thames to Fobney, to supply 40Ml/d to Kennet Valley. Existing treatment facilities are available at Fobney, but a new pipeline and associated structures are proposed to support this transfer.	Yes	Yes	Yes
4	Thames Water Rings Main (TWRM) extension - Hampton to Battersea Option (ID: TWU_LON_HI-ROC_NET_CNO_hampton-battersea)	New ring main tunnel from Hampton to Battersea. The Hampton Battersea TWRM extension will be required when additional resources from the west and/or east of the London water resource zone (WRZ) are increased. The extension tunnel will be 20km long and connect to the existing shafts at Hampton WTW and Battersea. Permanent land requirement of 2,000m^2 for shafts and temporary land requirement 30,000m^2.	Yes	Yes	Yes
5	Kempton - 150 - Construction SRO (ID: TWU_LON_HI-ROC_WT1_CNO_kemptonwtw150)	Treatment to drinking water standards of 150 Ml/d of raw water from the West London reservoirs. This option was previously assessed by Ricardo Energy & Environment [4] and conclusions are summarised to evaluate the potential in-combination effects of this option.	Yes	Yes	No
6	Datchet Increase DO (ID: TWU_SWA_HI-GRW_ALL_ALL_datchet do)	Replacement of submersible pumps and lower of intake levels in two boreholes (two pumps) and increasing the capacity of the contact tank. Deployable Output (DO) benefit 5.4 Ml/d (peak) and 1.6 Ml/d (average).	Yes	No	No

[4] Habitats Regulation Assessment - Appendix A: HRA screening assessment of WRMP19. Feasible Option Elements, Report for: Thames Water Utilities Limited produced by Ricardo Energy & Environment – ED10169 | Issue Number Final| 20/04/2020.

	Option	Option description	LSE	LSE - Screening Review	AA
7	SWOX to SWA (ID: TWU_SWA_HI-TFR_SWX_ALL_swoxswa48)	Abingdon WTW to Long Crendon to supply SWA.	Yes	Yes	Yes
8	Moulsford (ID: TWU_SWX_HI-GRW_ALL_ALL_moulsford gw)	Construction of an abstraction borehole in the unconfined Chalk north of Streatley on the west bank of the River Thames. Water abstracted from the borehole will be treated at the existing Cleeve water treatment works (WTW) located on the eastern side of the River Thames. DO benefit is 3.5Ml/d peak and 2Ml/d average.	Yes	Yes	Yes
9	Abingdon to Farmoor Reservoir pipeline (ID: TWU_SWX_HI-TFR_STR_ALL_abing-farmoor pipe)	Construction of a transfer pipeline to convey 24Ml/d of raw water between a proposed reservoir at Abingdon and the existing Farmoor reservoir, in the SWOX WRZ. (Note: Abingdon reservoir creation is not part of this option). The engineering scope includes the provision of a booster pump station at the proposed Abingdon Reservoir site to facilitate the transfer. Treatment would be provided at the existing WTW.	Yes	Yes	Yes
	Abingdon Options SESRO	Abingdon options includes Increase water treatment works (WTW) capacity and a new reservoir in the south east. These three options are part of the South East Strategic reservoir option (SESRO).and HRA Stage 1 Screening ToLS exercise was undertaken for Abingdon options combined. Located southwest of Abingdon, the SESRO project, is based on the abstraction of water from the River Thames at Culham, to be stored in a fully bunded reservoir during wetter months (when the reservoir is not already full). This water would then be released back into the River Thames at Culham so that it would be available for abstraction downstream, when required during drier periods. This option HRA Screening was assessed by Affinity Water and Thames Water[5] . Conclusions from this report are summarised and used to evaluate the potential in-combination effects of these options.	Yes	Yes	No
10	Reservoir Abingdon 100 (Lon) - Construction (ID: TWU_STR_HI-RSR_RE1_CNO_abingdon100(lon))				
11	Abingdon WTW Ph1 - Construction (ID: TWU_SWX_HI-ROC_WT1_CNO_abingdon wtw ph1)				
12	Abingdon WTW Enhanced (ID: TWU_SWX_HI-ROC_WT2_ALL_abingdon wtw ph2)				
	Severn to Thames transfer SRO (STT) Options	These four options comprise part of the Severn to Thames transfer SRO (STT)	Yes	Yes	Yes

[5] South East Strategic Reservoir Option Gate 2 – Supporting Document B4, Affinity Water and Thames Water. Draft version, Undated.

	Option	Option description	LSE	LSE - Screening Review	AA
13	Raw Water Transfer Deerhurst to Culham 500 Ml/d (Lon only) - Construction (ID: TWU_STT_HI-IMP_STT_CNO_sttpipe500(lon)) Bulk transfers into region (raw).	and all form parts of the proposed transfer from the River Severn to the River Thames. These options were assessed by Ricardo Energy & Environment [6] Conclusions from this report were summarised and used to evaluate the potential in-combination effects of these options.			
14	500: Vyrnwy Reservoir river release (75 Mld) and 25 Mld of Bypass (105Mld) (ID: TWU_STT_HI-RAB_RE1_ALL_p9-500-vyrnwy_100_b)				
15	500: Netheridge STW effluent diversion (35Mld) - Deerhurst Pipeline (ID: TWU_STT_HI-REU_RE1_ALL_p5-500-neth_p35)				
16	500: Unsupported flow (ID: TWU_U7T_HI-RAB_RE1_ALL_p1-500-unsupported)				
	Remaining options				
17	Wessex Water to SWOX (Flaxlands) (ID: TWU_SWX_HI-IMP_SWX_ALL_wessextoswoxflax)	Transfer 2.9Ml/d from Wessex Water to Flaxlands. One new main from Minety SR (Wessex) to Flaxlands SR (TW). Also included is the transfer main from Charlton WTW to Minety SR.	No	No	No
18	Henley to SWOX - 5 Ml/d (ID: TWU_SWX_HI-TFR_HEN_ALL_henley-swox5)	The option is for one new main from New Farm service reservoir (Henley) to Nettlebed service reservoir (SWOX). This will require a new 5.9km, 350mm diameter main from New Farm to Nettlebed and a new pumping station at New Farm. 5Ml/d capacity.	No	No	No
19	Thames Water (SWA) to Thames Water (SWOX) Conveyance (ID: TWU_SWX_HI-TFR_SWA_ALL_tw(swa)to(swx)con)	Potable Water Transfer -Thames Water (SWA) to Thames Water (SWOX).	No	No	No
20	Thames Water (Kennet Valley) to Thames Water (Henley) Conveyance (ID: TWU_HEN_HI-TFR_KVZ_ALL_tw(kv)to(hen)con)	Potable Water Transfer - Thames Water (Kennet Valley) to Thames Water (Henley) Conveyance.	No	No	No
21	Groundwater Addington (ID: TWU_LON_HI-GRW_ALL_ALL_addington gw)	New abstraction borehole & upgrade to WTW. DO benefit 1Ml/d average, 1.5Ml/d peak.	No	No	No

[6] Ricardo Energy and Environment on behalf of the STT group (2022) Severn Thames Transfer Solution Informal Habitats Regulations Assessment Report

	Option	Option description	LSE	LSE - Screening Review	AA
22	Southfleet/Greenhithe (new WTW) (ID: TWU_LON_HI-GRW_ALL_ALL_s'fleet lic disagg)	Southfleet-Greenhithe licence disaggregation, new headworks, and pumping station at borehole sites and new 3km main from Greenhithe to new WTW. DO benefit is 8Ml/d average, 9Ml/d peak.	No	No	No
23	Woods Farm Increase DO (ID: TWU_SWX_HI-GRW_ALL_ALL_woods farm do)	New borehole to be constructed on site to bring DO up to licence (this is an additional 2.4Ml/d to average licence of 4.99Ml/d or an additional 2.91Ml/d to peak licence of 5.5Ml/d). The option includes a new borehole and a 1.4km raw water pipeline from the new satellite borehole to Woods Farm WTW.	No	No	No
24	Dapdune Licence Disaggregation (ID: TWU_GUI_HI-GRW_ALL_ALL_dapdune lic disagg)	Refurbishment of two disused abstraction boreholes located on-site at the existing, but disused Mortimer WTW. Water abstracted from the boreholes will be treated at the disused WTW which will be upgraded for ammonia and iron removal and recommissioned. DO benefit 4.5 Ml/d average and peak.	No	No	No
25	Mortimer Disused Source (Recommission) (ID: TWU_KVZ_HI-GRW_ALL_ALL_mortimer recomm)	Construction of a new run to waste facility to allow operation of existing borehole.	No	No	No
26	Britwell Removal of Constraints (ID: TWU_SWX_HI-GRW_RE1_ALL_britwell roc)		No	No	No
27	ASR Horton Kirby (ID: TWU_LON_HI-GRW_RE1_ALL_asrhortonkirby)	Construction of pipelines between two existing ASR boreholes in the Lower Greensand aquifer to an existing WTW at Horton Kirby in Kent. Water abstracted from existing Chalk aquifer boreholes (via the mains supply) will be recharged into the two ASR boreholes during periods of water surplus and abstracted when needed and treated at the WTW.	No	No	No
28	M/ogden to Teddington outfall 75 Ml/d (ID: TWU_TED_HI-TFR_TED_ALL_teddingtondramog /ted)	Conveyance from Mogden to the River Thames at Teddington (Teddington DRA).	No	No	No
29	Teddington DRA 75 MLD - Construction (TWU_TED_HI-RAB_RE1_CNO_teddington dra 75)	Teddington DRA 75 MLD option.	No	No	No

	Option	Option description	LSE	LSE - Screening Review	AA
30	TLT extension from Lockwood PS to King George V Reservoir intake (ID: TWU_KGV_HI-TFR_KGV_ALL_lockwood ps-kgv res)	Tunnel from Lockwood to KGV reservoir	No	No	No
31	Direct River Abstraction - Teddington to Thames Lee Tunnel Shaft 75 MLD (ID: TWU_KGV_HI-TFR_TED_ALL_teddingtondrated/tlt)	Raw water abstraction at Teddington to Thames Lee Tunnel (Teddington DRA).	No	No	No
32	DP-Playhatch-KV (ID: TWU_KVZ_RE-DRP_ALL_ALL_dp-playhatch-kv)	Drought intervention – Drought Permits. The final two options included in the Thames Water WRMP BVP are two drought plan options: DP- Playhatch-KV and DP-Gatehampton-SWOX. These two options were assessed by Ricardo Energy & Environment. [7] who undertook a SEA and concluded that a HRA was not required.	NA	NA	NA
33	DP-Gatehampton-SWOX (ID: TWU_SWX_RE-DRP_ALL_ALL_dp-gatehampton-swox)				
LC/ BES	Dukes Cut to Farmoor (ID: TWU _SWX_HI-TFR_SWX_ALL_dukescut-farmoor)	Dukes Cut to Farmoor proposes a 15 Ml/d conveyance option from the Oxford Canal to Farmoor Reservoir.	Yes	Yes	Yes

Source: Mott MacDonald, 2022.

[7] Ricardo Energy & Environment on behalf of Thames Water (2022) Thames Water Final Drought Plan 2022 Habitats Regulations Assessment – Screening Report

3 Habitats Regulations Assessment Process

3.1 Habitats Regulations Assessment process

There is a requirement under the Conservation of Habitats and Species Regulations 2017 (as amended) ("the Habitats Regulations") to determine if a plan or project may have an adverse impact on a site designated under the same (or preceding Regulations) prior to any consent or permission being determined. The process of undertaking this assessment is known as a HRA.

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

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

Although the Habitats Regulations have been amended by The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019, due to the UK's exit from the EU, the effect of these amendments is largely related to wording, with requirements and processes remaining the same, as protection levels remain unchanged. As such existing EU guidance[8] and preceding case law from the European Court of Justice (ECJ)[9] [10] [11] remains valid as a source of direction and interpretation of the requirements of the legislation, although it should be noted that much case law has now been incorporated into guidance and/or best practice.

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

[8] European Commission (2018). Managing Natura 2000 Sites - The provisions of Article 6 of the 'Habitats' Directive 92/43/CEE [online] available at: EN_art_6_guide_jun_2019.pdf (europa.eu) (last accessed April 2022).

[9] Landelijke Vereniging tot Behoud van de Waddenzeecase/ Nederlandse Vereniging tot Bescherming van Vogels, European Court of Justice, Case C-127/02 'Waddenzee 2002'

[10] Sweetman et al v An Bord Pleanala, European Court of Justice, Case C-258/11 'Sweetman 2011'

[11] People over Wind/Sweetman v Coiltte Teorante, European Court of Justice Case C-323/17 'People over Wind 2017'

Table 3.1: HRA Stages

Stage	Description
Screening (Stage One)	This is the process which identifies the potential effects upon the Designated Sites and considers if these are likely to be significant (see definitions below). Screening is an iterative process and before moving to Stage Two it can be repeated if required. Proposals to mitigate any likely significant effects cannot be considered at the screening stage. If the Screening (Stage 1) identifies that the project or plan, alone or in combination, may have likely significant effects on a Habitats Site and/or its features of interest, or if there is uncertainty, the competent authority must undertake an Appropriate Assessment (Stage 2) of the implications for that Site in view of that Site's conservation objectives.
Appropriate Assessment (Stage Two)	This stage involves the consideration of the predicted adverse effects of the project or plan either alone, or in combination with other projects or plans, on the integrity of the Habitats Site with respect to the Site's structure, function, and conservation objectives. Additionally, where mitigation has been proposed to avoid or minimise likely significant effects, this stage includes assessment of the likely effectiveness of any mitigation applied. A key outcome of the Appropriate Assessment is to identify whether the integrity of the Habitats Site(s) is likely to be adversely affected by the plan/project.
Assessment of Alternative Solutions (Stage Three)	If the mitigation measures applied and assessed during Appropriate Assessment cannot avoid adverse effects on the integrity of a Habitats Site, this stage examines alternative ways of achieving the objectives of the project or plan that avoid adverse effects on the integrity of the Habitats Site.
Assessment where no alternative solutions exist and where adverse effects remain (Stage Four)	If no suitable alternative solutions are available, Stage Four requires an assessment of compensatory measures where, in the light of an assessment of Imperative Reasons of Overriding Public Interest ("IROPI"), it is considered that the project or plan should proceed. In making this assessment, it is important to recognise that it will be appropriate to the likely scale, importance, and impact of the proposed project. If it is impossible to avoid or mitigate the adverse impact, it must be demonstrated that there is IROPI.

Source: Mott MacDonald, 2022

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

Mott MacDonald Ltd undertook this plan-level HRA following the methodology in the *Environmental Assessment Guidance for Water Resources Management Plans and Drought Plans (21/WR/02/15)*[12].

3.2 Screening assessment methodology

The initial list of sites for the HRA screening was derived by adopting a pathway/receptor approach with a distance-based threshold of 10km, whilst including more distant sites subject to longer pathways; these included those sites which were hydrologically connected via surface- or groundwater catchments. This is based on the premise that most significant effects on qualifying

[12] UKWIR (2021). Environmental Assessment Guidance for Water Resources Management Plans and Drought Plans (21/WR/02/15), 287p.

features of Designated Sites will occur within a maximum of a 10km radius[13]. This distance of 10km is defined as the Zone of Influence (ZoI) of the Thames Water options, which has been extended where appropriate to capture all potential effects on Designated Sites.

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

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

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

- **Likelihood:** Where an effect was considered to be potentially significant, then the assessment of its occurrence was based on the likelihood of it occurring and not certainty that it would occur. Effects are scoped in unless there was evidence to the contrary demonstrating that they would not occur e.g., there being no valid pathway, or the absence of the species in that area, at that time.
- **Significance:** The significance of any effect is considered objectively, against the scale and nature of the impact in relation to those of that particular feature or condition and in relation to the extent of that feature or condition over the entire Habitats Site. A significant effect within this assessment is one which, if it occurred, would lead to a decline in the quality or status of the habitats or distribution and/or abundance of feature(s) of interest.
- **In-combination**: The assessment of in-combination effects considers those projects or plans which:
  - Are currently in operation
  - Those which are actually proposed - defined by being a valid live planning application, or any referenced with a local plan where there is potential for them being undertaken within a reasonable time period, specified within that plan.

In line with relevant case law, this assessment is undertaken in the absence of mitigation (including measures embedded into the options where these are intended for the avoidance of effects). Where LSE were identified the assessment has taken these effects through to Stage 2 AA.

[13] UKWIR (2021). Environmental Assessment Guidance for Water Resources Management Plans and Drought Plans (21/WR/02/15), 132p.[14] Designated Sites descriptions, qualifying features and conservation objectives are given in Appendix A.

3.3 Appropriate Assessment approach and methodology

3.3.1 Approach

Where a plan or project is likely to, or has the potential to, give rise to LSE upon a Designated Site, an assessment must be made of the implications on the integrity of that site in view of that site's structure, function and conservation objectives and considering any site-specific supplementary advice or site improvement plan.

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

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

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

This HRA Stage 2 AA has been formulated using the following approach:

- Review the sites identified at Stage 1 and confirm any additions or exclusions.
- Assessment of the construction and operation effects of the selected options.
- Assessment of the Designated Sites' characteristics and identification of their conservation objectives[14].
- Identification of the aspects of the proposed options that will significantly impact the conservation objectives of the Habitats Site(s)[15].

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

- GOV.UK (2019) Appropriate Assessment - Guidance on the use of Habitats Regulations Assessment. Published 22 July 2019[3; .]
- UK Water Industry Research (UKWIR, 2021)[16].
- European Commission (EU, 2018) Managing Natura 2000 sites - The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC[17].

3.3.2 Consultation

It is recommended that Thames Water work closely with Natural England and the Habitats Site managers to agree the specific mitigation measures to be included in the HRA. The agreed mitigation measures will be expected to form part of planning conditions, development consent

[14] Designated Sites descriptions, qualifying features and conservation objectives are given in Appendix A.

[15] This is the Appropriate Assessment given and tabulated in Sections 4, 5 and 7.

[16] UKWIR (2021). Environmental Assessment Guidance for Water Resources Management Plans and Drought Plans (21/WR/02/15).

[17] European Commission (2018). Managing Natura 2000 Sites - The provisions of Article 6 of the 'Habitats' Directive 92/43/CEE [online] available at: EN_art_6_guide_jun_2019.pdf (europa.eu) (last accessed April 2022).

orders and/or conditions of relevant environmental permits, and their implementation managed through contractual obligations with supervision from an Environmental Clerk of Works.

3.3.3 Potential effects considered as part of the HRA

Following UKWIR (2021)[16] guidance and given the nature of the 'No Regret' options, the potential effects considered in this assessment are summarised in Table 3.2. Proposed distances are also provided following the same guidance to ascertain if, where a pathway has been identified, the impact is likely to affect the habitats or species for which the Habitats Site(s) are designated.

Table 3.2: Potential effects and proposed Zone of Influence

Broad categories of potential effects on Designated Sites (with examples)	Examples of activities resulting in effects and proposed ZoI
Physical loss Destruction (including offsite effects) e.g., foraging habitat, smothering	Development of built infrastructure associated with the options, e.g., reservoir embankments and access routes[18]. Physical loss is only likely to be significant where the boundary of the option extends within the boundary of the Habitats Site, or within an offsite area of known foraging, roosting, breeding habitat (that supports species for which a Habitats Site is designated or where natural processes link the option to the site, such as through hydrological connectivity downstream, or the option effects the linking habitat).
Physical damage Habitat degradation Erosion Trampling Fragmentation Severance/barrier effects Edge effects	Development of built infrastructure associated with the options, e.g., reservoir embankments and access routes. Physical loss is only likely to be significant where the boundary of the option extends within the boundary of the Habitats Site, or within an offsite area of known foraging, roosting, breeding habitat (that supports species for which a Habitats Site is designated or where natural processes link the option to the site, such as through hydrological connectivity downstream, or the option effects the linking habitat).
Non-physical disturbance Noise Visual presence Light pollution	**Noise from construction activities.** Taking into consideration the noise level generated from general building activity (c. 122dB(A)) and considering the lowest noise level identified in guidance as likely to cause disturbance to waterbird species (although this guidance is designed primarily for estuarine birds it was considered appropriate to use for this plan), it is concluded that noise effects could be significant up to **1km** from the boundary of the Habitats Site. **Noise from vehicular traffic during construction of the option** Noise from construction traffic is only likely to be significant where the transport route to and from the option is within **500m** of the boundary of the Habitats Site(s). **Plant and personnel involved in operation of the option** These effects (noise, visual/human presence) are only likely to be significant where the boundary of the option extends within or is adjacent to an offsite area of known foraging, roosting, breeding habitat that support species for which a Habitats Site is designated.

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Broad categories of potential effects on Designated Sites (with examples)	Examples of activities resulting in effects and proposed ZoI
	Options that might include artificial lighting, e.g., for security around a temporary pumping station. Effects from light pollution are more likely to be significant where the boundary of the option is within **500m** of the boundary of the Habitats Site
Water table/ availability Drying Flooding/storm water Changes to surface water levels and flows Changes to groundwater level and flows	Change to water levels and flows due to water abstraction, storage and drainage interception associated with inland options. These effects are only likely to be significant where the boundary of the option extends within the same ground or surface water catchment as the Habitats Site. However, these effects are dependent on hydrological continuity between the option and the Habitats Site and whether the option is up or downstream from the Habitats Site.
Toxic contamination Water pollution Soil contamination Air pollution	**Reduced dilution in downstream or receiving waterbodies due to changes in abstraction or reduced compensation flow releases to river systems.** These effects are only likely to be significant where the boundary of the option extends within the same ground or surface water catchment as the Habitats Site. However, these effects are dependent on hydrological continuity between the option and the Habitats Site, and sometimes whether the option is up or downstream from that site. Air emissions associated with plant and vehicular traffic during construction and operation of the option. The effect of dust is only likely to be significant where site is within or in close proximity to the boundary of a Habitats Site. Without mitigation, dust and onto the public road network and then deposited/spread by vehicles on roads up to 500m from large sites, 200m from medium sites, and 50m from small sites as measured from the site exit. Effects of road traffic emissions from the transport route to be taken by the option traffic are only likely to be significant where the Habitats Site falls within 200 metres of the edge of a road affected.
Non-toxic contamination Nutrient enrichment (e.g., of soils and water) Algal blooms Changes in turbidity Changes in sedimentation/silting Air pollution (dust)	**Changes to water salinity, nutrient levels, turbidity, thermal regime due to increased water abstraction, discharges, storage, or reduced compensation flow releases to river systems.** These effects are only likely to be significant where the boundary of the option extends within the same ground or surface water catchment as the Habitats Site. However, these effects are dependent on hydrological continuity between the option and the Habitats Site, and sometimes whether the option is up or downstream from that site. Emissions of dust during the earthworks, construction of plant and tunnel/pipeline construction associated with options.

Broad categories of potential effects on Designated Sites (with examples)	Examples of activities resulting in effects and proposed ZoI
Biological Disturbances Direct mortality Changes to habitat availability Changes in species abundance or distribution Out-competition by non-native species Introduction of disease Introduction of invasive species	**Killing or injury due to construction activity.** Likely to be a risk where the boundary of the option extends within or is directly adjacent to the boundary of the Habitats Site, or within/adjacent to an offsite area of known foraging, roosting, breeding habitat (that supports species for which a Habitats Site is designated). **Changes in habitat availability, such as reductions in wetted width of rivers from abstraction or reduced compensation flow.** These effects are only likely to be significant where the boundary of the option extends within the same ground or surface water catchment as the Habitats Site. However, these effects are dependent on hydrological continuity between the option and the Habitats Site, and sometimes whether the option is up or downstream from that site. **Creation of new pathway for spread of non-native invasive species.** This effect is only likely to be significant where the option is situated within the Habitats Site or an upstream tributary of the Habitats Site, but also for inter-catchment water transfers.

Source: UK Water Industry Research (2021)[16].

3.3.4 Assumptions and standard best-practice mitigation measures

3.3.4.1 Overview

The high-level nature of this assessment undertaken at the plan stage reflects that there is some lack of detailed design for the WRMP24 options. By law, any plan being taken forward to be implemented will be subject to an AA at the project stage, when, in the light of more information relating to the construction and design of the option, a more refined HRA assessment can be undertaken. However, it is considered that this AA has been undertaken in a robust manner and to the fullest extent possible at this stage of the plan.

Based on the current level of detail available for the WRMP24, a number of assumed and established measures are defined which are integrated into the options' designs to alleviate adverse environmental effects. These measures are defined as industry-wide best practice measures to address common risks in the construction and development sectors and thus are proven to reduce the risk of the identified effects in so far as is reasonably possible. These measures will be applied to the construction of the final option and constitute mitigation to avoid or reduce adverse effects on Designated Site integrity, therefore are only mentioned at the AA stage.

3.3.4.2 Standard best practice measures during construction

The following assumptions constitute best practice for the WRMP24 options and are control measures which are essential features of the project and will be integrated into the construction phase. These are not considered to be targeted mitigation to avoid or reduce significant effects or adverse effects on Designated Sites; any further mitigation will be detailed in the subsequent sections for each option. Best practice for the options design, pollution control, biosecurity, disturbance, and the Construction and Environmental Management Plan (CEMP) includes:

Options design

- Should design be altered, every opportunity for avoiding potential effects on Designated Sites (e.g., through alternative pipeline routes and micro siting) should be taken.

- Construction of new pipelines at watercourse crossings will be designed to avoid direct impacts on riverbed and permanent habitat loss. If project-level hydrological investigations imply that there will be disruption to the water table, it will be recommended that a directional drilling method is employed to ensure that no direct impact on the water course or adjoining Habitats Site(s) occurs. Directional drilling will be used at all watercourses >3m wide- for water courses <3m wide, localised, and temporary water quality and hydrology changes may arise during construction, but as pollution control best practices will be applied to all water course crossings at all times, these measures are considered sufficient to mitigate for any significant effect related to water pollution. The potential for increased flood risk and groundwater impacts will be confirmed in the hydrological investigations which will inform the HRA at this stage; and Pipeline routes will be preferably designed to avoid unnecessary watercourses crossings and as distant as possible to Designated Sites boundaries to offer a buffer limiting pathways through disturbance and pollution runoff. The buffers applied to access potential effects will be specific to each option and will consider the Designated Sites and their qualifying features.

Pollution control

- Indirect construction-related pollution is identified as one key pathway through which Designated Sites may be affected. There is numerous guidance on environment good practice measures during construction which can be relied on (at this level) to prevent significant adverse effects on a designated site occurring. The best-practice procedures detailed in the following documents should be followed for all construction works derived from this option, as a minimum standard:
  - CIRIA C741 Environmental good practice on site guide (Charles and Edwards, 2015)[19];
  - CIRIA C532 Control of water pollution from construction sites (Masters-Williams et al. 2001)[20]; and
  - Environment Agency's Pollution Prevention Guidance Notes[21] including PPG1: General Guide to Prevention of Pollution (July 2013); PPG5: Works and maintenance in or near water (October 2007), PPG6: Pollution prevention guidance for working at construction and demolition sites (April 2010); PPG21: Pollution incident response planning (March 2009); PPG22: Dealing with spills (April 2011).
- The installation of sediment traps near or in watercourses or the use of cofferdams should be specified at the project stage.
- Compliance with the provisions of the *Health and Safety at Work Act 1974, the Environmental Protection Act 1990, the Environment Act 1995, the Clean Air Act 1993, and the regulations made thereunder, including the Control of Substances Hazardous to Health Regulations (SI 2002/2677)* with regard to air quality management.
- Mitigation plans to help mitigate air quality impacts to support this should include an Air Quality/Dust Management Plan and a Construction Traffic Management Plan (CTMP).

[19] Charles P. and Edwards P (2015) *Environmental good practice on site guide.* CIRIA C741, 260p.

[20] Masters-Williams H., Heap A., Kitts H. *et al.* (2001) *Control of water pollution from construction sites*. CIRIA C532, 27p.

[21] Note, the Environment Agency Pollution Prevention Guidance Notes have been withdrawn by the Government, although the principles within them are robust and still form a reasonable basis for pollution prevention measures. Documents are still available online at: [ARCHIVED CONTENT] Environment Agency - Pollution prevention advice and guidance (PPG) (nationalarchives.gov.uk) (last accessed April 2022).

Biosecurity

- Biosecurity measures will be in place to ensure the management of invasive non-native species on construction sites and during controlled activities. The following considerations will be given pre-construction:
  - Invasive non-native species (INNS) risk assessment to be undertaken at site feasibility stage;
  - Where INNS are identified, legal requirements and mitigation plan developed at early planning stage;
  - INNS to be included on all site method statements including CEMP and any Ecological Protection Plans. INNS risk to be managed by Clerk of Works and INNS brief given to all site contractors; and
  - Where a species requires long-term management (such as Japanese knotweed *Fallopia japonica*), a specific INNS management plan will be developed.
- The best-practice procedures detailed in the following documents should be followed to reduce the spread of INNS for all construction works derived from these options, as a minimum standard:
  - CIRIA Manual C679 'Invasive species management for infrastructure managers and the construction industry'; The Knotweed Code of Practice - managing Japanese knotweed on development sites'.

Disturbance - noise

- Construction activities will be conducted in accordance with noise limits to avoid disturbance.
- Construction related noise disturbance will be minimised by implementing best practice such as BS 5228-1:2009+A1:2014 (The British Standards Institute, 2008)[22].

Disturbance - light

- Lighting will be kept to a minimum to reduce disturbance. Should the works be undertaken at night and flood lighting required, lighting should be kept to a minimum and hooded spotlights directed away from potentially suitable habitat for qualifying species of Designated Sites, to reduce disturbance while ensuring standards for health and safety.
- The potential impact of artificial light may be minimised through the implementation of best practice such as '*Guidance Notes for the Reduction of Obtrusive Light*' (Institute of Lighting Professionals, 2011)[23].

Construction Environmental Management Plan (CEMP)

A CEMP must be developed prior to construction, including measures to ensure that the risk of uncontrolled discharges from construction is reduced (including sediment management) and detailing an Emergency Response Plan in the event of a pollution incident. This plan must be prepared for all works and include the industry best practice measures listed above and any targeted mitigation measures identified during the formal HRA.

3.3.4.3 Assumptions during operation

There are no assumptions relating to best practice or otherwise during the operation of the final option. This will be tailored to each option as needed.

[22] The British Standards Institute, 2008. BS 5228-1:2009+A1:2014. *Code of practice for noise and vibration control on construction and open sites. Noise*. BSI Standards Limited, London.

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

4 South East Water to Guildford

Option ID: South East Water to Guildford (ID: TWU_GUI_HI-TFR_RZ5_ALL_sewtogui)

4.1 Option Description

This option proposes a 10Ml/d transfer from South East Water (Hogsback) to Mount SR Guildford (See Table 2.1 for full option description). An acronyms list is presented at the beginning of this report.

4.2 Stage 1 Screening - Review

The Stage 1 Screening carried out on 2019 identified two Designated Sites within the ZoI of this option: Thames Basin Heaths SPA (UK9012141) and Thursley, Ash, Pirbright and Chobham SAC (UK0012793). This screening review identified LSE for Thames Basin Heaths SPA and Thursley, Ash, Pirbright and Chobham SAC and it further identified three Designated Sites with No LSE (See Table 4.1).

This option has proceeded to the next HRA stage – AA. The full HRA Screening review is presented in Annex A. Information on the Designated Sites is provided in Annex B, including qualifying features, conservation objectives, and threats and pressures to site integrity.

Table 4.1: South East Water to Guildford Option Stage 1 screening results reviewed

Potential for Significant Effects	No Likely Significant Effects
Thames Basin Heaths SPA (UK9012141) (unknown distance)	Thursley, Hankley & Frensham Commons SPA (UK9012131) (approx. 5km)
Thursley, Ash, Pirbright and Chobham SAC (UK0012793) (approx. 0.05km)	Thursley & Ockley Bogs Ramsar Site (UK11074) (approx. 7km)
	Windsor Forest & Great Park SAC (UK0012586) (approx. 9km)

4.3 Stage 2 Appropriate Assessment

4.3.1 Scope

The following Designated Sites were assessed at Stage 2 AA:

- Thames Basin Heaths SPA (UK9012141) (adjacent)
- Thursley, Ash, Pirbright and Chobham SAC (UK0012793) (approximately at. 0.05km)

4.3.2 Potential effects on Designated Sites

The potential effects of the construction and operation phases for South East Water to Guildford Option are described below, taking into account the type, size and scale of the option.

An assessment of each potential impact on the integrity of the designated sites is made, in view of the sites' structure, function and conservation objectives. Where adverse effects are deemed significant, mitigation measures are also proposed in the following section.

At this stage, a worst-case scenario is assumed, with effects and required mitigation measures outlined in Table 4.2.

Where adverse effects are deemed significant, further necessary mitigation measures are also proposed in the following section. Where stated these are in addition to the best practice outlined in Section 3.3.4.

The Level 2 Water Framework Directive assessment for the groundwater bodies identified minor localised impacts on water quality from below ground construction activities, therefore, effects on the Designated Sites are unlikely. The option footprint is also not hydrologically connected to either Designated Sites, therefore changes in the water table and related construction or operational effects or pathways for hydrological pollution events are also considered unlikely. However, potential adverse effects in the absence of mitigation are still identified in relation to:

- The proximity to Designated Sites may lead to potential pollution events, habitat loss and degradation, affecting these sites and its qualifying features as discussed below and summarised in the Table 4.2

4.3.2.1 Thames Basin Heaths SPA (UK9012141) (adjacent)

The Thames Basin Heaths was classified as a SPA in March 2005 and forms part of an extensive complex of lowland heathlands in southern England that support important breeding bird populations.

Designated for supporting migratory populations of birds, the site qualifies under article 4.1 of the Directive (79/409/EEC) as during the breeding season the area regularly supports 1% or more of the Great Britain (GB) populations of the following species listed in Annex I:

- Nightjar (*Caprimulgus europaeus*) - 7.8% of the GB breeding population
- Woodlark (*Lullula arborea*) - 9.9% of the GB breeding population
- Dartford warbler (*Sylvia undata*) - 27.8% of the GB breeding population

Construction effects

The proposed works may lead to temporary and permanent effects on this site and its qualifying features as a direct result of physical habitat loss, habitat degradation and/ or fragmentation, as the proposed pipeline route is in close proximity of this Designated Site.

The site is designated for supporting populations of heathland breeding birds. Woodlark nightjar and Dartford warbler breed in clear-fell and open heath areas, establishing nests on open ground provided by arable cultivation in the spring, as well as on grass-heath. Nests and chicks are vulnerable to construction activities during the breeding season, especially because they are well camouflaged, and chicks tend to stay motionless when disturbed. Physical loss and damage, including fragmentation and degradation of functional linked land used by these qualifying species are expected as a result of land clearance during construction.

Birds are likely to avoid areas of qualifying habitat within the vicinity of the works. The use of vehicles, machinery, and movement of personnel within this Designated Site may result in adverse effects due to noise and light pollution potentially affecting sensitive ground-breeding bird species. Traffic activity during construction may also exceed critical loads of emissions (such as NOx, SOx, and particulates) that can lead to nutrient enrichment and eutrophication having adverse effects on this designated site and its protected bird species (air pollution due to impact of atmospheric nitrogen deposition has been identified as a pressure and threat to the bird species and habitats on site).

Disturbance to qualifying species when foraging may jeopardise adult fitness, survival, and breeding success by displacing birds from preferred feeding and/or roosting areas. Effects of displacement may be temporary or long-lasting and may result in redistribution within or from a site, increased energy expenditure due to more frequent flights, disrupted incubation of eggs and abandonment of nests. The identified effects may also have the potential to reduce the

extent and distribution of functional linked habitat used by qualifying species' populations outside the Designated Site. In case of pollution events, a localised reduction on fish stocks, as well as on macrophytes may be observed, indirectly affecting this site's qualifying bird species due to reduction of food availability. Standard measures are recommended to mitigate possible effects from disturbance (vehicles and people movement), noise and light pollution. The site is sensitive to invasive species pressure and measures to avoid their spread need to be undertaken during construction.

