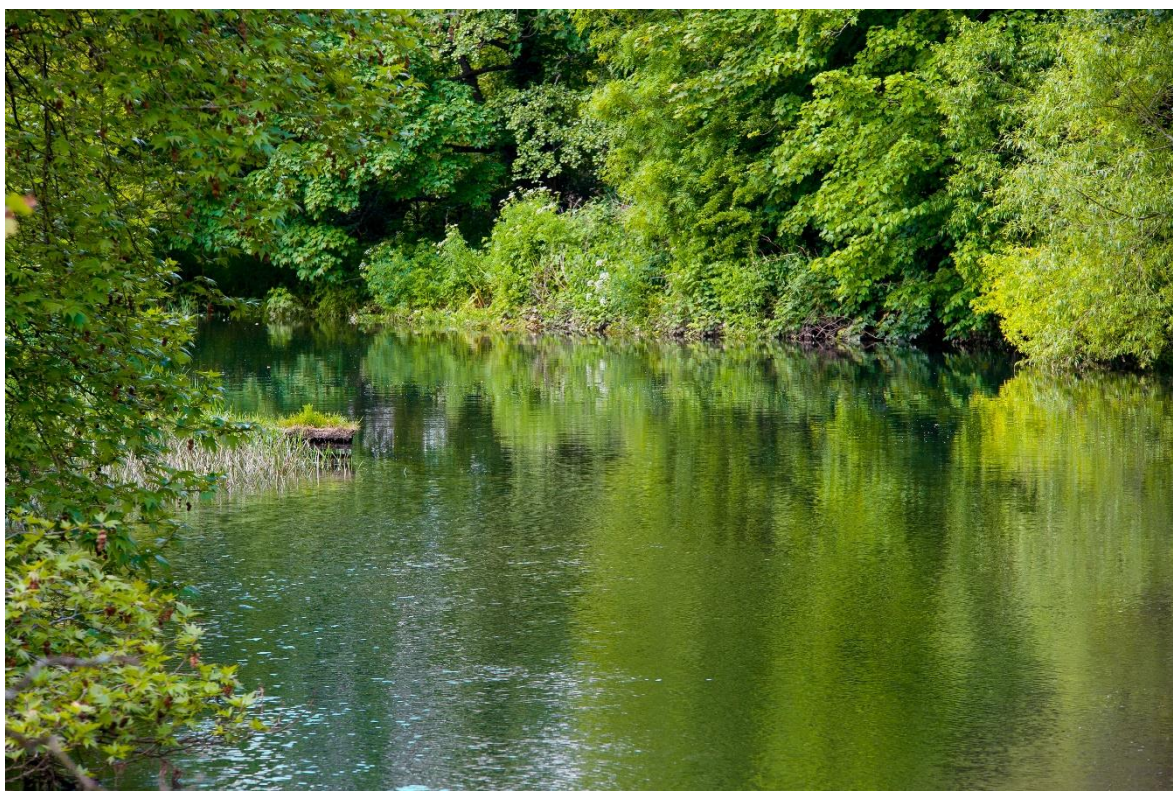


Strategic Regional Water Resource Solutions: Annex B2 Informal Habitats Regulations Assessment

Standard Gate Two Submission for Thames to Southern Transfer (T2ST)

Date: November 2022



Notice

Position Statement

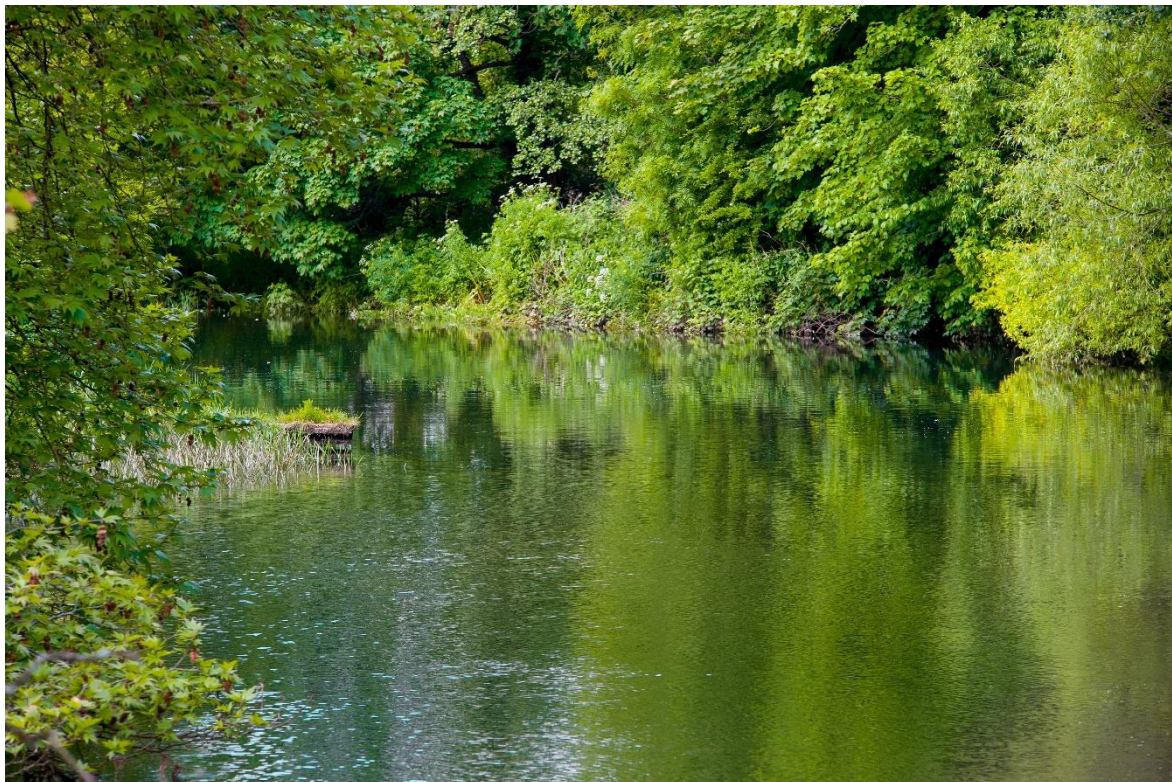
- *This document has been produced as the part of the process set out by RAPID for the development of the Strategic Resource Options (SROs). This is a regulatory gated process allowing there to be control and appropriate scrutiny on the activities that are undertaken by the water companies to investigate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

Disclaimer

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

Thames to Southern Transfer
Informal Habitats Regulations Assessment
T2ST-G2-REP-04 (Annex B2)

November 2022



THAMES TO SOUTHERN TRANSFER (T2ST)

Annex B2 Informal Habitats Regulations Assessment

Atkins Ref: T2ST-G2-REP-04 (Annex B2)

November 2022

Contents

Notice	ii
Glossary	v
Executive summary	1
1 Introduction	2
1.1 Overview	2
1.2 Gate 2 Thames to Southern Transfer Options	2
1.3 The purpose of the Habitats Regulation Assessment	2
1.4 Assumptions and limitations	3
2 Summary scheme description	4
2.1 Overview	4
2.2 Option B - Central route via Newbury (West of Newbury and remaining west of the A34, to Winchester)	5
2.3 Option C - Central route via Newbury (West of Newbury and then crossing to the east of the A34, to Winchester)	7
2.4 Asset description	8
2.5 Programme assumptions	9
3 HRA process for Gate 2 submission	10
3.1 HRA Process	10
3.2 Screening Assessment Methodology	11
3.3 Appropriate Assessment Methodology	12
4 Option B Appropriate Assessment	19
4.1 Review of sites identified at HRA Stage 1	19
4.2 HRA Stage 2 Appropriate Assessment	20
5 Option C Appropriate assessment	28
5.1 Review of sites identified at HRA Stage 1	28
5.2 HRA Stage 2 Appropriate Assessment	29
6 Summary and next steps	37
7 References	38
A. Designated Sites	39

A.1	River Lambourn SAC	39
A.2	Kennet and Lambourn Floodplain SAC	40
A.3	Kennet Valley Alderwoods SAC	40
A.4	Mottisfont Bats SAC	41

Tables

Table 2.1: Option B scheme description summary	7
Table 2.2: Option C scheme description summary	8
Table 3.1: HRA Stages	11
Table 3.2: Potential effects and proposed Zone of Influence	14
Table 4.1: Option B Stage 1 screening results	19
Table 4.2: Option B potential adverse effects to the site integrity	22
Table 5.1: Option C Stage 1 screening results	28
Table 5.2: Option C potential adverse effects to the site integrity	31

Glossary

Acronym	Definition
AA	Appropriate Assessment
BPT	Break Pressure Tank
CEMP	Construction Environmental Management Plan
DAF	Dissolved Air Flotation plant
DCO	Development Consent Order
EAR	Environmental Assessment Report
ECJ	European Court of Justice
EMS	Environmental Management Systems
GAC	Granular Activated Carbon Plant
HRA	Habitats Regulations Assessment
INNS	Invasive Non-Native Species
PS	Pumping Station
RAPID	Regulators' Alliance for Progressing Infrastructure Development
RGF	Rapid Gravity Filter plant
SAC	Special Areas of Conservation
SESRO	South East Strategic Reservoir Option
SNCB	Statutory Nature Conservation Body
SRO	Strategic Resource Option
STT	Severn to Thames Transfer
T2ST	Thames to Southern Transfer
UKWIR	United Kingdom Water Industry Research
WRMP24	Water Resources Management Plan 2024
WRSE	Water Resources South East
WSR	Water Supply Reservoir
WTW	Water Treatment Works
ZoI	Zone of Influence

Executive summary

This report presents the results of the Informal Habitats Regulations Assessment (HRA) Stage 2/ Appropriate Assessment (AA) undertaken at plan level for Options B and C in the Thames to Southern Transfer (T2ST) Strategic Resource Option (SRO). This report assesses the potential impacts of the options on Natura 2000 sites and the UK's National Site Network and Ramsar sites. These sites are collectively referred to in this document as 'Habitats Sites'.