Ahead of works surveys must be undertaken to gather information on habitat use by bird species with the intention to inform the best pipeline route to avoid areas mostly used by birds and ensure minimal habitat fragmentation (already a pressure on the site).

The construction period must avoid the breeding season, early consultation with Natural England is recommended to discuss timescales.

Surveys will inform the CEMP which will include all of the above proposed mitigation measures and any further measures identified at the project stage. Once the construction is complete habitats should be reinstated.

Given the size of the Designated Site and the fact that the pipeline route should only affect a very small proportion of the site, no adverse effects to the site integrity are expected if all mitigation measures proposed are in place. However, low and localised effects may still be possible and therefore this option will need to be included in the in-combination assessment.

Operation effects

No operation effects are anticipated for this option which could affect this designated site and/or its qualifying features.

4.3.2.2 Thursley, Ash, Pirbright and Chobham SAC (UK0012793) (approximately 0.05km from the proposed works)

The Thursley, Ash, Pirbright and Chobham site was classified as a SAC in April 2005 and is an extensive complex of heaths with large areas of wet and dry heath, acid mire and bog pools.

Designated for supporting habitats and plant species, the site qualifies under article 4(4) of the Directive (92/43/EEC) as it hosts the following habitats listed in Annex I:

- Depressions on peat substrates of the (*Rhynchosporion*)
- European dry heaths
- Northern Atlantic wet heaths with (*Erica tetralix*) (wet heathland with cross-leaved heath)

This site supports the sole area of lowland northern Atlantic wet heath in south-east England. This habitat supports an important assemblage of animal species, including numerous rare and local invertebrate species, including the Nationally Rare white-faced darter (*Leuccorhinia dubia)*, as well as sand lizard (*Lacerta agilis*) and smooth snake (*Coronella austriaca*).

Construction Effects

The site is designated for supporting early successional rare/scarce heathland vegetation.

Construction activities may lead to temporary and permanent loss of qualifying habitat resulting from land clearance around the pipeline construction area. Functionally linked habitats important for qualifying plant species can also be affected during construction due to air pollution (dust) affecting photosynthesis and decreasing productivity.

Critical loads of emissions (such as NOx, SOx, and particulates) from increased traffic can lead to nutrient enrichment and eutrophication. The movement of soil during construction may

worsen the already ongoing invasion of heath by Rhododendron, Gaultheria and Piri piri burr[24]. Habitat loss and degradation, including habitat fragmentation during construction may also have adverse effects on some of the smallest heaths and the connectivity between these and the larger heaths creating a hostile landscape to species dispersal.

Standard measures are recommended to mitigate possible effects from soil disturbance and light pollution. The site is sensitive to invasive species pressure and measures to avoid their spread need to be undertaken during construction.

Habitat surveys should be conducted ahead of construction to inform the pipeline route in areas where protected habitats may be affected. Surveys will inform the CEMP which will include all of the above proposed mitigation measures and any further measures identified at the project stage. Once the construction is complete habitats should be reinstated.

Given the fact that the pipeline is outside the site no adverse effects to the site integrity are expected if all mitigation measures proposed are in place. However, low and localised effects (in functionally linked habitat) may still be possible and therefore this option will need to be included in the in-combination assessment.

Operation Effects

No operational effects are anticipated for this option which could affect this designated site and/or its qualifying features.

[24] Natural England (2014) Site Improvement Plan: Thames Basin (SIP237) Available at: http://publications.naturalengland.org.uk/publication/6249258780983296. Accessed: 15/09/2022.

Table 4.2: South East Water to Guildford - Potential effects on designated qualifying features

Designated Sites	Qualifying features	Potential Significant Effects Alone	Proposed Mitigation Measures	Residual Effects -Alone
Thames Basin Heaths SPA (UK9012141) (adjacent)	Qualifying birds during breeding season: (Article 4.1 / Annex I) • Dartford warbler (*Sylvia undata)* (A302) • Nightjar (*Caprimulgus europaeus*) (A224) • Woodlark (*Lullula arborea*) (A246) Non-qualifying species of interest (non-breeding) • Hen harrier (*Circus cyaneus*), • Merlin (*Falco columbarius*) • Short-eared owl (*Asio flammeus*) • Kingfisher (*Alcedo atthis*)	The option is likely to affect this designated site as the proposed footprint is close to this site's boundaries. Therefore, there is the potential for a pathway for effects due to construction, including eventual pollution events and biological disturbances to the qualifying bird species populations. **During construction this option could result in:** • Physical loss - loss of supporting habitat/habitat damage due to the pipeline construction. • Physical damage - habitat degradation and edge effects resulting from pipeline construction. • Non-physical disturbance - air (dust) and light disturbance affecting not only the bird species directly but altering habitats for example; noise and anthropogenic disturbance. • Toxic contamination - air pollution from vehicle emissions and other airborne pollutants may lead to habitat degradation; • Invasive species spread, during construction works impacting upon birds' population due to habitat degradation, for example. • Biological disturbances - Rapid population fluctuations (habitat avoidance or eventual direct mortality), changes to habitat and prey availability. These effects are likely to be associated with all described above. Potential construction pollution events are likely to be localised and of short duration and may	Mitigation measures should follow best practice guidelines to minimise potential impacts whenever close to waterbodies e.g., use of sediment screens, coverage of construction stockpiles during adverse weather conditions, and sand/silt removal facilities. Standard best practice procedures must include: • CIRIA C741 Environmental good practice on site guide • Environment Agency's PPGs (PPG1: General Guide to Prevention of Pollution; PPG6: Pollution prevention guidance for working at construction and demolition sites). • Best practice such as BS 5228-1:2009+A1:2014 (The British Standards Institute, 2008) to avoid significant effects due to noise. • Best practice such as 'Guidance Notes for the Reduction of Obtrusive Light' (Institute of Lighting Professionals, 2011) to avoid significant effects due to increased light (if works are programmed at night). • Biosecurity measures to ensure appropriate removal and/or management control of INNS at source. • Works should be agreed with Natural England and, if possible, to be undertaken outside the breeding period to avoid effects on this site's qualifying bird species. • Development of a CEMP which will include all the above proposed mitigation measures	No adverse effects on the integrity of the site are expected that could affect: • The extent and distribution of qualifying bird species; • The structure and function of the habitats of qualifying species; and • The supporting processes on which habitats of qualifying species rely. However low and localised effects may still be possible and therefore this option will need to be included in the in-combination assessment. Further studies to better understand how the qualifying species use the linked habitats are required. Therefore, birds and habitat suitability surveys are recommended.

Designated Sites	Qualifying features	Potential Significant Effects Alone	Proposed Mitigation Measures	Residual Effects -Alone
		result in temporary and permanent effects on this site and its qualifying features. No operation pathways are identified for this option which could affect this site and its qualifying features.	and any further measures identified at the project stage.	
Thursley, Ash, Pirbright and Chobham SAC (UK0012793) (approx. at 0.05km of the proposed works)	Qualifying habitats: (Article 4.1 / Annex I) • Northern Atlantic wet heaths with (*Erica tetralix)* (4010) • European dry heaths (4030) • Depressions on peat substrates of the Rhynchosporion (7150)	The option is likely to affect this designated site as the proposed footprint is in close proximity to the designated site boundary (0.05km). Therefore, there is the potential for a pathway for effects due to construction including pollution, habitat fragmentation and dispersal of invasive species. **During construction this option could result in:** • Physical damage - habitat degradation and edge effects resulting from pipeline construction. • Non-physical disturbance - air (dust) disturbance affecting this site qualifying habitat and plant species. • Toxic contamination - air pollution from vehicle emissions and other airborne pollutants may lead to habitat degradation; water degradation from air pollution deposition. • Non-toxic contamination - localised pollution events leading to water quality degradation (from air pollution deposition) and consequently to physical damage and biological disturbances. • Given the proximity of this site's boundaries, invasive species spread/introduction may	Mitigation measures should follow best practice guidelines to minimise potential impacts whenever close to waterbodies e.g., use of sediment screens, coverage of construction stockpiles during adverse weather conditions, and sand/silt removal facilities. Standard best practice procedures must include: • CIRIA C741 Environmental good practice on site guide • Environment Agency's PPGs (PPG1: General Guide to Prevention of Pollution; PPG6: Pollution prevention guidance for working at construction and demolition sites). • Best practice such as BS 5228-1:2009+A1:2014 (The British Standards Institute, 2008) to avoid significant effects due to noise. • Best practice such as 'Guidance Notes for the Reduction of Obtrusive Light' (Institute of Lighting Professionals, 2011) to avoid significant effects due to increased light (if works are programmed at night). • Biosecurity measures to ensure appropriate removal and/or management control of INNS at source.	No adverse effects on the integrity of the site are expected that could affect: • The extent and distribution of qualifying bird species; • The structure and function of the habitats of qualifying species; and • The supporting processes on which habitats of qualifying species rely. However low and localised effects may still be possible and therefore this option will need to be included in the in-combination assessment. Further studies to better understand how the qualifying species use the linked habitats are required. Therefore, birds and habitat suitability surveys are recommended.

Designated Sites	Qualifying features	Potential Significant Effects Alone	Proposed Mitigation Measures	Residual Effects -Alone
		occur during construction works/machinery movement. Invasive species may lead to habitat degradation and should be prevented. • Biological disturbances - Rapid population fluctuations (direct mortality related to pollution events may lead to changes to habitat availability and changes in natural succession, for example. These effects are likely to be associated with all described above. Potential construction pollution events are likely to be localised and of short duration and may result in temporary and permanent effects upon this site and its qualifying features. No operation pathways are identified for this option which could affect this site and its qualifying features.	• Works should be agreed with Natural England and, if possible, to be undertaken outside the breeding period (April-August) to avoid effects on this site qualifying bird species. • Development of a CEMP which will include all the above proposed mitigation measures and any further measures identified at the project stage.	

Source: Mott MacDonald, 2022

4.3.3 Stage 2 outcomes

Following this HRA AA, it is considered that with adherence to the proposed mitigation, the proposed works associated with the option will not have adverse effects on the overall integrity of the Thames Basin Heaths SPA and Thursley, Ash, Pirbright and Chobham SAC and its qualifying features alone during the construction and operation phase of this option.

However, further investigation on the use of functionally linked habitat by qualifying species is recommended to assess potential effects in more detail and determine more targeted mitigation measures. A detailed review of the baseline ecological data is also recommended to determine further effects on this Designated Site qualifying features and reduce uncertainty.

5 T2ST Culham to Speen transfer Option

Option ID: T2ST Culham to Speen transfer Option (ID: TWU_KVZ_HI-TFR_T2S_ALL_t2st cul to speen)

5.1 Option Description

This option proposes a new pipeline to allow a 10Ml/d spur connection water transfer from the T2ST SRO at Culham to Speen WTW. This option is a spur off the Thames to Southern Transfer SRO (See Table 2.1 for full option description). An acronyms list is presented at the beginning of this report.

5.2 Stage 1 Screening - Review

The Stage 1 Screening carried out in 2019 identified a total of three Designated Sites within the ZoI of this option, two of which, Kennet and Lambourn Floodplain SAC (UK0030044) and Kennet Valley Alderwoods SAC (UK0030175), were assessed as potential for LSE. No LSE were identified for River Lambourn SAC (UK0030257).

This screening review does not identify any LSE for the Kennet Valley Alderwoods SAC (UK0030175). Given this site's distance to the option footprint (over 0.5km) and the lack of hydrological connection, effects related to light disturbance, dust and pollution events are unlikely to be observed. This review agrees with there being LSE on the Kennet and Lambourn Floodplain SAC (UK0030044) due to the proximity of this site to the option footprint (approximately 0.1km) (See Table 5.1). Therefore, this option progressed to Stage 2 AA.

The full HRA Screening review is presented in Annex A. Information on the Designated Sites is provided in Annex B, including qualifying features, conservation objectives, and threats and pressures to site integrity.

Table 5.1: T2ST Culham to Speen transfer Option Stage 1 screening results reviewed

Potential for Significant Effects	No Likely Significant Effects
Kennet & Lambourn Floodplain SAC (UK0030044) (approx. 0.1km)	River Lambourn SAC (UK0030257) (approx. 1km)
	Kennet Valley Alderwoods SAC (UK0030175) (approx. 0.6km)

5.3 Stage 2 Appropriate Assessment

5.3.1 Scope

The following Designated Sites were assessed at Stage 2 AA:

- Kennet & Lambourn Floodplain SAC (UK0030044) (approx. 0.1km)

5.3.2 Potential effects on Designated Sites

The following sections describe the potential effects of the construction and operational phases for TS2T Culham to Speen transfer option. These take into account the type, size, and scale of the option to determine their potential effect.

An assessment of each potential impact on the integrity of the Designated Sites is made, in view of the sites' structure, function and conservation objectives. Where adverse effects are deemed significant, further necessary mitigation measures are also proposed in the following section. Where stated these are in addition to the best practice and assumptions outlined in Section 3.3.4.

5.3.2.1 Kennet & Lambourn Floodplain SAC (UK0030044) (approx. 0.1km)

The Kennet and Lambourn Floodplain SAC consists of a cluster of sites in the Kennet and Lambourn River valleys. The site comprises bogs, marshes, water fringed vegetation and fens (59%) humid grassland and mesophile grassland (40%), with a minor portion of inland water bodies (standing water, running water) (1%).

- This site is designated under Annex II (1016) for supporting one of the most extensive known populations of Desmoulin's whorl snail (*Vertigo moulinsiana*) in the UK.

This SAC is one of two sites representing the species in the south-western part of its range in the important chalk stream habitat. Integrity of the population is being maintained by taking measures, including habitat creation, to safeguard populations. The habitat occupied at this site differs from the Fenland sites in East Anglia in that it is predominantly reed sweet-grass (*Glyceria maxima*) swamp or tall sedges at the river margins, in ditches and in depressions in wet meadows.

Air pollution and hydrological changes through the effects of climate change are the principal threats to this site's habitats as directly affects its vegetation and invertebrate communities (for further details please refer to Annex B).

Construction effects

The proposed pipeline route is located approximately 100m north of this SAC, therefore, the construction phase of this option has the potential to result in physical loss and damage, both temporary and permanent, of functionally linked habitat as a result of land clearance, erosion and trampling during the construction of the pipeline.

Desmoulin's whorl snail is often found in swampy, usually unshaded ground with tall plants such as reed sweet-grass and tall sedges at the river margins, in ditches and in depressions in wet meadows. Dust effects during the construction phase have the potential to affect photosynthesis and decrease productivity and growth of the vegetation that comprises the habitats supporting Desmoulin's whorl snail populations. This, in turn, could result in changes to habitat availability and biological disturbances, including rapid population fluctuations. Critical loads of emissions (such as NOx, SOx and particulates) from increased traffic can also lead to nutrient enrichment and eutrophication.

The vicinity of the pipeline route could constitute a supporting habitat for this qualifying species. In that case, physical damage (represented by supporting habitat loss, edge effects, and habitat damage) followed by biological disturbances listed above may be observed.

Desmoulin's whorl snail is dependent on the preservation of high-water levels and the conservation of its associated chalk stream habitat[25]. Therefore, it is vulnerable to changes in water levels (water levels must remain close to the surface so that the ground remains at least moist for most of the summer), although some seasonal drying appears to be acceptable[26]. The

[25] Natural England (2003) Hydrological requirements of Vertigo moulinsiana (ENRR549). Available at: http://publications.naturalengland.org.uk/publication/128006. Accessed on: 16/09/2022

[26] Natural England (2003) Ecology of Desmoulin's Whorl Snail (IN105). Available at: http://publications.naturalengland.org.uk/publication/69041. Accessed on: 16/09/2022.

pipeline route is located in the same catchment area as this SAC. However, no changes in groundwater levels and flows are anticipated during the construction phase of this option.

The new proposed pipeline route does not currently cross any immediate waterbody, although it is close to the River Kennet (<200m) which feeds this SAC. Therefore, a potential pathway for pollution effects via water degradation (air pollution followed by subsequent deposition in the water surface) should be considered. Water quality degradation from potential pollution events can lead to temporary changes in turbidity, sedimentation and/or silting associated with run-off during construction when crossing waterbodies interconnected to the River Kennet, as well as toxic contamination from dust/air pollution depositing on surface water. Ultimately, pollution events can alter the ecological balance of this SAC's habitats which may affect Desmoulin's whorl snail population survival.

No adverse effects on the site integrity are anticipated as a result of the construction phase on the qualifying features of this site if all mitigation measures are implemented.

Operation effects

No operation effects are anticipated for this option which could affect this designated site and/or its qualifying features.

Table 5.2: T2ST Culham to Speen transfer option - Potential effects on designated qualifying features

Designated Sites	Qualifying features	Potential Significant Effects Alone	Proposed Mitigation Measures	Residual Effects -Alone
Kennet & Lambourn Floodplain SAC (UK0030044) (approx. 0.1km)	1016 Desmoulin's whorl snail (*Vertigo moulinsiana*)	This option is likely to affect this site as it is located approximately at 100m to the south of the proposed pipeline route. Therefore, there is the potential for a pathway for effects due to construction of this option related to pollution events and biological disturbances. The proposed works may lead to temporary and permanent effects on this site and its qualifying features. The identified effects have the potential to reduce the extent and distribution of functional habitat which supports the qualifying species' populations. During construction, this option is likely to result in: • Physical loss - loss of supporting habitat/supporting habitat damage due to the structure's construction. • Physical damage - Supporting habitat degradation and edge effects resulting from pipeline / associated structures construction. • Non-physical disturbance - anthropogenic / vehicular disturbances related to the construction of the pipeline and associated structures. • Toxic contamination - air pollution (dust) and eventual water quality degradation from potential pollutions events, such as air pollution/pollution events affecting the River Kennet and indirectly this SAC. • Non-toxic contamination - air pollution (dust), temporary changes in turbidity, sedimentation and/or silting associated to	Standard best practice procedures should be followed during construction to limit construction-related disturbance and contamination. A detailed description of best practice procedures and mitigation of relevance to this option can be found in Section 3.3.4. The following provides an overview of these: • CIRIA C741 Environmental good practice on site guide • Environment Agency's PPGs (PPG1: General Guide to Prevention of Pollution; PPG6: Pollution prevention guidance for working at construction and demolition sites), 'Guidance Notes for the Reduction of Obtrusive Light'. • Biosecurity measures to ensure appropriate removal and/or management control of INNS (terrestrial) at source. • At this stage it's not clear how close vehicle movements or supporting area for the construction work will be undertaken. Such activity should be as far from the site as possible given the recognised risk of soil/roots compaction and dust. • Specific mitigation for night works and artificial lighting will incorporate lighting hoods to minimise the light spill. • Development of a CEMP which will include all the above proposed mitigation measures and any further measures identified at the project stage.	Assuming all proposed mitigation is implemented it is considered there will not be a significant change in: • The extent and distribution of qualifying snail species; • The structure and function of the habitats of qualifying species; and • The supporting processes on which habitats of qualifying species rely. Consequently, with appropriate mitigation measures in place this option is not expected to have an adverse effect on the integrity of the Site for the construction and operation phases of this option.

Designated Sites	Qualifying features	Potential Significant Effects Alone	Proposed Mitigation Measures	Residual Effects -Alone
		run-off during construction when crossing waterbodies interconnected to the River Kennet. • Biological disturbances - changes to habitat availability and population reduction (rapid population fluctuations) due to changes in habitat quality for example. In case of pollution events, direct mortality may be observed. Construction effects are expected to be localised and of short duration. No operation pathways are identified for this option which could affect this site and its qualifying features.		

Source: Mott MacDonald, 2022

5.3.3 Stage 2 outcomes

Following this HRA AA, it is considered that with adherence to the proposed mitigation, the proposed works associated with the option are not expected to have adverse effects on the overall integrity of Kennet and Lambourn Floodplain SAC and its qualifying features when evaluated alone during the construction and operation phase of this option. This option does not need an in-combination assessment.

6 River Thames to Fobney Transfer Option

Option ID: River Thames to Fobney Transfer Option (ID: TWU_KVZ_HI-TFR_UTC_ALL_thamestofobney)

6.1 Option Description

This option proposes a water transfer from the River Thames to Fobney WTW, to supply 40Ml/d to Kennet Valley. Existing treatment facilities available at Fobney WTW (See Table 2.1 for a full option description). An acronyms list is presented at the beginning of this report.

6.2 Stage 1 Screening - Review

The Stage 1 Screening identified a total of two Designated Sites within the ZoI of this option: Hartslock Wood SAC (UK0030164) and Thames Basin Heaths SPA (UK9012141), both of which were assessed as having potential for LSE.

This Screening review understands that both sites are located upstream of this option and sufficiently distant from the construction works to result in adverse effects. Therefore, this option has not progressed to Stage 2 AA (See Table 6.1).

The full HRA Screening review is presented in Annex A. Information on the Designated Sites is provided in Annex B, including qualifying features, conservation objectives, and threats and pressures to their integrity.

Table 6.1: River Thames to Fobney Transfer Option - Stage 1 screening results reviewed

Potential for Significant Effects	No Likely Significant Effects
None	Thames Basin Heaths SPA (UK9012141) (approx. 8.5km)
	Hartslock Wood SAC (UK0030164) (approx. 7km)

7 TWRM extension - Hampton to Battersea Option

Option ID: TWRM extension - Hampton to Battersea Option (ID: TWU_LON_HI-ROC_NET_CNO_hampton-battersea))

7.1 Option Description

This option proposes a new network reinforcement with an extension of the Thames Water Ring Main (TWRM) tunnel from Hampton to Battersea. (See Table 2.1 for full option description). An acronyms list is presented at the beginning of this report.

7.2 Stage 1 Screening - Review

The Stage 1 Screening carried out in 2020 identified a total of four Designated Sites within the ZoI of this option, two of which had potential for LSE: Richmond Park SAC (UK0030246) and Wimbledon Common SAC (UK0030301) (Table 7.1). Therefore, this option has progressed to Stage 2 AA.

Full HRA Screening review is presented in Annex A. Information on the Designated Sites is provided in Annex B, including qualifying features, conservation objectives, and threats and pressures to their integrity.

Table 7.1: TWRM extension - Hampton to Battersea Option Stage 1 screening results reviewed

Potential for Significant Effects	No Likely Significant Effects
Richmond Park SAC (UK0030246) 0km	South West London Waterbodies Ramsar Site (UK11065) (approx. 1.2km)
Wimbledon Common SAC (UK0030301) 0km	South West London Waterbodies SPA (UK9012171) (approx. 1.2km)

7.3 Stage 2 Appropriate Assessment

7.3.1 Scope

The following Designated Sites were assessed at Stage 2 AA:

- Richmond Park SAC (UK0030246) (0km)
- Wimbledon Common SAC (UK0030301) (0km)

7.3.2 Potential effects on Designated Sites

The following sections describe the potential effects and operational phases for the TWRM extension - Hampton to Battersea Option. These consider the type, size, and scale of the option to determine their potential effect.

An assessment of each potential impact on the integrity of the Designated Sites is made, in view of the sites' structure, function and conservation objectives. Where adverse effects are deemed significant, further necessary mitigation measures are also proposed in the following section. Where stated these are in addition to the best practice outlined in Section 3.3.4.

7.3.2.1 Richmond Park SAC (UK0030246) (0km)

Richmond Park SAC is composed of a variety of habitats such as inland water bodies, bogs, marshes and fens along humid grasslands, to heath / scrub (25%), dry / improved grasslands (38%) and broad-leaved deciduous woodland (25%). It is at the heart of the south London centre of distribution for stag beetle and is a site of national importance for the conservation of the fauna of invertebrates associated with the decaying timber of ancient trees[27].

- This site is designated under Annex II for supporting the stag beetle (*Lucanus cervus*) (1083). For detailed information regarding this site's qualifying features, conservation objectives, and threats and pressures to site integrity, please refer to Annex A.

This option proposes a new ring main tunnel from Hampton to Battersea and is located within this Designated Site.

Construction effects

As the option is within this site, direct loss of habitat due to construction activities may have a significant effect on the stag beetle. Construction of the tunnels and supporting structures, in addition to machinery / vehicular movement are likely to produce air, water, light and dust pollution which are likely to disturb the stag beetle population due to habitat degradation.

It is anticipated that no more than 200HGV movements per day are needed for the shaft construction (which is below the threshold for potential air quality impacts) but likely significant impacts in relation to air quality remain with regards to construction movements for the intermediate shafts' installations across the SAC.

During the construction habitat disturbance may lead to a loss of habitat availability and displacement for stag beetle species leading to a decrease in population numbers.

Construction effects (including effects of displacement), although likely to be temporary, may result in temporary and/or permanent effects upon this site and its qualifying features as detailed in Table 7.2.

Surveys should be conducted ahead of construction to inform if potential stag beetle suitable habitat maybe directly affected by construction. This could inform a pipeline re-route within the site. Surveys will inform the CEMP and any further mitigation measures identified at the project stage. Once the construction is complete habitats should be reinstated and opportunities for habitat improvement on site should be investigated.

Effects are considered to be temporary, consequently no adverse effects to the site integrity are expected if all mitigation measures proposed are in place. However, low, and localised effects may still be possible and therefore this option will need to be included in the in-combination assessment.

Operation effects

No operation effects are anticipated for this option which could affect this designated site and/or its qualifying features.

7.3.2.2 Wimbledon Common SAC (UK0030301) (0km)

Wimbledon Common SAC is mostly composed of dry grassland (45%) and broad-leaved deciduous woodland (45%). Similarly to Richmond Park SAC (UK0030246), this SAC is a site of

[27] https://sac.jncc.gov.uk/species/S1083/

national importance for the conservation of the fauna of invertebrates associated with the decaying timber of ancient trees, including stag beetle[28].

This site is designated under Annex I for comprising Northern Atlantic wet heaths with (*Erica tetralix*) (4010) and European dry heaths (4030) and under Annex II for supporting the stag beetle (*Lucanus cervus*) (1083). Public disturbance and air pollution (nitrogen deposition) are listed as pressures to this site as well as habitat fragmentation and invasive species. Detailed information regarding this site and the qualifying feature, conservation objectives, threats and pressures to site integrity are referred to in Annex B.

Construction Effects

As the option is within this site, direct loss of habitat due to construction activities may have a significant effect on the qualifying habitats and species of the site. Construction of the tunnels, supporting structures, machinery and vehicular movement are likely to produce dust, and air/soil pollution and light disturbance, affecting this site habitats and stag beetle population. As shafts are to be installed across the SAC, habitat loss, habitat damage may impose a direct threat upon this site's qualifying features.

During the construction phase, air pollution may reduce plant species' physiological processes, such as photosynthesis and transpiration. This may lead to a loss of habitat availability for supporting stag beetle. Air pollution may also lead to habitat degradation, negatively affecting the life cycle of this species by reducing habitat availability. However, given the location of the site, adjacent to the A3 it is not known if increased levels above the baseline will be significant.

Effects for the stag beetle are similar to the ones described for Richmond Park SAC.

Standard measures are recommended to mitigate possible effects from air pollution. Habitat surveys should be conducted ahead of construction to inform more specific mitigation measures. Surveys will inform the CEMP and any further mitigation measures identified at the project stage. Once construction is complete habitats should be reinstated and opportunities to deliver habitat improvement on site should be investigated.

The effects are considered temporary and as the proposed pipeline location is at the edge of the site, no adverse effects to the site integrity are expected if all mitigation measures proposed are in place. However, low, and localised effects may still be possible and therefore this option will need to be included in the in-combination assessment.

Operational Effects

No operation effects are anticipated for this option which could affect this designated site and/or its qualifying features.

[28] https://sac.jncc.gov.uk/species/S1083/

Table 7.2: TWRM extension - Hampton to Battersea Option - Potential effects on designated qualifying features

Designated Sites	Qualifying features	Potential Significant Effects Alone	Proposed Mitigation Measures	Residual Effects -Alone
Richmond Park SAC (UK0030246) 0km	Annex II -1083 Stag beetle (*Lucanus cervus*)	This option is likely to affect this site as the proposed footprint is located within this site. During construction, this option is likely to result in: • Physical loss: habitat loss • Physical damage - loss of supporting habitat, edge effects upon this site. No operation pathways are identified for this option which could affect this site and its qualifying features.	Standard best practice procedures should be followed during construction to limit construction-related disturbance and contamination. A detailed description of best practice procedures and mitigations of relevance to this option can be found in Section 3.3.4. The following provides an overview of these: • Biosecurity measures to ensure appropriate removal and/or management control of INNS. • It is known that this site will be crossed by the new pipeline but at this stage it's not clear how close vehicle movements or supporting area for the construction work will be undertaken. Such activity should be as far from the site as possible given the recognised risk of soil/roots compaction and dust. • Development of a CEMP which will include all the above proposed mitigation measures and any further measures identified at the project stage. • Once the construction is complete habitats should be reinstated and opportunities to habitat improvement on site should be investigated.	Assuming all proposed mitigation is implemented it is considered there will not be a significant change in: • The extent and distribution of qualifying species; • The structure and function of the habitats of qualifying species; and • The supporting processes on which habitats of qualifying species rely. Consequently, with appropriate mitigation measures in place this option is not expected to have an adverse effect on the integrity of the site for the construction and operation phases of this option.
Wimbledon Common SAC (UK0030301) 0km	Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: • 4010 Northern Atlantic wet heaths with (*Erica tetralix*)	This option is likely to affect this site as the proposed footprint is located within this site. During construction, this option is likely to result in:	Standard best practice procedures should be followed during construction to limit construction-related disturbance and contamination. A detailed description of best practice procedures and mitigations of relevance to this option can be found in Section 3.3.4. The following provides an overview of these:	Assuming all proposed mitigation is implemented it is considered there will not be a significant change in: • The extent and distribution of qualifying species; • The structure and function of the habitats of qualifying species; and

Designated Sites	Qualifying features	Potential Significant Effects Alone	Proposed Mitigation Measures	Residual Effects -Alone
	• 4030 European dry heaths Annex II species that are a primary reason for selection of this site: • 1083 Stag beetle (*Lucanus cervus*)	• Physical loss: habitat loss • Physical damage - loss of supporting habitat, edge effects upon this site. No operation pathways are identified for this option which could affect this site and its qualifying features.	• Best practice such as 'Guidance Notes for the Reduction of Obtrusive Light (Institute of Lighting Professionals, 2011) • Biosecurity measures to ensure appropriate removal and/or management control of INNS. • It is known that this site will be crossed by the new pipeline but at this stage it's not clear how close vehicle movements or supporting area for the construction work will be undertaken. Such activity should be as far from the site as possible given the recognised risk of soil/roots compaction and dust. • Development of a CEMP which will include all the above proposed mitigation measures and any further measures identified at the project stage. • Once the construction is complete habitats should be reinstated and opportunities to habitat improvement on site should be investigated.	• The supporting processes on which habitats of qualifying species rely. Consequently, with appropriate mitigation measures in place this option is not expected to have an adverse effect on the integrity of the Site for the construction and operation phases of this option.

Source: Mott MacDonald, 2022

7.3.3 Stage 2 outcomes

Following this HRA AA, it is considered that with adherence to the proposed mitigation, the proposed works associated with the option are not expected to have adverse effects on the overall integrity of the Designated Sites and their features alone for the construction and operation phases of the proposed option.

8 Kempton 150Ml/d WTW Option

Option ID: Kempton - 150 - Construction (ID: TWU_LON_HI-ROC_WT1_CNO_kemptonwtw150)

8.1 Option Description

This option proposes a 150 Ml/d water treatment works at Kempton treating raw reservoir water in West London, with the purpose to accommodate additional future demand (See Table 2.1 for full option description) (*Habitats Regulation Assessment - Appendix A: HRA screening assessment of WRMP19. Feasible Option Elements, Report for: Thames Water Utilities Limited produced by Ricardo Energy & Environment – ED10169 | Issue Number Final| 20/04/2020)*. An acronyms list is presented at the beginning of this report.

8.2 Stage 1 Screening - Review

A HRA Stage 2 AA carried out in 2020 identified four Designated Sites within the ZoI of this option, of which two had potential for LSE in relation to the implementation of this option given their proximity to the option and in relation to noise and light disturbances, as summarised in Table 8.1.

Table 8.1: Designated Sites Scoped to proceed for HRA AA

Potential for Significant Effects	No Likely Significant Effects
South West London Waterbodies Ramsar Site (UK11065) (approx. 0.5km)	Wimbledon Common SAC (UK0030301) (approx. 9.9km)
South West London Waterbodies SPA (UK9012171) (approx. 0.5km)	Richmond Park SAC (UK0030246) (approx. 7.5km)

8.3 Stage 2 Appropriate Assessment

8.3.1 Stage 2 outcomes

The HRA AA Stage 2 was carried out for this option where specific mitigations in relation to its implementation (construction and operation phases) upon the Designated Sites scoped in were outlined. A precautionary potential noise disturbance distance for over-wintering birds (gadwall and shoveler) was suggested, as well as work avoidance from October to March (inclusive). The HRA AA has not identified any 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. The AA concluded that no adverse effects resulting from the implementation of the option are reasonably foreseeable on the features of interest of the screened-in Designated Sites as long as the mitigation outlined is adopted. In the absence of mitigation, likely significant effects cannot be discounted for disturbance to birds and spread of invasive non-native species. No further stages in the HRA process will be necessary for the option.

9 Datchet Increase DO Option

Option ID: Datchet Increase DO (ID: TWU_SWA_HI-GRW_ALL_ALL_datchet do)

9.1 Option Description

This option proposes replacement of pumps, lower of intake levels in the boreholes and increasing the capacity of the contact tank (See Table 2.1 for full option description). An acronyms list is presented at the beginning of this report.

9.2 Stage 1 Screening - Review

The Stage 1 Screening carried out in 2020 identified two Designated Sites within the ZoI of this option: South West London Waterbodies SPA (UK9012171) and Ramsar Site (UK11065).

This screening review identified a total of four Designated Sites within 10km distance of this option, all of which were assessed as NLSE (See Table 9.1). These Designated Sites are not in direct hydrological connection to this option footprint, and they are located sufficiently distant to exclude effects related to noise, light, dust, and other construction disturbances. Therefore, this option has not progressed to Stage 2 AA. The full HRA Screening review is presented in Annex A.

Table 9.1: Datchet Increase DO Stage 1 screening results reviewed

Potential for Significant Effects	No Likely Significant Effects
None	Windsor Forest and Great Park SAC (UK0012586) (approx. 3km)
	South West London SPA (UK9012171) (approx. 3.8km)
	South West London SPA Ramsar Site (UK11065) (approx. 3.8km)
	Burnham Beeches SAC (UK0030034) (approx. 7km)

10 SWOX to SWA Option

Option ID: SWOX to SWA (ID: TWU_SWA_HI-TFR_SWX_ALL_swoxswa48)

10.1 Option Description

This option proposes a new water transfer from Abingdon WTW to Long Crendon to supply SWA (See Table 2.1 for full option description). An acronyms list is presented at the beginning of this report.

10.2 Stage 1 Screening - Review

The Stage 1 Screening carried out in 2020 identified unknown effects on two Designated Sites within the ZoI of this option: Cothill Fen SAC (UK0012889) and Oxford Meadows SAC (UK0012845). This screening review identified a total of three Designated Sites within 10km distance of this option, of which Cothill Fen SAC and Oxford Meadows SAC have potential for LSE. This option progresses to Stage 2 AA.

The screening results as reviewed are presented in Table 10.1. The full HRA Screening review is presented in Annex A. Information on the Designated Sites is provided in Annex B, including qualifying features, conservation objectives, and threats and pressures to site integrity.

Table 10.1: SWOX to SWA Stage 1 screening results reviewed

Potential for Significant Effects	No Likely Significant Effects
Cothill Fen SAC (UK0012889) (approx. 0.05km)	Little Wittenham SAC (UK0030184) (approx. 10km)
Oxford Meadows SAC (UK0012845) (approx. 0.2km)	

10.3 Stage 2 Appropriate Assessment

The Stage 2 AA provides an assessment to determine whether this option will result in an Adverse Effect on the Site Integrity (AESI) on the Designated Sites identified at the screening stage with potential for adverse effects. At this stage, mitigation measures to prevent adverse effects can be included. These include those identified as best practice measures outlined in Section 3.3.4.

The AA will result in one of three potential outcomes:

- Evidence is sufficient and demonstrates there will be no adverse effects
- Evidence is sufficient but indicates that there will be an adverse effect
- Insufficient evidence to determine the effects

The information in this document will be presented to Natural England during consultation. Where the Stage 2 AA concludes that there would be residual AESI on any of the Designated Sites, the HRA must proceed to the next stages (See Section 3.1).

10.3.1 Scope

The following Designated Sites were assessed at Stage 2 AA:

- Cothill Fen SAC (UK0012889) (approx. 0.05km)
- Oxford Meadows SAC (UK0012845) (approx. 0.2km)

10.3.2 Potential effects on Designated Sites

The following sections describe the potential effects of the construction and operational phases for SWOX to SWA Option. These consider the type, size, and scale of the option to determine their potential effect upon this Designated Site and its qualifying features. An assessment of each potential impact on the integrity of the Designated Sites is made, in view of the sites' structure, function and conservation objectives. Where adverse effects are deemed significant, further necessary mitigation measures are also proposed in the following section. Where stated these are in addition to the best practice outlined in Section 3.3.4.

Potential effects were identified in relation to:

- Proximity between the option footprint and Designated Sites may lead to potential pollution and habitat degradation effects during construction of this option.

10.3.2.1 Cothill Fen SAC (UK0012889) (approx. 0.05km)

Cothill Fen is an exceptionally important site with an outstanding range of nationally rare habitats which support a large number of rare invertebrates and plants. This SAC's habitats indirectly support over 330 species of vascular plant and over 120 nationally scarce or rare invertebrates, including the Nationally Rare southern damselfly (*Coenagrion mercuriale*). These habitats consist of calcareous fen, calcareous grassland, woodland, and scrub of varying degrees of wetness.

This site is designated for supporting alkaline fens; calcium-rich spring water-fed fens (H7230) and alluvial forests with (*Alnus glutinosa*) and (*Fraxinus excelsior*) (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) in addition to alder woodland on floodplains (H91E0).

Water pollution, hydrological changes and air pollution (nitrogen deposition) are the principal threats to this site's habitats as directly affects its vegetation and invertebrate communities (for further details please refer to Annex B).

Construction effects

Given the proximity between this site and the option footprint dust and light during the construction phase has the potential to affect the qualifying habitats including calcareous fen, calcareous grassland, woodland, and scrub thereby impacting on its productivity, photosynthesis, and growth.

Vehicle emissions and other airborne pollutants due to machinery / vehicular movements are known to directly contribute to increased nitrogen deposition, which is already listed as a threat to this site.

Construction activities may lead to temporary and permanent loss of qualifying habitat resulting from land clearance around the pipeline construction area. Functionally linked habitats important for qualifying tree species can also be affected during construction due to air pollution (dust) affecting photosynthesis and decreasing productivity. Critical loads of emissions (such as NOx, SOx and particulates) from increased traffic can lead to nutrient enrichment and eutrophication. Habitat loss and degradation, including habitat fragmentation during construction may also have adverse effects on some of the woodland on floodplains and the connectivity between them creating a hostile landscape to species dispersal. Depending on the severity/duration of the construction activities, effects such as loss of habitat and changes in biological processes such as natural succession may be observed.

The hydrological connectivity between the site and the option's footprint needs detailed investigation, but it is likely to be via small, slow-flowing ditches and streams that may be crossed by the new pipeline around Meadow Farm House area, such as Sandford Brook.

Consequently, at this stage a potential pathway for pollution effects via water degradation cannot be ruled out.

Water quality degradation from potential pollution events is listed in this SAC's threats list and can be represented by temporary changes in turbidity, sedimentation and/or silting associated to run-off during construction when crossing waterbodies, toxic contamination (dust/air pollution depositing on surface water), among others. These effects may lead to a significant effect upon the qualifying vegetation and important invertebrate communities (such as the nationally rare Southern Damselfly) occurring within this site as detailed in Table 10.2.

Standard measures are recommended to mitigate possible effects from soil disturbance and light pollution. The site is sensitive to invasive species pressure and measures to avoid their spread need to be undertaken during construction.

Habitat surveys should be conducted ahead of construction to inform the pipeline route in areas where protected habitats may be affected. Surveys will inform the CEMP which will include all the above proposed mitigation measures and any further measures identified at the project stage. Once the construction is complete habitats should be reinstated.

Given the fact that the pipeline is outside the site boundary no adverse effects on site integrity are expected if all mitigation measures proposed are in place. Given the size of the Designated Site and the fact that the pipeline only indirectly affects a very small proportion of the site no adverse effects to the site integrity are expected if all mitigation measures proposed are in place. However, low, and localised effects (in functionally linked habitat may still be possible and therefore this option will need to be included in the in-combination assessment).

Operational effects

No operation effects are anticipated for this option which could affect this site and/or its qualifying features.

10.3.2.2 Oxford Meadows SAC (UK0012845) (approx. 0.2km)

The Oxford Meadows was classified as a Special Area of Conservation on 1 April 2005 and is composed of an extensive complex of meadows and pastures which support species-rich grassland vegetation which would once have been widespread on floodplains in lowland England, but which is now very rare. The option footprint is located at approximately 0.2km of this SAC.

Designated for supporting habitats and flora, this site qualifies under article 4(4) of the Directive (92/43/EEC) as follows:

- Annex I: Lowland hay meadows (*Alopecurus pratensis, Sanguisorba officinalis*)
- Annex II: Creeping marshwort (*Apium repens*)

Construction Effects

Giving this site is located less than 0.5km from the option footprint and is also designated for supporting habitats / plant species, the expected construction effects are the same as listed above for Cothill Fen SAC.

Operational Effects

No operation effects are anticipated for this option which could affect these Designated Sites and/or its qualifying features.

Table 10.2: SWOX to SWA - Potential effects on designated qualifying features

Designated Sites	Qualifying features	Potential Significant Effects Alone	Proposed Mitigation Measures	Residual Effects -Alone
Cothill Fen SAC /(UK0012889) (approx. 0.05Km east of the proposed works)	Annex I: • 7230 Alkaline fens • 91E0 Alluvial forests with (*Alnus glutinosa*) and (*Fraxinus excelsior*) (Alno-Padion, *Alnion incanae, Salicion albae*)* Priority feature	Due to the proximity to this option adverse effects may be observed during construction phase and in relation to: • Physical damage – Air pollution followed by dust deposition in the waterbodies near the construction site may lead to habitat degradation by compromising this site's unique soil composition and, indirectly, causing reduction of habitat availability for its qualifying species. • Physical disturbance - light and dust produced by the machinery during the construction phase of this option. • Toxic and non-toxic contamination – air pollution (dust) • Invasive species spread, during construction works impacting on qualifying features due to habitat degradation, for example. • Biological disturbances – rapid population fluctuation (direct mortality) may be followed by changes in natural succession for example. Potential construction pollution events are likely to be localised and of short duration and may result in temporary and/or permanent effects on this site and its qualifying features. No operation effects are anticipated.	Mitigation measures should follow best practice guidelines to minimise potential impacts e.g., use of sediment screens whenever close to waterbodies, coverage of construction stockpiles during adverse weather conditions, and sand/silt removal facilities. Standard best practice procedures must include: • CIRIA C741 Environmental good practice on site guide • Environment Agency's PPGs (PPG1: General Guide to Prevention of Pollution; PPG6: Pollution prevention guidance for working at construction and demolition sites). • Best practice such as 'Guidance Notes for the Reduction of Obtrusive Light' (Institute of Lighting Professionals, 2011) to avoid significant effects due to increased light (if works are programmed at night). • Biosecurity measures to ensure appropriate removal and/or management control of INNS at source. • Development of a CEMP which will include all the above proposed mitigation measures and any further measures identified at the project stage. • Any dewatering needed for the construction will be discharged to the river to help maintain flow if necessary.	Assuming all proposed mitigation is implemented it is considered there will not be a significant change in: • The extent and distribution of qualifying plant species and habitat • The structure and function of the habitats of qualifying species; and • The supporting processes on which habitats of qualifying species rely. Consequently, with appropriate mitigation measures in place this option is not expected to have an adverse effect on the integrity of the site for the construction and operation phases of this option.

Designated Sites	Qualifying features	Potential Significant Effects Alone	Proposed Mitigation Measures	Residual Effects -Alone
			• Construction methods to minimise need for dewatering in the shallow aquifer (such as diaphragm walls or secant piling)	
Oxford Meadows SAC (UK0012845) (approx. 0.2Km east of the proposed works)	Annex I habitats that are a primary reason for selection of this site: • 6510 Lowland hay meadows (*Alopecurus pratensis, Sanguisorba officinalis*) Annex II species that are a primary reason for selection of this site: • 1614 Creeping marshwort (*Apium repens)*	Same as listed above for Cothill Fen SAC	Same as listed above for Cothill Fen SAC	Assuming all proposed mitigation is implemented it is considered there will not be a significant change in: • The extent and distribution of qualifying species; • The structure and function of the habitats of qualifying species; and • The supporting processes on which habitats of qualifying species rely. Consequently, with appropriate mitigation measures in place this option is not expected to have an adverse effect on the integrity of the Site for the construction phase of this option.

10.3.3 Stage 2 outcomes

Following this HRA AA, it is considered that with adherence to the proposed mitigation measures, the proposed works associated with the option are not expected to have any significant adverse effects on the overall integrity of the Designated Sites and their features alone for the construction and operation phases of the proposed option.

11 Moulsford Option

Option ID: Moulsford (ID: TWU_SWX_HI-GRW_ALL_ALL_moulsford gw)

11.1 Option Description

This option proposes the construction of an abstraction borehole in the unconfined Chalk north of Streatley on the west bank of the River Thames (See Table 2.1 for full option description). An acronyms list is presented at the beginning of this report.

11.2 Stage 1 Screening - Review

The Stage 1 Screening carried out in 2020 identified one Designated Site within the ZoI of this option, Hartslock Wood SAC (UK0030164), which was assessed as potential for LSE. This screening review agrees with the previous assessments and, therefore, this option progresses to Stage 2 AA (See Table 11.1).

The full HRA Screening review is presented in Annex A. Information on the Designated Sites is provided in Annex B, including qualifying features, conservation objectives, and threats and pressures to site integrity.

Table 11.1: Moulsford Option Stage 1 screening results reviewed

Potential for Significant Effects	No Likely Significant Effects
Hartslock Wood SAC (UK0030164) (approx. 2.3km)	

11.3 Stage 2 Appropriate Assessment

11.3.1 Scope

The following Designated Site was assessed at Stage 2 AA:

- Hartslock Wood SAC (UK0030164) (approx. 2.3km)

11.3.2 Potential effects on Designated Sites

The following sections describe the potential effects of the construction and operational phases for the Moulsford option. These consider the type, size, and scale of the option to determine their potential effect upon this Designated Site and its qualifying features.

An assessment of each potential impact on the integrity of the Designated Sites is made, in view of the sites' structure, function and conservation objectives. Where adverse effects are deemed significant, further necessary mitigation measures are also proposed in the following section. Where stated these are in addition to the best practice and assumptions outlined in Section 3.3.4.

Potential effects were identified in relation to:

- Hydrological connectivity between the option footprint and Designated Site may lead to potential pollution and habitat degradation effects during construction of this option as discussed below and summarised in the Table 11.2.

11.3.2.1 Hartslock Wood SAC (UK0030164) (approximately 2.3km)

Hartslock Wood SAC is located approximately 2.3km from the proposed works and is in direct hydrological connection with the proposed pipeline route via the River Thames. This hydrological connection constitutes a pathway for potential pollution events within this SAC.

Hartslock Wood is designated as a SAC for:

- Semi-natural dry grasslands and scrubland facies habitats, and
- Yew-dominated woodland of the British Isles.

Comprising areas of mosaic of chalk grassland, chalk scrub and broadleaved woodland and mostly composed of calcareous substrates, these grasslands are generally found on thin, well-drained, lime-rich soils associated with underlying chalk and limestone geology. This composition offers support for a large number of rare plant species, justifying this SAC's unique status of "orchid rich sites" for hosting important orchid populations (at least one nationally uncommon orchid species and one or several orchid species considered to be rare, very rare or exceptional in the UK). Associated with this habitat a noteworthy invertebrate fauna is also identified. Hartslock Wood is also one of the few examples remaining of ancient yew wood in the Chilterns. This evergreen tree occurs on shallow, dry soils usually on chalk or limestone slopes, but in a few areas stands /on more mesotrophic soils (see Annex B for further information). The WFD Level 2 assessment (Mott MacDonald,2022) identified potential for minor localised adverse effects on the River Thames (Thames Wallingford to Caversham - GB106039030331) and no groundwater effects on the Chiltern Chalk Scarp groundwater body, where this site is located.

Construction effects

The construction works are sufficiently distant from this Designated Site to exclude construction effects resulting from increased air and soil pollution related to machinery traffic. However, due to the existing hydrological connection, pollution events may be observed. Therefore, habitat damage due to toxic and non-toxic contamination related to potential pollution events may be observed, such as an increase in turbidity, increase in silting, sedimentation, and changes in water quality. In that case, rapid population fluctuation related to direct mortality due to potential pollution events associated to the hydrological connection may be observed.

The effects of construction are considered to be of short duration and localised, however may lead to temporary and permanent effects on this site and its qualifying species.

Operational effects

No pathways have been identified through which this designated site and its qualifying features could be affected by this option during its operation phase.

Table 11.2: Moulsford Option - Potential effects on designated qualifying features

Designated Sites	Qualifying features	Potential Significant Effects Alone	Proposed Mitigation Measures	Residual Effects -Alone
Hartslock Wood SAC (UK0030164) (approx. 2.3km downstream of the proposed works)	Semi-natural dry grasslands and scrubland facies: on calcareous substrates (*Festuco Brometalia*) (important orchid sites). Dry grasslands and scrublands on chalk or limestone, including important orchid sites.	Hartslock Wood SAC is approximately 2.3km from the proposed works and is in direct hydrological connection with the proposed pipeline route via the River Thames. Potential reduction in flow in the River Thames as result of this option has been identified during the WFD level 2 Assessments, and as the River Thames is already considered to be impacted by abstraction, it is likely this option can reinforce this issue. During construction, as in hydrological connection and located downstream of option, toxic and non-toxic contamination related to potential pollution events may be observed. Therefore, this option is likely to result in: • Physical damage - habitat damage due to toxic and non-toxic contamination related to potential pollution events may be observed, such as an increase in turbidity, increase in silting, sedimentation, and changes in water quality. • Rapid population fluctuation - due to direct mortality related to toxic and non-toxic contamination (potential pollution events associated with the hydrological connection / water quality degradation). The effects of construction are considered to be of short duration and localised, however may lead to temporary and permanent effects on this site and its qualifying species.	Standard best practice procedures should be followed during construction to limit construction-related disturbance and contamination including (but not limited to) the following: • CIRIA C741 Environmental good practice on site guide • Environment Agency's PPGs (PPG1: General Guide to Prevention of Pollution; PPG6: Pollution prevention guidance for working at construction and demolition sites). • Industry best practice mitigation measures for dust suppression. • Development of groundwater modelling to predict likely impacts to changes in nearby hydrological systems and identify time periods in which significant damage could be caused due to abstraction • Works in the vicinity of this site should be agreed with Natural England and, if possible, to be undertaken outside the dry season, when the plant species are more sensitive to humidity fluctuations. • Reinstatement of any lost habitat once the pipeline's construction is over will ensure any physical loss of habitats is temporary. • Biodiversity risk assessment for the introduction and spread of Invasive non-native species (INNS) and mitigation from the findings of the assessment to be included in the CEMP. • Development of a CEMP which will include all the above proposed mitigation measures	During construction, assuming all proposed mitigation is implemented it is considered there will not be a significant change in: • The extent and distribution of qualifying plant species and habitat; • The structure and function of the habitats of qualifying species; and • The supporting processes on which habitats of qualifying species rely. Consequently, with appropriate mitigation measures in place this option is not expected to have an adverse effect on the integrity of the Site for the construction phase of this option.

Designated Sites	Qualifying features	Potential Significant Effects Alone	Proposed Mitigation Measures	Residual Effects -Alone
		No pathways have been identified through which this designated site and its qualifying features could be affected by this option during operation phase.	and any further measures identified at the project stage.	
	Taxus baccata woods of the British Isles. (Yew-dominated woodland)	Same as above	Same as above	Same as above

Source: Mott MacDonald, 2022

11.3.3 Stage 2 outcomes

Following this HRA AA, it is considered that with adherence to the proposed mitigation, the proposed works associated with the option are not expected to have any significant adverse effects on the overall integrity of the Designated Sites and their features alone for the construction and operation phases of the proposed option.

12 Abingdon to Farmoor Reservoir pipeline

Option ID: Abingdon to Farmoor Reservoir pipeline (ID: TWU_SWX_HI-TFR_STR_ALL_abing-farmoor pipe)

12.1 Option Description

This option proposes the construction of a transfer pipeline to convey 24 Ml/d of raw water between a proposed reservoir at Abingdon and the existing Farmoor reservoir (See Table 2.1 for full option description. An acronyms list is presented at the beginning of this report.

12.2 Stage 1 Screening - Review

The Stage 1 Screening carried out in April 2020 identified a total of three Designated Sites within the ZoI of this option, out of which one site, Cothill Fen SAC (UK0012889), was assessed as having a potential for LSE. No LSEs were identified for Oxford Meadows SAC and Little Wittenham SAC. This screening review agrees with previous findings (Table 12.1). Therefore, this option progresses to Stage 2 AA.

The full HRA Screening review is presented in Annex A. Information on the Designated Sites is provided in Annex B, including qualifying features, conservation objectives, and threats and pressures to site integrity.

Table 12.1: Abingdon to Farmoor Reservoir pipeline Option Stage 1 screening results reviewed

Potential for Significant Effects	No Likely Significant Effects
Cothill Fen SAC (UK0012889) (approx. 0.1km)	Oxford Meadows SAC (UK0012845) (approx. 4.8km)
	Little Wittenham SAC (UK0030184) (approx. 8 km)

12.3 Stage 2 Appropriate Assessment

12.3.1 Scope

The following Designated Site was assessed at Stage 2 AA:

- Cothill Fen SAC (UK0012889) (approx. 0.1km)

12.3.2 Potential effects on Designated Sites

The following sections describe the potential effects of the construction and operational phases for the Abingdon to Farmoor Reservoir pipeline Option. These consider the type, size, and scale of the option to determine their potential effect upon this Designated Site and its qualifying features. An assessment of each potential impact on the integrity of the Designated Sites is made, in view of the sites' structure, function and conservation objectives. Where adverse effects are deemed significant, further necessary mitigation measures are also proposed in the following section. Where stated these are in addition to the best practice and assumptions outlined in Section 3.3.4.

Potential effects were identified in relation to:

- Proximity between the option footprint and Designated Sites may lead to potential pollution and habitat degradation effects during construction of this option.

12.3.2.1 Cothill Fen SAC (UK0012889) (approx. 0.1km)

Cothill Fen is an exceptionally important site with an outstanding range of nationally rare habitats which support a large number of rare invertebrates and plants. This SAC habitat indirectly supports over 330 species of vascular plant and over 120 nationally scarce or rare invertebrates, including the nationally rare Southern Damselfly. These habitats consist of calcareous fen, calcareous grassland, woodland, and scrub of varying degrees of wetness.

This site is designated for comprising alkaline fens; calcium-rich spring water-fed fens (H7230) and alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) in addition to alder woodland on floodplains (H91E0).

Water pollution, hydrological changes, and air pollution (nitrogen deposition) are the principal threats to this site's habitats as they directly affect its vegetation and invertebrate communities (for further details please refer to Annex B).

This option proposes the construction of a transfer pipeline to convey 24 Ml/d of raw water between a proposed reservoir at Abingdon and the existing Farmoor reservoir. The proposed water transfer itself is not expected to result in significant effects upon this site, as this SAC is not in the same groundwater/surface waterbody as the option new intake/discharge. However, the proposed pipeline is located approximately 100m to the east of Cothill Fen SAC and as such, construction effects from the new pipeline may result in permanent and temporary adverse effects upon this SAC's qualifying habitats and supporting species.

Construction effects

Given the proximity between this site and the option footprint, without mitigation, dust during the construction phase has the potential to affect the plant species that are present on this site including: calcareous fen, calcareous grassland, woodland, and scrub thereby impacting on its productivity, photosynthesis and growth. Equally, disturbances from artificial light are expected to result in similar effects upon this site's plant species. Vehicle emissions and other airborne pollutants due to machinery / vehicular movements are known to directly contribute to the increase of nitrogen deposition, which is already listed as a threat to this site. During the construction phase air pollution may affect plant species and lead to direct mortality due to habitat degradation. Depending on the severity/duration of this impact, effects such as loss of habitat and changes in biological processes including natural succession may be observed.

The hydrological connectivity between the site and the option's footprint is not clear (e.g., via a main river), but likely to be via small, slow-flowing ditches and streams to be crossed by the new pipeline around the Great Park Farm area. In addition, given the proximity of the new pipeline to waterbodies feeding this site (e.g., around the Great Farm Park area), a potential pathway for pollution effects via water degradation (air pollution followed by subsequent deposition in the water surface) cannot be ruled out.

Water quality degradation from potential pollution events is listed as a threat to this SAC and can be represented by temporary changes in turbidity, sedimentation and/or silting associated with run-off during construction when waterbodies are crossed, toxic contamination (dust/air pollution depositing on surface water), among others. These effects may lead to significant effects upon the qualifying vegetation and important invertebrate communities (such as the nationally rare Southern Damselfly) occurring within this site as detailed in Table 12.2.

Standard measures are recommended to mitigate possible effects from soil disturbance and light pollution. The site is sensitive to invasive species pressure and measures to avoid its spread need to be undertaken during construction.

Habitat surveys should be conducted ahead of construction to inform the pipeline route in areas where protected habitats may be affected. Surveys will inform the CEMP which will include all the above proposed mitigation measures and any further measures identified at the project stage. Once the construction is complete habitats should be reinstated.

Given the fact that construction works are outside the site boundary no adverse effects to the site integrity are expected if all mitigation measures proposed are in place. However, low and localised effects (in functionally linked habitat may still be possible and therefore this option will need to be included in the in-combination assessment).

Operational effects

This SAC is located within the Sandford Brook (source to Ock) groundwater body (GB106039023410) which is not affected by the proposed new intake/discharge of this option. There is no surface waterbody associated with the new proposed intake/discharge which may be connected to this site. Therefore, no changes in the water table are anticipated. No other operation pathways are identified for this option which could affect this site and its qualifying features.

Table 12.2: Abingdon to Farmoor Reservoir pipeline Option - Potential effects on designated qualifying features

Designated Sites	Qualifying features	Potential Significant Effects Alone	Proposed Mitigation Measures	Residual Effects -Alone
Cothill Fen SAC (UK0012889)	• H7230. Alkaline fens; Calcium-rich spring water-fed fens • H91E0. Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*); Alder woodland on floodplains	This option is likely to affect this designated site as the proposed footprint is approximately 100m to the south of the proposed pipeline route. Therefore, there is the potential for a pathway for effects due to construction of this option related to pollution events and biological disturbances. The proposed works may lead to temporary and permanent effects on this site and its qualifying features. The identified effects have the potential to reduce the extent and distribution of functional habitat which supports the qualifying species' populations. During construction, this option is likely to result in: • Physical loss - loss of habitat/habitat damage due to the structure's construction. • Physical damage - habitat degradation and edge effects resulting from pipeline / associated structures construction. • Non-physical disturbance - air (dust) and light pollution impacting on productivity and vegetation growth/photosynthesis. • Toxic contamination - air pollution may lead to habitat degradation; water degradation from air pollution deposition. Vehicle emissions and other airborne pollutants increasing nitrogen deposition. • Biological disturbances - direct mortality, rapid population fluctuations, changes to	Standard best practice procedures should be followed during construction to limit construction-related disturbance and contamination. A detailed description of best practice procedures and mitigations of relevance to this option can be found in section 3.3.4. The following provides an overview of these: • CIRIA C741 Environmental good practice on site guide • Environment Agency's PPGs (PPG1: General Guide to Prevention of Pollution; PPG6: Pollution prevention guidance for working at construction and demolition sites), 'Guidance Notes for the Reduction of Obtrusive Light'. • Biosecurity measures to ensure appropriate removal and/or management control of INNS (terrestrial) at source. • At this stage it's not clear how close vehicle movements or supporting area for the construction work will be undertaken. Such activity should be as far from the site as possible given the recognised risk of soil/roots compaction and dust. • Specific mitigation for night works and artificial lighting will incorporate lighting hoods to minimise the light spill. • Development of a CEMP which will include all the above proposed mitigation measures and any further measures identified at the project stage.	Assuming all proposed mitigation is implemented it is considered there will not be a significant change in: • The extent and distribution of qualifying species; • The structure and function of the habitats of qualifying species; and • The supporting processes on which habitats of qualifying species rely. Consequently, with appropriate mitigation measures in place this option is not expected to have an adverse effect on the integrity of the Site for the construction phase of this option.

Designated Sites	Qualifying features	Potential Significant Effects Alone	Proposed Mitigation Measures	Residual Effects -Alone
		habitat availability, changes to habitat natural succession. No operation pathways are identified for this option which could affect this site and its qualifying features.		

Source: Mott MacDonald, 2022

12.3.3 Stage 2 outcomes

Following this HRA AA, it is considered that with adherence to the proposed mitigation, the proposed works associated with the option are not expected to have any significant adverse effects on the overall integrity of Cothill Fen SAC and their features alone during the construction and operation phase of the proposed option.

13 Abingdon Options including SESRO - SRO

13.1 Options Description

These options include a new reservoir in the south east (SESRO, an SRO) and two options to increase water treatment works (WTW) capacity. A HRA Stage 1 Screening ToLS exercise was undertaken considering the following options:

- Abingdon WTW Enhanced (ID: TWU_SWX_HI-ROC_WT2_ALL_abingdon wtw ph2)
- Abingdon WTW Ph1 - Construction (ID: TWU_SWX_HI-ROC_WT1_CNO_abingdon wtw ph1)
- Reservoir Abingdon 100 (Lon) - Construction (ID: TWU_STR_HI-RSR_RE1_CNO_abingdon100(lon))

The HRA Screening of these was undertaken by Affinity Water [5] (*South East Strategic Reservoir Option Gate 2 – Supporting Document B4, Affinity Water and Thames Water, 2022)*The full options description is summarised in Table 2.1. An acronyms list is presented at the beginning of this report.

13.2 Stage 1 Screening - Review

This screening review identified a total of three Designated Sites within 10km distance of this option, all of which were assessed as NLSE (See Table 13.1). These Designated Sites are not in direct hydrological connection to this option footprint, and they are located at a sufficient distance to exclude effects related to noise, light, dust, and other construction disturbances. Therefore, this option has not progressed to Stage 2 AA. The full HRA Screening is provided in Annex A.

Table 13.1: Abingdon Options Stage 1 screening results reviewed

Potential for Significant Effects	No Likely Significant Effects
None	Cothill Fen SAC
	Hackpen Hill SAC
	Little Wittenham SAC.

14 Severn to Thames Transfer STT - SRO

14.1 Options Description

The Severn to Thames Transfer (STT) SRO proposes to transfer water from the River Severn to the River Thames, optionally making use of supported and unsupported flows via several different options. The STT Gate 1 submission was assessed by RAPID who concluded that it should progress to Gate 2 (Ricardo Energy and Environment on behalf of the STT group (2022) Severn Thames Transfer Solution Informal Habitats Regulations Assessment Report). The recommendations and actions received from RAPID and feedback from Stakeholders from the Gate 1 process have been reflected in the scheme development and environmental assessments. Thames Water's WRMP24 BVP includes four of the STT Options before 2050:

- Raw Water Transfer Deerhurst to Culham 500 Ml/d (Lon only) - Construction (ID: TWU_STT_HI-IMP_STT_CNO_sttpipe500(lon)) Bulk transfers into region (raw).
- 500: Vyrnwy Reservoir river release (75 Mld) and 25 Mld of Bypass (105Mld) (ID: TWU_STT_HI-RAB_RE1_ALL_p9-500-vyrnwy_100_b) (N.B. This option has subsequently been updated to reduce the river release to 25Ml/d and increase the bypass to up to 155 Ml/d as a result of further environmental work at Gate 2; the impacts in this report reflect the updated design).
- 500: Netheridge STW effluent diversion (35Mld) - Deerhurst Pipeline (ID: TWU_STT_HI-REU_RE1_ALL_p5-500-neth_p35)
- 500: Unsupported flow (ID: TWU_U7T_HI-RAB_RE1_ALL_p1-500-unsupported)

The full options description is summarised in Table 2.1. An acronyms list is presented at the beginning of this report.

14.2 Stage 1 Screening - Review

The STT Options HRA Screening review undertaken in July 2022 identified potential LSE on the following Designated Sites for all options considered within the STT plan:

- Severn Estuary SPA;
- Severn Estuary Ramsar;
- Severn Estuary SAC;
- River Clun SAC;
- River Usk SAC; and
- River Wye SAC.

As a result of Raw Water Transfer Deerhurst to Culham Option, potential for LSE were also identified on Dixton Wood SAC. Vyrnwy Reservoir River Release and Bypass Option identified potential for LSE on Midland Meres and Mosses Phase 2 Ramsar and Severn Estuary/ Mor Hafren SAC in addition to the Designated Sites mentioned above.

The pathways for LSE effects are justified in relation to the Designated Sites' proximity to the option footprint and by possible changes in the hydrological regime/ groundwater supply, as well as linked habitats hydrologically connected to the options and supporting fish migration. The Screening results for STT options are summarised in Table 14.1 below.

Table 14.1: Severn to Thames transfer STT – SRO Stage 1 screening results reviewed

STT Options name	Potential for Significant Effects	No Likely Significant Effects
Applicable to all options (STT)	River Clun SAC River Usk SAC River Wye SAC Severn Estuary SPA Severn Estuary Ramsar Severn Estuary SAC	
Raw Water Transfer Deerhurst to Culham 500 Ml/d (Lon only) - Construction (ID: TWU_STT_HI-IMP_STT_CNO_sttpipe500(lon)) Bulk transfers into region (raw).	Dixton Wood SAC (approx. 0.9km) River Clun SAC (all components) River Usk SAC (all components) River Wye (all components) Severn Estuary SPA (all components) Severn Estuary Ramsar (all components) Severn Estuary SAC (all components)	Hartslock Wood SAC (approx. 19.4km) Little Wittenham SAC (approx. 7km) Bredon Hill SAC (approx. 8.5km) Chilterns Beechwoods SAC (approx. 0.14km) Cothill Fen SAC (approx. 3.2km)
500: Vyrnwy Reservoir river release (75 Mld) and 25 Mld of Bypass (105Mld) (ID: TWU_STT_HI-RAB_RE1_ALL_p9-500-vyrnwy_100_b)	Midland Meres and Mosses Phase 2 Ramsar (approx. 1.1km) Severn Estuary/ Mor Hafren SAC Severn Estuary SPA (all components) Severn Estuary Ramsar (all components) Severn Estuary SAC (all components) River Clun SAC (all components) River Usk SAC (all components) River Wye SAC (all components)	Berwyn and South Clywd Mountains SAC (approx. 1.9km) Berwyn SPA (approx. 0.5km) Montgomery Canal SAC (approx. 2.6km) River Dee and Bala Lake SAC Tanat and Vyrnwy Bat sites SAC (approx. 9.4km)
500: Netheridge STW effluent diversion (35Mld) - Deerhurst Pipeline (ID: TWU_STT_HI-REU_RE1_ALL_p5-500-neth_p35)	Severn Estuary SPA (all components) Severn Estuary Ramsar (all components) Severn Estuary SAC (all components) River Clun SAC (all components) River Usk SAC (all components) River Wye SAC (all components)	Cotswolds Beechwoods SAC (approx. 6.5km) Walmore Common SPA (approx. 6km) Walmore Common Ramsar (approx. 6km)

STT Options name	Potential for Significant Effects	No Likely Significant Effects
500: Unsupported flow (ID: TWU_U7T_HI-RAB_RE1_ALL_p1-500-unsupported)	Severn Estuary SPA (all components) Severn Estuary Ramsar (all components) Severn Estuary SAC (all components) River Clun SAC (all components) River Usk SAC (all components) River Wye SAC (all components)	

14.3 Stage 2 Appropriate Assessment

14.3.1 Stage 2 outcomes

A HRA AA Stage 2 was carried out for these options in July 2022 where specific mitigations in relation to their implementation (construction and operation phases) upon the Designated Sites scoped in were outlined. The risk of adverse effects during construction and operation of STT Options are presented by Designated Site as below:

With regards to construction related impacts:

- For Dixton Wood SAC, no suitable functionally linked habitat was identified for violet click beetle within the footprint of the interconnector and due to the distance from the construction works to the European site no adverse effects are anticipated from increased air pollution.
- For the Midland Meres and Mosses Phase 2 Ramsar, potential changes to the hydrological regime/ groundwater supply for the site were identified but no adverse effects on site integrity were identified, based on the localised impacts anticipated from the Vyrnwy Bypass installation.
- For the Severn Estuary European sites, no adverse effects on site integrity from the construction of the outfall associated with the Vyrnwy Bypass or the intake associated with the interconnector were identified, assuming the implementation of appropriate mitigation measures.

With regards to impacts during operation:

- The available data (modelled and measured), indicates that changes in flow, velocity and depth will not be discernible and will not result in a change in the quality or quantity of supporting habitat within the River Severn (and tributaries) or within the Severn Estuary. As such, no risk of adverse effects on site integrity have been identified. This is because the changes in flow including pass forward flow into the estuary and the resulting changes in velocity, depth and water level will be within the interannual variations that would be observed under baseline conditions.
- The available data also indicates that changes in water quality will be minimal. The available data (modelled) suggests that changes in physical-chemical characteristics within the River Severn and the Severn Estuary will not be discernible with a likely decrease in selected nutrients during operation of the STT. There is a risk of an increase in the load (and concentration) of a handful of chemical determinands, but the potential increase is not considered to be of a magnitude that would result in a risk of adverse effects on site integrity. Furthermore, the assessment has considered the restrictions on the use of selected determinands.