This Annex supports the Environmental Assessment Report (EAR) that accompanies the Gate 2 submission to Regulators' Alliance for Progressing Infrastructure Development (RAPID).

This informal HRA and AA has followed the methodology in the *Environmental Assessment Guidance for Water Resources Management Plans and Drought Plans (21/WR/02/15)*.

The HRA screening identified a number of potential 'likely significant effects', and a number of 'uncertain effects' for each of the options.

Following the AA, no adverse effects resulting from the implementation of Option B (alone and in-combination with other projects or plans), or Option C (alone and in-combination with other projects or plans) are reasonably foreseeable on the integrity of the Habitats Sites, if the suggested mitigation measures are observed.

This result depends on the implementation of the proposed mitigation measures including:

- Trenchless crossings: The current design of all options includes a pipeline route that will cross watercourses that are designated as a Habitats Site (River Lambourn SAC in Options B and C). The identified result of no adverse effects to the site integrity depends on the use of pipejack or micro tunnel crossings in all options, in order to avoid effects on watercourses;
- Any mature tree lines or hedgerows that might be traversed by the route are either preserved in situ (such as through pipe jacking beneath the hedge) or are immediately reinstated in order to avoid effects on bats;
- Standard best practice pollution control measures;
- Standard best practice biosecurity measures;
- Disturbance mitigation measures: including light, noise and visual mitigation measures; and
- A Construction Environmental Management Plan (CEMP) must be developed at the appropriate stage in the SRO development that will include the proposed mitigation measures in this AA as well as any other specific measures identified following further HRA activities or formal HRA.

No adverse effects to the site integrity have been identified resulting from the implementation of either Option B or Option C, and any residual effects are considered negligible. Consequently an in-combination assessment with other projects or plans is not required.

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

1 Introduction

1.1 Overview

This Annex supports the Environmental Assessment Report (EAR) that accompanies the Gate 2 submission to the Regulators' Alliance for Progressing Infrastructure Development (RAPID) for the Thames to Southern Transfer (T2ST) Strategic Resource Option (SRO). This Annex presents the findings of an Informal Habitats Regulations Assessment (HRA) Stage 2/ Appropriate Assessment (AA) applied to Options B and C for the Gate 2 T2ST pipeline route options.

A full HRA for the T2ST SRO is not required until a planning and/or permit application (or its equivalent, for example a Development Consent Order (DCO)) is submitted. However, this informal HRA has been undertaken following the principles of a HRA, to inform the development of the scheme and identify any reduce risk of non-compliance at a later stage of the SRO.

1.2 Gate 2 Thames to Southern Transfer Options

The assessment presented here develops work undertaken at Gate 1. The assessments undertaken at Gate 1 were applied to six options for transferring water between the Thames Water Region and the Southern Water Region.

Route and site selection undertaken at Gate 2 has identified two options for the T2ST SRO, with 3 possible capacities of 50MI/d, 80MI/d and 120MI/d, transferring potable water from land to the west of A34 near Drayton in Oxfordshire in the Thames Water region to the existing Yew Hill Water Supply Reservoir (WSR) near Winchester in the Southern Water region. These options have been developed based on series of criteria that consider engineering, environmental, social, and planning constraints. The route for each option has been identified within a wider corridor that meets a majority of the criteria and therefore the pipeline can avoid a large number of environmental designations and communities along its route. These options are listed below and further detailed in Section 2.

- Option B – Central route via Newbury (West of Newbury and remaining west of the A34, to Winchester); and
- Option C – Central route via Newbury (West of Newbury and then crossing to the east of the A34, to Winchester).

Option C is a variation of option B. The majority of the route is common to both, with the only difference being the central section of the route to the south of Newbury which goes west of the A34 in Option B, and east of the A34 in Option C.

Full details of the route and site selection undertaken at Gate 2 is included in the Route and Site Selection Annex A2, which also details the discounted options.

1.3 The purpose of the Habitats Regulation Assessment

This HRA has been undertaken at Gate 2, in order to inform any likely impediments to the practicality or deliverability of the SRO. 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 Regulations, by ensuring that the potential effects of the scheme are fully considered at each Gate.

At later Gates, further consultation with the relevant competent authority and Statutory Nature Conservation Body (SNCB – Natural England) will be required and this report will form the basis

of future iterations of the assessment, which will be updated when changes are made beyond Gate 2.

The competent authority will be required to determine whether the scheme will adversely affect the integrity of the Habitats Site(s). The integrity of a Habitats Site is the coherence of its ecological structure and function, across its whole area, that enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was designated.

1.4 Assumptions and limitations

This assessment has been undertaken assuming the maximum transfer capacity of 120MI/d.

Information provided by third parties, including publicly available information and databases, is considered correct at the time of assessment (March 2022). 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. Changes since the date of assessment, such as additional designated sites, will be taken into account in future assessments.

Any uncertainties and the 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 Habitats Sites identified by this report are also based on the information available at the time of the assessment. It is acknowledged that the requirement for mitigation may change as the design of the SRO progresses. This is expected to be through increasing the level of detail available during later stages of option development for subsequent gateways, if the relevant options are progressed.

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

2 Summary scheme description

2.1 Overview

The T2ST route begins at a new WTW at the intake location to be located on existing agricultural land to the west of A34 near Drayton in Oxfordshire in the Thames Water region and ends at the existing Yew Hill WSR near Winchester in the Southern Water region. The transfer scheme has 3 possible capacities of 50MI/d, 80MI/d and 120MI/d and includes a number of intermediate break pressure tanks and pumping stations to allow hydraulic transfer of the water between the new WTW at the intake location and Yew Hill WSR. In practice T2ST will either be supplied by either the Severn to Thames Transfer SRO (STT) or the South East Strategic Reservoir Option (SESRO).

A full scheme description can be found in the RAPID Gate 2 Report and in Annex A3 the Concept Design Report, however a summary of the main aspects of the options are included below.

The transfer route between the new WTW at the intake location and Yew Hill WSR is approximately 80-85km in length.

The majority of the pipeline installed will be 1000 to 1100mm diameter at maximum capacity of 120MI/d which will be installed primarily using open cut excavation. The pipeline route passes predominantly through open rural countryside, crossing a number of roads, rivers and railways. To provide sufficient working space to construct the pipeline a temporary working easement will be required, typically up to 40m wide depending on the final design depth of the pipeline. During construction the topsoil within the easement would be stripped back and stored locally within the easement, followed by excavation of the pipe trench which would be approximately 1.8m wide x 2.2m deep, to allow minimum cover of 900mm above the pipe and 300mm pipe bedding under the pipeline, for a 1000mm diameter pipeline.

Smaller diameter connection pipelines are also required in two locations, to the existing water supply network at Beacon Hill WSR and Micheldever WSR, as detailed in the sections below.

There are expected to be several major road, rail and river crossings located along the preliminary pipeline routes which are anticipated to require trenchless technology. Through consultation with Thames Water and Southern Water it has been assumed at concept design stage that all expected trenchless crossings will comprise a single tunnelled crossing, using pipe jacking and micro tunnelling. Launch and reception shafts would be constructed either side of the surface feature and a concrete tunnel section then constructed between the two shafts.

Pipejack or micro tunnel crossings will be required to cross existing railways, motorways, A roads and B Roads. Other minor road crossings will be installed using open cut methods and temporary road closure.

Pipejack or micro tunnel crossings will also be required to cross main watercourses. Crossings for ordinary watercourses will be installed using open cut methods and temporary culverts.

Full details of the crossings lengths and locations can be found in Annex A3, the Concept Design Report.