Table 14.2 presents the summary of the results of the HRA AA Stage 2 in relation to the risk of adverse effects on the Designated Sites identified

Table 14.2: Summary of the HRA AA Stage 2 results

Designated Sites	Associated components	Risk of adverse effects
Berwyn and South Clywd Mountains SAC	Vyrnwy Bypass	N/A
Berwyn SPA	Vyrnwy Bypass	N/A
Bredon Hill SAC	Deerhurst to Culham Interconnector Mythe abstraction licence transfer	N/A
Chilterns Beechwoods SAC	Deerhurst to Culham Interconnector	N/A
Cothill Fen SAC	Deerhurst to Culham Interconnector	N/A
Cotswold Beechwoods SAC	Netheridge Transfer	N/A
Dixton Wood SAC	Deerhurst to Culham Interconnector Mythe abstraction licence transfer	No
Hartslock Wood SAC	Deerhurst to Culham Interconnector	N/A
Little Wittenham SAC	Deerhurst to Culham Interconnector	N/A
Montgomery Canal SAC	Vyrnwy Bypass	N/A
Midland Meres and Mosses Phase 1 Ramsar	Vyrnwy Bypass	No
Midland Meres and Mosses Phase 2 Ramsar	Vyrnwy Bypass	No
River Clun SAC	All components (including unsupported)	No (uncertain)
River Dee and Bala Lake SAC	Vyrnwy Bypass	N/A
River Usk SAC	All components (including unsupported)	No (uncertain)
River Wye SAC	All components (including unsupported)	No (uncertain)
Severn Estuary SAC	All components (including unsupported)	No (uncertain)
Severn Estuary SPA	All components (including unsupported)	No (uncertain)
Severn Estuary Ramsar	All components (including unsupported)	No (uncertain)
Tanat and Vyrnwy Bat sites SAC	Vyrnwy Bypass	No
Walmore Common SPA	Netheridge Transfer	N/A
Walmore Common Ramsar	Netheridge Transfer	N/A

Source: Ricardo Energy and Envronment on behalf of the STT group (2022) Severn Thames Transfer Solution Informal Habitats Regulations Assessment Report

The AA concluded that the ecological data and information to inform the HRA at Gate 2 is considered sufficient, however, there is some remaining uncertainty with regards to the current condition of some of the features of the Severn Estuary SAC.

Sufficient physical environment and water quality evidence is available for the Gate 2 assessment. However, there likely remain gaps in understanding the possible scheme operation that can be assessed through further scenario modelling using the 1D hydraulic models as the gated process progresses.

For the River Severn and Avon environmental water quality model, as there were significant missing data, monitoring locations to ensure that sufficient data are available to complete further modelling and assessment in Gate 3 are recommended.

Further information is also required regarding the proposed advanced treatment processes at the Minworth and Netheridge WwTWs to fully understand the efficacy of the proposed treatment process and the overall risk to the ecological features of the Severn Estuary European site and associated tributaries.

As potential functionally linked habitat is present (coastal and floodplain grazing marsh priority habitat) for qualifying birds of the Severn Estuary SPA and Ramsar site at the intake and pipeline route, additional wintering surveys are recommended to determine species presence and movement from feeding and roosting grounds. This will determine if qualifying bird populations present are associated with the Severn Estuary SPA and Ramsar site.

Lastly, fish habitat surveys are also recommended at the outfall location of Vyrnwy Bypass to determine if suitable silt beds are present for lamprey ammocoetes. Therefore, the STT options will be considered in the in-combination assessment.

15 Remaining options

The following 15 options have been subject to a HRA level 1 screening. None of them had LSE identified. The screening for these options is presented in Annex A. These are:

- Wessex Water to SWOX (Flaxlands) (ID: TWU_SWX_HI-IMP_SWX_ALL_wessextoswoxflax);
- Henley to SWOX – 5 Ml/d (ID: TWU_SWX_HI-TFR_HEN_ALL_henley-swox5);
- Thames Water (SWA) to Thames Water (SWOX) Conveyance (ID: TWU_SWX_HI-TFR_SWA_ALL_tw(swa)to(swx)con);
- Thames Water (Kennet Valley) to Thames Water (Henley) Conveyance (ID: TWU_HEN_HI-TFR_KVZ_ALL_tw(kv)to(hen)con);
- Groundwater Addington (ID: TWU_LON_HI-GRW_ALL_ALL_addington gw);
- Southfleet/Greenhithe (new WTW) (ID: TWU_LON_HI-GRW_ALL_ALL_s'fleet lic disagg);
- Woods Farm Increase DO (ID: TWU_SWX_HI-GRW_ALL_ALL_woods farm do);
- Dapdune Licence Disaggregation (ID: TWU_GUI_HI-GRW_ALL_ALL_dapdune lic disagg);
- Mortimer Disused Source (Recommission) (ID: TWU_KVZ_HI-GRW_ALL_ALL_mortimer recomm);
- Britwell Removal of Constraints (ID: TWU_SWX_HI-GRW_RE1_ALL_britwell roc);
- ASR Horton Kirby (ID: TWU_LON_HI-GRW_RE1_ALL_asrhortonkirby);
- Mogden to Teddington outfall 75 Ml/d (ID: TWU_TED_HI-TFR_TED_ALL_teddingtondramog/ted);
- Teddington DRA 75 MLD - Construction (TWU_TED_HI-RAB_RE1_CNO_teddington dra 75);
- TLT extension from Lockwood PS to King George V Reservoir intake (ID: TWU_KGV_HI-TFR_KGV_ALL_lockwood ps-kgv res); and
- Direct River Abstraction - Teddington to Thames Lee Tunnel Shaft 75 MLD (ID: TWU_KGV_HI-TFR_TED_ALL_teddingtondrated/tlt).

As No LSE have been identified for all these options no further stages of HRA are required.

The final two options included in the Thames Water WRMP24 BVP are two drought plan options:

- DP-Playhatch-KV (ID: TWU_KVZ_RE-DRP_ALL_ALL_dp-playhatch-kv)
- DP-Gatehampton-SWOX (ID: TWU_SWX_RE-DRP_ALL_ALL_dp-gatehampton-swox)

These two options were not subject to a HRA as part of this report as they were assessed not to require a HRA from a SEA undertaken by Ricardo Energy & Environment as part of preparing Thames Water's Drought Plan[7].

16 Dukes Cut to Farmoor (LC and BES option)

16.1 Option Description

This option proposes a 15 Ml/d conveyance option from the Oxford Canal to Farmoor Reservoir (see Table 2.1 for full option description). An acronyms list is presented at the beginning of this report.

16.2 Stage 1 Screening - Review

The Stage 1 Screening carried out in 2020 identified unknown effects on one Designated Site within the ZoI of this option: Oxford Meadows SAC (UK0012845). This screening review identified a total of four Designated Sites within 10km distance of this option, of which Oxford Meadows SAC as the only Designated Site with potential for LSE in relation to the implementation of this option. The remaining sites are assessed as NLSE (See Table 16.1). This option progresses to Stage 2 AA.

The full HRA Screening review is presented in Annex A. Information on the Designated Sites is provided in Annex B, including qualifying features, conservation objectives, and threats and pressures to site integrity.

Table 16.1: Dukes Cut to Farmoor Stage 1 screening results reviewed

Potential for Significant Effects	No Likely Significant Effects
Oxford Meadows SAC (UK0012845) (approx. 0.9km)	Cothill Fen SAC (UK0012889) (approx. 5.2km)
	Burnham Beeches SAC (UK0030034) (approx. 4.8km)
	Windsor Forest & Great Park SAC (UK0012586) (approx. 5.2km)

16.3 Stage 2 Appropriate Assessment

The Stage 2 Appropriate Assessment provides an assessment to determine whether this option will result in an Adverse Effect on the Site Integrity (AESI) on the Habitats Sites identified at the screening stage with potential for LSE. At this stage, mitigation measures to prevent adverse effects can be included. These include those identified as best practice measures outlined in Section 3.3.4.

The AA will result in one of three potential outcomes:

- Evidence is sufficient and demonstrates there will be no adverse effects
- Evidence is sufficient but indicates that there will be an adverse effect
- Insufficient evidence to determine the effects

The information in this document will be presented to Natural England during consultation. Where the Stage 2 AA concludes that there would be residual AESI on any of the Habitats Sites, the HRA must proceed to the next stages (See Section 3.1).

16.3.1 Scope

The following Designated Sites were assessed at Stage 2 AA:

- Oxford Meadows SAC (UK0012845) (approx. 0.9km).

16.3.2 Potential effects on Designated Sites

The following sections describe the potential effects of the construction and operational phases for the Dukes Cut to Farmoor Option. These consider the type, size and scale of the option to determine their potential effect upon this Designated Site and its qualifying features. An assessment of each potential impact on the integrity of the Designated Sites is made, in view of the sites' structure, function and conservation objectives. Where adverse effects are deemed significant, further necessary mitigation measures are also proposed in the following section. Where stated these are in addition to the best practice outlined in Section 3.3.4.

LSE were identified in relation to:

- Hydrological connectivity between the option footprint and Designated Site via River Thames may lead to potential pollution effects during construction of this option.

16.3.2.1 Oxford Meadows SAC (UK0012845) (approx. 0.9km).

Together with North Meadow and Clattinger Farm, also in southern England, Oxford Meadows represents lowland hay meadows in the Thames Valley centre of distribution. The site includes vegetation communities that are perhaps unique in the world in reflecting the influence of long-term grazing and hay-cutting on lowland hay meadows. The site has benefited from the survival of traditional management, which has been undertaken for several centuries and so exhibits good conservation of structure and function. Oxford Meadows is selected because Port Meadow is the larger of only two known sites in the UK for creeping marshwort.

This site is designated under Annex I for comprising Lowland hay meadows (*Alopecurus pratensis, Sanguisorba officinalis*) (6510) and Annex II for supporting creeping marshwort (*Apium repens)* species (1614). This SAC is vulnerable to degradation, through excessive nutrient input, changes in the cutting or grazing regime, and changes in hydrology and potential invasive species spread are the principal threats to this site (for further details please refer to Annex B).

Construction effects

The works will involve an abstraction on the Oxford Canal, the Oxford Canal connects with the Wolvercote Stream which runs through the SAC area. The SAC supports extensive areas of grassland vegetation with a number of important plant species associated with floodplain meadows and seasonally flooded habitats.

Abstraction of water from the Oxford Canal should not have an adverse effect on the designated features due to the system of locks to prevent water levels being affected downstream. However, the pipeline route will cross the River Evenlode which flows downstream connecting the River Isis and River Thames, both of which support the floodplain areas of the SAC. The crossing of the River Evenlode could result in the release of sediment of concrete / hydrocarbon pollutants that could be washed downstream and deposited within the floodplain habitats of the SAC. Toxic and non-toxic contamination may be observed due to pollution events (such as chemical contamination, high levels of turbidity or siltation due to runoff, for example) (See Table 16.2).

Potential invasive species spread during construction works (due to the option and waterbodies proximity) may indirectly affect this site qualifying species due to habitat degradation, increasing the pressures to this site integrity.

Given the fact that the construction works are outside the site boundary no adverse effects to the site integrity are expected if all mitigation measures proposed are in place. However, low, and localised effects given the hydrological connection between the Designated Site and this

option during construction phase may still be possible and therefore this option will need to be included in the in-combination assessment.

Operational effects

Even though this option proposes a new abstraction from the Oxford Canal no operation effects which could affect this site and/or its qualifying features are anticipated. The abstraction system is composed of a system of locks to prevent water levels being affected downstream. The canal draws water from the River Cherwell at Thrupp and is a lowering lock at Dukes Cut; no water level changes should be observed at the SAC.

Table 16.2: Dukes Cut to Farmoor - Potential effects on designated qualifying features

Designated Sites	Qualifying features	Potential Significant Effects Alone	Proposed Mitigation Measures	Residual Effects -Alone
Oxford Meadows SAC (UK0012845) (approximately 0.9Km of the proposed works)	Annex I habitats that are a primary reason for selection of this site: • 6510 Lowland hay meadows (Alopecurus pratensis, Sanguisorba officinalis) Annex II species that are a primary reason for selection of this site: • 1614 Creeping marshwort (*Apium repens)*	This site is hydrologically connected to the option footprint and potential pollution effects may be observed. **During construction this option could result in:** • Toxic and non-toxic contamination - pollution events leading to water quality degradation and consequently to physical damage (habitat damage related to potential pollution events via hydrological connection). • Invasive species spread, during construction works impacting on both the gadwall and shoveler population due to habitat degradation, for example. • Rapid population fluctuations related to direct mortality may be observed. These effects are likely to be associated with all described above. Potential construction pollution events are likely to be localised and of short duration and may result in temporary and permanent effects on this site and its qualifying features. No operation effects are anticipated.	Mitigation measures should follow best practice guidelines to minimise potential impacts e.g. use of sediment screens whenever close to waterbodies, coverage of construction stockpiles during adverse weather conditions, and sand/silt removal facilities. Standard best practice procedures must include: • CIRIA C741 Environmental good practice on site guide • Environment Agency's PPGs (PPG1: General Guide to Prevention of Pollution; PPG6: Pollution prevention guidance for working at construction and demolition sites). • Biosecurity measures to ensure appropriate removal and/or management control of INNS at source. • Development of a CEMP which will include all the above proposed mitigation measures and any further measures identified at the project stage.	Assuming all proposed mitigation is implemented it is considered there will not be a significant change in: • The extent and distribution of qualifying species and habitat; • The structure and function of the habitats of qualifying species; and • The supporting processes on which habitats of qualifying species rely. Consequently, with appropriate mitigation measures in place this option is not expected to affect the site integrity.

16.3.3 Stage 2 outcomes

Following this HRA Appropriate Assessment, it is considered that with adherence to the proposed mitigation, the proposed works associated with the scheme are not expected to have any significant adverse effects on the overall integrity of the Designated Sites and their features alone for the construction and operation phases of the proposed option.

17 In-combination effects

17.1 WRMP options in-combination assessment

This section aims to provide an assessment of the potential in-combination effects of options included in the WRMP.

The in-combination assessment within the BVP options shows that Cothill Fen SAC may be affected by two or more options within Thames Water WRMP24, as shown in Table 17.1:

- Cothill Fen SAC may be affected by: SWOX to SWA (located at approximately 0.05km distance and detailed in Table 10.2) and Abingdon to Farmoor Reservoir pipeline (located at approximately 0.1km distance and detailed in Table 12.2).

This SAC is designated for supporting alkaline fens; calcium-rich spring water-fed fens (H7230) and alluvial forests with (*Alnus glutinosa*) and (*Fraxinus excelsior*) (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) in addition to alder woodland on floodplains (H91E0).

Water pollution, hydrological changes, and air pollution (nitrogen deposition) are the principal threats to this site's habitats as directly affects its vegetation and invertebrate communities (for further details refer to Annex B).

Given the proximity of the option footprint to Cothill Fen SAC (< 0.1km), potential pollution and habitat degradation effects during the construction phase cannot be dismissed. No operation effects are anticipated.

It is considered that with adherence to the proposed mitigation outlined in this report, the proposed works are not expected to have any significant adverse effects on the overall integrity of Cothill Fen SAC and their features alone during the construction phase of the proposed options. However, as the timescale for the options works are to overlap, it is possible for in-combination effects to result during the construction phases of these options. Therefore, further studies are required to estimate the magnitude of potential effects on this SAC from the two options. This will inform more targeted mitigation measures. These studies should be completed for supporting the HRA undertaken at planning application.

The in-combination assessment within the BVP options and the additional option selected in the LC and BES plans (Duke's Cut to Farmoor) shows that Oxford Meadows SAC may also be affected by two or more options within this report, as shown in Table 17.1:

- Oxford Meadows SAC may be affected by: SWOX to SWA (BVP option located at approximately 0.2km distance and detailed in Table 10.2) and Dukes Cut to Farmoor (located at approximately 0.9km distance and detailed in Table 16.2).

This site is designated under the Annex I for comprising Lowland hay meadows (*Alopecurus pratensis, Sanguisorba officinalis*) (6510) and Annex II for supporting creeping marshwort (*Apium repens)* species (1614).

Water pollution and air pollution (nitrogen deposition) are the principal threats to this site's habitats as directly affects its vegetation and invertebrate communities (for further details refer to Annex B).

Given the proximity of the option footprint to Oxford Meadows SAC (< 0.2km), potential pollution and habitat degradation effects during the construction phase cannot be dismissed. No operation effects are anticipated.

It is considered that with adherence to the proposed mitigation outlined in this report, the proposed works are not expected to have any significant adverse effects on the overall integrity of Oxford Meadows SAC and its features alone during the construction phase of the proposed options. However, as the timescale for the options works are to overlap, it is possible for in-combination effects to result during the construction phases of these options. Therefore, further studies are required to estimate magnitude of potential effects on this SAC from the two options. This will inform more targeted mitigation measures. These studies should be completed for supporting the HRA undertaken at planning application.

Table 17.1: Thames Water WRMP 24 Options In-combination Assessment

	Best Value Plan Options	Cothill Fen SAC	Hartslock Wood SAC	Kennet & Lambourn Floodplain SAC	Kennet Valley Alderwoods SAC	Oxford Meadows SAC	Richmond Park SAC	South West London Waterbodies Ramsar Site	South West London Waterbodies SPA	Thames Basin Heaths SPA	Thursley, Ash, Pirbright and Chobham SAC	Wimbledon Common SAC	Midland Meres and Mosses Phase 2 Ramsar	Severn Estuary/ Mor Hafren SAC	Severn Estuary SPA	Severn Estuary Ramsar	Severn Estuary SAC	Dixton Wood SAC	River Usk SAC	River Wye SAC
1	South East Water to Guildford (ID: TWU_GUI_HI-TFR_RZ5_ALL_sewtogui)									Yes	Yes									
2	T2ST Culham to Speen transfer Option (ID: TWU_KVZ_HI-TFR_T2S_ALL_t2st cul to speen)			Yes																
3	River Thames to Fobney Transfer Option (ID: TWU_KVZ_HI-TFR_UTC_ALL_thamestofobney)	This option has not progressed to Stage 2 AA and not considered to result in in-combination effects.																		
4	TWRM extension - Hampton to Battersea Option (ID: TWU_LON_HI-ROC_NET_CNO_hampton-battersea)						Yes					Yes								

	Best Value Plan Options	Cothill Fen SAC	Hartslock Wood SAC	Kennet & Lambourn Floodplain SAC	Kennet Valley Alderwoods SAC	Oxford Meadows SAC	Richmond Park SAC	South West London Waterbodies Ramsar Site	South West London Waterbodies SPA	Thames Basin Heaths SPA	Thursley, Ash, Pirbright and Chobham SAC	Wimbledon Common SAC	Midland Meres and Mosses Phase 2 Ramsar	Severn Estuary/ Mor Hafren SAC	Severn Estuary SPA	Severn Estuary Ramsar	Severn Estuary SAC	Dixton Wood SAC	River Usk SAC	River Wye SAC
5	Kempton - 150 - Construction SRO (ID: TWU_LON_HI-ROC_WT1_CNO_kemptonwtw150)							Yes	Yes											
6	Datchet Increase DO (ID: TWU_SWA_HI-GRW_ALL_ALL_datchet do)	Not considered to in-combination. A total of four Designated Sites within 10km distance of this option, all of which were assessed as NLSE (See Table 9.1). These Designated Sites are not in direct hydrological connection to this option footprint, and they are located sufficiently distant to exclude effects related to noise, light, dust, and other construction disturbances. Therefore, this option has not progressed to Stage 2 AA.																		
7	SWOX to SWA (ID: TWU_SWA_HI-TFR_SWX_ALL_swoxswa48)	Yes				Yes														
8	Moulsford (ID: TWU_SWX_HI-GRW_ALL_ALL_moulsford gw)		Yes																	
9	Abingdon to Farmoor Reservoir pipeline (ID: TWU_SWX_HI-TFR_STR_ALL_abing-farmoor pipe)	Yes																		

Best Value Plan Options		Cothill Fen SAC	Hartslock Wood SAC	Kennet & Lambourn Floodplain SAC	Kennet Valley Alderwoods SAC	Oxford Meadows SAC	Richmond Park SAC	South West London Waterbodies Ramsar Site	South West London Waterbodies SPA	Thames Basin Heaths SPA	Thursley, Ash, Pirbright and Chobham SAC	Wimbledon Common SAC	Midland Meres and Mosses Phase 2 Ramsar	Severn Estuary/ Mor Hafren SAC	Severn Estuary SPA	Severn Estuary Ramsar	Severn Estuary SAC	Dixton Wood SAC	River Usk SAC	River Wye SAC
10, 11 and 12	Abingdon Options SESRO is composed by three sub-options [5]: – Reservoir Abingdon 100 (Lon) - Construction (ID: TWU_STR_HI-RSR_RE1_CNO_abingdon100(lon)) – Abingdon WTW Ph1 - Construction (ID: TWU_SWX_HI-ROC_WT1_CNO_abingdon wtw ph1) – Abingdon WTW Enhanced (ID: TWU_SWX_HI-ROC_WT2_ALL_abingdon wtw ph2)	A total of four Designated Sites within 10km distance of this option, all of which were assessed as NLSE (See Table 13.1). These Designated Sites are not in direct hydrological connection to this option footprint and they are located sufficiently distant to exclude effects related to noise, light, dust and other construction disturbances. Therefore, this option has not progressed to Stage 2 AA and not considered to result in in-combination effects.																		
13, 14, 15 and 16	Severn to Thames transfer STT – SRO is composed by four sub-options[6]: – Raw Water Transfer Deerhurst to Culham 500 Ml/d (Lon only) - Construction (ID: TWU_STT_HI-																			

Best Value Plan Options	Cothill Fen SAC	Hartslock Wood SAC	Kennet & Lambourn Floodplain SAC	Kennet Valley Alderwoods SAC	Oxford Meadows SAC	Richmond Park SAC	South West London Waterbodies Ramsar Site	South West London Waterbodies SPA	Thames Basin Heaths SPA	Thursley, Ash, Pirbright and Chobham SAC	Wimbledon Common SAC	Midland Meres and Mosses Phase 2 Ramsar	Severn Estuary/ Mor Hafren SAC	Severn Estuary SPA	Severn Estuary Ramsar	Severn Estuary SAC	Dixton Wood SAC	River Usk SAC	River Wye SAC
IMP_STT_CNO_sttpipe500(lon)) Bulk transfers into region (raw). – 500: Vyrnwy Reservoir river release (75 Mld) and 25 Mld of Bypass (105Mld) (ID: TWU_STT_HI-RAB_RE1_ALL_p9-500-vyrnwy_100_b) – 500: Netheridge STW effluent diversion (35Mld) - Deerhurst Pipeline (ID: TWU_STT_HI-REU_RE1_ALL_p5-500-neth_p35) – 500: Unsupported flow (ID: TWU_U7T_HI-RAB_RE1_ALL_p1-500-unsupported)																			
17 Wessex Water to SWOX (Flaxlands) (ID: TWU_SWX_HI-IMP_SWX_ALL_wessextoswoxflax)	This option has not progressed to Stage 2 AA and not considered to result in in-combination effects.																		

	Best Value Plan Options	Cothill Fen SAC	Hartslock Wood SAC	Kennet & Lambourn Floodplain SAC	Kennet Valley Alderwoods SAC	Oxford Meadows SAC	Richmond Park SAC	South West London Waterbodies Ramsar Site	South West London Waterbodies SPA	Thames Basin Heaths SPA	Thursley, Ash, Pirbright and Chobham SAC	Wimbledon Common SAC	Midland Meres and Mosses Phase 2 Ramsar	Severn Estuary/ Mor Hafren SAC	Severn Estuary SPA	Severn Estuary Ramsar	Severn Estuary SAC	Dixton Wood SAC	River Usk SAC	River Wye SAC
18	Henley to SWOX - 5 Ml/d (ID: TWU_SWX_HI-TFR_HEN_ALL_henley-swox5)	This option has not progressed to Stage 2 AA and not considered to result in in-combination effects.																		
19	Thames Water (SWA) to Thames Water (SWOX) Conveyance (ID: TWU_SWX_HI-TFR_SWA_ALL_tw(swa)to(swx)con)	This option has not progressed to Stage 2 AA and not considered to result in in-combination effects.																		
20	Thames Water (Kennet Valley) to Thames Water (Henley) Conveyance (ID: TWU_HEN_HI-TFR_KVZ_ALL_tw(kv)to(hen)con)	This option has not progressed to Stage 2 AA and not considered to result in in-combination effects.																		
21	Groundwater Addington (ID: TWU_LON_HI-GRW_ALL_ALL_addington gw)	This option has not progressed to Stage 2 AA and not considered to result in in-combination effects.																		
22	Southfleet/Greenhithe (new WTW) (ID: TWU_LON_HI-GRW_ALL_ALL_s'fleet lic disagg)	This option has not progressed to Stage 2 AA and not considered to result in in-combination effects.																		

	Best Value Plan Options	Cothill Fen SAC	Hartslock Wood SAC	Kennet & Lambourn Floodplain SAC	Kennet Valley Alderwoods SAC	Oxford Meadows SAC	Richmond Park SAC	South West London Waterbodies Ramsar Site	South West London Waterbodies SPA	Thames Basin Heaths SPA	Thursley, Ash, Pirbright and Chobham SAC	Wimbledon Common SAC	Midland Meres and Mosses Phase 2 Ramsar	Severn Estuary/ Mor Hafren SAC	Severn Estuary SPA	Severn Estuary Ramsar	Severn Estuary SAC	Dixton Wood SAC	River Usk SAC	River Wye SAC
23	Woods Farm Increase DO (ID: TWU_SWX_HI-GRW_ALL_ALL_woods farm do)	This option has not progressed to Stage 2 AA and not considered to result in in-combination effects.																		
24	Dapdune Licence Disaggregation (ID: TWU_GUI_HI-GRW_ALL_ALL_dapdune lic disagg)	This option has not progressed to Stage 2 AA and not considered to result in in-combination effects.																		
25	Mortimer Disused Source (Recommission) (ID: TWU_KVZ_HI-GRW_ALL_ALL_mortimer recomm)	This option has not progressed to Stage 2 AA and not considered to result in in-combination effects.																		
26	Britwell Removal of Constraints (ID: TWU_SWX_HI-GRW_RE1_ALL_britwell roc)	This option has not progressed to Stage 2 AA and not considered to result in in-combination effects.																		
27	ASR Horton Kirby (ID: TWU_LON_HI-GRW_RE1_ALL_asrhortonkirby)	This option has not progressed to Stage 2 AA and not considered to result in in-combination effects.																		

	Best Value Plan Options	Cothill Fen SAC	Hartslock Wood SAC	Kennet & Lambourn Floodplain SAC	Kennet Valley Alderwoods SAC	Oxford Meadows SAC	Richmond Park SAC	South West London Waterbodies Ramsar Site	South West London Waterbodies SPA	Thames Basin Heaths SPA	Thursley, Ash, Pirbright and Chobham SAC	Wimbledon Common SAC	Midland Meres and Mosses Phase 2 Ramsar	Severn Estuary/ Mor Hafren SAC	Severn Estuary SPA	Severn Estuary Ramsar	Severn Estuary SAC	Dixton Wood SAC	River Usk SAC	River Wye SAC
28	Mogden to Teddington outfall 75 Ml/d (ID: TWU_TED_HI-TFR_TED_ALL_teddingtondramog/ted)	This option has not progressed to Stage 2 AA and not considered to result in in-combination effects.																		
29	Teddington DRA 75 MLD - Construction (TWU_TED_HI-RAB_RE1_CNO_teddington dra 75)	This option has not progressed to Stage 2 AA and not considered to result in in-combination effects.																		
30	TLT extension from Lockwood PS to King George V Reservoir intake (ID: TWU_KGV_HI-TFR_KGV_ALL_lockwood ps-kgv res)	This option has not progressed to Stage 2 AA and not considered to result in in-combination effects.																		
31	Direct River Abstraction - Teddington to Thames Lee Tunnel Shaft 75 MLD (ID: TWU_KGV_HI-TFR_TED_ALL_teddingtondrated/tlt)	This option has not progressed to Stage 2 AA and not considered to result in in-combination effects.																		

Best Value Plan Options		Cothill Fen SAC	Hartslock Wood SAC	Kennet & Lambourn Floodplain SAC	Kennet Valley Alderwoods SAC	Oxford Meadows SAC	Richmond Park SAC	South West London Waterbodies Ramsar Site	South West London Waterbodies SPA	Thames Basin Heaths SPA	Thursley, Ash, Pirbright and Chobham SAC	Wimbledon Common SAC	Midland Meres and Mosses Phase 2 Ramsar	Severn Estuary/ Mor Hafren SAC	Severn Estuary SPA	Severn Estuary Ramsar	Severn Estuary SAC	Dixton Wood SAC	River Usk SAC	River Wye SAC
32 and 33	DP-Playhatch-KV (ID: TWU_KVZ_RE-DRP_ALL_ALL_dp-playhatch-kv) DP-Gatehampton-SWOX (ID: TWU_SWX_RE-DRP_ALL_ALL_dp-gatehampton-swox)	Not undertaken within this HRA AA[7]																		
Extra	Dukes Cut to Farmoor (ID: TWU _SWX_HI-TFR_SWX_ALL_dukescut-farmoor)					Yes														

17.2 In-combination with other plans and projects

The list of plans and developments identified for the Thames Water region are presented in the Table 17.2 below. A 2km buffer was applied to the BVP options and other plans to be considered for possible cumulative effects evaluation. However, at this stage it is not possible to quantify and detail the cumulative impacts expected as part of the BVP options due to the early stages in options design. Similarly, it is still not possible to identify the pathways and the Designated Sites that could result in cumulative effects within the plans and developments listed below. The next step in this assessment will include listing the potential effects of the plans and/or projects based on existing HRAs carried out for the same plans and developments. Consideration of the proposed timings also needs to the taken to further to refine this assessment. This assessment needs to be undertaken as the design of the options progresses particularly at the project level.

Table 17.2: Plans and Developments to be considered for potential cumulative effects

Reference	County	Council	Scheme Type	Location	Description	Best Value Plan within 2km
ALL.BER.REA1	Berkshire	Reading	Local Plan Allocation	STATION HILL & FRIARS WALK	Indicative potential: 380-570 dwellings, 80,000-100,000 sq m of offices, retail and leisure (no significant net gain assumed).	TWU_KVZ_HI-TFR_UTC_ALL_thamestofobney
ALL.BER.REA2	Berkshire	Reading	Local Plan Allocation	Hosier Street	Indicative potential: 500-750 dwellings, 4,000-6,000 sq m of retail and leisure.	TWU_KVZ_HI-TFR_UTC_ALL_thamestofobney
ALL.BER.REA3	Berkshire	Reading	Local Plan Allocation	Forbury Retail Park	Indicative potential: 1,230-1,840 dwellings, no net gain of retail.	TWU_KVZ_HI-TFR_UTC_ALL_thamestofobney
ALL.BER.REA4	Berkshire	Reading	Local Plan Allocation	Land north of Manor Farm Road Major Opportunity Area	Redevelopment of the Manor Farm Road site will primarily be for housing (between 680- 1,020 dwellings), an extension to the Whitley District Centre, school provision and open space and public realm improvements.	TWU_KVZ_HI-TFR_UTC_ALL_thamestofobney
ALL.BER.WOK1	Berkshire	Wokingham	Local Plan Allocation	Arborfield Garrison	1200 homes from 2021-26.	N/A
ALL.BER.WOK2	Berkshire	Wokingham	Local Plan Allocation	South Wokingham	600 homes from 2021-26.	N/A
ALL.ESS.EPP2	Essex	Epping Forest	Emerging Local Plan Allocation	North Weald Bassett	1050 homes, including the following Site Allocations; NWB.R1 Land at Bulmans; NWB.R2 Land at Tylers Farm; NWB.R3 Land South of Vicarage Lane; NWB.R4 Land at Chase Farm; NWB.R5 Land at The Acorns; NWB.T1 Land West of Tylers Green.	N/A
ALL.ESS.EPP1	Essex	Epping Forest	Emerging Local Plan Allocation	Waltham Abbey North	612 homes, including the following Site Allocations; WAL.R1 Land West of Galley Hill Road; WAL.R2 Land at Lea Valley Nursery; WAL.R3 Land Adjoining Parklands; WAL.T1 Land to the rear of Lea Valley Nursery.	N/A

Reference	County	Council	Scheme Type	Location	Description	Best Value Plan within 2km
ALL.LON.BRE1	Greater London	Brent	Site Allocation	The area around the existing Neasden underground station and a potential West London Orbital overground station. Neasden Lane, Denzil Road and Selbie Avenue NW10.	In addition to around 2000 homes, the area will through co-location of industrial and other commercial floorspace, provide a major boost to business and employment opportunities.	N/A
ALL.LON.BRE2	Greater London	Brent	Site Allocation	Staples Corner Strategic Industrial Land, adjacent to the Edgware Road and North Circular Road	In addition to around 2,200 homes, the area will through industrial intensification together with co-location of industrial provide a major boost to business and employment opportunities through increased floorspace.	N/A
ALL.LON.BRO1	Greater London	Bromley	Site Allocation	Land adjacent to Bromley North Station	Redevelopment for mixed use including 525 residential units, 2000 sqm of office accommodation, space for community use, 230 sqm café/retail, transport interchange and parking.	N/A
ALL.LON.BRO2	Greater London	Bromley	Site Allocation	West of Bromley High Street and land at Bromley South	Redevelopment for mixed use including 1230 residential units, offices, retail and transport interchange.	N/A
ALL.LON.CRO1	Greater London	Croydon	Site Allocation	500 Purley Way, CR0 4NZ	Redevelopment of a mix of residential, retail, commercial and community uses to form the basis of a new residential community. 251 to 1028 homes.	N/A
ALL.LON.CRO2	Greater London	Croydon	Site Allocation	Cane Hill Hospital Site, Farthing Way, CR5 3YL	Residential development with new community, health and educational facilities. 650 homes.	N/A
ALL.LON.CRO3	Greater London	Croydon	Site Allocation	61 Dingwall Road and Lansdowne Road, CR0 2EW	Mixed use development comprising residential, offices, restaurant/café and fitness centre. 550 to 625 homes.	N/A

Reference	County	Council	Scheme Type	Location	Description	Best Value Plan within 2km
ALL.LON.CRO4	Greater London	Croydon	Site Allocation	Lunar House, Wellesley Road, CR0 9YD	Office and residential and/or hotel (with healthcare facility if required by the NHS) if the site is no longer required by the Home Office. 188 to 542 homes.	N/A
ALL.LON.CRO5	Greater London	Croydon	Site Allocation	Valley Park (B&Q and Units A-G Daniell Way), Hesterman Way, CR0 4YJ	Redevelopment of this area to a mixture of residential, retail, healthcare facility (if required by the NHS), community and leisure to form the basis of a new residential community and local centre. 403 to 1092 homes.	N/A
ALL.LON.CRO6	Greater London	Croydon	Site Allocation	Whitgift Centre, North End	Expansion of shopping centre improved public realm and residential development and car parking provision. 400 to 1000 homes.	N/A
ALL.LON.GRE1	Greater London	Greenwich	Emerging Site Allocations	Land between Anchor & Hope Lane, Woolwich Road and Eastmoor Street	Mixed use development including retention, diversification and intensification of industrial floorspace, workspace suitable for SMEs, residential, small-scale retail/leisure/cultural uses, primary school, primary healthcare centre, other appropriate structures.	N/A
ALL.LON.GRE2	Greater London	Greenwich	Emerging Site Allocations	The site is located on the western side of Greenwich Peninsula, south of North Greenwich Station and bounded by Millennium Way and the A102.	Residential-led mixed use development including local-scale Greenwich Peninsula retail/café/restaurant/leisure uses, hotel, offices, B1 workspace, archiving/storage facilities, appropriate D1 community facilities and public open space.	N/A
ALL.LON.GRE3	Greater London	Greenwich	Emerging Site Allocations	Greenwich Peninsula	Residential-led mixed use development up to 12,678 residential units.	N/A
ALL.LON.GRE4	Greater London	Greenwich	Emerging Site Allocations	Peartree Way, SE10	Residential-led mixed use development including local-scale retail/café/restaurant/leisure uses, B1 workspace and appropriate community facilities, including a nursery.	N/A
ALL.LON.GRE5	Greater London	Greenwich	Emerging Site Allocations	Thamesmead Waterfront	Residential-led mixed-use development including a site for an all through school (primary and secondary). Area currently designated as MOL to be made publicly accessible as a District Park.	N/A