There are two options within the T2ST SRO for transferring water from the new WTW site at the intake location to the west of A34 near Drayton to the existing Yew Hill WSR near Winchester as described below:

- Option B - Central route via Newbury (West of Newbury and remaining west of the A34, to Winchester), with a total pipeline length including spur connections of 93.8km; and
- Option C - Central route via Newbury (West of Newbury and then crossing to the east of the A34, to Winchester), with a total pipeline length including spur connections of 94.2km.

Option C is a variation of option B. The majority of the route is common to both, with the only difference being the central section of the route to the south of Newbury which goes west of the A34 in Option B, and east of the A34 in Option C.

A schematic of the Options B and C is provided in Figure 2.1 which shows indicative locations for the WTW, pipe route corridors and connection points to the existing water network.

Figure 2.1: Schematic of preferred T2ST options B and C



Each route can be split into 4 sections as discussed in the below sections.

2.2 Option B - Central route via Newbury (West of Newbury and remaining west of the A34, to Winchester)

2.2.1 Option B Section 1 – Water Treatment Works to BS3

This section is approximately 18.0km in length.

2no. Pipe jack crossings will be required along this section including the Didcot to Swindon railway line and the A417. The following above ground assets are located within this section:

- BS1 Water Treatment Works (WTW) and Pumping Station (PS) - 120MI/d, approx. land area 300m x 150m;
- BS2 Break Pressure Tank (BPT) – 5MI/d, approx. land area 75 x 55m; and
- BS3 PS and BPT - 5MI/d, approx. land area 80 x 80m.

2.2.2 Option B Section 2 – BS3 to north of the River Enbourne

This section is approximately 19.6km in length.

8no. Pipe jack crossings will be required along this section including B4494, M4, Winterbourne Road, River Lambourn, B4000, A4, Wick Wood, and River Kennet & Newbury railway line (including the Kennet and Avon Canal). There are no above ground assets required within this section.

2.2.3 Option B Section 3 – River Enbourne, west of the A34 to River Test

This section is approximately 32.1km in length.

The route includes a 250mm diameter pipeline connection to an existing tank at Beacon Hill, approximately 1.8km in length.

The route also includes a 700mm diameter pipeline connection to the existing Micheldever WSR, approximately 7km in length.

9no. Pipe jack crossings will be required along this section including River Enbourne, A343, Bourne Rivulet/B3048, Andover railway line, B3400, A303 (1), A303 (2), B3048 and the River Test.

The following assets are located within this section:

- BS4 PS and BPT – Options 1, 2 and 3 (only one location required, but currently reviewing 3 options) – 5MI/d, approx. land area 80 x 80m;
- BS5 BPT – 5MI/d, approx. land area 75 x 55m;
- Beacon Hill WSR – existing asset, not part of this assessment;
- Micheldever WSR - existing asset, not part of this assessment; and
- BS6 PS, approx. size 65 x 40m.

2.2.4 Option B Section 4 – River Test to Yew Hill WSR

This section is approximately 24.1km in length.

6no. Pipe jack crossings will be required along this section including A303, River Dever, A30, A272, B3049, and A3090.

The route includes a connection to the existing Crabwood WSR.

The route ends with a connection to the existing Yew Hill WSR.

There are no above ground assets proposed for this section.

2.2.5 Option B summary

Table 2.1 summarises the proposed works for Option B.

Table 2.1: Option B scheme description summary

Section	Pipe length	New assets	Trenchless crossings of natural features
Section 1 – Water Treatment Works to BS3	18.0km	BS1 WTW and PS BS2 BPT BS3 PS and BPT	None
Section 2 –BS3 to north of the River Enbourne	19.6km	None	River Lambourn Wick Wood River Kennet
Section 3 – River Enbourne, west of A34 to River Test	32.1km	BS4 PS and BPT BS5 BPT BS6 PS	River Enbourne Bourne Rivulet River Test
Section 4 – River Test to Yew Hill WSR	24.1km	None	River Dever

2.3 Option C - Central route via Newbury (West of Newbury and then crossing to the east of the A34, to Winchester)

2.3.1 Option C Section 1 –Water Treatment Works to CS3

As per option B.

This section is approximately 18.0km in length.

2no. Pipe jack crossings will be required along this section including the Didcot to Swindon railway line and the A417.

The following assets are located within this section:

- CS1 WTW and PS - 120Ml/d, approx. land area 300m x 150m;
- CS2 BPT – 5Ml/d, approx. land area 75 x 55m; and
- CS3 PS and BPT - 5Ml/d, approx. land area 80 x 80m.

2.3.2 Option C Section 2 – CS3 to north of the River Enbourne

As per option B.

This section is approximately 19.6km in length.

8no. Pipe jack crossings will be required along this section including B4494, M4, Winterbourne Road, River Lambourn, B4000, A4, Wick Wood, and River Kennet & Newbury railway line (including the Kennet and Avon Canal).

There are no above ground assets required within this section.

2.3.3 Option C Section 3 – River Enbourne, east of the A34 to River Test

This section is approximately 32.5km in length.

The route includes a 250mm diameter pipeline connection to an existing tank at Beacon Hill, approximately 4.2km in length.

The route also includes a 700mm diameter pipeline connection to the existing Micheldever WSR, approximately 9.2km in length.

15No. Pipe jack or micro tunnel crossings will be required along this section including, River Enbourne, A34 (1), A343, Penwood Road, Woodland (1), Hopping Common and B4640,

Woodland (2), A34 (2), Whitchurch railway line, B3400, River Test (1), A34 (3), River Test (2), B3048, A303 (1), A303 (2).

The following assets are located within this section:

- CS4 PS and BPT – 5Ml/d, approx. land area 80 x 80m;
- Beacon Hill WSR – existing asset, not part of this assessment;
- Micheldever WSR - existing asset, not part of this assessment; and
- CS5 PS, approx. land area 65 x 40m.

2.3.4 Option C Section 4 – River Test to Yew Hill WSR

As per option B.

This section is approximately 24.1km in length.

6no. Pipe jack crossings will be required along this section including A303, River Dever, A30, A272, B3049, and A3090.

The route includes a connection to the existing Crabwood WSR.

The route ends with a connection to the existing Yew Hill WSR.

There are no above ground assets proposed for this section.

2.3.5 Option C summary

Table 2.1 summarises the proposed works for Option C.

Table 2.2: Option C scheme description summary

Section	Pipe length	New assets	Trenchless crossings of natural features
Section 1 – Water Treatment Works to CS3	18.0km	CS1 WTW and PS CS2 BPT CS3 PS and BPT	None
Section 2 – CS3 to River Enbourne	19.6km	None	River Lambourn Wick Wood River Kennet
Section 3 – River Enbourne, east of the A34 to River Test	32.5km	CS4 PS and BPT CS5 PS	River Enbourne Woodland and Hopping Common Woodland (west of Burghclere) River Test (two crossings required)
Section 4 – River Test to Yew Hill WSR	24.1km	None	River Dever

2.4 Asset description

The below sections describe the new assets to be installed as part of the SRO and list the equipment expected to be associated with them.

2.4.1 BS1/CS1 WTW and PS

The WTW is to be located at the north end of both corridor options B and C. Raw water will enter the screening and treatment processing before entering the option pipelines. The waste

water by-product of the treatment process will be sent for treatment to a local sewage treatment works. The WTW has approximately a 45,000m² area and will contain the following equipment

- Waste and sludge handling
- Ozone contact tanks
- Granular Activated Carbon (GAC) Plant
- UV plant
- Rapid Gravity Filter (RGF) plant
- Chlorine contact tank
- Dissolved Air Flotation (DAF) plant
- Flocculation tank
- Welfare
- Chemical storage
- Treated water storage
- Pumping station

It should be noted that at the time of writing no formal plans of the WTW has been issued. It is unknown at this point where equipment will be located on the site. An area has been identified with an approximate boundary for the location of the WTW and will be assessed against flood risk and other environmental impacts.

2.4.2 BS2/CS2 BPT, BS5 BPT

The area size of the BPT is approximately 4125m² and only includes a 5MI storage tank and access roads.

2.4.3 BS3/CS3 PS and BPT, BS4 PS and BPT and CS4 PS and BPT

For each of the PS and BPT assets, the PS and BPT are located on one site with area size approximately 6400m² and includes the following equipment:

- HV/LV transformer x2
- Surge tanks
- Standby generator
- Pumping station
- 5MI Storage tanks

2.4.4 BS6/CS5 PS

The PS area size is approximately 2600m² and includes the following equipment.

- HV/LV transformer
- Surge tanks
- Standby generator
- Pumping station

2.5 Programme assumptions

The draft Water Resources South East (WRSE) regional plan sets out the overall need for T2ST and this feeds into the relevant Water Resource Management Plans (WRMPs) from both Thames Water and Southern Water. The draft WRSE regional plan has determined a need for a T2ST scheme of up to 120MI/d by 2040-2053 depending on the scenario in the adaptive plan. Therefore, at this stage, it is envisaged the project will not be operational until at least 2040.

3 HRA process for Gate 2 submission

3.1 HRA Process

There is a requirement under the Conservation of Habitats and Species Regulations 2017 (as amended) (“the 2017 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 Habitats Regulations Assessment (HRA).

The 2017 Regulations include measures to establish and maintain a network of sites protecting habitats which in themselves are valuable as well as for the species they support. These sites form a network across Europe that is known as Natura 2000. Within the UK, this network is known as the National Site Network and 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 Ramsar sites also treated equally within this assessment framework. These sites are collectively referred to in this document as ‘Habitats Sites’.

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

Although the 2017 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 and requirements and processes remain the same, as protection levels remain unchanged. As such existing EU guidance¹ and preceding case law from the European Court of Justice (ECJ)^{2 3 4} 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 on any features of a Habitats Site, there is no requirement to undertake further stages. Similarly, if the Stage 2 Appropriate Assessment concludes there will be no adverse effect on integrity of the site, then the assessment is concluded. The HRA stages are summarised within Table 3.1.

¹ Managing Natura 2000 Sites - The provisions of Article 6 of the ‘Habitats’ Directive 92/43/CEE (European Communities 2020)

² Landelijke Vereniging tot Behoud van de Waddenzee/ Nederlandse Vereniging tot Bescherming van Vogels, European Court of Justice, Case C-127/02 ‘Waddenzee 2002’

³ Sweetman et al v An Bord Pleanala, European Court of Justice, Case C-258/11 ‘Sweetman 2011’

⁴ People over Wind/Sweetman v Coillte Teorante, European Court of Justice Case C-323/17 ‘People over Wind 2017’

Table 3.1: HRA Stages

Stage	Description
Screening (Stage One)	<p>This is the process which identifies the potential effects upon the Habitats Sites and considers if these are likely to be significant (see definitions below).</p> <p>Screening is an iterative process and before moving to Stage Two it can be repeated if required.</p> <p>Proposals to mitigate any likely significant effects cannot be considered at the screening stage.</p> <p>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.</p>
Appropriate Assessment (Stage Two)	<p>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.</p> <p>Additionally, where mitigation has been proposed to avoid or minimise adverse effects to the site integrity, this stage includes assessment of the likely effectiveness of any mitigation applied.</p> <p>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.</p>
Assessment of Alternative Solutions (Stage Three)	<p>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 impacts on the integrity of the Habitats Site.</p>
Assessment where no alternative solutions exist and where adverse impacts remain (Stage Four)	<p>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.</p> <p>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.</p>

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'.

The informal HRA and AA has followed the methodology in the *Environmental Assessment Guidance for Water Resources Management Plans and Drought Plans (21/WR/02/15)*.

3.2 Screening Assessment Methodology

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 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 Zone of Influence (ZoI) of these effects, noting this may extend some distance from the site itself, it is not confined to activities on or adjacent to the site;
- Any viable pathways for the project (or plan) to the receptor (designated site itself or functionally linked land);

- The features of interest of the designated site(s) in question; and
- The conservation objectives of the designated site, including any site sensitivities given within any supplementary advice, site improvement plan, or equivalent document published by the relevant nature conservation body.

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

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

Where likely significant effects are identified the assessment has taken these effects through to Stage 2, Appropriate Assessment (AA).

3.3 Appropriate Assessment Methodology

3.3.1 Approach

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

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

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

Potential effects on the qualifying features of the Habitats Sites 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: Appropriate Assessment uses the following approach:

- Review the sites identified at Stage 1 and confirm any additions or exclusions; and.
- Stage 2 Appropriate Assessment of the potential effects of the construction and operational phases of the SRO, including an assessment of each potential effect on the integrity of the Habitats Sites' characteristics and conservation objectives⁵.

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 2019⁶.
- UK Water Industry Research (UKWIR, 2021)⁷.
- European Commission (EU, 2018) *Managing Natura 2000 sites - The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC*⁸.
- Waterbird Disturbance and Mitigation Toolkit, (TIDE Tidal River Development 2022)⁹.

3.3.2 Consultation

It is a statutory requirement of the HRA process that as the competent authority (Natural England) be consulted at the Appropriate Assessment stage.

Engagement during Gate 2 has focused on development of the pipeline route corridor and location of above ground infrastructure.

Regular engagement has been undertaken with the National Appraisal Unit (NAU) during Gate 2. Key areas of engagement include NAU feedback on risks of options that involved raw water transfers. NAU provided some data on environmental constraints to inform the route and site selection process, as well as providing feedback on the shortlisted options, recognising there remained challenges with all options. NAU did not indicate that the preferred routes were not feasible and provided information on the expected mitigation, for example, for crossing watercourses.

Engagement with the NAU has helped refine the options to potable transfers. Information and feedback provided by NAU has informed route and site selection, helping to avoid sensitive areas. Mitigation suggestions provided by NAU have been included in the design and environmental assessments. Constraints and location-specific challenges flagged by NAU have been identified as areas for further work.

Stakeholder engagement activity with other stakeholders is described in the Gate 2 Report.

⁵ This is the Appropriate Assessment given and tabulated in Sections 4 and 5.

⁶ Available at: [Appropriate assessment - GOV.UK \(www.gov.uk\)](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/414213/AA-Guidance-2019.pdf)

⁷ *Environmental Assessment Guidance for Water Resources Management Plans and Drought Plans (21/WR/02/15)*

⁸ Available at: https://ec.europa.eu/environment/nature/natura2000/management/docs/art6/Provisions_Art_.nov_2018_end_cox.pdf

⁹ Available at: [TIDE toolbox - TIDE tools \(tide-toolbox.eu\)](https://tide-toolbox.eu/)

3.3.3 Potential impacts considered as part of the HRA

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

Table 3.2: Potential effects and proposed Zone of Influence

Broad categories of potential impacts on Habitats Sites (with examples)	Examples of operations resulting in effects and proposed Zoi
Physical loss Destruction (including offsite effects) eg. foraging habitat, smothering	Development of built infrastructure associated with the pipelines, access routes. Indirect effects from a reduction in flows for example. drying out of water-margin habitat. 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, long shore drift along the coast, or the scheme impacts the linking habitat).
Physical damage Habitat degradation Erosion Trampling Fragmentation Severance/barrier effects Edge effects	Development of built infrastructure associated with the scheme, e.g. reservoir embankments, water treatment plants, pipelines, pumping stations. Physical damage is likely to be significant where the boundary of the scheme 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, or where natural processes link the scheme to the site, such as through hydrological connectivity downstream of an option or sediment drift along the coast.
Non-physical disturbance Noise Visual presence Light pollution	Noise from temporary construction or temporary pumping activities. Taking into consideration the noise level generated from general building activity (c. 122dB(A)) and considering the lowest noise level identified in guidance as likely to cause disturbance to waterbird species (although this guidance is designed primarily for estuarine birds it was considered appropriate to use for this plan), it is concluded that noise effects could be significant up to 1km from the boundary of the Habitats Site. Noise from vehicular traffic during construction of the scheme Noise from construction traffic is only likely to be significant where the transport route to and from the scheme is within 3-5km of the boundary of the Habitat Site. 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 scheme 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. Options that might include artificial lighting , e.g. for security around a temporary pumping station. Effects from light pollution are more likely to be significant where the boundary of the scheme is within 500m of the boundary of the Habitats Site.
Water table/ availability Drying Flooding/storm water Changes to surface water levels and flows	Change to water levels and flows due to water abstraction, storage and drainage interception. These effects are only likely to be significant where the boundary of the scheme extends within the same ground or surface water catchment as the Habitats Site. However, these effects are dependent on hydrological continuity

Broad categories of potential impacts on Habitats Sites (with examples)	Examples of operations resulting in effects and proposed Zol
Changes to groundwater level and flows	between the scheme and the Habitats Site and sometimes whether the scheme is up or downstream from the Habitats Site.
Toxic contamination Water pollution Soil contamination Air pollution Spillage (fuels, oils etc)	Reduced dilution in downstream or receiving waterbodies due to changes in abstraction or reduced compensation flow releases to river systems. These effects are only likely to be significant where the boundary of the scheme extends within the same ground or surface water catchment as the Habitats Site. However, these effects are dependent on hydrological continuity between the scheme and the Habitats Site, and sometimes whether the scheme is up or down stream from that Site(s). Air emissions associated with plant and vehicular traffic during construction and operation of the scheme. The effect of dust is only likely to be significant where site is within or in close proximity to the boundary of the 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 scheme traffic are only likely to be significant where the protected 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 scheme extends within the same ground or surface water catchment as the Habitats Site. However, these effects are dependent on hydrological continuity between the scheme and the Habitats Site, and sometimes whether the option is up or down stream from the Site(s). Emissions of dust during the earthworks, construction of plant and tunnel/pipeline construction associated with options. Natural England's updated guidance on Nutrient Neutrality ¹⁰ will be taken into consideration.
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 scheme 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). Creation of new pathway for spread of non-native invasive species. This effect is only likely to be significant where the scheme is situated within the Habitats Site or an upstream tributary of the Habitats Site, but also for inter-catchment water transfers.