Reference	County	Council	Scheme Type	Location	Description	Best Value Plan within 2km
ALL.LON.GRE6	Greater London	Greenwich	Emerging Site Allocations	Thamesmead Town Centre	Town centre uses with significant residential development.	N/A
ALL.LON.H&F1	Greater London	Hammersmith and Fulham	Site Allocation	White City Regeneration Area	6000 indicative additional homes.	N/A
ALL.LON.H&F2	Greater London	Hammersmith and Fulham	Site Allocation	Hammersmith Regeneration Area	2800 indicative additional homes.	N/A
ALL.LON.H&F3	Greater London	Hammersmith and Fulham	Site Allocation	Fulham Regeneration Area	7000 indicative additional homes.	N/A
ALL.LON.H&F4	Greater London	Hammersmith and Fulham	Site Allocation	South Fulham Riverside Regeneration Area	4000 indicative additional homes.	TWU_LON_HI-ROC_NET_CNO_hampton-battersea
ALL.LON.HAC1	Greater London	Hackney	Site Allocation	Woodberry Down, Seven Sisters Road N4 1DH	Residential units: 4045 (gross) 2915 (net) to 2033 and beyond.	N/A
ALL.LON.HIL1	Greater London	Hillingdon	Site Allocation		1800 homes from 2021-2026.	N/A
ALL.LON.K&C2	Greater London	Kensington and Chelsea	Site Allocation	Earl's Court Exhibition Centre	The Council allocates development on the site to deliver, in terms of: Land use a. a minimum of 900 (C3) homes within the Royal Borough; b. a minimum of 10,000sq.m of office floor space; c. retail and other uses within the A class of the Use Classes Orde.	N/A
ALL.LON.K&C3	Greater London	Kensington and Chelsea	Site Allocation	Former Territorial Army site, 245 Warwick Road Former Empress Telephone Exchange, 213-215 Warwick Road Former Homebase, 195 Warwick Road 100 and 100a West Cromwell Road	The Council allocates development on the site to deliver, in terms of: Land use a. a minimum of 1,219 total combined residential (C3) units across all four sites: i. 255 residential (C3) units on the Former Territorial Army site; ii. 163 residential unit.	N/A

Reference	County	Council	Scheme Type	Location	Description	Best Value Plan within 2km
ALL.LON.LAM1	Greater London	Lambeth	Site Allocation	Land Bounded By Wandsworth Road To The West, Parry Street To The North, And Bondway And Railway Line To The East (Vauxhall Square)	578 residential units.	TWU_LON_HI-ROC_NET_CNO_hampton-battersea
ALL.WAS.LON1	Greater London	West London Waste Authority	Waste Allocation	Victoria Road, Park Royal, Ealing	Waste site.	N/A
ALL.WAS.LON2	Greater London	West London Waste Authority	Waste Allocation	Forward Drive, Harrow	Waste site.	N/A
ALL.WAS.LON3	Greater London	West London Waste Authority	Waste Allocation	Hayes, Hillingdon	Waste site.	N/A
ALL.WAS.LON4	Greater London	West London Waste Authority	Waste Allocation	Langhorn Drive, Twickenham, Richmond	Waste site.	TWU_KGV_HI-RAB_RE1_CNO_teddington dra 75, TWU_TED_HI-TFR_TED_ALL_teddingtondramog/ted
ALL.WAS.LON5	Greater London	West London Waste Authority	Waste Allocation	Hayes Road, Southall, Hounslow	Waste site.	N/A
ALL.WAS.LON6	Greater London	North London Waste Authority	Waste Allocation	Industrial area of Eleys Estate which incorporates a number of existing waste sites and neighbours Edmonton Eco Park and Aztec A406 Industrial Estate.	Integrated resource recovery facilities/resource parks, Thermal treatment, anaerobic digestion, pyrolysis/gasification, mechanical biological treatment, Waste transfer, indoor composting, in-vessel composting, processing and recycling.	TWU_KGV_HI-TFR_KGV_ALL_lockwood ps-kgv res

Reference	County	Council	Scheme Type	Location	Description	Best Value Plan within 2km
ALL.WAS.LON8	Greater London	North London Waste Authority	Waste Allocation	Industrial Estate	Thermal treatment, anaerobic digestion, pyrolysis/gasification, mechanical biological treatment, waste transfer, processing and recycling. Areas not within Source Protection Zone 1 are potentially suitable to handle hazardous waste.	TWU_KGV_HI-TFR_KGV_ALL_lockwood ps-kgv res
ALL.WAS.LON11	Greater London	North London Waste Authority	Waste Allocation	There is a sports ground to the north, Lea Valley Park, allotments and residential properties to the east, industrial properties to the south and a railway line to the west.	Waste transfer, indoor/in-vessel composting, processing and recycling. Areas not lying within Flood Zone 3 are potentially suitable to handle hazardous waste.	N/A
ALL.LON.NEW1	Greater London	Newham	Site Allocation	Silvertown Quays	Residential-led mixed-use with potential for leisure and hospitality, green industries, and research and development, building on the visitor attraction cluster at the western end of the docks (ExCeL, Siemens building).	N/A
ALL.LON.NEW2	Greater London	Newham	Site Allocation	Minoco Wharf	The Managed Release of land designated as a Strategic Industrial Location at Thameside West up to the eastern boundary of Lyle Park, will assist in the development of a new neighbourhood at West Silvertown.	N/A
ALL.LON.RED1	Greater London	Redbridge	Site Allocation	Sainsbury's, Roden Street, Ilford	Comprehensive redevelopment of site is proposed, to include provision of a new supermarket, employment floorspace and the delivery of approximately 700 new homes.	N/A
ALL.LON.RED3	Greater London	Redbridge	Site Allocation	822 High Road (Tesco), Goodmayes	Comprehensive redevelopment of this underutilised site is proposed including housing (723 homes), retail and education uses.	N/A
ALL.LON.RED4	Greater London	Redbridge	Site Allocation	Goodmayes Retail Park, High Road Goodmayes	Comprehensive redevelopment of the site is proposed to deliver approximately 514 new homes and a health facility.	N/A
ALL.LON.SOU1	Greater London	Southwark	Site Allocation	Biscuit Factory	1548 residential units.	N/A

Reference	County	Council	Scheme Type	Location	Description	Best Value Plan within 2km
ALL.LON.SOU2	Greater London	Southwark	Site Allocation	Sampson House	598 residential units.	N/A
ALL.LON.SOU3	Greater London	Southwark	Site Allocation	Elephant and Castle Shopping Centre and London College of Communications	977 residential units.	N/A
ALL.LON.SOU4	Greater London	Southwark	Site Allocation	Mandela Way	724 residential units.	N/A
ALL.LON.SOU5	Greater London	Southwark	Site Allocation	Land bounded by Glengall Road, Latona Road and Cantium Retail Park	13000 residential units.	N/A
ALL.LON.SOU6	Greater London	Southwark	Site Allocation	Sandgate Street and Verney Road	1152 residential units.	N/A
ALL.LON.SOU7	Greater London	Southwark	Site Allocation	Hatcham Road, Penarth Street and Ilderton Road	1154 residential units.	N/A
ALL.LON.SOU8	Greater London	Southwark	Site Allocation	760 and 812 Old Kent Road (ToysRUs) and 840 Old Kent Road (Aldi)	694 residential units.	N/A
ALL.LON.SOU9	Greater London	Southwark	Site Allocation	Aylesham Centre and Peckham Bus Station	850 residential units.	N/A
ALL.LON.SOU11	Greater London	Southwark	Site Allocation	Harmsworth Quays, Surrey Quays Leisure Park, Surrey Quays Shopping Centre and Robert's Close	2735 residential units.	N/A
ALL.LON.SOU10	Greater London	Southwark	Site Allocation	Decathlon Site and Mulberry Business Park	1031 residential units.	N/A
ALL.LON.TOW1	Greater London	Tower Hamlets	Site Allocation	SEE IMAGE	Housing and employment allocation.	N/A

Reference	County	Council	Scheme Type	Location	Description	Best Value Plan within 2km
ALL.LON.TOW2	Greater London	Tower Hamlets	Site Allocation	SEE IMAGE	Housing and retail allocation.	N/A
ALL.LON.TOW3	Greater London	Tower Hamlets	Site Allocation	SEE IMAGE	Housing and employment allocation.	N/A
ALL.LON.TOW4	Greater London	Tower Hamlets	Site Allocation	SEE IMAGE	Housing and employment allocation.	N/A
ALL.LON.TOW5	Greater London	Tower Hamlets	Site Allocation	SEE IMAGE	Housing and employment allocation.	N/A
ALL.LON.TOW6	Greater London	Tower Hamlets	Site Allocation	SEE IMAGE	Housing and employment allocation.	N/A
ALL.LON.TOW7	Greater London	Tower Hamlets	Site Allocation	SEE IMAGE	Housing allocation.	N/A
ALL.LON.TOW8	Greater London	Tower Hamlets	Site Allocation	SEE IMAGE	Housing and employment allocation.	N/A
ALL.LON.TOW9	Greater London	Tower Hamlets	Site Allocation	SEE IMAGE	Housing and employment allocation.	N/A
ALL.LON.TOW10	Greater London	Tower Hamlets	Site Allocation	SEE IMAGE	Housing and employment allocation.	N/A
ALL.LON.TOW11	Greater London	Tower Hamlets	Site Allocation	SEE IMAGE	Housing and employment allocation.	N/A
ALL.LON.TOW12	Greater London	Tower Hamlets	Site Allocation	SEE IMAGE	Housing and employment allocation.	N/A
ALL.LON.TOW13	Greater London	Tower Hamlets	Site Allocation	SEE IMAGE	Housing and employment allocation.	N/A
ALL.LON.TOW14	Greater London	Tower Hamlets	Site Allocation	SEE IMAGE	Housing and employment allocation.	N/A
ALL.LON.TOW15	Greater London	Tower Hamlets	Site Allocation	SEE IMAGE	Housing and employment allocation.	N/A
ALL.LON.TOW16	Greater London	Tower Hamlets	Site Allocation	SEE IMAGE	Housing and employment allocation.	N/A
ALL.LON.TOW17	Greater London	Tower Hamlets	Site Allocation	SEE IMAGE	Housing and employment allocation.	N/A
ALL.LON.WAN1	Greater London	Wandsworth	Emerging Site Allocation	Ram Street/Armoury Way, Wandsworth, SW18	Mixed use development including residential, replacement economic floorspace; retail, restaurants, business space, cultural, and entertainment uses with provision for a riverside walk.	TWU_LON_HI-ROC_NET_CNO_hampton-battersea
ALL.LON.WAN2	Greater London	Wandsworth	Emerging Site Allocation	Armoury Way, SW18	Development should provide a mix of residential and intensified economic uses, including cultural workspace and provision for SMEs.	TWU_LON_HI-ROC_NET_CNO_hampton-battersea

Reference	County	Council	Scheme Type	Location	Description	Best Value Plan within 2km
ALL.LON.WAN3	Greater London	Wandsworth	Emerging Site Allocation	The site is located to the east of the junction of the A3205 (Nine Elms Lane/Battersea Park Road) and 'A Road', which separates this site and 41-49 Nine Elms Lane, and 49-59 Battersea Park Road site (NE2).	Residential-led, mixed-use development with retail and flexible workspace, a permeable network of new streets and urban spaces, and publicly accessible open space (forming part of Nine Elms Park).	TWU_LON_HI-ROC_NET_CNO_hampton-battersea
ALL.LON.WAN4	Greater London	Wandsworth	Emerging Site Allocation	Burntwood Lane / Glenburnie Road, SW17	New and improved hospital facilities, residential and small-scale commercial / retail use serving the hospital, residential and school facilities.	N/A
ALL.HAM.BAS1	Hampshire	Basingstoke and Deane	Local Plan Allocation	Manydown, west of Basingstoke	290 hectare site that will deliver a high quality mixed use development that will provide for the phased delivery of approximately 3,400 dwellings.	N/A
ALL.HER.BRO1	Hertfordshire	Broxbourne	Local Plan Allocation	Brookfield Garden Village	Brookfield Garden Village is expected to provide approximately 1,250 new homes (40% of which should be affordable); elderly persons' accommodation; a primary school providing 3 forms of entry; open space for leisure and recreation;	N/A
ALL.HAM.BAS2	Hampshire	Basingstoke and Deane	Local Plan Allocation	Basingstoke Golf Course, south west of Basingstoke	44.5 hectare site that will deliver a high quality mixed-use development that will: a) Make provision for approximately 1,000 dwellings.	N/A
ALL.HAM.BAS3	Hampshire	Basingstoke and Deane	Local Plan Allocation	Hounsome Fields, south west of Basingstoke	43 hectare site lies to the south west of Basingstoke and will deliver a high quality mixed-use development that will: a) Make provision for approximately 750 dwellings.	N/A
ALL.HER.BRO2	Hertfordshire	Broxbourne	Local Plan Allocation	Chesnut Lakeside	Cheshunt Lakeside will be developed as a new mixed use urban village to accommodate: 1. c. 1,750 new homes; 2. 40% affordable homes; 3. Buildings limited to a maximum of 8 storeys in height; 4. Elderly persons' accommodation; 5. Approximately 20,000 square metres.	N/A

Reference	County	Council	Scheme Type	Location	Description	Best Value Plan within 2km
ALL.HER.DAC1	Hertfordshire	Dacorum	Local Plan Allocation	West Hemel Hempstead	Local Allocation LA3 at West Hemel Hempstead as identified on the Policies Map has been released from the Green Belt and will deliver the following: 900 new homes; shop, doctors surgery, and additional social and community provision.	N/A
ALL.HER.EAS1	Hertfordshire	East Hertfordshire	Local Plan Allocation	Bishop's Stortford South	750 dwellings.	N/A
ALL.HER.EAS2	Hertfordshire	East Hertfordshire	Local Plan Allocation	The Goods Yard, Bishop's Stortford	600 dwellings.	N/A
ALL.HER.EAS3	Hertfordshire	East Hertfordshire	Local Plan Allocation	West of Hertford	550 dwellings.	N/A
ALL.HER.EAS4	Hertfordshire	East Hertfordshire	Local Plan Allocation	East of Stevenage	600 dwellings.	N/A
ALL.HER.EAS5	Hertfordshire	East Hertfordshire	Local Plan Allocation	Land North and East of Ware	1000 dwellings.	N/A
ALL.HER.EAS6	Hertfordshire	East Hertfordshire	Local Plan Allocation	The Gilston Area	3050 dwellings.	N/A
ALL.HER.EAS7	Hertfordshire	East Hertfordshire	Local Plan Allocation	Land East of Welwyn Garden City	1350 dwellings.	N/A
ALL.MIN.HER1	Hertfordshire	Hertfordshire	Emerging Minerals Allocation	Located to the east of Stanstead Abbotts, between the A414 and B180 Easting: 540509, Northing: 212096	Sand and Gravel site. Extraction expected to take 18 years.	N/A
ALL.HER.BRO3	Hertfordshire	Broxbourne	Local Plan Allocation	Rosedale Park	Rosedale Park will be developed as a series of interlinked new suburban parkland communities as follows: Rosedale Park South (Tudor Nursery and environs) approximately 360 new homes; South of Andrews Lane and East of Burton Lane approximately 60 homes;	N/A

Reference	County	Council	Scheme Type	Location	Description	Best Value Plan within 2km
ALL.OXF.CHE2	Oxfordshire	Cherwell	Site Allocation	Graven Hill	This predominantly brownfield site to the south of Bicester is proposed for a mixed-use development of 2,100 dwellings, significant employment land providing for high quality job opportunities, associated services, facilities and other infrastructure.	N/A
ALL.OXF.CHE3	Oxfordshire	Cherwell	Site Allocation	South West Bicester	726 homes with associated services, facilities and other infrastructure.	N/A
ALL.OXF.CHE4	Oxfordshire	Cherwell	Site Allocation	Banbury Canalside	Provision of new homes, retail, office and leisure uses, public open space, pedestrian and cycle routes including new footbridges over the railway line, river and canal, and multi-storey car parks to serve Banbury railway station.	N/A
ALL.OXF.CHE5	Oxfordshire	Cherwell	Site Allocation	Hardwick Farm, Southam Road (East and West)	Residential development (of approximately 600 dwellings).	N/A
ALL.OXF.CHE7	Oxfordshire	Cherwell	Site Allocation	North of Hanwell Fields	Residential-led strategic development site will provide approximately 544 dwellings with associated facilities.	N/A
ALL.OXF.CHE8	Oxfordshire	Cherwell	Site Allocation	South of Salt Way - East	New neighbourhood of up to 1,345 dwellings with associated facilities and infrastructure as part of South West Banbury.	N/A
ALL.OXF.CHE9	Oxfordshire	Cherwell	Site Allocation	Former RAF Upper Heyford	A settlement of approximately 1,600 dwellings (in addition to the 761 dwellings (net) already permitted) and necessary supporting infrastructure, including primary and secondary education provision and appropriate community.	N/A
ALL.OXF.OXF1	Oxfordshire	Oxford	Site Allocation	Thornhill Park	Planning permission will be granted for a residential-led mixed use redevelopment of the Thornhill Park site. This should include some employment use, given the strategic location of the site. Other complementary uses will be considered on their merits.	N/A
ALL.OXF.SOU1	Oxfordshire	South Oxfordshire	Site Allocation	Didcot Garden Town	At Didcot, provision will be made for around 6,399* new homes between 2011 and 2035.	N/A

Reference	County	Council	Scheme Type	Location	Description	Best Value Plan within 2km
ALL.OXF.WES1	Oxfordshire	West Oxfordshire	Site Allocation	Land to the north of Witney	Land to the north of Witney to accommodate a sustainable, integrated community that forms a positive addition to Witney, including about 1,400 homes with a balanced and appropriate mix of residential accommodation to meet identified needs.	N/A
ALL.OXF.WES2	Oxfordshire	West Oxfordshire	Site Allocation	Land to the east of Chipping Norton	Land to the east of Chipping Norton to accommodate a sustainable, integrated community that forms a positive addition to the town, including about 1,200 homes with a balanced and appropriate mix of residential accommodation to meet identified needs.	N/A
ALL.OXF.WES3	Oxfordshire	West Oxfordshire	Site Allocation	Land to the north of the A40, near Eynsham	Land to the north of Witney to accommodate a sustainable, integrated community that forms a positive addition to Witney, including about 1,400 homes with a balanced and appropriate mix of residential accommodation to meet identified needs.	N/A
ALL.OXF.WES4	Oxfordshire	West Oxfordshire	Site Allocation	Land to the west of Eynsham	Land to the west of Eynsham to accommodate a sustainable integrated community that forms a positive addition to Eynsham, including: about 1,000 homes with a balanced and appropriate mix of house types and tenures to meet identified needs.	N/A
ALL.SUR.GUI1	Surrey	Guildford	Local Plan Allocation	Slyfield Area Regeneration Project, Guildford	Mixed-use development including 1000 dwellings.	TWU_GUI_HI-GRW_ALL_ALL_dapdune roc
ALL.SUR.GUI2	Surrey	Guildford	Local Plan Allocation	Gosden Hill Farm, Merrow Lane, Guildford	Mixed-use development including 1700 dwellings.	N/A
ALL.SUR.GUI3	Surrey	Guildford	Local Plan Allocation	Blackwell Farm, Hogs Back, Guildford	Mixed-use development including 1500 dwellings.	TWU_GUI_HI-TFR_RZ5_ALL_sewtogui
ALL.SUR.GUI4	Surrey	Guildford	Local Plan Allocation	Land to the south and east of Ash and Tongham	1750 homes (C3) and new road and footbridge.	N/A
ALL.SUR.GUI5	Surrey	Guildford	Local Plan Allocation	Former Wisley airfield, Ockham	Mixed-use development including 2000 dwellings.	N/A

Reference	County	Council	Scheme Type	Location	Description	Best Value Plan within 2km
ALL.SUR.GUI6	Surrey	Guildford	Local Plan Allocation	Land at Garlick's Arch, Send Marsh Burnt Common and Ripley	Homes (C3) and Travelling Showpeople plots (sui generis) comprising 550 dwellings	N/A
ALL.MIN.WIL1	Wiltshire & Swindon	Wiltshire & Swindon	Minerals Allocation	Grid reference: E 413500 N 197000	Sand and Gravel site.	N/A
ALL.MIN.WIL2	Wiltshire & Swindon	Wiltshire & Swindon	Minerals Allocation	Grid reference: E 414200 N 196400	Sand and Gravel site.	N/A
ALL.MIN.WIL3	Wiltshire & Swindon	Wiltshire & Swindon	Minerals Allocation	Grid reference: E 413600 N 195700	Sand and Gravel site.	N/A
ALL.MIN.WIL4	Wiltshire & Swindon	Wiltshire & Swindon	Minerals Allocation	Grid reference: E 411900 N 193800	Sand and Gravel site.	N/A
ALL.MIN.WIL5	Wiltshire & Swindon	Wiltshire & Swindon	Minerals Allocation	Grid reference: E 403600 N 195600	Sand and Gravel site.	N/A
ALL.WAS.WIL6	Wiltshire & Swindon	Wiltshire & Swindon	Waste Allocation	Grid reference 405054 183946	Landfill/landraise extension and Waste Treatment	N/A
ALL.WAS.WIL7	Wiltshire & Swindon	Wiltshire & Swindon	Waste Allocation	Grid reference 413200 190900	Waste Treatment (energy from waste).	N/A
ALL.WAS.WIL8	Wiltshire & Swindon	Wiltshire & Swindon	Waste Allocation	Grid reference 413199 186317	Local Recycling, Inert Waste Recycling /Transfer and Waste Treatment.	N/A
ALL.WAS.WIL1	Wiltshire & Swindon	Wiltshire & Swindon	Waste Allocation	Grid reference 407675 188866	Materials Recovery Facility/Waste Transfer Station, Local Recycling, Inert Waste Recycling/Transfer and Waste Treatment.	N/A
ALL.WAS.WIL2	Wiltshire & Swindon	Wiltshire & Swindon	Waste Allocation	Grid reference 408777 188722	Materials Recovery Facility/Waste Transfer Station, Local Recycling and Waste Treatment.	N/A
ALL.WAS.WIL3	Wiltshire & Swindon	Wiltshire & Swindon	Waste Allocation	Grid reference 402156 170841	Waste Treatment (excluding energy from waste).	N/A
ALL.WAS.WIL4	Wiltshire & Swindon	Wiltshire & Swindon	Waste Allocation	Grid reference 392539 179518	Materials Recovery Facility/Waste Transfer Station, Local Recycling and Waste Treatment.	N/A
ALL.WAS.WIL5	Wiltshire & Swindon	Wiltshire & Swindon	Waste Allocation	Grid reference 391965 179461	Materials Recovery Facility/Waste Transfer Station, Local Recycling, Inert Waste Recycling/Transfer and Waste Treatment.	N/A

Reference	County	Council	Scheme Type	Location	Description	Best Value Plan within 2km
ALL.WIL.SWI1	Wiltshire & Swindon	Swindon	Local Plan Allocation	N/A	Land at Wichelstowe, as defined on the Policies Map, is allocated for a mixed-use development. b. The development at Wichelstowe shall provide: a total of 4,500 homes (including those already completed) at an average density of 40 dwellings per hectare.	N/A
ALL.WIL.SWI2	Wiltshire & Swindon	Swindon	Local Plan Allocation	N/A	Land to the East of the A419, as defined on the Policies Map, is allocated for a mixed-use development. The form of the development shall comprise a series of new inter-connected distinct villages and an expanded South Marston village defined by the network.	N/A
ALL.WIL.WIL1	Wiltshire & Swindon	Wiltshire	Local Plan Allocation	Land at Netherhampton Road	640 dwellings.	N/A
ALL.WAS.LON10	Greater London	North London Waste Authority	Waste Allocation	N/A	Waste transfer, Recycling, Composting, including indoor in-vessel composting and outdoor composting. Areas not lying within Flood Zone 3 are potentially suitable to handle hazardous waste.	N/A
ALL.WAS.LON9	Greater London	North London Waste Authority	Waste Allocation	N/A	Thermal treatment, anaerobic digestion, pyrolysis/gasification, mechanical biological treatment, waste transfer, processing and recycling.	TWU_KGV_HI-TFR_KGV_ALL_lockwood ps-kgv res
ALL.WAS.LON7	Greater London	North London Waste Authority	Waste Allocation	Industrial Site occupied by a Hackney Council Waste Transfer Station and Fleet Depot and a Power Station	Waste Transfer which is protected under the London Plan. Areas which are not within flood zone 3 are potentially suitable to handle hazardous waste.	N/A
ALL.LON.HAR1	Greater London	Haringey	Site Allocation	Clarendon Square, Hornsey Park Rd, Mayes Rd, Clarendon Rd, N8	1080 net residential units.	N/A
ALL.OXF.CHE1	Oxfordshire	Cherwell	Site Allocation	North West Bicester	A new zero carbon mixed use development including 6,000 homes will be developed on land identified at North West Bicester.	N/A

Reference	County	Council	Scheme Type	Location	Description	Best Value Plan within 2km
ALL.OXF.SOU2	Oxfordshire	South Oxfordshire	Site Allocation	West of Wallingford	Land within the allocation at West of Wallingford will be developed to deliver approximately 555 new homes.	N/A
ALL.BUC.AYL5	Buckinghamshire	Aylesbury Vale	Local Plan Allocation	Berryfields	2,885 homes built up to 2020, 487 homes to be delivered 2020-2025 and no homes to be delivered 2025-2033. 9ha of employment and a district centre.	N/A
ALL.BUC.AYL1	Buckinghamshire	Aylesbury Vale	Local Plan Allocation	South Aylesbury	95ha site allocated for 1,000 dwellings, primary school, multi-functional green infrastructure, Aylesbury South East Link Road (A413 to B4443 Lower Road), local centre cycling and walking link.	N/A
ALL.BUC.AYL2	Buckinghamshire	Aylesbury Vale	Local Plan Allocation	South west Aylesbury	113ha site allocated for at least 1,490 dwellings up to 2033, primary school, multi-functional green infrastructure (totalling 56.33ha), strategic flood defences and surface water attenuation.	N/A
ALL.BUC.AYL3	Buckinghamshire	Aylesbury Vale	Local Plan Allocation	Aylesbury north of A41	Around 102,800 sqm of employment land (appropriate class E (25,600sqm), B2 (44,400 sqm) and B8 (32,800 sqm)). At least 1,747 dwellings up to 2033 (including custom and self-build units). 60 residential extra care units (Use Class C2).	N/A
ALL.BUC.AYL4	Buckinghamshire	Aylesbury Vale	Local Plan Allocation	Aylesbury south of A41	At least 2,913 dwellings 60-bed care home/extra care facility Land for a park & ride site 6.90ha of employment land Two primary schools A mixed use local centre Multi-functional green infrastructure (totalling 108.43ha) Strategic flood defences.	N/A
ALL.BUC.AYL6	Buckinghamshire	Aylesbury Vale	Local Plan Allocation	Kingsbrook	2,450 homes 10ha employment Two primary schools A neighbourhood centre Construction of the northern section of the Eastern Link Road and the rural section of the Stocklake Link road.	N/A
ALL.BUC.AYL7	Buckinghamshire	Aylesbury Vale	Local Plan Allocation	Land south of the A421 and east of Whaddon Road, Newton Longville	300 homes to be delivered 2020-2025 and 1,555 homes to be delivered 2025-2033.	N/A

Reference	County	Council	Scheme Type	Location	Description	Best Value Plan within 2km
ALL.BUC.AYL8	Buckinghamshire	Aylesbury Vale	Local Plan Allocation	Shenley Park	The development will provide a balanced mix of facilities to ensure that it meets the needs and aspirations of new and existing residents, at least 1,150 homes, 110 bed care home/extra care facility, new primary school, subject to need a site.	N/A
ALL.BUC.AYL9	Buckinghamshire	Aylesbury Vale	Local Plan Allocation	RAF Halton	At least 1,000 homes during the Plan period and associated infrastructure, services and facilities including a primary school, new local centre, new access routes if needed and new green infrastructure.	N/A
ALL.BUC.WYC1	Buckinghamshire	Wycombe	Local Plan Allocation	Abbey Barn South and Wycombe Summit	505 dwellings.	N/A
ALL.BUC.WYC2	Buckinghamshire	Wycombe	Local Plan Allocation	Gomm Valley and Ashwells	530 dwellings.	N/A
ALL.BUC.WYC3	Buckinghamshire	Wycombe	Local Plan Allocation	Terriers Farm and Terriers House	500 dwellings.	N/A
ALL.BUC.WYC4	Buckinghamshire	Wycombe	Local Plan Allocation	Princes Risborough Expansion Area	1662 dwellings.	N/A
ALL.LON.RED2	Greater London	Redbridge	Site Allocation	Land in and around King George/ Goodmayes Hospitals	The site is proposed to be comprehensively redeveloped to deliver approximately 500 new homes, new secondary school, health/community hub and open space/sport provision. The existing King George Hospital and Sunflowers Court will be retained.	N/A
ALL.LON.K&C1	Greater London	Kensington and Chelsea	Site Allocation	Kensal Canalside Opportunity Area	Comprehensive development of the site, including a minimum of: i. 3,500 new residential (C3) units; ii. 10,000sq.m of new offices; iii. 2,000sq.m of new non-residential floorspace, including social and community and local shopping facilities	N/A
ALL.LON.RED5	Greater London	Redbridge	Site Allocation	Billet Road	The site is proposed to be comprehensively redeveloped to deliver approximately 800 new homes, a new secondary school and public open space and sports provision.	TWU_KVZ_HI-TFR_UTC_ALL_thamestofobney

Reference	County	Council	Scheme Type	Location	Description	Best Value Plan within 2km
ALL.OXF.CHE6	Oxfordshire	Cherwell	Site Allocation	Bankside Phase 2	600 homes with associated services, facilities and other infrastructure.	TWU_KVZ_HI-TFR_UTC_ALL_thamestofobney

17.3 Options post 2050

There are a small number of options in the BVP which are scheduled post-2050. As outlined in the Assumptions and Limitations in Section 1.3 the HRA assessments for these options have not been carried out in the absence of pre-existing assessments from WRMP19. AA and the assessment of cumulative effects provided primarily focusses on schemes up to 2050, with schemes post-2050 considered on a lighter touch basis. This is because post-2050 there is less certainty regarding the status/condition of environment and any assessments would be undertaken in an overly precautionary manner. A summary of post-2050 BVP options is outlined in Table 17.3.

Table 17.3: Options scheduled post-50

Option ID	Screening Outcome	Comment
TWU_KGV_HI-REU_RE1_CNO_deephams reuse 46.5b	Potential LSE Identified for: Lee Valley Ramsar Lee Valley SPA Epping Forest SAC Epping Forest SAC	At WRMP19 the AA concluded no adverse effects: If the mitigation measures described in the 'Assessment of effects on quantifying features' section can be imposed and implemented, then it can be reasonably concluded that the proposed option will not have an adverse effect on the integrity of any SACs, SPAs and Ramsar sites.
TWU_LON_HI-GRW_ALL_ALL_merton recommission	NLSE Identified	No further assessment needed
TWU_LON_HI-ROC_WT1_CNO_kemptonwtw100 p1	Potential LSE Identified for: South West London Waterbodies SPA South West London Waterbodies Ramsar	At WRMP19 the AA concluded no adverse effects: If the mitigation measures described in the 'Assessment of effects on quantifying features' section can be imposed and implemented, then it can be reasonably concluded that the proposed option will not have an adverse effect on the integrity of any SACs, SPAs and Ramsar sites.
TWU_STT_HI-RAB_RE1_ALL_p10-500-vyrnwy_180_b	Please see STT SRO Assessment	
TWU_STT_HI-RAB_RE1_ALL_p7-500-vyrnwy_135_b	As above	
TWU_STT_HI-RAB_RE1_ALL_p8-500-vyrnwy_155_b	As above	
TWU_STT_HI-REU_RE1_ALL_p11-500-min_115_p2	As above	
TWU_STT_HI-REU_RE1_ALL_p7-500-minworth_115	As above	

18 Conclusions and Recommendations

This HRA Stage 2 AA, undertaken at plan level, concluded that all of the 16 BVP options evaluated at AA in this report are unlikely to result in adverse effects on the integrity of the Designated Sites (alone) after mitigation has been implemented. However, further investigation on the use of functionally linked habitat by qualifying species to assess potential adverse effects in more detail and determine more targeted mitigation measures is recommended for two of the BVP options to better inform mitigations and reduce uncertainties:

- South East Water to Guildford (ID: TWU_GUI_HI-TFR_RZ5_ALL_sewtogui) – No adverse effects on the Designated Sites' integrity identified, but potential adverse effects in relation to changes to the extent and distribution of qualifying features on Thames Basin Heaths SPA and Thursley, Ash, Pirbright and Chobham SAC. Further studies to better understand how the qualifying species uses linked habitats are required and habitat suitability and birds surveys are therefore recommended. Given this option location and layout design, an opportunity for habitat enhancement should also be explored.
- Four options forming part of the STT SRO Option - No adverse effects on the Designated Sites' integrity was concluded but further studies on the Severn Estuary SPA and Ramsar are proposed as part of Gate 3 to better understand how the qualifying bird species use the linked habitats. Clarification on the current condition of the Severn Estuary SAC features is also needed. Fish surveys to determine habitat suitability and potential effects on migratory species and lampreys are equally recommended and involve the connections between the Severn Estuary, the River Clun SAC, the River Usk SAC and the River Wye SAC. At the outfall location of Vyrnwy Bypass, habitat surveys to determine if suitable silt beds are present for lamprey ammocoetes is particularly suggested. Opportunities for habitat enhancement across this region are encouraged to be explored.

In this report, all the 16 options that have progressed to Stage 2 AA have the potential to adversely affect the integrity of Designated Sites without mitigation through the following pathways:

- Physical loss during the construction of the pipelines and their associated built infrastructure. This may also include loss of land functionally linked to the Designated sites and used by qualifying species with large distribution ranges like birds.
- Physical damage, including habitat degradation as a result of water quality changes in case of pollution events may affect qualifying species.
- Non-physical disturbance caused by noise/vibration, visual presence and light pollution leading to the displacement of qualifying bird species from foraging areas.
- Toxic contamination leading to biomass reduction and food web disruptions that may affect the life cycle of qualifying species.
- Non-toxic contamination as a result of changes in water turbidity, sediment loading and silt deposition.
- Biological disturbances, including direct mortality, changes to habitat availability and changes in species abundance or distribution, e.g. changes in natural succession.

However, assuming that all proposed mitigation measures are implemented, it is considered that there will not be a significant change in:

- The extent and distribution of qualifying species.
- The structure and function of the habitats of qualifying species.

- The supporting processes on which habitats of qualifying species rely for three out of the four options evaluated.