Source: Adapted from: UK Water Industry Research (2021)¹¹.

3.3.4 Assumptions on constructing and operating the SRO

3.3.4.1 Overview

The high-level nature of this assessment undertaken at the plan stage means that there is some lack of detailed design for the SRO. By law, any scheme being taken forward to be implemented will be subject to an Appropriate Assessment at the project stage, when, in the light of more

¹⁰ [Nutrient Neutrality: A summary guide and frequently asked questions - NE776 \(naturalengland.org.uk\)](https://www.naturalengland.org.uk/nature-conservation/science-and-research/nutrient-neutrality) [accessed July 2022]

¹¹ UK Water Industry Research (UKWIR, 2021). *Environmental Assessment Guidance for Water Resources Management Plans and Drought Plans (21/WR/02/15)*

information relating to the construction and design of the scheme, a more refined HRA assessment can be undertaken.

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. As such, a number of assumed and established measures are proposed with the assumption that they will be followed at later stages as per the below. 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 impacts occurring in so far as is reasonably possible. These measures are assumed to be applied unless the project stage HRAs or option-specific environmental studies demonstrate that they are not required (i.e. the anticipated effect will not occur), not appropriate, or that alternative or additional measures are necessary or more appropriate. Note that these measures must be reviewed at later stages, taking into account any changes in best-practice as well as option-specific survey information or baseline studies.

3.3.4.2 Assumptions during construction

The assumptions made on the mitigation measures for the SRO design, pollution control, biosecurity, disturbance are detailed below. These are expected to be contained within a Construction and Environmental Management Plan (CEMP), to be developed at the appropriate stage in the SRO development 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 measures listed below and any additional ones identified during the project HRA. These assumptions for mitigation are the responsibility of a future contractor to secure, but should be fully complied with, and have been assumed as fully complied with for the purposes of this assessment.

SRO design

- Should design be altered, every opportunity for avoiding potential effects on Habitats Sites (e.g. through alternative pipeline routes, micro siting, etc.) should be taken.
- Construction of new pipeline at watercourse crossings, where the watercourse is in hydrological continuity with a Habitats Site will be carried out using pipejack or micro tunnel crossings to avoid direct effects on riverbed and permanent habitat loss.
- Pipeline routes will be sufficiently distant to watercourses and designated sites boundaries to offer a buffer limiting pathways through disturbance and pollution runoff.

Pollution control

- Indirect construction-related pollution is identified as one key pathway through which Habitats 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)¹²

¹² Charles P. and Edwards P (2015) *Environmental good practice on site guide*. CIRIA C741, 260p.

- Environment Agency’s Pollution Prevention Guidance Notes¹³ including PPG1: *General Guide to Prevention of Pollution* (May 2001); PPG5: *Works and maintenance in or near water* (October 2007), PPG6: *Pollution prevention guidance for working at construction and demolition sites* (April 2010); PPG21: *Pollution incident response planning* (March 2009); PPG22: *Dealing with spillages on highways* (June 2002).
- The installation of sediment traps near or in watercourses or the use of cofferdams should be specified at the project stage.

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:
 - INNS risk assessment undertaken at Gate 2, to be reviewed upon finalisation of the conceptual design to account for any changes that may introduce INNS risk.
 - Where INNS are identified, legal requirements and mitigation plan developed at early planning stage.
 - INNS to be included on all site method statements including the CEMP (to be developed at the appropriate stage in the SRO development) and any Ecological Protection Plans. INNS risk to be managed by Clerk of Works and INNS brief given to all site contractors.
 - Where a species requires long-term management (such as Japanese knotweed *Fallopia japonica*), a specific INNS management plan 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.
- Programme activities likely to result in disturbance to breeding birds outside of the bird breeding season, in the period April to mid-September inclusive.
- Programme activities likely to result in disturbance to wintering birds outside of the period October to March inclusive.
- Construction related noise disturbance can be further minimised by implementing best practice such as BS 5228-1:2009+A1:2014 (The British Standards Institute, 2008)¹⁴.

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

¹³ 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.

¹⁴ 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.

directed away from potential suitable habitat, to reduce disturbance while ensuring standards for health and safety.

- The potential effect 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)¹⁵.

3.3.4.3 Assumptions during operation

Thames Water and Southern Water have Environmental Management Systems (EMS) in place for their assets. The EMS aims to identify and implement the necessary actions to avoid adverse effects to the environment during the operation phase. For example, the EMS will include standard measures relating to pollution control and control of disturbance from light or noise. As such, it is expected that these will be updated to incorporate the requirements of new assets commissioned as part of the T2ST SRO, and it is assumed that the appropriate EMS will be followed in order to avoid adverse effects to the environment.

¹⁵ Institution of Lighting Professionals (2020) Guidance note for the reduction of obtrusive light. Guidance Note1/20.

4 Option B Appropriate Assessment

4.1 Review of sites identified at HRA Stage 1

4.1.1 Identifying sites

The Stage 1 Screening identified ten Habitats Sites within the Zol of Option B (Table 4.1). The potential for likely significant effects were identified for four Habitats Sites and qualifying features for which they were designated, and uncertain effects were identified for six Habitats Sites and qualifying features for which they were designated.

Table 4.1: Option B Stage 1 screening results

Potential for likely significant effect	Uncertain Effect
River Lambourn SAC (0km - option intersects SAC)	Mottisfont Bats SAC (12km west of option)
Kennet and Lambourn Floodplain SAC (0.23km east of option and 0.46km northwest of option)	Solent Maritime SAC (14.4km southwest of option)
Kennet Valley Alderwoods SAC (0.04km west of option)	Solent and Southampton Water SPA (14.3km south of option)
River Itchen SAC (2.25km east of option)	Solent and Southampton Water Ramsar Site (13.3km south of option)
	Salisbury Plain SPA (15.8km southwest of the pipeline route)
	Porton Down SPA (13.5km southwest of the pipeline route)

4.1.2 Review of identified sites

The HRA screening identified potential for likely significant effects on the River Itchen SAC; however, this site is located more than 2km away from this option and therefore will not result in direct effects alone or in-combination with other projects or plans. In addition, the River Itchen SAC is not in hydrological connection with the option and therefore will not result in indirect effects alone or in-combination with other projects or plans. As such, it is considered that there is no pathway through which this site could be affected so there is no potential for likely significant effects, and it therefore, does not require a Stage 2 Appropriate Assessment.

The following sites were identified with potential Uncertain effects due to hydrological connection with the River Itchen SAC:

- Solent Maritime SAC
- Solent and Southampton Water Ramsar Site
- Solent and Southampton Water SPA

As no likely significant effects are identified for the River Itchen SAC alone or in-combination with other projects or plans, it is considered that there is no pathway for these sites to be affected by this option either directly or indirectly, alone or in-combination with other projects or plans, and consequently, these sites do not require a Stage 2 Appropriate Assessment. Therefore, these Habitats Sites are not considered further.

Salisbury Plain SPA and SAC and Porton Down SPA are not in hydrological connection with the waterbodies likely to be affected by this option and are located a substantial distance from the proposed pipeline route. As such, following UKWIR guidance, it is considered that effects from

this option on these Habitats Sites are negligible alone or in-combination with other projects or plans, and therefore these Habitats Sites are not considered further.

4.1.3 Outcomes of site review

Based on the identification and review of Habitats Sites, the following sites are taken forward to Stage 2:

- River Lambourn SAC (0km - option intersects SAC) – potential for likely significant effects
- Kennet and Lambourn Floodplain (0.23km east of option and 0.46km northwest of option) – potential for likely significant effects
- Kennet Valley Alderwoods SAC (0.04km west of option) – potential for likely significant effects
- Mottisfont Bats SAC (12km west of option) – Uncertain effects

The sites that are screened out have not been considered further as no effects are identified at the Stage 1 screening alone or in-combination with other projects or plans.

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

4.2 HRA Stage 2 Appropriate Assessment

4.2.1 Scope

The following four sites were assessed at Stage 2 Appropriate Assessment:

- River Lambourn SAC (0km - option intersects SAC) – potential for Likely significant effects
- Kennet and Lambourn Floodplain (0.23km east of option and 0.46km northwest of option) – potential for Likely significant effects
- Kennet Valley Alderwoods SAC (0.04km west of option) – potential for Likely significant effects
- Mottisfont Bats SAC (12km west of option) – Uncertain effects

Information on these designated sites are provided in Appendix A which includes their qualifying features, conservation objectives and threats and pressures affecting the Habitats Sites.