The following 15 options have been subject to a HRA level 1 screening. None of them had LSE identified. The screening for these options is presented in Annex A. These are:

- Wessex Water to SWOX (Flaxlands) (ID: TWU_SWX_HI-IMP_SWX_ALL_wessextoswoxflax).
- Henley to SWOX - 5 Ml/d (ID: TWU_SWX_HI-TFR_HEN_ALL_henley-swox5).
- Thames Water (SWA) to Thames Water (SWOX) Conveyance (ID: TWU_SWX_HI-TFR_SWA_ALL_tw(swa)to(swx)con).
- Thames Water (Kennet Valley) to Thames Water (Henley) Conveyance (ID: TWU_HEN_HI-TFR_KVZ_ALL_tw(kv)to(hen)con).
- Groundwater Addington (ID: TWU_LON_HI-GRW_ALL_ALL_addington gw).
- Southfleet/Greenhithe (new WTW) (ID: TWU_LON_HI-GRW_ALL_ALL_s'fleet lic disagg)
- Woods Farm Increase DO (ID: TWU_SWX_HI-GRW_ALL_ALL_woods farm do).
- Dapdune Licence Disaggregation (ID: TWU_GUI_HI-GRW_ALL_ALL_dapdune lic disagg).
- Mortimer Disused Source (Recommission) (ID: TWU_KVZ_HI-GRW_ALL_ALL_mortimer recomm).
- Britwell Removal of Constraints (ID: TWU_SWX_HI-GRW_RE1_ALL_britwell roc).
- ASR Horton Kirby (ID: TWU_LON_HI-GRW_RE1_ALL_asrhortonkirby).
- Mogden to Teddington outfall 75 Ml/d (ID: TWU_TED_HI-TFR_TED_ALL_teddingtondramog/ted).
- Teddington DRA 75 MLD - Construction (TWU_TED_HI-RAB_RE1_CNO_teddington dra 75).
- TLT extension from Lockwood PS to King George V Reservoir intake (ID: TWU_KGV_HI-TFR_KGV_ALL_lockwood ps-kgv res).
- Direct River Abstraction - Teddington to Thames Lee Tunnel Shaft 75 MLD (ID: TWU_KGV_HI-TFR_TED_ALL_teddingtondrated/tlt).

As No LSE have been identified for all these options no further stages of HRA are required.

The final two BVP options (of the 33 supply options included in the pathway 4 of Thames Water's WRMP24 BVP) are two drought plan options:

- DP- Playhatch-KV and DP-Gatehampton-SWOX. DP-Playhatch-KV (ID: TWU_KVZ_RE-DRP_ALL_ALL_dp-playhatch-kv).
- DP-Gatehampton-SWOX (ID: TWU_SWX_RE-DRP_ALL_ALL_dp-gatehampton-swox).

These two options were not subject to a HRA process within this report due to the SEA report that was undertaken for Thames Water's drought plan concluding a HRA was not necessary as potential effects were unlikely[7].However, an in-combination assessment including other plans or projects will have to be performed as part of the HRA (Stage 2) AA to confirm that no further stages in the HRA process will be necessary.

In relation to the In-combination effects of options included in this report, the assessment shows that two Designated Sites may be affected and during the construction phases only:

- Cothill Fen SAC may be affected by two options within Thames Water BVP WRMP24:
  - SWOX to SWA (ID: TWU_SWA_HI-TFR_SWX_ALL_swoxswa48); and
  - Abingdon to Farmoor Reservoir pipeline (ID: TWU_SWX_HI-TFR_STR_ALL_abing-farmoor pipe).

- Oxford Meadows SAC may be affected by two options within this report:
  - SWOX to SWA (BVP option located at approximately 0.2km distance and detailed in Table 10.2).
  - Dukes Cut to Farmoor (located at approximately 0.9km distance and detailed in Table 16.2)

It is considered that with adherence to the proposed mitigation in this report outlined, the proposed works are not expected to have any significant adverse effects on the overall integrity of Cothill Fen SAC and their features alone during the construction phase of the proposed options. However, it is possible for in-combination effects to result during the construction phases of these options. Therefore, further studies are required to estimate potential damages on this SAC. The potential for in-combination effects for the different options should be updated in light of these studies findings.

Similarly, it is considered that with adherence to the proposed mitigation outlined in this report, the proposed works are not expected to have any significant adverse effects on the overall integrity of Oxford Meadows SAC and its features alone during the construction phase of the proposed options. However, as outlined above for Cothill Fen SAC, as the timescale for the otions works are to overlap, it is possible for in-combination effects to result during the construction phases of these options. Further studies are required to estimate magnitude of potential effects on this SAC from the two options to inform more specific mitigation measures to be applied during construction phases of both options. These studies should be completed for supporting the HRA undertaken at planning application.

In relation to the Inter-Plan cumulative effects, the list of plans and developments identified for the Thames Water region are presented in Table 17.2. At this stage it is not possible to quantify and detail the inter-plan cumulative impacts expected as part of the BVP due to the early stages in options design. Similarly, it is not possible to identify the pathways and the Designated Sites that could result in cumulative effects within the plans and developments listed. A next step in this assessment will include listing the potential effects of the plans and/or projects based on existing HRAs carried out for the same plans and developments. Consideration of the proposed timings also needs to be taken to further refine this assessment. This assessment needs to be undertaken as the design of the options progresses particularly at the project level.

The recommended mitigation measures detailed within this document assume a worst-case scenario at this stage, in the absence of detailed survey data or local records. As such, they are appropriate to avoid adverse effects on the Designated Sites. The receipt of additional data may provide evidence that there will be no adverse effects on Designated Sites even in the absence of mitigation; in this scenario this document should be revised accordingly.

In addition to best practice measures for construction, the mitigation measures proposed to avoid effects during the construction phase include sensitive timings of works to avoid key periods for overwintering bird populations. It is also recommended that a CEMP be put in place that will include the proposed mitigation measures in this AA as well as any other specific measures identified following a HRA undertaken at project level.

This report will be sent for consultation with the relevant nature conservation authorities and the public. Further design iterations will require revisions to this document and may result in changes to the current conclusion.

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A. HRA Screening Review Results

A.1 South East Water to Guildford (ID: TWU_GUI_HI-TFR_RZ5_ALL_sewtogui) Option Stage 1 screening review results

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
ID: TWU_GUI_HI-TFR_RZ5_ALL_sewtogui	South East Water to Guildford Option	10Ml/d transfer from South East Water (Hogsback) to Mount SR Guildford	Thames Basin Heaths SPA (0.05km)	Article 4.1 Qualification - During the breeding season the SPA regularly supports 1% or more of the Great Britain (GB) populations of the following species listed in Annex I: A302 Dartford Warbler (*Sylvia undata*) - 27.8% of the GB population A224 Nightjar (*Caprimulgus europaeus*) - 7.8% of the GB population A246 Woodlark (*Lullula arborea*) - 9.9% of the GB population Non-qualifying species of interest: Hen harrier (*Circus cyaneus*) Merlin (*Falco columbarius*) Short-eared owl (*Asio flammeus*) Kingfisher (*Alcedo atthis*) (all Annex I species) occur in nonbreeding numbers of less than European importance (less than 1% of the GB population).	Likely Significant Effects	The construction of this section of pipeline is likely to have adverse effects on the breeding populations of the qualifying bird species. Although habitat loss upon this site itself might be negligible, disturbance due to noise, vibration, light and disturbance due to human presence are likely to affect breeding pairs during construction. No operational effects are identified.

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
			Thursley, Ash, Pirbright and Chobham SAC (approx. 0.05km)	Annex I habitats that are a primary reason for selection of this site: 4010 Northern Atlantic wet heaths with (*Erica tetralix*) 4030 European dry heaths 7150 Depressions on peat substrates of the Rhynchosporion	Likely Significant Effects	The construction of these pipelines may adversely affect this site qualifying habitats during construction phase. During operational phase, effects to the groundwater altering movement to/from the designated site, cannot be dismissed. Excess production of dust during construction could result in dust deposition on habitats, with likely adverse effects.
			Thursley, Hankley & Frensham Commons SPA (approx. 5km)	Dartford warbler (*Sylvia undata*) - A302, b Nightjar (*Caprimulgus europaeus*) - A224, b Woodlark (*Lullula arborea*) - A246, b	No Likely Significant Effects	This site is sufficiently distant to not result in effects related to light/ noise/ anthropogenic disturbances during construction phase of this option. This site is not hydrologically connection to the option footprint. No pathways are identified where this option could affect this Designated Site and/or its qualifying features during construction and/or operational phases.
			Thursley & Ockley Bogs Ramsar Site (approx. 7km)	Ramsar Site criterion 2 Supports a community of rare wetland invertebrate species including notable numbers of breeding dragonflies. Ramsar Site criterion 3 It is one of few sites in Britain to support all six native reptile species. The site also supports nationally important breeding populations of European nightjar	No Likely Significant Effects	This site is sufficiently distant to not result in effects related to light/ noise/ anthropogenic disturbances during construction phase of this option. This site is not hydrologically connection to the option footprint. No pathways are identified where this option could affect this Designated Site and/or its qualifying features during construction and/or operational phases.

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				(*Caprimulgus europaeus)* and woodlark (*Lullula arborea*)		
			Windsor Forest & Great Park SAC (approx. 9km)	H9120 Atlantic acidophilous beech forests with (*Ilex* sp.) H9190 Old acidophilous oak woods with (*Q. robur*) on sandy plains S1079 Violet click beetle (*Limoniscus violaceus*)	No Likely Significant Effects	This site is sufficiently distant to not result in effects related to light/ noise/ anthropogenic disturbances during construction phase of this option. This site is not hydrologically connection to the option footprint. No pathways are identified where this option could affect this Designated Site and/or its qualifying features during construction and/or operational phases.

A.2 T2ST Culham to Speen transfer Option (ID: TWU_KVZ_HI-TFR_T2S_ALL_t2st cul to speen) Stage 1 screening review results

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_KVZ_HI-TFR_T2S_ALL_t2st cul to speen	T2ST Culham to Speen transfer Option	This option proposes a new pipeline to allow 10Ml/d spur connection water transfer from Culham T2ST to Speen WTW.	Kennet & Lambourn Floodplain SAC (approx. 0.1km)	Annex II species that are a primary reason for selection of this site • 1016 Desmoulin's whorl snail (*Vertigo moulinsiana*)	Potential for Likely Significant Effects	This SAC is designated for supporting one of the most extensive known populations of desmoulin's whorl snail in the UK and is one of the only two sites representing the species in chalk stream habitats. The integrity of this species population relies on ecological measures, such as habitat creation, to safeguard populations. This site is located at approximately 100m of the proposed works footprint and in the same water catchment area (groundwater and surface) of the

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
						option. However, no changes in groundwater levels as well in flows are anticipated. The new proposed pipeline route does not currently cross any immediate waterbody, although it is close to the River Kennet (<200m) which feeds this SAC. Therefore, given the option's close location to this site, temporary and permanent effects related to the construction works are likely to be observed. As a result, the following likely significant effects are identified during the construction of this option: • Physical damage - supporting habitat loss, edge effects, habitat damage. • Non-physical disturbance - anthropogenic disturbance and light disturbances related to the construction of the pipeline and associated structures. • Toxic contamination - air pollution (dust) and eventual water quality degradation from potential pollutions events, such as air pollution/pollution events affecting the River Kennet and indirectly this SAC. • Non-toxic contamination - air pollution (dust), temporary changes in turbidity, sedimentation and/or silting associated to run-off during construction when crossing waterbodies interconnected to the River Kennet. • Biological disturbances - changes to habitat availability and population reduction due to changes in habitat quality for example. No operation effects were identified at this stage.

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
			Kennet Valley Alderwoods SAC (approx. 0.6km)	Annex I habitats that are a primary reason for selection of this site • 91E0 Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, *Alnion incanae, Salicion albae*) * Priority feature	No Likely Significant Effects	This SAC comprises the largest fragments of alder-ash woodland on the Kennet floodplain, lie on alluvium overlain by a shallow layer of moderately calcareous peat. The wettest areas are dominated by alder (*Alnus glutinosa*) over tall herbs, sedges and reeds, but dryer patches include a base-rich woodland flora with much dog's mercury (*Mercurialis perennis)* and also herb-Paris (*Paris quadrifolia*). This site is located at approximately 600m of the proposed works footprint the new proposed pipeline route does not currently cross any immediate waterbody connected to this site. Therefore, given the distance between the option footprint to this site construction effects related to dust, light and anthropogenic disturbances are unlikely to be observed. No operation effects were identified at this stage. Therefore, no pathways have been identified through which this designated site and its qualifying features could be affected by this option during construction and operation phases.
			River Lambourn SAC (approx. 1km)	S1166 Great crested newt, (*Triturus cristatus*)	No Likely Significant Effects	This SAC is an example of sub-type 1 in central southern England, a chalk stream discharging into the middle reaches of the Thames system. For part of its length, it is a winterbourne, drying through the summer months. It is one of the least-modified rivers of this type, with a characteristic flora dominated by pond water-crowfoot and stream water-crowfoot. This site is designated for supporting these

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
						macrophyte species in addition to important native fish, such as the bullhead and brook lamprey. This site is located at approximately 1km of the proposed works footprint. Given the distance between this site and the option footprint, and as the new proposed pipeline route does not cross any immediate waterbody, potential construction effects are unlikely. Therefore, no pathways have been identified through which this designated site and its qualifying features could be affected by this option during construction and operation phases.

A.3 River Thames to Fobney Transfer Option (ID: TWU_KVZ_HI-TFR_UTC_ALL_thamestofobney) Stage 1 screening review results

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_KVZ_HI-TFR_UTC_ALL_thamestofobney	River Thames to Fobney Transfer Option	This option proposes to transfer water from the River Thames to Fobney, to supply 40Ml/d to Kennet Valley. Existing treatment facilities are available at Fobney, but a new pipeline and associated structures are proposed to support this transfer.	Hartslock Wood SAC (approx. 7km)	Annex I habitats that are a primary reason for site selection: • 6210 Semi-natural grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*)	No Likely Significant Effects	During construction, as this site is sufficiently distant from the option footprint (7km) light, dust and human related construction disturbances are unlikely. This site is also located upstream of the proposed works, therefore, pollution effects can equally be dismissed. Therefore, no pathways have been identified through which this designated site and its qualifying features could be affected by this option.

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				(*important orchid sites) • 91J0 (*Taxus baccata*) woods of the British Isles * Priority feature		
			Thames Basin Heaths SPA (approx. 8.5km)	Article 4.1 Qualification (79/409/EEC) During the breeding season the area regularly supports: • (*Caprimulgus europaeus*) 7.8% of the GB breeding population • (*Lullula arborea*) 9.9% of the GB breeding population • (*Sylvia undata*) 27.8% of the GB breeding population	No Likely Significant Effects	The designated site is hydrologically connected to the proposed pipeline via the River Whitewater, however, is located upstream of the option footprint, dismissing potential hydrological pollution effects. Given the distance between this site and the option footprint, potential construction effects are also unlikely. Therefore, no pathways have been identified through which this designated site and its qualifying features could be affected by this option during construction and operation phases.

A.4 TWRM extension - Hampton to Battersea Option (ID: TWU_LON_HI-ROC_NET_CNO_hampton-battersea) Stage 1 screening review results

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_LON_HI-ROC_NET_C	TWRM extension -	New ring main tunnel from Hampton to Battersea. The Hampton Battersea TWRM extension will be required	Richmond Park SAC (0km)	Annex II species that are a primary reason for selection of this site	Potential for Likely	Construction of the tunnels (not shafts) will not have an impact on the designated site and features due to the depth of the tunnels (30m-70m below the designated site. The tunnel will be

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
NO_hampton-battersea	Hampton to Battersea Option	when additional resources from the west and/or east of the London water resource zone (WRZ) are increased reach a trigger value. The extension tunnel will be 20km long and connect to the existing shafts at Hampton WTW and Battersea. Permanent land requirement of 2,000m^2 for shafts and temporary land requirement 30,000m^2.		• 1083 Stag beetle (*Lucanus cervus*) Richmond Park has a large number of ancient trees with decaying timber. It is at the heart of the south London centre of distribution for Stag beetle (*Lucanus cervus*) and is a site of national importance for the conservation of the fauna of invertebrates associated with the decaying timber of ancient trees.	Significant Effects	situated within the London Clay (an aquiclude) so it is hydrologically isolated from the SAC and therefore no disturbance to the designated features of the site. It is anticipated that no more than 200HGV movements per day are needed for the shaft construction etc. which is below the threshold for potential air quality impacts. Likely significant impacts remain with regards to construction movements across the designated site and the impact upon the designated features. It is not thought possible to install intermediate shafts across the SAC without impacting designated features. This option can be reassessed if all construction activities can remain outside of the designated areas although unlikely. No disturbance to the designated features during operation are anticipated.
			Wimbledon Common SAC (0km)	Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site • 4010 Northern Atlantic wet heaths with (*Erica tetralix)* • 4030 European dry heaths Annex II species that are a primary reason for selection of this site:	Potential for Likely Significant Effects	Construction of the tunnels (not shafts) will not have an impact on the designated site and features due to the depth of the tunnels (30m-70m below the designated site. The tunnel will be situated within the London Clay (an aquiclude), so it is hydrologically isolated from the SAC and therefore no disturbance to the designated features of the site. It is anticipated that no more than 200HGV movements per day are needed for the shaft construction etc. which is below the threshold for potential air quality impacts. Likely significant impacts remain with regards to construction movements across the designated site and the impact upon the designated features.

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				• 1083 Stag beetle (*Lucanus cervus*) Wimbledon Common has a large number of old trees and much fallen decaying timber. It is at the heart of the south London centre of distribution for Stag beetle (*Lucanus cervus*) and a relatively large number of records were received from this site during a recent nationwide survey for the species (Percy et al. 2000). The site supports a number of other scarce invertebrate species associated with decaying timber.		It is not thought possible to install intermediate shafts across the SAC without impacting designated features. This option can be reassessed if all construction activities can remain outside of the designated areas although unlikely. No disturbance to the designated features during operation are anticipated.
			South West London Waterbodies Ramsar Site (approx. 1.2km)	Ramsar Site criterion 6 - species/population occurring at levels of international importance. Qualifying Species/populations (as identified at designation): Species with peak counts in spring/autumn: • Northern shoveler (*Anas clypeata*), NW & C Europe 397 individuals, representing an average of 2.6% of the GB	No Likely Significant Effects	Option footprint is located at 1.2km distance of this site and it is not hydrologically linked to the option. Construction works and traffic are unlikely to have significant effects upon this Ramsar Site and/or supporting habitat for its qualifying species through air, lighting, and noise pollution. No pathways are identified during the operation of this option. Therefore, no pathways have been identified through which this designated site and its qualifying features could be affected by this option during construction and operation phases.

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				population (5-year peak mean 1998/9-2002/3) Species with peak counts in winter: • Gadwall (*Anas strepera strepera*), NW Europe 487 individuals, representing an average of 2.8% of the GB population (5-year peak mean 1998/9-2002/3).		
			South West London Waterbodies SPA (approx. 1.2km)	Article 4.2 Qualification (79/409/EEC) It is used regularly by 1% or more of the biogeographical populations of the following regularly occurring migratory species (other than those listed on Annex 1), in any season: • Gadwall (*Anas strepera strepera*) 710 individuals - wintering (5-year peak mean 1993/94 - 1997/98) 2.4% NW Europe • Shoveler (*Anas clypeata*) 853 individuals - wintering (5-year peak mean 1993/94 - 1997/98) 2.1% NW/Central Europe"	No Likely Significant Effects	Option footprint is located at 1.2km distance of this site and it is not hydrologically linked to the option. Construction works and traffic are unlikely to have significant effects upon this SPA and/or supporting habitat for its qualifying species through air, lighting, and noise pollution. No pathways are identified during the operation of this option. Therefore, no pathways have been identified through which this designated site and its qualifying features could be affected by this option during construction and operation phases.

A.5 Kempton - 150 - Construction SRO (ID: TWU_LON_HI-ROC_WT1_CNO_kemptonwtw150)

The HRA screening assessment was undertaken by Ricardo Energy & Environment - Habitats Regulation Assessment - Appendix A: HRA screening assessment of WRMP19. Feasible Option Elements, Report for: Thames Water Utilities Limited produced by Ricardo Energy & Environment – ED10169 | Issue Number Final| 20/04/2020

A.6 Datchet Increase DO (ID: TWU_SWA_HI-GRW_ALL_ALL_datchet do) Option Stage 1 screening review results

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_SWA_HI-GRW_ALL_ALL_datchet do	Datchet Increase DO	Replacement of submersible pumps and lower of intake levels in two boreholes (two pumps) and increasing the capacity of the contact tank. DO benefit 5.4Ml/d (peak) and 1.6Ml/d (average).	Windsor Forest & Great Park SAC (approx. 3km)	Annex I habitats that are a primary reason for selection of this site: • 9190 Old acidophilous oak woods with (*Quercus robur*) on sandy plains. Windsor represents old acidophilous oak woods in the south-eastern part of its UK range. It has the largest number of veteran oaks (*Quercus spp.*) in Britain (and probably in Europe), a consequence of its management as wood-pasture. It is of importance for its range and diversity of saproxylic invertebrates, including many rare species (e.g., the beetle (*Lacan querceus*)), some known in the UK only from this site, and has recently been recognised as	No Likely Significant Effects	The proposed option is not hydrologically connected to this SAC. The proposed pump replacement is unlikely to impact any habitats within the SAC and any of its qualifying features. The distance between the option and the SAC will also negate any impacts that may arise from dust pollution during the construction phase.

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				having rich fungal assemblages. Windsor Forest and Great Park has been identified as of potential international importance for its saproxylic invertebrate fauna by the Council of Europe (Speight 1989). Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: • 9120 Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrub layer (*Quercion robori-petraeae* or *Ilici-Fagenion*). Annex II species that are a primary reason for selection of this site: • 1079 Violet click beetle (*Limoniscus violaceus*). Violet clicks beetle (*Limoniscus violaceus*) was first recorded at Windsor Forest in 1937. The site is thought to support the largest of the known populations of this species in the UK. There is a large population of ancient trees on the site, which, combined with the historical continuity of woodland cover, has resulted in Windsor Forest being listed as the most important site in the UK for fauna associated with decaying timber on ancient trees (Fowles,		

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				Alexander & Key 1999). The site was also identified as of potential international importance for its saproxylic invertebrate fauna by the Council of Europe (Speight 1989).		
			South West London SPA (approx. 3.8km)	Article 4.2 Qualification (79/409/EEC) It is used regularly by 1% or more of the biogeographical populations of the following regularly occurring migratory species (other than those listed on Annex 1), in any season: • Gadwall (*Anas strepera strepera*) 710 individuals - wintering (5 year peak mean 1993/94 - 1997/98) 2.4% NW Europe • Shoveler (*Anas clypeata*) 853 individuals - wintering (5 year peak mean 1993/94 - 1997/98) 2.1% NW/Central Europe"	Likely Significant Effects	During construction phase of this option there is the potential that works could pose a risk of surface water pollution from construction machinery/vehicular run-off and sedimentation possibly affecting SPA further along the River Thames. Mitigation measures should follow best practice guidelines to minimise potential impacts e.g. use of sediment screens, coverage of construction stockpiles during adverse weather conditions, and sand / silt removal facilities, all of which could be detailed in a Construction and Ecological Management Plan. The operational phase is unlikely to affect the SPA. The measures above could mitigate the potential construction impacts to the SPA.
			South West London Ramsar Site (approx. 3.8km)	The South West London Waterbodies site comprises a series of reservoirs and former gravel pits that support internationally important numbers of wintering (*Anas strepera*) and shoveler (*Anas clypeata*).	No Likely Significant Effects	During construction phase of this option there is the potential that works could pose a risk of surface water pollution from construction machinery/vehicular run-off and sedimentation possibly affecting the Ramsar Site further along the River Thames. Mitigation measures should follow best practice guidelines to minimise potential impacts e.g., use of sediment screens, coverage of construction stockpiles during adverse weather conditions, and sand / silt

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				Qualifying Species/populations (as identified at designation): Species with peak counts in spring/autumn: • Northern shoveler (*Anas clypeata*) Species with peak counts in winter: • Gadwall (*Anas strepera*)		removal facilities, all of which could be detailed in a Construction and Ecological Management Plan. The operational phase is unlikely to affect the Ramsar Site. The measures above could mitigate the potential construction impacts to the Ramsar Site.
			Burnham Beeches SAC (approx. 7km)	Annex I habitats that are a primary reason for selection of this site: • 9120 Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrublayer (*Quercion robori-petraeae* or *Ilici-Fagenion*). Burnham Beeches is an example of Atlantic acidophilous beech forests in central southern England. It is an extensive area of former beech wood-pasture with many old pollards and associated beech (*Fagus sylvatica*) and oak (*Quercus spp.*) high forest. Surveys have shown that it is one of the richest sites for saproxylic invertebrates in the UK, including 14 Red Data Book species. It also retains nationally important epiphytic communities, including the moss (*Zygodon forsteri*).	No Likely Significant Effects	The proposed option is not hydrologically connected to this SAC. The proposed pump replacement is unlikely to impact any habitats within the SAC and any of its qualifying features. The distance between the option and the SAC will also negate any impacts that may arise from dust pollution during the construction phase.

A.7 SWOX to SWA (ID: TWU_SWA_HI-TFR_SWX_ALL_swoxswa48) Option Stage 1 screening review results

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_SWA_HI-TFR_SWX_ALL_swoxswa48	SWOX to SWA	Abingdon WTW to Long Crendon to supply SWA.	Cothill Fen SAC (approx. 0.05km)	Annex I habitats that are a primary reason for selection of this site: • 7230 Alkaline fens This lowland valley mire contains one of the largest surviving examples of alkaline fen vegetation in central England, a region where fen vegetation is rare. The M13 (*Schoenus nigricans - Juncus subnodulosus*) vegetation found here occurs under a wide range of hydrological conditions, with frequent bottle sedge (*Carex rostrata*), grass-of-Parnassus (*Parnassia palustris*), common butterwort (*Pinguicula vulgaris*) and marsh helleborine (*Epipactis palustris*). The alkaline fen vegetation forms transitions to other vegetation types that are similar to M24 (*Molinia caerulea - Cirsium dissectum*) fen-meadow and S25 (*Phragmites australis - Eupatorium cannabinum*) tall-herb fen and wet alder (*Alnus spp.*) wood. Annex I habitats present as a qualifying feature, but not a	Likely Significant Effects	Due to the proximity to the SAC, likely significant effects are likely to remain. Construction works will follow best practice guidelines e.g., use of a robust CEMP detailing mitigation measures to minimise potential impacts e.g., DMPs, PP, use of sediment screens etc., but even with these good practice guidelines in place, adverse effects remain.

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				primary reason for selection of this site: • 91E0 Alluvial forests with (*Alnus glutinosa*) and (*Fraxinus excelsior*) (*Alno-Padion, Alnion incanae, Salicion albae*) * Priority feature		
			Oxford Meadows SAC (approx. 0.2km)	Annex I habitats that are a primary reason for selection of this site: • 6510 Lowland hay meadows (*Alopecurus pratensis, Sanguisorba officinalis*) Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: • Not Applicable Annex II species that are a primary reason for selection of this site: • 1614 Creeping marshwort (*Apium repens*) Oxford Meadows is selected because Port Meadow is the larger of only two known sites in the UK for creeping marshwort (*Apium repens*).	Likely Significant Effects	Due to the proximity to the SAC, likely significant effects are likely to remain. Construction works will follow best practice guidelines e.g., use of a robust CEMP detailing mitigation measures to minimise potential impacts e.g., DMPs, PP, use of sediment screens etc., but even with these good practice guidelines in place, adverse effects remain.

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				Annex II species present as a qualifying feature, but not a primary reason for site selection: • Not Applicable		
			Little Wittenham SAC (approx. 10km)	S1166 Great crested newt, (*Triturus cristatus*)	No Likely Significant Effects	The proposed option is not hydrologically connected to this SAC. The proposed pump replacement is unlikely to impact any habitats within the SAC and any of its qualifying features. The distance between the option and the SAC will also negate any impacts that may arise from dust pollution during the construction phase.

A.8 Moulsford (Option ID: TWU_SWX_HI-GRW_ALL_ALL_moulsford gw) Option Stage 1 screening review results

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_SWX_HI-GRW_ALL_ALL_moulsford gw	Moulsford	Construction of an abstraction borehole in the unconfined Chalk north of Streatley on the west bank of the River Thames. Water abstracted from the borehole will be treated at the existing Cleeve water treatment works (WTW) located on the eastern side of the River Thames. The option also includes: Test pumping to support application for a new abstraction licence; 0.6km run	Hartsock Wood SAC: (approx. 2.75km)	Annex I habitats that are a primary reason for selection of this site: • 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) * Important orchid sites • 91J0 (*Taxus baccata*) woods of the British Isles	Likely Significant Effects	Abstraction from the new borehole may impact on designated features of the site which is located downstream of the option point. The pipeline crossing under the River Thames may release silt or pollutants into the river which may have adverse effects on the designated features. Dashboard GIS does not show proposed pipeline to the Cleeve WTW but mentions in the description that the pipeline goes under the river and railway.

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
		to waste pipeline for clearance pumping of the boreholes to the River Thames; and 1.5km raw water pipeline between the boreholes and the WTW including a crossing under the River Thames and the Great Western Railway line. DO benefit is 3.5Ml/d peak and 2Ml/d average		* Priority feature Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: • Not Applicable Annex II species that are a primary reason for selection of this site: • Not Applicable Annex II species present as a qualifying feature, but not a primary reason for site selection: • Not Applicable		

A.9 Abingdon to Farmoor Reservoir pipeline (ID: TWU_SWX_HI-TFR_STR_ALL_abing-farmoor pipe) Option Stage 1 screening review results

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_SWX_HI-TFR_STR_ALL_abing-farmoor pipe	Abingdon to Farmoor Reservoir pipeline	Raw Water Conveyance: Construction of a transfer pipeline to convey 24 Ml/d of raw water between a proposed reservoir at Abingdon and the existing Farmoor reservoir, in	Cothill Fen SAC (approx. 0.1km)	Annex I habitats that are a primary reason for selection of this site: • 7230 Alkaline fens	Likely Significant Effects	Due to designated site being approximately 100m to the south of the proposed pipeline route, significant effects predicted from construction activities such as dust arisings which have the potential to smother the features thereby impacting on productivity and regrowth.

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
		the SWOX WRZ. (Note: Abingdon reservoir creation is not part of this option). The engineering scope includes the provision of a booster pump station at the proposed Abingdon Reservoir site to facilitate the transfer. Treatment would be provided at the existing WTW.		This lowland valley mire contains one of the largest surviving examples of alkaline fen vegetation in central England, a region where fen vegetation is rare. The M13 (*Schoenus nigricans - Juncus subnodulosus*) vegetation found here occurs under a wide range of hydrological conditions, with frequent bottle sedge (*Carex rostrata*), grass-of-Parnassus (*Parnassia palustris*), common butterwort (*Pinguicula vulgaris*) and marsh helleborine (*Epipactis palustris*). The alkaline fen vegetation forms transitions to other vegetation types that are similar to M24 (*Molinia caerulea - Cirsium dissectum*) fen-meadow and S25 (*Phragmites australis - Eupatorium cannabinum*) tall-herb fen and wet alder (*Alnus spp.*) wood. Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: • 91E0 Alluvial forests with (*Alnus glutinosa*) and (*Fraxinus excelsior*) (*Alno-Padion, Alnion incanae, Salicion albae*) * Priority feature		Vehicle emissions and other airborne pollutants has the ability to reduce vigour within the designated features. The pipeline will abstract water from the River Thames for storage within the new Abingdon Reservoir and then transfer to Farmoor Reservoir. Abstraction not likely to affect downstream designations due to the distance between the abstraction point and designated sites. The construction of the pipeline in the area of the SAC could alter ground water movements in the area (Upwood Quarry). The altering of ground water movements could have a significant effect on the designated features of the SAC.

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				Annex II species that are a primary reason for selection of this site: • Not Applicable Annex II species present as a qualifying feature, but not a primary reason for site selection: • Not Applicable		
			Oxford Meadows SAC (approx. 4.8km)	Annex I habitats that are a primary reason for selection of this site: • 6510 Lowland hay meadows (*Alopecurus pratensis, Sanguisorba officinalis*) Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: • Not Applicable Annex II species that are a primary reason for selection of this site: • 1614 Creeping marshwort (*Apium repens*) Oxford Meadows is selected because Port Meadow is the larger of only two known sites in	No Likely Significant Effects	The proposed option is not hydrologically connected to this SAC and construction activities unlikely to have an impact on the designated features.

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				the UK for creeping marshwort (*Apium repens*). Annex II species present as a qualifying feature, but not a primary reason for site selection: • Not Applicable		
			Little Wittenham SAC (approx. 8km)	S1166 Great crested newt, (*Triturus cristatus*)	No Likely Significant Effects	The river abstraction along the Thames for this option is not thought to effect water levels downstream near the SAC. Therefore, water draw down within waterbodies associated with the features of this SAC are not thought to have a significant effect upon the GCN within the SAC. Should pollution or sediment be released into the River Thames at the abstraction point, it is thought that it would be diffused enough to not have a permanent effect on the population within the SAC or the meta-population in the area, thereby maintaining a positive conservation status. The proposed pipeline crosses several watercourses which in turn join to form tributaries of the River Thames. Any pollution or silt within these watercourses will have local effects but will diffuse along the length of the watercourses before entering the River Thames.

A.10 Abingdon Options SESRO

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
Abingdon WTW Enhanced (ID: TWU_SWX_HI-ROC_WT2_ALL_abingdon wtw ph2) Abingdon WTW Ph1 - Construction (ID: TWU_SWX_HI-ROC_WT1_CNO_abingdon wtw ph1) Reservoir Abingdon 100 (Lon) - Construction (ID: TWU_STR_HI-RSR_RE1_CNO_abingdon100(lon))	Abingdon WTW Enhanced	Construction of a 24 Ml/d water treatment works adjacent to and supplied by the new Abingdon reservoir to supply parts of the SWOX WRZ. The Engineering scope includes the raw water pipeline from the reservoir to the treatment works and the treated water pipeline from the treatment works to Beacon Hill Service Reservoir.	Cothill Fen SAC (approx. 2.6km)	Annex I habitats that are a primary reason for selection of this site • 7230 Alkaline fens Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site • 91E0 Alluvial forests with (*Alnus glutinosa*) and (*Fraxinus excelsior*) (*Alno-Padion, Alnion incanae, Salicion albae*) * Priority feature Annex II species that are a primary reason for selection of this site • Not Applicable Annex II species present as a qualifying feature, but not a primary reason for site selection • Not Applicable	No Likely Significant Effects	No effect pathways identified between the N2k site and the option.

A.13 Severn to Thames transfer STT SRO's

The HRA screening assessment was undertaken by Ricardo Energy & Environment Habitats Regulation Assessment - Appendix A: HRA screening assessment of WRMP19. Feasible Option Elements, Report for: Thames Water Utilities Limited produced by Ricardo Energy & Environment – ED10169 | Issue Number Final| 20/04/2020

A.17 Wessex Water to SWOX (Flaxlands) (ID: TWU_SWX_HI-IMP_SWX_ALL_wessextoswoxflax) Option Stage 1 screening review results

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_SWX_HI-IMP_SWX_ALL_wessextoswoxflax	Wessex Water to SWOX (Flaxlands)	Transfer 2.9 Ml/d from Wessex Water to Flaxlands. One new main from Minety SR (Wessex) to Flaxlands SR (TW). Also included is the transfer main from Charlton WTW to Minety SR.	North Meadow & Clattinger Farm SAC (approx. 6.5km)	Annex I habitats that are a primary reason for selection of this site: • 6510 Lowland hay meadows (*Alopecurus pratensis, Sanguisorba officinalis*) Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: • Not Applicable Annex II species that are a primary reason for selection of this site: • Not Applicable Annex II species present as a qualifying feature, but not a primary reason for site selection: • Not Applicable	No Likely Significant Effects	No viable effects pathway between SAC and site. SAC is located 6.5km north-west and 8.2km north-east from site, at this distance any adverse construction impacts from dust, air and lighting effects are unlikely to affect SAC. No effects on N2K site and qualifying species predicted.

A.18 Henley to SWOX - 5 Ml/d (ID: TWU_SWX_HI-TFR_HEN_ALL_henley-swox5) Option Stage 1 screening review results

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_SWX_HI-TFR_HEN_ALL_henley-swox5	Henley to SWOX - 5 Ml/d	The option is for one new main from New Farm service reservoir (Henley) to Nettlebed service reservoir (SWOX). This will require a new 5.9km, 350mm diameter main from New Farm to Nettlebed and a new pumping station at New Farm. 5Ml/d capacity	Aston Rowant SAC (approx. 8.4km)	Annex I habitats that are a primary reason for selection of this site: • 5130 (*Juniperus communis*) formations on heaths or calcareous grasslands Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: • 9130 (*Asperulo-Fagetum*) beech forests Annex II species that are a primary reason for selection of this site: • Not Applicable Annex II species present as a qualifying feature, but not a primary reason for site selection: • Not Applicable	No Likely Significant Effects	This option is not hydrologically connected to the site. The pipeline mostly follows infrastructure and will not be constructed in any source protection zone or near any PW abstraction points, therefore no significant effects predicted.
			Chilterns Beechwoods SAC (approx. 11.7 km)	Annex I habitats that are a primary reason for selection of this site: • 9130 (*Asperulo-Fagetum*) beech forests The Chilterns Beechwoods represent a very extensive tract	No Likely Significant Effects	This option is not hydrologically connected to the site. The pipeline mostly follows infrastructure and will not be constructed in any source protection zone or near any PW abstraction points, therefore no significant effects predicted.

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				of (*Asperulo-Fagetum*) beech forests in the centre of the habitat's UK range. The woodland is an important part of a grassland-scrub-woodland mosaic. A distinctive feature in the woodland flora is the occurrence of the rare coralroot (*Cardamine bulbifera*) Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: • 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) * Important orchid sites Annex II species that are a primary reason for selection of this site: • Not Applicable Annex II species present as a qualifying feature, but not a primary reason for site selection: • 1083 Stag beetle (*Lucanus cervus*)		

A.19 Thames Water (SWA) to Thames Water (SWOX) Conveyance (ID: TWU_SWX_HI-TFR_SWA_ALL_tw(swa)to(swx)con) Option Stage 1 screening review results

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_SWX_HI-TFR_SWA_ALL_tw(swa)to(swx)con	Thames Water (SWA) to Thames Water (SWOX) Conveyance	Potable Water Transfer - Thames Water (SWA) to Thames Water (SWOX) - Conveyance	N/A	N/A	No Likely Significant Effects	This is an existing transfer with no new construction impacts and no operational impacts as this is an existing pipeline infrastructure. No significant impacts predicted.

A.20 Thames Water (Kennet Valley) to Thames Water (Henley) Conveyance (ID: TWU_HEN_HI-TFR_KVZ_ALL_tw(kv)to(hen)con) Option Stage 1 screening review results

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_HEN_HI-TFR_KVZ_ALL_tw(kv)to(hen)con	Thames Water (Kennet Valley) to Thames Water (Henley) Conveyance	Potable Water Transfer - Thames Water (Henley) to Thames Water (Kennet Valley) - Conveyance	N/A	N/A	No Likely Significant Effects	This is an existing transfer with no new construction impacts and no operational impacts as this is an existing pipeline infrastructure. No significant impacts predicted.

A.21 Groundwater Addington (ID: TWU_LON_HI-GRW_ALL_ALL_addington gw) Option Stage 1 screening review results

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_LON_HI-GRW_ALL_ALL_addington gw	Groundwater Addington	New abstraction borehole & upgrade to WTW. DO benefit 1 Ml/d average, 1.5 Ml/d peak	Mole Gap to Reigate Escarpment (approx. 15.3km)	Annex I habitats that are a primary reason for selection of this site • 5110 (*Stable xerothermophilous*) formations with (*Buxus sempervirens*) on rock slopes (*Berberidion* p.p.) Mole Gap in south-east England supports the only area of stable box scrub in the UK, on steep chalk slopes where the River Mole has cut into the North Downs Escarpment, creating the Mole Gap. Here natural erosion maintains the open conditions required for the survival of this habitat type. The site therefore supports a stable formation and has good conservation of habitat structure and function. • 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) * Important orchid sites This site hosts the priority habitat type "orchid rich sites". This large but fragmented site on the North Downs escarpment supports a wide range of	No Likely Significant Effect	This designated site is 15.3km away from the option site and therefore no impacts are predicted.

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				calcareous grassland types on steep slopes, including CG2 (*Festuca ovina - Avenula pratensis*), CG3 (*Bromus erectus*), CG4 (*Brachypodium pinnatum*), CG5 (*Brachypodium pinnatum – Bromus erectus*) and CG6 (*Avenula pubescens*) grasslands. It exhibits a wide range of structural conditions ranging from short turf through to scrub margins, and is particularly important for rare vascular plants, including orchids. It is also significant in exhibiting transitions to scarce scrub, woodland and dry heath types, notably 5110 (*Stable xerothermophilous*) formations with (*Buxus sempervirens*) on rock slopes, 91J0 yew (*Taxus baccata*) woods, and chalk heath (4030 European dry heaths). • 91J0 (*Taxus baccata*) woods of the British Isles * Priority feature At Mole Gap to Reigate Escarpment yew Taxus baccata woodland has been formed both by invasion of chalk grassland and from development within beech Fagus sylvatica woodland following destruction of the beech overstorey. Yew occurs here in extensive stands, with, in		

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				places, an understorey of box Buxus sempervirens at one of its few native locations. Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site • 4030 European dry heaths • 9130 (*Asperulo-Fagetum*) beech forests Annex II species that are a primary reason for selection of this site • Not Applicable Annex II species present as a qualifying feature, but not a primary reason for site selection • 1166 Great crested newt (*Triturus cristatus*) • 1323 Bechstein's bat (*Myotis bechsteinii*)		

A.22 Southfleet/Greenhithe (new WTW) (ID: TWU_LON_HI-GRW_ALL_ALL_s'fleet lic disagg) Option Stage 1 screening review results

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_LON_HI-GRW_ALL_ALL_s'fleet lic disagg	Southfleet/Greenhithe (new WTW)	Southfleet-Greenhithe licence disaggregation and new headworks and pumping station at borehole sites and new 3km main from Greenhithe to new WTW. DO benefit is 8 Ml/d average, 9 Ml/d peak	Thames Estuary and Marshes Ramsar Site (approx. 6km)	Ramsar Site criterion 2: • The site supports more than 20 British Red Data Book invertebrates and populations of the GB Red Book endangered least lettuce (*Lactuca saligna*) as well as the vulnerable slender hare's-ear (*Bupleurum tenuissimum*), divided sedge (*Carex divisa*), sea barley (*Hordeum marinum*), Norrer's saltmarsh-grass (*Puccinellia fasciculata*) and dwarf eelgrass (*Zoestera noltei*). Ramsar Site criterion 5 - Assemblages of international importance: Species with peak counts in winter: • 45,118 waterfowl (5 year peak mean 1998/99-2002/2003) Ramsar Site criterion 6 - Species/populations occurring at levels of international importance.	No Significant Effect	The closest part of this option element to the Ramsar Site is approximately 6km to the west, with the closest part of the SPA being approximately 6.8km. The only potential off-site functional habitat for birds within 1km of the works is a large waterbody approximately 800m to the east. Whilst this may be used sporadically by individual waders, this is expected to be a rarity due to the narrow shoreline and the abundant alternative functional habitat along the River Thames closer to the SPA/Ramsar Site Sites. As such, no significant disturbance impact to off-site functional habitat is expected. The SIP element of potential relevance to this proposed option is (10) air pollution. Given the significant distance of the option element to the SPA and Ramsar Site, air quality impacts can be immediately excluded. The SSSI conditions (vast majority favourable) could potentially be affected by hydrological changes, which in turn could affect the ability to achieve the various sites conservation objectives. The remainder of this assessment considers the likely impacts of any hydrological changes. Groundwater in the chalk aquifer is likely to be fairly close to the surface (information obtained from surrounding boreholes). It is estimated that groundwater could be drawn down by an additional approximately 0.7m at a distance of 2km under the full annual abstraction scenario. There is some uncertainty around the drawdown estimates which would require further modelling or pump test investigations to confirm; however

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				Qualifying Species/populations (as identified at designation): Species with peak counts in spring/autumn: • Black-tailed godwit (*Limosa islandica*), Iceland/W Europe 1,640 individuals, representing an average of 4.5% of the population (5 year peak mean 1998/9-2002/3) Species with peak counts in winter: • Dunlin, (*Calidris alpina alpina*), W Siberia/W Europe 15,171 individuals, representing an average of 1.1% of the population (5 year peak mean 1998/9-2002/3) • Red knot, (*Calidris canutus islandica*), W & Southern Africa (wintering) 7,279 individuals, representing an average of 1.6% of the population (5 year peak mean 1998/9-2002/3).		it is considered unlikely that habitats supporting the qualifying features of the SPA/Ramsar Site would be significantly adversely affected, given the volume of abstraction relative to the overall flows to the Thames Estuary and the distance upstream from the designated sites - the change in flow contribution due to the abstraction is unlikely to significantly affect qualifying features of the SPA and Ramsar Site. No construction impacts (e.g. disturbance of birds and air quality degradation) are likely to arise as the option is located at a sufficient distance from the sites and the commonly applied threshold for potential air quality impacts of 1000AADT or 200HGV movements per day (within 200m of a designated site) will not be exceeded (in total construction will involve 1000HGV movements).
			Thames Estuary and Marshes SPA (approx. 6.8km)	Article 4.1 Qualification: Over winter the area regularly supports:	No Significant Effect	The closest part of this option element to the Ramsar Site is approximately 6km to the west, with the closest part of the SPA being approximately 6.8km. The only potential off-site functional habitat for birds within 1km of the

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				• (*Circus cyaneus*) (Europe - breeding) 1% of the GB population 5-year peak count, 1993/94 to 1997/98 • (*Recurvirostra avosetta*) 28% of the GB population 5-year peak count, 1992/93 to 1997/98 Article 4.2 Qualification: Over winter the area regularly supports: • (*Calidris alpina alpina*) (Northern Siberian / Europe / Western Africa) 2.1% of the population in Great Britain 5-year peak mean 1993/94-1997/98 • (*Calidris canutus*) (North-eastern Canada /Greenland /Iceland/ North-western Europe) 1.8% of the population in Great Britain 5-year peak mean 1991/92-1995/96 • (*Limosa limosa*) (Iceland – breeding) 2.4% of the population 5 year peak mean for 1993/94 to 1997/98 • (*Pluvialis squatarola*) (Eastern Atlantic – wintering) 17% of the population 5 year		works is a large waterbody approximately 800m to the east. Whilst this may be used sporadically by individual waders, this is expected to be a rarity due to the narrow shoreline and the abundant alternative functional habitat along the River Thames closer to the SPA/Ramsar Site Sites. As such, no significant disturbance impact to off-site functional habitat is expected. The SIP element of potential relevance to this proposed option is (10) air pollution. Given the significant distance of the option element to the SPA and Ramsar Site, air quality impacts can be immediately excluded. The SSSI conditions (vast majority favourable) could potentially be affected by hydrological changes, which in turn could affect the ability to achieve the various sites conservation objectives. The remainder of this assessment considers the likely impacts of any hydrological changes. Groundwater in the chalk aquifer is likely to be fairly close to the surface (information obtained from surrounding boreholes). It is estimated that groundwater could be drawn down by an additional approximately 0.7m at a distance of 2km under the full annual abstraction scenario. There is some uncertainty around the drawdown estimates which would require further modelling or pump test investigations to confirm; however it is considered unlikely that habitats supporting the qualifying features of the SPA/Ramsar Site would be significantly adversely affected, given the volume of abstraction relative to the overall flows to the Thames Estuary and the distance upstream from the designated sites - the change in flow contribution due to the abstraction is unlikely to significantly affect qualifying features of the SPA and Ramsar Site. No construction

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				peak mean for 1993/94 to 1997/98 • (*Tringa tetanus*) (Eastern Atlantic – wintering) 2.2% of the population 5 year peak for 1993/94 to 1997/97 On passage the area regularly supports: • (*Charadrius hiatiula*) (Europe / Northern Africa – wintering) 2.6% of the population 5 year peak mean for 1993/94 to 1997/98 Internationally Important Assemblage of Birds: • 75019 waterfowl (5-year peak mean 21/03/2000) Including: (*Recurvirostra avosetta, Pluvialis squatarola, Calidris canutus, Calidris alpina alpina, Limosa limosa islandica, Tringa totanus)*		impacts (e.g., disturbance of birds and air quality degradation) are likely to arise as the option is located at a sufficient distance from the sites and the commonly applied threshold for potential air quality impacts of 1000 AADT or 200 HGV movements per day (within 200m of a designated site) will not be exceeded (in total construction will involve 1000 HGV movements).

A.23 Woods Farm Increase DO (ID: TWU_SWX_HI-GRW_ALL_ALL_woods farm do) Option Stage 1 screening review results

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_SWX_HI-GRW_ALL_ALL_woods farm do	Woods Farm Increase DO	New borehole to be constructed on site to bring DO up to licence (this is an additional 2.4 Ml/d to average licence of 4.99 Ml/d or an additional 2.91 Ml/d to peak licence of 5.5 Ml/d). Currently the site is only able to produce up to 2.59 Ml/d constrained by turbidity. Woods Farm WRMP24 option comprises: - Retaining the current abstraction licence with construction of a new abstraction borehole in the unconfined Chalk, 1.4km east of the existing Woods Farm boreholes;- The option also includes a new 1.4km raw water pipeline from the new satellite borehole to Woods Farm WTW.	Hartslock Wood SAC (approx. 1.1km)	Annex I habitats that are a primary reason for selection of this site • 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) * Important orchid sites • 91J0 (*Taxus baccata*) woods of the British Isles * Priority feature Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site • Not Applicable Annex II species that are a primary reason for selection of this site • Not Applicable Annex II species present as a qualifying feature, but not a primary reason for site selection • Not Applicable	No Likely Significant Effects	The proposed option is potentially hydrologically connected to Hartslock Wood SAC. The SAC runs along the bank of the River Thames. The habitats in the AC are not groundwater dependent; any groundwater they needs is likely to come indirectly from the adjacent river, and the proposed abstraction is unlikely to affect this.

A.24 Dapdune Licence Disaggregation (ID: TWU_GUI_HI-GRW_ALL_ALL_dapdune lic disagg) Option Stage 1 screening review results

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_GUI_HI-GRW_ALL_ALL_dapdune lic disagg	Dapdune Licence Disaggregation	Upgrade of pumps and pump control to increase DO. DO benefit 1 Ml/d peak	Thames Basin Heaths SPA (approx. 2.5km)	Article 4.1 Qualification During the breeding season the SPA regularly supports 1% or more of the Great Britain (GB) populations of the following species listed in Annex I: • A302 Dartford Warbler (*Sylvia undata*) – 27.8% of the GB population • A224 Nightjar (*Caprimulgus europaeus*) – 7.8% of the GB population • A246 Woodlark (*Lullula arborea*) – 9.9% of the GB population Non-qualifying species of interest: • Hen harrier (*Circus cyaneus*) • Merlin (*Falco columbarius*) • Short-eared owl (*Asio flammeus*) • Kingfisher (*Alcedo atthis*) (all Annex I species) occur in nonbreeding numbers of less than European importance (less than 1% of the GB population).	No Likely Significant Effect	The SPA is located to the north of the pump upgrades. The site is not hydrologically connected to the River Wey which will see an increase in abstraction as a result of the works and as such will not be impacted by the increase in abstraction. While the SPA is situated on a GWDTE it is not fed by the River Wey or its tributaries. The option will see small scale upgrades to two pump locations, works will be localised to these locations which are on hardstanding areas and as such are not suitable for any of the qualifying features.

A.25 Mortimer Disused Source (Recommission) (ID: TWU_KVZ_HI-GRW_ALL_ALL_mortimer recomm) Option Stage 1 screening review results

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_KVZ_HI-GRW_ALL_ALL_mortimer recomm	Mortimer Disused Source (Recommission)	N/A	Thames Basin Heaths (approx. 7.2km)	Article 4.1 Qualification During the breeding season the SPA regularly supports 1% or more of the Great Britain (GB) populations of the following species listed in Annex I: • A302 Dartford Warbler (*Sylvia undata*) – 27.8% of the GB population • A224 Nightjar (*Caprimulgus europaeus*) – 7.8% of the GB population • A246 Woodlark (*Lullula arborea*) – 9.9% of the GB population Non-qualifying species of interest: • Hen harrier (*Circus cyaneus*) • Merlin (*Falco columbarius*) • Short-eared owl (*Asio flammeus*) • Kingfisher (*Alcedo atthis*) (all Annex I species) occur in nonbreeding numbers of less than European importance (less than 1% of the GB population).	No Likely Significant Effect	The N2K site is sufficiently distanced from the works to negate impacts from noise and air pollution. Furthermore, is it not hydrologically linked to the N2k site and as such will not be impacted in the event of run-off or pollution events.

A.26 Britwell Removal of Constraints (ID: TWU_SWX_HI-GRW_RE1_ALL_britwell roc) Option Stage 1 screening review results

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_SWX_HI-GRW_RE1_ALL_britwell roc	Britwell Removal of Constraints	Run to waste to allow operation of existing borehole	Aston Rowant SAC (approx. 4.8km)	Annex I habitats that are a primary reason for selection of this site: • 5130 (*Juniperus communis*) formations on heaths or calcareous grasslands Aston Rowant represents *Juniperus communis* formations near the northern edge of the habitat's range on the chalk of southern England where it is rare and declining. The juniper population has been estimated to be between 1,000 and 2,000 individuals of various age-classes. It is one of the best remaining examples in the UK of lowland juniper scrub on chalk. Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: • 9130 (*Asperulo-Fagetum*) beech forests Annex II species that are a primary reason for selection of this site:	No Likely Significant Effect	The option involves the increase of raw water abstraction presumably from the existing borehole adjacent to the B480 according to the GIS dashboard. This abstraction could lead to the lowering of water levels in the local area (Chalgrove Brook), however this watercourse is not linked to the designated site directly but rather through ground water bodies (Chiltern Chalk Scarp). It is thought that the flow of groundwater is from the SAC towards the option, so effects are unlikely.

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				• Not Applicable Annex II species present as a qualifying feature, but not a primary reason for site selection: • Not Applicable		
			Little Wittenham SAC (approx. 9km)	Annex I habitats that are a primary reason for selection of this site: • Not Applicable Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: • Not Applicable Annex II species that are a primary reason for selection of this site: • 1166 Great crested newt (*Triturus cristatus*) Annex II species present as a qualifying feature, but not a primary reason for site selection: • Not Applicable	No Likely Significant Effect	The option has no direct hydrological connection to the designated site and is a significant distance away from the minor works required with this option.
			Chiltern Beechwoods SAC (approx. 6.3km)	Annex I habitats that are a primary reason for selection of this site:	No Likely Significant Effect	The option involves the increase of raw water abstraction presumably from the existing borehole adjacent to the B480 according to the dashboard. This abstraction could lead to the lowering of water levels in the local area

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				• 9130 (*Asperulo-Fagetum*) beech forests The Chilterns Beechwoods represent a very extensive tract of (*Asperulo-Fagetum*) beech forests in the centre of the habitat's UK range. The woodland is an important part of a grassland-scrub-woodland mosaic. A distinctive feature in the woodland flora is the occurrence of the rare coralroot (*Cardamine bulbifera*). Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: • 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) * Important orchid sites Annex II species that are a primary reason for selection of this site: • Not Applicable Annex II species present as a qualifying feature, but not a primary reason for site selection:		(Chalgrove Brook), however this watercourse is not linked to the designated site directly but rather through ground water bodies (Chiltern Chalk Scarp). Saying that, water flows away from the designated site so is unlikely to have a significant risk on the SAC.

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				• 1083 Stag beetle (*Lucanus cervus*)		

A.27 ASR Horton Kirby (ID: TWU_LON_HI-GRW_RE1_ALL_asrhortonkirby) Option Stage 1 screening review results

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_LON_HI-GRW_RE1_ALL_asrhortonkirby	ASR Horton Kirby	Construction of pipelines between two existing ASR boreholes in the Lower Greensand aquifer to an existing WTW at Horton Kirby in Kent. Water abstracted from existing Chalk aquifer boreholes (via the mains supply) will be recharged into the two ASR boreholes during periods of water surplus and abstracted when needed and treated at the WTW.	Thames Estuary & Marshes Ramsar (approx. 12km)	Ramsar Site criterion 2 – this site supports one endangered plant species and at least 14 nationally scarce plants of wetland habitats. The site also supports more than 20 British Red Data Book invertebrates. Assemblages of international importance: • Species with peak counts in winter = 45118 waterfowl	Potential for Likely Significant Effects	This option proposes an aquifer recharge /artificial recharge with construction of pipelines between two existing ASR boreholes in the Lower Greensand aquifer to an existing WTW at Horton Kirby in Kent. Water abstracted from existing Chalk aquifer boreholes (via the mains supply) will be recharged into the two ASR boreholes during periods of water surplus and abstracted when needed and treated at the WTW. A new licence and discharge consent will be required from the Environment Agency to allow

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
		Screening information to be added to the next version of this HRA.		Ramsar Site criterion 6 – species with peak counts in spring/autumn: • Ringed plover *(Charadrius haiticula)* • Black-tailed godwit *(limosa islandica)* • Grey plover *(pluvialis squatarola)* • Red knot *(calidris canutus islandica)* • Dunlin *(calidris alpina alpina))* • Common redshank *(tringa totanus totanus)*		abstraction/recharge from the Lower Greensand aquifer. The proposed option is located about 12km northeast from this site and works in the scheme are unlikely to have a significant operational effects upon this Ramsar and its qualifying features. Given the distance between the two, no effects during construction are expected due to dust pollution and vehicle emissions (increased nitrogen from numerous vehicle movements). Potential for effects due to changes in the water table and/or water pollution events may occur (as in case of pipeline route crosses the waterbodies there is a potential to affect downstream water quality, siltation and/or hydrological regime, or result in toxic contamination, for example). It is considered that the following construction measures included in the project design would mitigate effects: - directional drilling will be used at all water courses crosses when >3m wide - for water courses <3m wide, localised and temporary water quality and hydrology changes may arise during construction, but as pollution control best practices will be applied to all water course crossings at all times, these measures are considered sufficient to mitigate for any significant long-term impact related to water pollution on this designated site.

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
						No pathways have been identified through which this designated site and its qualifying features could be affected by this option during the operation phase.
			Norths Downs Woodlands SAC (approx. 11km)	Annex I habitats that are a primary reason for selection of this site • 9130 (*Asperulo-Fagetum)* beech forests • 91J0 Yew *(Taxus baccata)* of the British Isles * Priority feature Annex I habitats present as a qualifying feature, but not a primary reason for selection of the site: • 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates *(Fetsuco-Bromatalia)* (*important orchid sites)	No Likely Significant Effects	This option proposes an aquifer recharge /artificial recharge with construction of pipelines between two existing ASR boreholes in the Lower Greensand aquifer to an existing WTW at Horton Kirby in Kent. Water abstracted from existing Chalk aquifer boreholes (via the mains supply) will be recharged into the two ASR boreholes during periods of water surplus and abstracted when needed and treated at the WTW. A new licence and discharge consent will be required from the Environment Agency to allow abstraction/recharge from the Lower Greensand aquifer. The proposed option is located about 11km southeast from this site and works in the scheme are unlikely to have a significant effect upon the SAC and its qualifying features. The sites are not hydrologically connected (as in different groundwater bodies), therefore any effects as a result of hydrological connection are unlikely. During construction effects due to dust arisings and vehicle emissions (i.e. increased nitrogen from numerous vehicle

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				Annex II species that are a primary reason for selection of this site: • Not Applicable Annex II species present as a qualifying feature, but not a primary reason for site selection: • Not Applicable		movements) are not expected given the distance between the two. Similarly, changes in water table are not foreseen during operation phase. Therefore, no pathways have been identified through which this designated site and its qualifying features could be affected by this option during construction and operation phases.

A.28 Mogden to Teddington outfall 75 Ml/d (ID: TWU_TED_HI-TFR_TED_ALL_teddingtondramog/ted) Option Stage 1 screening review results

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_TED_HI-TFR_TED_ALL_teddingtondramog/ted	Mogden to Teddington outfall 75 Ml/d	Conveyance from Mogden to the River Thames at Teddington (Teddington DRA). Screening information to be added to the next version of this HRA.	Richmond Park SAC (1.2km SE of option)	Annex I habitats that are a primary reason for selection of this site: • Not Applicable Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: • Not Applicable Annex II species that are a primary reason for selection of this site: • 1083 Stag Beetle (*Lucanus cervus*) Richmond Park has a large number of ancient trees with decaying timber. It is at the heart of the south of London centre of distribution for stag beetle (*Lucanus cervus*) and is a site of national importance for the conservation of the fauna of invertebrates associated with the decaying timber of ancient trees.	No Likely Significant Effect	This option is unlikely to have any significant effects on the limited qualifying features of the designated site; the site is upstream of the option, so hydrological connections do not exist. It is considered that the distance is such that construction effects are also unlikely.

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				Annex II species present as a qualifying feature, but not a primary reason for site selection: • Not Applicable		

A.29 Teddington DRA 75 MLD - Construction (TWU_TED_HI-RAB_RE1_CNO_teddington dra 75) Option Stage 1 screening review results

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_TED_HI-RAB_RE1_CNO_teddington dra 75	Teddington DRA 75 MLD	Teddington DRA 75 MLD option. Screening information to be added to the next version of this HRA.	Richmond Park (SAC 3.0km SE)	Annex I habitats that are a primary reason for selection of this site • Not Applicable Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site • Not Applicable Annex II species that are a primary reason for selection of this site • 1083 Stag beetle Lucanus cervus Richmond Park has a large number of ancient trees with decaying timber. It is at the heart of the south London centre of distribution for stag beetle (*Lucanus cervus*) and is a site of national importance for the conservation of the fauna of invertebrates associated with the decaying timber of ancient trees.	No Likely Significant Effect	This option is unlikely to have any significant effects on the limited qualifying features of the designated site; the site is upstream of the option, so hydrological connections do not exist. It is considered that the distance is such that construction effects are also unlikely.

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				Annex II species present as a qualifying feature, but not a primary reason for site selection • Not Applicable		

A.30 TLT extension from Lockwood PS to King George V Reservoir intake (ID: TWU_KGV_HI-TFR_KGV_ALL_lockwood ps-kgv res) Option Stage 1 screening review results

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_KGV_HI - TFR_KGV_ALL_lockwood ps-kgv res	TLT extension from Lockwood PS to King George V Reservoir intake	Tunnel from Lockwood to KGV reservoir.	Epping Forest Sac (1.7km north)	Annex I habitats that are a primary reason for selection of this site • 9120 Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrub layer (*Quercion robori-petraeae* or *Ilici-Fagenion*) Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site • 4010 Northern Atlantic wet heaths with (*Erica tetralin)* • 4030 European dry heaths		SAC is located E of the pipeline option. This SAC is considered sufficiently far enough from the option that there are no likely significant impacts to occur during construction and operational phases. The Site Improvement Plan indicates that atmospheric nitrogen deposition is likely to have adverse effects on three key habitats - wet heathland with cross-leaved heath, European dry heaths and Beech forests on acid soils. This option is not predicted to affect these habitats due to nitrogen deposition, due primarily to the distance between the option and the designated site. Noise and vibration generated during the construction and operational phases will likely dissipate across the 1.7km distance between the SAC and the option site, due to the mostly-urbanised surroundings of the option.

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				Annex II species that are a primary reason for selection of this site • 1083 Stag beetle (*Lucanus cervus)* Annex II species present as a qualifying feature, but not a primary reason for site selection • Not Applicable		

A.31 Direct River Abstraction - Teddington to Thames Lee Tunnel Shaft 75 MLD (ID: TWU_KGV_HI-TFR_TED_ALL_teddingtondrated/tlt) Option Stage 1 screening review results

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_KGV_HI-TFR_TED_ALL_teddingtondrated/tlt	Direct River Abstraction - Teddington to Thames Lee Tunnel Shaft 75 MLD	Raw water abstraction at Teddington to Thames Lee Tunnel (Teddington DRA).	Richmond Park SAC (1.4km E of option)	Annex I habitats that are a primary reason for selection of this site • Not Applicable Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site • Not Applicable Annex II species that are a primary reason for selection of this site • 1083 Stag beetle (*Lucanus cervus)* Richmond Park has a large number of ancient trees with decaying timber. It is at the heart of the south London centre of distribution for stag beetle (*Lucanus cervus*) and is a site of national importance for the conservation of the fauna of invertebrates associated with the decaying timber of ancient trees.	No Likely Significant Effects	Using the GIS layer, the location of the option is adjacent to the River Thames. The distance between the option and the SAC along this hydrological connection is unlikely to have a significant impact on the SAC. The option is not thought to have the potential for significant effects on the designated features of this SAC site; the distance and very urban nature of the general area mean that any effects would be hugely dissipated over this distance, so would not affect the site's qualifying features. Similarly, there is not likely to be any disturbance caused by noise and vibration during the construction and operational phases.

Option ID Number	Option Title	Option Description	Designated Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				Annex II species present as a qualifying feature, but not a primary reason for site selection • Not Applicable		

A.32 Extra-option (not BVP) Dukes Cut to Farmoor (ID: TWU_SWX_HI-TFR_SWX_ALL_dukescut-farmoor) Option Stage 1 screening review results

Option ID Number	Option Title	Option Description	Habitat Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
TWU_SWX_HI-TFR_SWX_ALL_dukescut-farmoor	Dukes Cut to Farmoor	15 Ml/d conveyance option from the Oxford Canal to Farmoor Reservoir, with abstraction from a point approximately 800m north of Dukes Cut on the Oxford Canal, discharging into the River Thames for subsequent re-abstraction at the existing Farmoor Reservoir intake. Resource to be provided by CRT - refer to separate F909 (RES-RWTS-OXC-DKC-15) for resource costs. This scheme has been developed	Oxford Meadows SAC (UK0012845) (approx. 0.9km)	Annex I habitats that are a primary reason for selection of this site: 6510 Lowland hay meadows (*Alopecurus pratensis, Sanguisorba officinalis*) Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: Not Applicable Annex II species that are a primary reason for selection of	No Likely Significant Effects	During construction of the pipeline, works will follow best practice guidelines e.g. use of a robust CEMP detailing mitigation measures to minimise potential impacts e.g. DMPs, PP, use of sediment screens, coverage of construction stockpiles during adverse weather conditions to minimise potential effects of pollution and run-off thus mitigating effects on the designated site. During operation, abstraction of water from the Oxford Canal will not have an adverse effect on the designated features due to the system of locks to prevent water levels being affected downstream. The canal draws water

Option ID Number	Option Title	Option Description	Habitat Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
		with the following assumptions: It has been assumed that, as the transfer will only be used in periods of low flow, no works will be required to upgrade the existing intake structure at Farmoor Reservoir. It has been assumed that, as the transfer will only be used in periods of low flow, no works will be required to upgrade the existing treatment facilities at Farmoor Reservoir.		this site: 1614 Creeping marshwort (*Apium repens*) Oxford Meadows is selected because Port Meadow is the larger of only two known sites in the UK for creeping marshwort (*Apium repens*). Annex II species present as a qualifying feature, but not a primary reason for site selection: Not Applicable		from the River Cherwell at Thruppand is a lowering lock at Dukes Cut.
			Cothill Fen SAC (UK0012889) (approx. 5.2m)	Annex I habitats that are a primary reason for selection of this site: 7230 Alkaline fens This lowland valley mire contains one of the largest surviving examples of alkaline fen vegetation in central England, a region where fen vegetation is rare. The M13 (*Schoenus nigricans - Juncus subnodulosus)* vegetation found here occurs under a wide range of hydrological conditions, with frequent bottle sedge (*Carex rostrata*), grass-of-Parnassus (*Parnassia palustris*), common butterwort (*Pinguicula vulgaris*) and marsh helleborine (*Epipactis palustris*). The alkaline fen vegetation forms transitions to other vegetation types that are similar to M24 (*Molinia caerulea - Cirsium dissectum*) fen-	No Likely Significant Effects	The proposed option is not hydrologically connected to this SAC. The proposed pump replacement is unlikely to impact any habitats within the SAC and any of its qualifying features. The distance between the option and the SAC will also negate any impacts that may arise from dust pollution during the construction phase.

Option ID Number	Option Title	Option Description	Habitat Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				meadow and S25 (*Phragmites australis - Eupatorium cannabinum*) tall-herb fen and wet alder (*Alnus spp.*) wood. Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: 91E0 Alluvial forests with (*Alnus glutinosa*) and (*Fraxinus excelsior*) (*Alno-Padion, Alnion incanae, Salicion albae*) *Priority feature Annex II species that are a primary reason for selection of this site: Not Applicable Annex II species present as a qualifying feature, but not a primary reason for site selection: Not Applicable		
			Burnham Beeches SAC (UK0030034) (approx. 4.8km)	Annex I habitats that are a primary reason for selection of this site 9120 Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrublayer (*Quercion robori-petraeae* or *Ilici-Fagenion*)	No Likely Significant Effects	This site is sufficient distant to result in effects related to light/ anthropogenic disturbances and not in direct hydrological connection to the option footprint. No pathways are identified where this option could affect this Habitat Site and/or its qualifying features during construction and/or operational phases.
			Windsor Forest & Great Park SAC (UK0012586) (approx. 5.2km)	Annex I habitats that are a primary reason for selection of this site	No Likely Significant Effects	This site is sufficient distant to result in effects related to light/ anthropogenic disturbances and not in direct hydrological connection to the option footprint.

Option ID Number	Option Title	Option Description	Habitat Sites Assessed (inc distances)	Qualifying Features	Screening Result	Justification for Assessment
				9190 Old acidophilous oak woods with (*Quercus robur*) on sandy plains Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site 9120 Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrublayer (*Quercion robori-petraeae* or (*Ilici-Fagenion).* Annex II species that are a primary reason for selection of this site 1079 Violet click beetle (*Limoniscus violaceus)*		No pathways are identified where this option could affect this Habitat Site and/or its qualifying features during construction and/or operational phases.

B. Designated Site Information

B.1 Cothill Fen SAC (UK0012889)

B.1.1 Description

Cothill Fen is an exceptionally important site with an outstanding range of nationally rare habitats which support a large number of rare invertebrates and plants.

The habitats consist of calcareous fen, calcareous grassland, woodland and scrub of varying degrees of wetness. The habitat supports over 330 species of vascular plant and over 120 nationally scarce or rare invertebrates, including the nationally rare southern damselfly (*Coenagrion mercuriale*)[29].

B.1.2 Qualifying features

The site qualifies under article 4(4) of the Directive (92/43/EEC) as it hosts the following habitats listed in Annex I[30]:

- H7230. Alkaline fens; Calcium-rich springwater-fed fens
- H91E0. Alluvial forests with (*Alnus glutinosa*) and (*Fraxinus excelsior*) (*Alno-Padion*, *Alnion incanae*, *Salicion albae*). Alder woodland on floodplains are Annex I priority habitats.

B.1.3 Conservation objectives

With regard to the SAC and the natural habitats and/or species for which the site has been designated (the 'Qualifying Features' listed below), and subject to natural change. This lowland valley mire contains one of the largest surviving examples of alkaline fen vegetation in central England, a region where fen vegetation is rare. Alkaline fens consist of a complex assemblage of wetland vegetation characteristic of sites where there is tufa and/or peat formation with a high water table and a calcareous base-rich water supply. The M13 (*Schoenus nigricans*) - (*Juncus subnodulosus*) vegetation type found here occurs under a wide range of hydrological conditions.

Alluvial forests with (*Alnus glutinosa*) and (*Fraxinus excelsior*), comprise dynamic woods that are part of a successional series of habitats. Their structure and function are best maintained within a larger unit that includes the open communities, mainly fen and swamp, of earlier successional stages. They also occur as a stable component within transitions to surrounding dry-ground forest, sometimes including other Annex I woodland types. These transitions from wet to drier woodland and from open to more closed communities provide an important facet of ecological variation[31].