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

4.2.2 Potential effects on the Habitats Sites

The potential effects of the construction and operational phases for Option B are described below, taking into account the type, size and scale of the option.

An assessment of each potential effect on the integrity of the Habitats Sites are 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.

4.2.2.1 Construction

Construction activities associated with Option B include trenching and new pipeline layout as well as the building and new infrastructure including a Water Treatment Works, Pumping

Stations and Brake Pressure Tanks. These activities have the potential to result in permanent and temporary habitat loss as well as habitat degradation. For some species habitat degradation outside the site boundary can also result in indirect effects by changes to foraging habitat for example. In the particular case of river crossings, construction activities can result in temporary habitat degradation through in-channel works or potentially due to river diversions. Pipejack or micro tunnel crossings will also be required in order to cross main watercourses. Crossings for ordinary watercourses will be installed using open cut methods and temporary culverts.

Construction activities are also likely to result in disturbance due to noise, light and visual presence from human activities. Standard mitigation and industry wide best practice construction measures are considered adequate to reduce disturbance impacts during construction to levels that will not result in significant effects to habitats and species. This is particularly relevant to bird and bat species which are a qualifying feature of the Habitats Sites within the ZoI. Proposed mitigation and avoidance measures are listed in Table 4.2 and further described in Section 3.3.4.

Similarly, during construction there is the potential for pollution resulting from increased traffic to and from construction sites and potential accidents that can result in contamination of watercourses and habitats. In addition, where works are undertaken near watercourses or in-channel there is potential for increased sedimentation and silting of watercourses.

Spread of invasive species may occur during construction where workers move between and within sites. The presence and increase in Invasive Non-Native Species (INNS) can lead to loss of habitat and overtake native species affecting habitats and qualifying species they support.

Details of each of the potential effects are given in Table 4.2.

4.2.2.2 Operation

The proposed water transfer will include increased abstraction in the Thames River which could lead to impacts on river levels with associated effects on river habitats and species. However, there are no Habitats Sites in the River Thames in the vicinity of this option's proposed intake that could be affected by changes in water flows.

Water transfers between different water bodies can result in the spread of INNS and species diseases. Option B proposes to transfer potable water and consequently the risks associated with the spread of INNS and pathogens is considered negligible and not considered further.

Table 4.2: Option B potential adverse effects to the site integrity

Designated sites	Qualifying features	Potential adverse effect on integrity before mitigation	Mitigation measures	Adverse effect on integrity after mitigation
<p>River Lambourn SAC (0km - option intersects the site)</p>	<ul style="list-style-type: none"> Water courses of plain to montane levels with the <i>Ranuncion fluitantis</i> and <i>Callitricho-Batrachion</i> vegetation 	<p>The proposed pipeline route will cross the River Lambourn SAC with potential temporary effects likely during the construction of the pipeline. These will include:</p> <ul style="list-style-type: none"> Physical loss/damage - significant localised habitat loss and/or habitat degradation leading to reduction of habitat extent; Changes to the water table - Significant changes to water quantity and velocity during construction; Toxic contamination- changes to water quality during construction are likely due to water pollution resulting from in-channel works, increased traffic and works near riverbanks; Non-toxic contamination - increased sediments in suspension due to construction activities likely to result in increased turbidity, siltation and river substrate smothering. Air pollution may also affect habitat vegetation due to dust deposition; and Biological disturbance - potential for invasive species spread. <p>The impacts are considered to be temporary and localised. This designated site is already suffering from similar pressures from other sources and therefore the proposed works may further prevent the improvement of the site condition (currently unfavourable-recovering). The identified effects have the potential to reduce the extent and distribution of this habitat as well as affecting its structure and function compromising the integrity of the River Lambourn SAC.</p> <p>No significant effects are identified during operation.</p>	<p>The following measures will be implemented to avoid or reduce significant effects:</p> <ul style="list-style-type: none"> Pipejack or micro tunnel crossings will be undertaken where the pipeline crosses the River Lambourn SAC to avoid direct impacts on the banks and riverbed. Pipejack or micro tunnel crossings should extend to the on-site and functionally linked habitat of the SAC. The length of pipejack or micro tunnel crossings should be determined through on site survey; CIRIA Environmental good practice on site guide (C741 (CIRIA, C741) and Environment Agency's PPGs (PPG1: General Guide to Prevention of Pollution; PPG5: Works and maintenance in or near water) will be followed to avoid or minimise toxic contamination; Sediment traps near or in watercourses or the cofferdams will be implemented to control sediment runoff; Biosecurity measures will be implemented; 'Guidance Notes for the Reduction of Obtrusive Light' (Institute of Lighting Professionals, 2011) will be followed to avoid significant effects due to increased light; and Development of a Construction and Environmental Management Plan which will include all the above proposed mitigation measures and any further measures identified at project level. <p>Assuming all proposed mitigation is implemented it is considered there will not be a significant change in:</p> <ul style="list-style-type: none"> The extent and distribution of habitats; and 	<p>No adverse effect on integrity. Any residual effects are considered negligible.</p>

Designated sites	Qualifying features	Potential adverse effect on integrity before mitigation	Mitigation measures	Adverse effect on integrity after mitigation
<ul style="list-style-type: none"> ● Bullhead <i>Cottus gobio</i> ● Brook lamprey <i>Lampetra planeri</i> 	<p>Habitats that support fish species may potentially be affected during the construction phase through:</p> <ul style="list-style-type: none"> ● Physical loss/damage - significant localised habitat loss and/or habitat degradation leading to reduction of suitable fish habitat extent. This may affect the availability of habitat for different life cycle stages in particular breeding, nursery and feeding habitat; ● Changes to the water table - Significant changes to water quantity and velocity during construction; ● Toxic contamination- changes to water quality during construction are likely due to water pollution resulting from in-channel works, increased traffic and works near riverbanks; ● Non-toxic contamination - increased sediments in suspension due to construction activities likely to result in increased turbidity, siltation and river substrate smothering; ● Biological disturbance - potential for invasive species and pathogen spread; ● Habitat loss and habitat degradation can result in habitat fragmentation with potential consequences for the completion of fish life cycle particular for brook lamprey if it prevents upstream migration to reach spawning grounds. Bullhead is vulnerable to water quality changes and substrate modification. In addition, changes to habitats has the potential to affect food resources such as macroinvertebrates communities. <p>The impacts are considered to be temporary and localised. The identified effects have the potential to reduce the extent and distribution of the qualifying species as well as affecting its structure and function compromising the integrity of the River Lambourn SAC.</p> <p>No significant effects are identified during operation.</p>	<ul style="list-style-type: none"> ● The structure and function of the habitats. <p>The following measures will be implemented to avoid or reduce significant effects:</p> <ul style="list-style-type: none"> ● Pipejack or micro tunnel crossings will be undertaken where the pipeline crosses the River Lambourn SAC to avoid direct impacts on the banks and riverbed. The length of pipejack or micro tunnel crossings should be determined through on site survey; ● CIRIA Environmental good practice on site guide (C741 (CIRIA, C741) and Environment Agency's PPGs (PPG1: General Guide to Prevention of Pollution; PPG5: Works and maintenance in or near water) will be followed to avoid or minimise significant toxic contamination; ● Sediment traps near or in watercourses or the use of cofferdams will be implemented to control sediment runoff; ● Biosecurity measures will be implemented; ● Best practice such as BS 5228-1:2009+A1:2014 (The British Standards Institute, 2008) will be followed to avoid significant effects due to noise; ● 'Guidance Notes for the Reduction of Obtrusive Light' (Institute of Lighting Professionals, 2011) will be followed to avoid significant effects due to increased light (if works are programmed at night); and ● Development of a Construction and Environmental Management Plan which will include all the above proposed mitigation measures and any further measures identified at project level. 	<p>No adverse effect on integrity. Any residual effects are considered negligible.</p>	