B.1.4 Pressures and threats

The Site Improvement Plan[32] has identified the following issues for the site and the features they may affect:

[29] Improvement Programme for England's Natura 2000 sites (IPENS) (2014). Site Improvement Plan Cothill Fen SAC

[30] English Nature (2005). EC Directive 92/43 on the Conservation of Natural Habitats and of Wild Fauna and Flora. Citation for Special Area of Conservation (SAC)

[31] Natural England (2016). European Site Conservation Objectives: Supplementary Advice on Conserving and Restoring Site Features Cothill Fen Special Area of Conservation (SAC) Site code: UK0012889

[32] Improvement Programme for England's Natura 2000 sites (IPENS) (2014). Site Improvement Plan Cothill Fen SAC

- **Water pollution:** Water samples from streams, ponds and ditches at Parsonage Moor and //Cothill National Nature Reserve (NNR) show high nitrate levels. Further water quality monitoring, together with monitoring of vegetation and invertebrate populations, on Parsonage Moor, the NNR and Lashford Lane Fen needs to be carried out to identify sources, pathways and potential means of reducing nitrate levels, and to understand the effects of diffuse nitrate pollution on fen vegetation and invertebrate communities.
- **Hydrological changes:** There is concern that fen areas of Cothill Fen SAC may be becoming drier, and that this may be affecting populations of rare fen plants and invertebrates. This needs to be investigated by carrying out hydrological studies of the fen, and detailed studies of vegetation & invertebrates.
- **Air pollution:** Modelled nitrogen deposition exceeds site relevant critical load for the rich calcareous fen feature. Excess reed growth in unit 2 (Parsonage Moor & Cothill Fen NNR) which supports southern damselfly, could potentially be related to atmospheric nitrogen deposition.

B.2 Hartslock Wood SAC (UK0030164)

B.2.1 Description

Hartslock Wood SAC was classified on 1 April 2005 and comprises areas of mosaic of chalk grassland, chalk scrub and broadleaved woodland, and one of the few examples of ancient yew (*Taxus baccata*) wood in the Chilterns. The chalk grassland consists mainly of close-grazed, species-rich turf and supports one of only three UK populations of monkey orchid (*Orchis simia*). The site comprises an area of approximately 34.24 ha and shares a boundary with component SSSI Hartslock SSSI.[33]

B.2.2 Qualifying features

Qualifying habitats: The site is designated under article 4(4) of the Directive (92/43/EEC) as it hosts the following habitats listed in Annex I:

- Semi-natural dry grasslands and scrubland facies: on calcareous substrates (*Festuco Brometalia*) (important orchid sites). (Dry grasslands and scrublands on chalk or limestone, including important orchid sites)*
- (*Taxus baccata*) woods of the British Isles. (Yew-dominated woodland)*

This site is designated for Semi-natural dry grasslands and scrubland facies: on calcareous substrates (Festuco-Brometalia) (‘important orchid sites’*). These grasslands are generally found on thin, well-drained, lime-rich soils associated with underlying chalk and limestone geology. A large number of rare plants are associated with this habitat and its associated invertebrate fauna can also be noteworthy. This SAC is also distinctive in hosting the priority habitat type "orchid rich sites" and important populations of at least one nationally uncommon orchid species or one or several orchid species considered to be rare, very rare or exceptional in the UK.

This site is also designated for (*Taxus baccata*) woods of the British Isles (‘yew-dominated woodland’*) occurs on shallow, dry soils usually on chalk or limestone slopes, but in a few areas stands on more mesotrophic soils are found. The habitat corresponds to NVC type W13 (*Taxus baccata*) woodland (Rodwell, 1991). Within this community yew tends to be overwhelmingly dominant and is usually associated with a very sparse shrub and tree layer.

[33] English Nature (2005). EC Directive 92/43 on the Conservation of Natural Habitats and of Wild Fauna and Flora Citation for Special Area of Conservation (SAC)

B.2.3 Conservation objectives

Maintaining the total extend of the features, maintaining its distribution and configuration, maintaining its vegetation composition, structure, class and layers are essential for this site success.[34]

B.2.4 Pressures and threats

The Site Improvement Plan[35] has identified the following issues for the site and the features they may affect:

Air pollution and the impact of nitrogen deposition has been identified as a threat to Dry grasslands and scrublands on chalk or limestone (important orchid sites) and Yew dominated woodland. It is proposed the impacts of atmospheric nitrogen deposition will be investigated by Natural England.

B.3 Kennet & Lambourn Floodplain SAC (UK0030044)

B.3.1 Description

The Kennet and Lambourn Floodplain SAC is situated in the river valleys of the Lambourn and Kennet in the Berkshire and Marlborough Downs (NE482) and Thames Basin Heaths National Character Areas (NE530). The underlying geology is chalk. The site is particularly important as it has a significant concentration of areas supporting a threatened species of snail - the desmoulin's whorl snail (*Vertigo moulinsiana*). This species inhabits permanently wet habitats, particularly riverside fen, sedge beds and swamps. Parts of the SAC are former water-meadows managed by extensive cattle grazing but most areas are fringing, riverside or ditch-side vegetation which receives little management intervention. Part of the site is managed as a Local Nature Reserve with open public access.

B.3.2 Qualifying features

Desmoulin's whorl snail is widely distributed along the valleys of both the River Kennet between just downstream of Marlborough and to the east of Newbury, and on the River Lambourn between Welford and Newbury. The areas selected for inclusion in the SAC were, at the time of designation, the areas known to support particularly high populations of this snail.

The supporting habitats are mostly dominated by lesser pond-sedge (*Carex acutiformis*), greater pond-sedge (*Carex riparia*) or reed sweet-grass (*Glyceria maxima*) and are usually unshaded or partly shaded. The snail inhabits a particular 'zone' in the transition between truly aquatic habitat and terrestrial habitat where ground conditions are permanently wet and humid, but not subject to significant flooding or rapid flow of surface water. The snail feeds on minute algae on the surface of leaves and over-winter in the leaf litter above the ground layer of peat. The areas of supporting habitat are all fed by calcareous or base-rich groundwater which appears to be an important factor in providing suitable environmental conditions

B.3.3 Conservation objectives

Desmoulin's whorl snail populations are sensitive to changes in land management, particularly management neglect which results in increased shading due to an increase in scrub or tree cover, drainage of fens and lowering of the water table, increased grazing intensity or mowing of riverside vegetation for fishery management. The species may also be strongly susceptible to

[34] Natural England (2016) European Site Conservation Objectives: Supplementary Advice on Conserving and Restoring Site Features Hartslock Wood Special Area of Conservation (SAC) Site code: UK0030164

[35] Improvement Programme for England's Natura 2000 sites (IPENS) (2015). Site Improvement Plan Hartslock Wood

the effects of climate change. In particular, prolonged periods of exceptional flooding and high river flow rates may deplete colonies, and subsequent recovery may take many years if colonies are isolated. Conservation objectives encompasses[36]:

- Management measures (either within and/or outside the site boundary)
- Extent of supporting habitat for this snail
- Supporting processes to absorb or adapt to wider environmental changes (given this SAC high sensitivity to climate change and this snail high dependency of humidity)
- Supporting processes to maintain the soil properties (including structure, bulk density, total carbon, pH, soil nutrient status and fungal: bacterial ratio, within typical values for the supporting habitat)
- Supporting processes to maintain (or restore where appropriate) water quality and quantity to a standard which provides the necessary conditions to support desmoulin's whorl snail habitat.

B.3.4 Pressures and threats

This Site Improvement Plan[37] identifies three pressures (siltation, spread of invasive species and water pollution) and seven threats (hydrological changes, inland flood defence works, inappropriate cutting/mowing, change in inland management, inappropriate water levels, hydrological changes and water pollution).

B.4 Kennet Valley Alderwoods SAC (UK0030175)

B.4.1 Description

Kennet Valley Alderwoods SAC is composed of two blocks of wet woodland situated on the floodplain of the River Kennet, a tributary of the River Thames, which rises in the Berkshire and Marlborough Downs. These woodlands are the largest remaining fragments of damp, ash-alder woodland in the Kennet floodplain. They are situated on alluvial soils, overlain by a shallow layer of moderately calcareous peat through most of the woodland. The water table is relatively high, giving a range of soil moisture conditions from waterlogged to relatively dry.

The underlying geology of the catchment is chalk, which gives rise to strongly calcareous groundwater conditions. The alder woods are situated on a largely undeveloped section of the floodplain surrounded by grazed pastures. The woods include natural river valley features such as former river channels and seasonal ponds. These woods have a relatively natural structure with hydrological features typical of unmodified floodplains (although man-made features such as ditches and sluices are also evident). The woods are said to have a long history and may have originally been utilised as a source of charcoal.

In comparison with other examples of this habitat type in the national context, the Kennet Valley Alderwoods SAC is regarded as a particularly species-rich and relatively undisturbed example. It supports an unusually rich diversity of plants associated with this woodland type, and displays a complete transition from open water and swamp through to relatively dry woodland.

The site comprises Alluvial forests with alder (*Alnus glutinosa*) and ash (*Fraxinus excelsior*). These, the two largest fragments of alder-ash woodland on the Kennet floodplain, lie on alluvium overlain by a shallow layer of moderately calcareous peat. The wettest areas are dominated by alder (*Alnus glutinosa*) over tall herbs, sedges and reeds, but dryer patches include a base-rich woodland flora with much dog's mercury (*Mercurialis perennis*) and also herb-Paris (*Paris quadrifolia*). The occurrence of the latter is unusual, as it is more typically

[36] http://publications.naturalengland.org.uk/publication/6261183967395840

[37] http://publications.naturalengland.org.uk/publication/4738329056641024

associated with ancient woodland, whereas the evidence suggests that these stands have largely developed over the past century.

B.4.2 Qualifying features

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

- 91E0 Alluvial forests with (*Alnus glutinosa*) and (*Fraxinus excelsior*) (*Alno-Padion, Alnion incanae, Salicion albae*) * Priority feature

B.4.3 Conservation objectives

There should be no measurable reduction (excluding any trivial loss) in the extent and area of this feature, and in some cases, the full extent of the feature may need to be restored. Vegetation community composition, structure, age class distribution and others need to be maintained at a desirable level to indicate the promotion of natural processes with as lower human intervention as possible. The overall vulnerability of this particular SAC to climate change has been assessed by Natural England as being moderate, taking into account the sensitivity, fragmentation, topography and management of its habitats. This means that some adaptation action for specific issues may be required, such as reducing habitat fragmentation, creating more habitat to buffer the site or expand the habitat into more varied landscapes and addressing particular management and condition issues. Individual species may be more or less vulnerable than their habitat itself. In many cases, change will be inevitable so appropriate monitoring would be required.[38]

B.4.4 Pressures and threats

The Site Improvement Plan lists two priority issues as pressure of threat for this site: One related to Inappropriate water levels and the other related to game management: other.[39]

B.5 Oxford Meadows SAC (UK0012845)

B.5.1 Description

The Oxford Meadows was classified as a Special Area of Conservation on 1 April 2005 and is composed by an extensive complex of meadows and pastures which support species-rich grassland vegetation which would once have been widespread on floodplains in lowland England but which is now very rare. The SAC covers an area of 265.89 ha, in Oxfordshire on the broad floodplain of the River Thames and within the Upper Thames Clay Vales National Character Area (NCA profile 108[40]) with some areas overlapping with Pixey and Yarnton Meads SSSI, Port Meadow with Wolvercote Common and Green SSSI, Cassington Meadows SSSI, Wolvercote Meadows SSSI[41].

B.5.2 Qualifying features

The site qualifies under article 4(4) of the Directive (92/43/EEC) as it hosts the following listed habitat and species[42]:

- Annex I: Lowland hay meadows (*Alopecurus pratensis, Sanguisorba officinalis*)

[38] http://publications.naturalengland.org.uk/publication/4608485786386432

[39] http://publications.naturalengland.org.uk/publication/5578853737037824

[40] http://publications.naturalengland.org.uk/file/6557755053703168

[41] Natural England (2019). European Site Conservation Objectives: Supplementary Advice on Conserving and Restoring Site Features Oxford Meadows Special Area of Conservation (SAC) Site code: UK0012845

[42] English Nature (2005). EC Directive 92/43 on the Conservation of Natural Habitats and of Wild Fauna and Flora. Citation for Special Area of Conservation (SAC)

- Annex II: Creeping marshwort (*Apium repens*)

B.5.3 Conservation objectives

The vegetation at the SAC includes extensive stands of a grassland type which is strongly associated with floodplain meadows. The site includes vegetation communities that are perhaps unique in the world in reflecting the influence of centuries of traditional management by long-term grazing and hay-cutting on lowland hay meadows which contributes to the special character and composition of the grasslands. It exhibits good conservation of structure and function. It also contains a nationally rare grassland type, classified as type MG4 (*Alopecurus pratensis - Sanguisorba officinalis*) grassland in the National Vegetation Classification, with less than 1500 hectares estimated to remain in England. This is vulnerable to degradation, through excessive nutrient input, changes in the cutting or grazing regime, and changes in hydrology thus in need to be protected.

(*Apium repens*) is a very rare plant of seasonally flooded habitats which are unshaded, have very low levels of competition with surrounding vegetation and is tolerant of heavy grazing (grow very close to the ground and flower below the grazing level of cattle and horses). It is specially protected through inclusion in Schedule 8 of the Wildlife and Countryside Act 1981, which makes it an offence to pick or uproot any part of the plant for the purpose of offering for sale.

B.5.4 Pressures and threats

The Site Improvement Plan[43] has identified the following issues for the site and the features they may affect:

- Hydrological changes have been identified as a pressure and threat to Creeping marshwort. It is proposed to improve the knowledge and understanding of the hydrological conditions on the site by the following delivering bodies: Environment Agency, Natural England, Network Rail, Oxford City Council, Oxfordshire Rare Flora Group.
- Invasive species has been identified as a threat to Creeping marshwort. It is proposed to eliminate/control the Crassula populations on the site by the following delivering bodies: Natural England, Oxford City Council, Oxfordshire Rare Flora Group, Wolvercote Commons Committee.

B.6 Richmond Park SAC (UK0030246)

B.6.1 Description

Richmond Park has been managed as a royal deer park since the seventeenth century, producing a range of habitats of value to wildlife. In particular, Richmond Park is of importance for its diverse deadwood beetle fauna associated with the ancient trees found throughout the parkland. Many of these beetles are indicative of ancient forest areas where there has been a long continuous presence of over-mature timber. The site is at the heart of the south London centre of distribution for stag beetle (*Lucanus cervus*).

B.6.2 Qualifying features

The site is designated under article 4(4) of the Directive (92/43/EEC) as it hosts the following species listed in Annex II:

- Stag beetle (*Lucanus cervus*)

[43] Improvement Programme for England's Natura 2000 sites (IPENS) (2014). Site Improvement Plan Oxford Meadows

B.6.3 Conservation objectives

Maintaining the decaying wood habitat, habitat structure, the natural processes ensuring the continuity of timber decay, maintaining and restoring the presence of the stag beetle population across the SAC, maintain the management measures which are necessary to maintain or restore the structure, functions and supporting processes associated with the stag beetle feature[44].

B.6.4 Pressures and threats

No current issues have been identified on this site. The Richmond Park Management Plan should continue to be periodically reviewed to ensure the continuing availability of decaying wood habitat[45].

B.7 South West London Waterbodies Ramsar Site (UK11065)

B.7.1 Description

South West London Waterbodies was classified as a Ramsar Site on 9 October 2000. The site comprises of a number of reservoirs and former gravel pits in the Thames Valley adjacent to Heathrow Airport between Windsor and Hampton Court which support internationally important numbers of gadwall (*Anas strepera*) and shoveler (*Anas clypeata*) (Criterion 6)[46]. Potential future decommissioning of reservoirs once they are no longer needed for water supply may eventually require discussions with the current owners. Threats from potential urban development pressures are felt to be covered by existing regulations. Disturbance from recreational activities in parts of the site in winter months will be monitored. Ramsar Site no. 1038. Most recent RIS information: 2000.[47]

B.7.2 Qualifying features

The site qualifies under the following Ramsar Site criterion 6[48]:

- Gadwall (*Anas strepera*) 710 individuals - wintering 2.4 % NW Europe
- Shoveler (*Anas clypeata*) 853 individuals - wintering 2.1 % NW/Central Europe

B.7.3 Conservation objectives

N/A

B.7.4 Issues and threats from site improvement plan

N/A

B.8 South West London Waterbodies SPA (UK9012171)

B.8.1 Description

The South West London Waterbodies was classified as a Special Protection Area on 22 September 2000 and comprises a series of embanked water supply reservoirs and former gravel /pits that support a range of man-made and semi-natural open-water habitats. The SPA

[44] http://publications.naturalengland.org.uk/publication/5279688851193856

[45] http://publications.naturalengland.org.uk/publication/6625232836100096

[46] https://rsis.Ramsar Site.org/RISapp/files/RISrep/GB1038RIS.pdf

[47] JNCC (2000). South West London Waterbodies Ramsar Site Information Sheet: 7UK152

[48] JNCC (2000). South West London Waterbodies Ramsar Site Information Sheet: 7UK152 https://rsis.Ramsar Site.org/RISapp/files/RISrep/GB1038RIS.pdf

covers an area of 828.14 ha, with its boundary coinciding with Kempton Park Reservoirs SSSI, Knight & Bessborough Reservoirs SSSI, Thorpe Park, Gravel Pit SSSI, Wraysbury Reservoir SSSI, and parts of Staines Moor SSSI and Wraysbury & Hythe End Gravel Pits SSSI.[49]

B.8.2 Qualifying features

The site qualifies under article 4.2 of the Directive (79/409/EEC) as it is used regularly by 1% or more of the biogeographical populations of the following regularly occurring migratory species (other than those listed on Annex 1), in any season:

- Gadwall (*Anas strepera*) 710 individuals - wintering 2.4 % NW Europe
- Shoveler (*Anas clypeata*) 853 individuals - wintering 2.1 % NW/Central Europe

B.8.3 Conservation objectives

The following Conservation objectives have been identified for this site[50]:
The site is designated for internationally important numbers of gadwall (*Anas strepera*) and regularly supports this species in the winter season. Gadwall favour shallow eutrophic water bodies with a low level of human disturbance. Water quality and chemistry are important aspects in habitat suitability as factors such as high levels of turbidity or siltation may render sites or parts of sites unsuitable if macrophyte beds are affected.

The site is also designated for internationally important numbers of shoveler (*Anas clypeata*) Birds tend to start arriving at the end of September and will generally disperse to breeding areas in March to early April. They favour waterbodies with shallow margins/areas and where at least parts have an open, tree-less landscape character. Shoveler may spend less time feeding as winter progresses than gadwall. Unlike gadwall they utilise different lake and reservoir types at different times of day for different types of behaviour and may show changes in site preference as winter progresses. Numbers of birds using the complex appear to have remained relatively stable since the classification of the SPA but there is evidence of changing patterns of utilisation of waterbodies.

B.8.4 Pressures and threats

The Site Improvement Plan[51] has identified the following issues for the site and the features they may affect:

- Public Access/Disturbance has been identified as a pressure and threat to gadwall and shoveler populations. It is proposed a written agreement is made with landowners and recreational users to reduce disturbance which will be carried out by the following delivering bodies: Local Authorities, Natural England, RSPB, Thames Water Utilities Ltd, Parish Council(s), Affinity Water, Silver Wing Sailing Club, R K Leisure (Angling club), Local residents' association(s), Local bird watching groups(s)
- Changes in species distributions has been identified as a pressure and a threat to gadwall and Shoveler populations. It is proposed existing data will be reviewed and fit for-purpose recording practices will be secured across the SPA and its surroundings. This will be carried out by the following delivering bodies: Local Authorities, Natural England, RSPB,

[49] English Nature (2000). EC Directive 79/409 on the Conservation of Wild Birds: Special Protection Area (SPA). South West London Waterbodies SPA

[50] Natural England (2018). European Site Conservation Objectives: Supplementary Advice on Conserving and Restoring Site Features South West London Waterbodies Special Protection Area (SPA) Site code: UK9012171

[51] Improvement Programme for England's Natura 2000 sites (IPENS) (2014). Site Improvement Plan South West London Waterbodies

University(ies), British Trust for Ornithology (BTO), Joint Nature Conservation Committee (JNCC), Local bird watching group(s)

- The invasive species, (*Crassula helmsii*), has been identified as a pressure and threat to gadwall and shoveler populations. It is proposed the invasive species is managed and recreational users and landowners are instructed on how to monitor for the plant. This will be carried out by the following delivering bodies: Environment Agency, Natural England, Thames Water Utilities Ltd, GB Non-native Species Secretariat (NNSS), R K Leisure (Angling club).
- Natural changes to site conditions have been identified as a pressure and threat to gadwall and shoveler populations. It is proposed that strategic habitat management will be carried out including the management of bankside vegetation. This will be carried out by the following delivering bodies: Natural England, Thames Water Utilities Ltd, Landowner(s), Local conservation group, Affinity Water
- Fish stocking (Fisheries) has been identified as a pressure to gadwall and shoveler populations. This will be managed by securing appropriate fish stocking levels and will be implemented by the following delivering bodies: Natural England, Thames Water Utilities Ltd, R K Leisure (Angling club), Local angling club(s).
- Inappropriate weed control has been identified as a threat to gadwall and shoveler populations. This will be managed by clarifying appropriate weed control with owners and tenants through consents and carry out enforcement action where necessary. This will be implemented by the following delivering bodies: Natural England, RSPB, Thames Water Utilities Ltd, Royal Yachting Association (RYA), Silver Wing Sailing Club.
- The Invasive species Egyptian goose (*Alopochen aegyptiaca*) has been identified as a threat to gadwall and shoveler populations. It is proposed further research is done into this invasive species and identify control measures if necessary. This will be carried out by the following: Natural England, RSPB, Thames Water Utilities Ltd, GB Non-native Species Secretariat (NNSS), Local bird watching group(s), Heathrow Airport.

B.9 Thames Basin Heaths SPA (UK9012141)

B.9.1 Description

The Thames Basin Heaths was classified as a Special Protection Area in March 2005 and forms part of an extensive complex of lowland heathlands in southern England that support important breeding bird populations.

The SPA covers an area of 8274.72 ha, fragmented across Surrey, Berkshire, Hampshire and within the Thames Basin Heaths National Character Area (NCA). Some areas overlap with Ash to Brookwood Heaths SSSI, Bourley and Long Valley SSSI, Bramshill SSSI, Broadmoor to Bagshot Woods and Heaths SSSI, Castle Bottom to Yateley and Hawley Commons SSSI, Chobham Common SSSI, Colony Bog and Bagshot Heaths SSSI, Eelmoor Marsh SSSI, Hazeley Heath SSSI, Horsell Common SSSI, Ockham and Wisley Commons SSSI, Sandhurst to Owlsmoor Bogs and Heaths SSSI, Whitmoor Common SSSI and Thursley, Ash, Pirbright & Chobham SAC[52].

[52] Natural England (2016) version 2. European Site Conservation Objectives: Supplementary Advice on Conserving and Restoring Site Features Thames Basin Heaths Special Protection Area (SPA) Site code: UK9012141

B.9.2 Qualifying features

The site qualifies under article 4.1 of the Directive (79/409/EEC) as during the breeding season the area regularly supports 1% or more of the Great Britain (GB) populations of the following species listed in Annex I:

- Nightjar (*Caprimulgus europaeus*) - 7.8% of the GB breeding population
- Woodlark (*Lullula arborea*) - 9.9% of the GB breeding population
- Dartford warbler (*Sylvia undata*) - 27.8% of the GB breeding population

B.9.3 Conservation objectives

The SPA is designated for the above-mentioned qualifying feature that are supported by principal habitats of lowland heathland and rotationally managed coniferous plantation woodland. Heathland is particularly important for the ground nesting birds (Nightjar and Woodlark) and also the Dartford Warbler which often nests close to the ground amongst dense heather and gorse.

The protected birds are most likely to be present in the months shown in Figure 19.1, nevertheless in the remining times of the year, their presence is less significant but not to be considered absent. If project timescale is within the breading season, early consultation with Natural England is beneficial.

Figure 19.1: Site-specific seasonality of SPA features

Feature	Season	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Dartford Warbler	Breeding												
Nightjar	Breeding												
Woodlark	Breeding												

Source: extract from Natural England (2016) version 2. European Site Conservation Objectives: Supplementary Advice on Conserving and Restoring Site Features Thames Basin Heaths Special Protection Area (SPA) Site code: UK9012141

B.9.4 Pressures and threats

The Site Improvement Plan[53] has identified the following issues for the site and the features they may affect:

- Public access/disturbance has been identified as a pressure and threat to Nightjar, Woodlark and Dartford warbler populations. It is proposed to agree and implement an over-arching access management strategy among multiple delivering bodies: Berks, Bucks and Oxon Wildlife, Trust, Crown Estate (Rural), Forest Enterprise, Forestry Commission, Hampshire and Isle of Wight Wildlife Trust, Local Authorities, National Trust, Natural England, RSPB, Surrey County Council, Surrey Heath Borough Council, Surrey Wildlife Trust, Defence Infrastructure Organisation (DIO), Amphibian and Reptile Conservation Trust (ARCT), Horsell Common Preservation Society, Local partnership.
- Undergrazing has been identified as a pressure to Nightjar, Woodlark, Dartford warbler, wet heathland with cross-leaved heath, European dry heaths and depressions on peat substrates. It is proposed to agree and implement an over-arching access management strategy by the following delivering bodies: National Trust, Natural England, RSPB, DIO.
- Forestry and woodland management have been identified as a pressure to Nightjar, Woodlark, Dartford warbler, wet heathland with cross-leaved heath and European dry

[53] Improvement Programme for England's Natura 2000 sites (IPENS). (2014) Site Improvement Plan Thames Basin

heaths. It is proposed to review and agree forestry plans/policies to ensure compatibility with objectives by the following delivering bodies: Forest Enterprise, Natural England, DIO, Crown Estate.

- Hydrological changes have been identified as a threat to wet heathland with cross-leaved heath and depressions on peat substrates. It is proposed to undertake hydrological investigations by the following delivering bodies: Natural England, Surrey Wildlife Trust, DIO.
- Inappropriate scrub control has been identified as a pressure to Nightjar, Woodlark, Dartford warbler, wet heathland with cross-leaved heath and European dry heaths. It is proposed to agree a habitat management strategy among multiple delivering bodies: Berks, Bucks and Oxon Wildlife Trust, Bracknell Forest Borough Council, Crown Estate (Rural), Forestry Commission, Hampshire and Isle of Wight Wildlife Trust, Natural England, RSPB, Surrey County Council, Surrey Heath Borough Council, Surrey Wildlife Trust, Windsor and Maidenhead Royal Borough Council, ARCT.
- Invasive species has been identified as a pressure and threat to wet heathland with cross-leaved heath and European dry heaths. It is proposed to agree and implement invasive control strategy by the following delivering bodies: Hampshire and Isle of Wight Wildlife Trust, Natural England, Surrey Wildlife Trust, DIO.
- Wildfire/arson has been identified as a pressure to Nightjar, Woodlark, Dartford warbler, wet heathland with cross-leaved heath, European dry heaths and depressions on peat substrates. It is proposed to agree and implement a fire risk reduction strategy among multiple delivering bodies: Berks, Bucks and Oxon Wildlife Trust, Forestry Commission, Hampshire and Isle of Wight Wildlife Trust, Hampshire County Council, Local Authorities, Natural England, Surrey County Council, Surrey Wildlife Trust, DIO, Royal Berkshire Fire and Rescue Service, Hampshire Fire and Rescue Service, Surrey Fire and Rescue Service, Wildfire, Horsell Common Preservation Society, South East England Wildfire Group.
- Air pollution: impact of atmospheric nitrogen deposition has been identified as a pressure and threat to Nightjar, Woodlark, Dartford warbler, wet heathland with cross-leaved heath, European dry heaths and depressions on peat substrates. It is proposed to agree and implement nitrogen management/mitigation strategy among multiple delivering bodies: Berks, Bucks and Oxon Wildlife Trust, Hampshire and Isle of Wight Wildlife Trust, Hampshire County Council, Natural England, Surrey Heath Borough Council, Surrey Wildlife Trust, DIO.
- Feature location/extent/condition unknown has been identified as a threat to Nightjar, Woodlark and Dartford warbler. It is proposed to develop and implement improved bird monitoring strategy by the following delivering bodies: Hampshire and Isle of Wight Wildlife Trust, Natural England, RSPB, Surrey Wildlife Trust, DIO, Surrey Bird Club.
- Military has been identified as a threat to Nightjar, Woodlark, Dartford warbler, wet heathland with cross-leaved heath, European dry heaths and depressions on peat substrates. It is proposed to agree and implement integrated management plans for military sites by the following delivering bodies: Hampshire and Isle of Wight Wildlife Trust, Natural England, Surrey Wildlife Trust, DIO, ARCT.
- Habitat fragmentation has been identified as a pressure to Nightjar, Woodlark, Dartford warbler, wet heathland with cross-leaved heath, European dry heaths and depressions on peat substrates. It is proposed to commission study to identify habitat management priorities to reduce fragmentation among multiple delivering bodies: Berks, Bucks and Oxon Wildlife Trust, Bracknell Forest Borough Council, Crown Estate (Rural), Forestry Commission, Hampshire and Isle of Wight Wildlife Trust, Natural England, RSPB, Surrey Heath Borough Council, Surrey Wildlife Trust, ARCT.

B.10 Thursley, Ash, Pirbright and Chobham SAC (UK0012793)

B.10.1 Description

The Thursley, Ash, Pirbright and Chobham was classified as a Special Area of Conservation in April 2005 and is an extensive complex of heaths with extensive areas of wet and dry heath, acid mire and bog pools.

The SAC covers an area of 5138 ha, fragmented across Surrey, within the Surrey Hills Area of Outstanding Natural Beauty (AONB) and is part of the Weald National Character Area. Some areas overlap with Ash to Brookwood Heaths SSSI, Colony Bog and Bagshot Heaths SSSI, Chobham Common SSSI, Thursley, Hankley and Frensham Commons SSSI, Thames Basin Heaths SPA and Thursley, Hankley and Frensham Commons (Wealden Heaths Phase 1) SPA and includes Thursley and Ockley Bog Ramsar Site[54].

B.10.2 Qualifying features

The site qualifies under article 4(4) of the Directive (92/43/EEC) as it hosts the following habitats listed in Annex I[55]:

- Depressions on peat substrates of the (*Rhynchosporion*)
- European dry heaths
- Northern Atlantic wet heaths with (*Erica tetralix*) (wet heathland with cross-leaved heath)

This site supports the sole area of lowland northern Atlantic wet heath in south-east England. The heathland supports an important assemblage of animal species, including numerous rare and local invertebrate species, including the nationally rare white-faced darter (*Leuccorhinia dubia*), as well as sand lizard (*Lacerta agilis*) and smooth snake (*Coronella austriaca*).

B.10.3 Conservation objectives

Many detailed conservation objectives have been identified for each qualifying feature of this site[56]. Here are reported those applicable to all habitats:

- Maintain the total extent, distribution, configuration and abundance of the species so they can be a viable component
- Ensure the vegetation communities are preferable to and characterised by the National Vegetation Classification type(s)
- Ensure invasive, non-native and introduced non-native species are either rare or absent, but if present are causing minimal damage
- Maintain or restore where appropriate, the management measures within and/or outside the site boundary which are necessary to maintain or restore the structure, functions and supporting processes (e.g. spatial configuration of land or habitat, connectivity - critical habitat ‘corridors’ and habitat patches)
- Maintain or restore (where habitats are suffering) natural hydrological processes, water chemistry and soil properties to provide the conditions necessary to sustain each feature

[54] Natural England (2016). European Site Conservation Objectives: Supplementary Advice on Conserving and Restoring Site Features Thursley, Ash, Pirbright and Chobham Special Area of Conservation (SAC) Site code: UK0012793

[55] English Nature (2005). EC Directive 92/43 on the Conservation of Natural Habitats and of Wild Fauna and Flora. Citation for Special Area of Conservation (SAC)

[56] Natural England (2016). European Site Conservation Objectives: Supplementary Advice on Conserving and Restoring Site Features Thursley, Ash, Pirbright and Chobham Special Area of Conservation (SAC) Site code: UK0012793

- Maintain or restore (where the resilience is degraded) the feature's ability, and that of its supporting processes, to adapt or evolve to wider environmental change
- Restore the concentrations and deposition of air pollutants to below the site-relevant Critical Load or Level values given for each qualifying feature of the site on the Air Pollution Information System (www.apis.ac.uk).

B.10.4 Pressures and threats

The Site Improvement Plan[57] that cover this SAC also cover Thames Basin Heaths SPA and Thursley, Hankley & Frensham Commons SPA. Therefore, the issues for the site and the features that might be affected are summarised here and detailed in section B.9.4:

- Public access/disturbance - pressure and threat
- Undergrazing - pressure
- Forestry and woodland management - pressure
- Hydrological changes - threat
- Inappropriate scrub control - pressure
- Invasive species - pressure and threat
- Wildfire/arson - pressure
- Air pollution: impact of atmospheric nitrogen deposition - pressure and threat
- Feature location/extent/condition unknown - threat
- Military - threat
- Habitat fragmentation - pressure

B.11 Wimbledon Common SAC (UK0030301)

B.11.1 Description

Wimbledon Common supports an extensive area of open, wet heath on acidic soil and also contains a variety of other acidic heath and grassland communities. The high plateau in the east and north of the site has a capping of glacial gravels overlying Claygate Beds and London Clay, which are exposed on the western slope of the Common. The acidic soils and poor drainage give rise to a mosaic of wet heath and unimproved acidic grassland. Semi-natural broadleaved woodland covers the deeper, clay soils of the western slope.

A significant cover of heather (*Calluna vulgaris*) distinguishes areas of dry and wet heath. The wet heath supports typical species such as the heath rush (*Juncus squarrosus*). The brown sedge (*Carex disticha*) is present, as is mat-grass (*Nardus stricta*) on drier parts. Localised areas of dry heath support bell heather (*Erica cinerea*) and dwarf gorse (*Ulex minor*). The semi-natural woods of the clay soils comprise a dense canopy of maturing pedunculate oak.

Wimbledon Common has a large number of old trees and much fallen decaying timber. The site supports a number of other scarce invertebrate species associated with decaying timber, including stag beetle (*Lucanus cervus*).

B.11.2 Qualifying features

Qualifying habitats - The site is designated under article 4(4) of the Directive (92/43/EEC) as it hosts the following habitats listed in Annex I:

[57] Improvement Programme for England's Natura 2000 sites (IPENS). (2014) Site Improvement Plan Thames Basin

- European dry heaths
- Northern Atlantic wet heaths with (*Erica tetralix*). (Wet heathland with cross-leaved heath)

Qualifying species - The site is designated under article 4(4) of the Directive (92/43/EEC) as it hosts the following species listed in Annex II:

- Stag beetle (*Lucanus cervus*)

B.11.3 Conservation objectives

Maintaining the decaying wood habitat, maintain or restore a well-structured broadleaved woodland habitat, with sheltered, sunlit glades and rides containing stumps and other suitable decaying wood habitat structure, maintaining the natural processes ensuring the continuity of timber decay, maintaining and restoring the presence of the stag beetle population across the SAC, maintain the management measures which are necessary to maintain or restore the structure, functions and supporting processes associated with the stag beetle feature[58].

B.11.4 Pressures and threats

Public disturbance and air pollution (nitrogen deposition) are listed as pressures to this site. Habitat fragmentation and invasive species are listed as threat to this SAC[59].

[58] http://publications.naturalengland.org.uk/publication/5706571287887872

[59] http://publications.naturalengland.org.uk/publication/5638512552443904


Thames
Water