Designated sites	Qualifying features	Potential adverse effect on integrity before mitigation	Mitigation measures	Adverse effect on integrity after mitigation
<p>Kennet and Lambourn Floodplain SAC (0.23km east of option and 0.46km northwest of option)</p>	<ul style="list-style-type: none"> Desmoulin's whorl snail <i>Vertigo moulinsiana</i> 	<p>During construction, where the proposed pipeline route lies in close proximity to the Kennet and Lambourn Floodplain SAC, there is potential for significant changes to the habitats that support this species. These changes may include:</p> <ul style="list-style-type: none"> Physical loss/damage - significant localised habitat loss and/or habitat degradation leading to reduction of habitat extent; Changes to water quality and water table - changes to the water table during construction due to pipeline laying activities; Toxic contamination- potential for pollution from contaminants due to the use of heavy machinery; Non-toxic contamination -air pollution may also affect habitat vegetation due to dust deposition; and Biological disturbance - mortality during pipeline laying activities within the Habitats Site <p>This species is particularly affected by changes in water table. The Desmoulin's whorl snail inhabits a particular 'zone' in the transition between truly aquatic habitat and terrestrial habitat where ground conditions are permanently wet and humid therefore changes in the water table level may significantly affect the conditions of this species habitat. Inappropriate water levels are currently a pressure affecting this SAC's habitats.</p>	<p>Assuming all proposed mitigation is implemented it is considered there will not be a significant change in:</p> <ul style="list-style-type: none"> The extent and distribution of habitats of qualifying species; The structure and function of the habitats of qualifying species; and The supporting processes on which habitats of qualifying species rely. <p>The following measures will be implemented to avoid or reduce significant effects:</p> <ul style="list-style-type: none"> Pipejack or micro tunnel crossings will be undertaken where the pipeline crosses the River Lambourn SAC to avoid habitat loss and direct mortality. The length of pipejack or micro tunnel crossings should be determined through on site survey; CIRIA Environmental good practice on site guide (C741 (CIRIA, C741) and Environment Agency's PPGs (PPG1: General Guide to Prevention of Pollution; PPG5: Works and maintenance in or near water) will be followed to avoid or minimise significant toxic contamination; Natural England SAC objective guidance regarding soil saturation and composition for <i>Vertigo moulinsiana</i> will be followed to protect the integrity of populations where appropriate; Biosecurity measures will be implemented; and Development of a Construction and Environmental Management Plan which will include all the above proposed mitigation measures and any further measures identified at project level. 	<p>No adverse effect on integrity. Any residual effects are considered negligible.</p>

Designated sites	Qualifying features	Potential adverse effect on integrity before mitigation	Mitigation measures	Adverse effect on integrity after mitigation
Kennet Valley Alderwoods SAC (0.04km west of option)	<ul style="list-style-type: none"> Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (<i>Alno-Padion</i>, <i>Alnion incanae</i>, <i>Salicion albae</i>) * Priority feature 	<p>Impacts resulting from this option would be temporary and would affect one unit of the Habitats Site.</p> <p>No pathways have been identified during operation that could lead to adverse effects to the integrity of this SAC.</p> <p>Inappropriate water level is identified as a threat to this habitat. The proposed pipeline route would be located less than 50m from the site boundary. The River Kennet runs through the site and the pipeline would cross the river downstream of the site, consequently direct effects due to the construction of the pipeline where it crosses the River Kennet are not considered. Given the nature of the work at this location and distance from the designated site it is considered that water levels in the designated site will not be significantly affected.</p> <p>Other effects during construction could include effects from light and dust deposition; however, following UKWIR (2021) guidance (Table 3.2) the site is considered to be sufficiently distant from works, relating with the pipeline layout, to result in significant effects from dust. The works would be located within 500m from the site boundary and therefore effects from light pollution need to be considered.</p> <p>No pathways have been identified during operation that could lead to adverse effects to the integrity of this SAC.</p>	<p>Assuming all proposed mitigation is implemented it is considered there will not be a significant change in:</p> <ul style="list-style-type: none"> The extent and distribution of habitats of qualifying species; The structure and function of the habitats of qualifying species; The supporting processes on which habitats of qualifying species rely; and The populations and distribution of qualifying species. <p>The following measures will be implemented to avoid or reduce significant effects:</p> <ul style="list-style-type: none"> 'Guidance Notes for the Reduction of Obtrusive Light' (Institute of Lighting Professionals, 2011) will be followed to avoid significant effects due to increased light (if works are programmed at night); and Development of a Construction and Environmental Management Plan which will include all the above proposed mitigation measures and any further measures identified at project level. <p>Assuming all proposed mitigation is implemented it is considered there will not be a significant change in:</p> <ul style="list-style-type: none"> The extent and distribution of habitats of qualifying species; The structure and function of the habitats of qualifying species; and <p>The supporting processes on which habitats of qualifying species rely.</p>	<p>No adverse effect on integrity. Any residual effects are considered negligible.</p>

Designated sites	Qualifying features	Potential adverse effect on integrity before mitigation	Mitigation measures	Adverse effect on integrity after mitigation
<p>Mottisfont Bats SAC (12.0km west of option)</p>	<ul style="list-style-type: none"> Barbastelle <i>Barbastella barbastellus</i> 	<p>The site is designated for the presence of a colony of barbastelle bats, <i>Barbastella barbastellus</i> which use trees in the woodlands as summer maternity roost. The bats also use the site as a foraging area and have known navigation routes through the woodlands to (predominantly) riverine areas and subsequent feeding areas in the surrounding landscape. A target has been to support off-site habitat (foraging areas) by restoring any core areas of feeding habitat outside of the SAC boundary that are critical to Barbastelles during their breeding period.</p> <p>The proposed works in relation with the laying of the pipeline is more than 12km away from this designated site and although no direct or indirect effects are expected to impact the site, Barbastelle bats are known to travel long distances to forage. The River Test and River Dun located close to the site (within 1km), along with the fens, marshy areas, wet grassland and flowing ditches found in the surrounding valley floors are identified as the main foraging habitats for Barbastelle bats. It is therefore unlikely that the areas surrounding the proposed pipeline route located much further away will be of importance to this population of bats.</p> <p>The proposed option is therefore unlikely to affect the structure and function of the habitats (outside the Habitats Site boundary) that support this species.</p>	<p>Any mature tree lines or hedgerows that might be traversed by the route are either preserved in situ (such as through pipe jacking beneath the hedge) or are immediately reinstated. The use of pipejacking beneath hedges should be used to avoid temporary effects from hedge removal. The length of pipejack or micro tunnel crossings should be determined through on site survey.</p>	<p>No adverse effect on integrity. Any residual effects are considered negligible.</p>

4.2.3 In-combination effects

The following plans, programmes and projects have been considered within the in-combination effects assessment:

- Other Strategic Resource Options (SROs);
- Other water company schemes;
- Local Development Frameworks;
- Relevant planning applications; and
- NSIP/DCOs (none identified as relevant within the study area).

As such, the following projects or plans have been considered for T2ST in-combination effects assessment:

- SESRO
- STT
- Southampton Link Main and Andover Link Main schemes (Southern Water)
- Winchester District Local Plan Part 1 – Joint Core Strategy Policy WT2 - Strategic Housing Allocation – North Winchester
- Winchester District Local Plan Part 1 – Joint Core Strategy Policy WT3 - Bushfield Camp Employment Site
- Vale of White Horse District Local Plan 2031 Part 2 Core Policy 15b: Harwell Campus - Harwell Campus Comprehensive Development Framework
- Test Valley Borough - The land is not currently allocated in the Local Plan but is being promoted for residential development
- Vale of White Horse District Council (planning application: P22/V0599/O)

An in-combination assessment is required when adverse effects to the site integrity and/or low level effects that would not result in adverse effects alone are identified (UKWIR, 2021).

As per the programme assumptions in Section 2.5, the draft WRSE regional plan has determined a need for a T2ST scheme of up to 120Ml/d by 2040-2053 depending on the scenario in the adaptive plan. Therefore, at this stage, it is envisaged the project will not be operational until at least 2040.

No adverse effects to the site integrity have been identified resulting from the implementation of Option B, any potential residual effects are considered negligible and consequently an in-combination assessment is not required for this option. The requirement for a further in-combination assessment will be reviewed as part of a future project level HRA.

4.2.4 Stage 2 Outcomes for Option B

No adverse effects resulting from the implementation of this option (alone and in-combination) are reasonably foreseeable on the integrity of the following Habitats Sites, if the suggested mitigation measures are observed:

- River Lambourn SAC
- Kennet and Lambourn Floodplain
- Kennet Valley Alderwoods SAC
- Mottisfont Bats SAC

In conclusion, provided that the proposed mitigation measures are taken forward at appropriate stages of the project development, no adverse effects on the integrity of the Habitats Sites are likely to occur, and therefore no further stages in the HRA process are necessary for Option B.

5 Option C Appropriate assessment

5.1 Review of sites identified at HRA Stage 1

5.1.1 Identifying sites

The Stage 1 Screening identified ten Habitats Sites within the Zol of Option C (Table 5.1). The potential for likely significant effects were identified for four Habitats Sites and qualifying features for which they were designated, and uncertain effects were identified for six Habitats Sites and qualifying features for which they were designated.

Table 5.1: Option C Stage 1 screening results

Potential for likely significant effect	Uncertain Effect
River Lambourn SAC (0km - option intersects SAC)	Mottisfont Bats SAC (12km west of option)
Kennet and Lambourn Floodplain SAC (0.23km east of option and 0.46km northwest of option)	Solent Maritime SAC (14.4km southwest of option)
Kennet Valley Alderwoods SAC (0.04km west of option)	Solent and Southampton Water SPA (14.3km south of option)
River Itchen SAC (2.25km east of option)	Solent and Southampton Water Ramsar Site (13.3km south of option)
	Salisbury Plain SPA (15.8km southwest of the pipeline route)
	Porton Down SPA (13.5km southwest of the pipeline route)

5.1.2 Review of identified sites

The HRA screening identified potential for likely significant effects on the River Itchen SAC; however, this site is located more than 2km from this option and therefore will not result in direct effects alone or in-combination with other projects or plans. In addition, the River Itchen SAC is not in hydrological connection with the option and therefore will not result in indirect effects. As such, it is considered that there is no pathway through which this site could be affected and it therefore, does not require a Stage 2 Appropriate Assessment.

The following sites were identified with potential Uncertain effects due to hydrological connection with the River Itchen SAC:

- Solent Maritime SAC
- Solent and Southampton Water Ramsar Site
- Solent and Southampton Water SPA

As no likely significant effects are identified for the River Itchen SAC alone or in-combination with other projects or plans, it is considered that there is no pathway for these sites to be affected by this option either directly or indirectly, alone or in-combination with other projects or plans, and consequently, these sites do not require a Stage 2 Appropriate Assessment. Therefore, these Habitats Sites are not considered further.

Salisbury Plain SPA and SAC and Porton Down SPA are not in hydrological connection with the waterbodies likely to be affected by this option and are located a substantial distance from the proposed pipeline route. As such, following UKWIR guidance, it is considered that effects from this option on these Habitats Sites are negligible alone or in-combination with other projects or plans, and therefore these Habitats Sites are not considered further.

5.1.3 Outcomes of site review

Based on the identification and review of Habitats Sites, the following sites are taken forward to Stage 2:

- River Lambourn SAC (0km - option intersects SAC) – potential for Likely significant effects
- Kennet and Lambourn Floodplain (0.23km east of option and 0.46km northwest of option) – potential for Likely significant effects
- Kennet Valley Alderwoods SAC (0.04km west of option) – potential for Likely significant effects
- Mottisfont Bats SAC (112km west of option) – Uncertain effects

The sites that are screened out have not been considered further as no effects are identified at the Stage 1 screening alone or in-combination with other projects or plans..

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

5.2 HRA Stage 2 Appropriate Assessment

5.2.1 Scope

The following four sites were assessed at Stage 2 Appropriate Assessment:

- River Lambourn SAC (0km - option intersects SAC) – potential for Likely significant effects
- Kennet and Lambourn Floodplain (0.23km east of option and 0.46km northwest of option) – potential for Likely significant effects
- Kennet Valley Alderwoods SAC (0.04km west of option) – potential for Likely significant effects
- Mottisfont Bats SAC (12km west of option) – Uncertain effects

Information on these designated sites are provided in Appendix A which includes their qualifying features, conservation objectives and threats and pressures affecting the Habitats Sites.

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

5.2.2 Potential effects on the Habitats Sites

The potential effects of the construction and operational phases for Option C are described below, taking into account the type, size and scale of the option.

An assessment of each potential effects on the integrity of the designated sites are 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.

5.2.2.1 Construction

Construction activities associated with Option C include trenching and new pipeline layout as well as the building and new infrastructure including a Water Treatment Works, Pumping Stations and Break Pressure Tanks. These activities have the potential to result in permanent and temporary habitat loss as well as habitat degradation. For some species habitat degradation outside the site boundary can also result in indirect effects by changes to foraging

habitat for example. In the particular case of river crossings, construction activities can result in temporary habitat degradation through in-channel works or potentially due to river diversions. Pipejack or micro tunnel crossings will be required in order to cross main watercourses. Crossings for ordinary watercourses will be installed using open cut methods and temporary culverts.

Construction activities are also likely to result in disturbance due to noise, light and visual presence from human activities. Standard mitigation and industry wide best practice construction measures are considered adequate to reduce disturbance effects during construction to levels that will not result in significant effects to habitats and species. This is particularly relevant to bird and bat species which are a qualifying feature of the Habitats Sites within the ZoI. Proposed mitigation and avoidance measures are listed in Table 5.2 and further described in Section 3.3.4.

Similarly, during construction there is the potential for pollution resulting from increased traffic to and from construction sites and potential accidents that can result in contamination of watercourses and habitats. In addition, where works are undertaken near watercourses or in-channel there is potential for increased sedimentation and silting of watercourses.

Spread of invasive species may occur during construction where workers move between and within sites. The presence and increase in INNS can lead to loss of habitat and overtake native species affecting habitats and qualifying species they support.

Details of each of the potential effects are given in Table 5.2.

5.2.2.2 Operation

The proposed water transfer will include increased abstraction in the Thames River which could lead to impacts on river levels with associated effects on river habitats and species. However, there are no Habitats Sites in the River Thames in the vicinity of this option's proposed intake that could be affected by changes in water flows.

Water transfers between different water bodies can result in the spread of INNS and species diseases. Option C proposes to transfer potable water and consequently the risks associated with the spread of INNS and pathogens is considered negligible and not considered further.

Table 5.2: Option C potential adverse effects to the site integrity

Designated sites	Qualifying features	Potential adverse effect on integrity before mitigation	Mitigation measures	Adverse effect on integrity after mitigation
<p>River Lambourn SAC (0km - option intersects the site)</p>	<ul style="list-style-type: none"> Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>Callitricho-Batrachion</i> vegetation 	<p>The proposed pipeline route will cross the River Lambourn SAC with potential temporary effects likely during the construction of the pipeline. These will include:</p> <ul style="list-style-type: none"> Physical loss/damage – significant localised habitat loss and/or habitat degradation leading to reduction of habitat extent; Changes to the water table – Significant changes to water quantity and velocity during construction; Toxic contamination- changes to water quality during construction are likely due to water pollution resulting from in-channel works, increased traffic and works near riverbanks; Non-toxic contamination – increased sediments in suspension due to construction activities likely to result in increased turbidity, siltation and river substrate smothering. Air pollution may also affect habitat vegetation due to dust deposition; and Biological disturbance – potential for invasive species spread. <p>The impacts are considered to be temporary and localised. This designated site is already suffering from similar pressures from other sources and therefore the proposed works may further prevent the improvement of the site condition (currently unfavourable-recovering).</p> <p>The identified effects have the potential to reduce the extent and distribution of this habitat as well as affecting its structure and function compromising the integrity of the River Lambourn SAC.</p> <p>No significant effects are identified during operation.</p>	<p>The following measures will be implemented to avoid or reduce significant effects:</p> <ul style="list-style-type: none"> Pipejack or micro tunnel crossings will be undertaken where the pipeline crosses the River Lambourn SAC to avoid direct impacts on the banks and riverbed. Pipejack or micro tunnel crossings should extend to the on-site and functionally linked habitat of the SAC. The length of pipejack or micro tunnel crossings should be determined through on site survey; CIRIA Environmental good practice on site guide (C741 (CIRIA, C741) and Environment Agency’s PPGs (PPG1: General Guide to Prevention of Pollution; PPG5: Works and maintenance in or near water) will be followed to avoid or minimise significant toxic contamination; Sediment traps near or in watercourses or the cofferdams will be implemented to control sediment runoff; Biosecurity measures will be implemented; ‘Guidance Notes for the Reduction of Obtrusive Light’ (Institute of Lighting Professionals, 2011) will be followed to avoid significant effects due to increased light; and Development of a Construction and Environmental Management Plan which will include all the above proposed mitigation measures and any further measures identified at project level. <p>Assuming all proposed mitigation is implemented it is considered there will not be a significant change in:</p> <ul style="list-style-type: none"> The extent and distribution of habitats; and 	<p>No adverse effect on integrity. Any residual effects are considered negligible.</p>

Designated sites	Qualifying features	Potential adverse effect on integrity before mitigation	Mitigation measures	Adverse effect on integrity after mitigation
<ul style="list-style-type: none"> • Bullhead <i>Cottus gobio</i> • Brook lamprey <i>Lampetra planeri</i> 	<p>Habitats that support fish species may potential be affected during the construction phase through:</p> <ul style="list-style-type: none"> • Physical loss/damage – significant localised habitat loss and/or habitat degradation leading to reduction of suitable fish habitat extent. This may affect the availability of habitat for different life cycle stages in particular breeding, nursery and feeding habitat; • Changes to the water table – Significant changes to water quantity and velocity during construction; • Toxic contamination- changes to water quality during construction are likely due to water pollution resulting from in-channel works, increased traffic and works near riverbanks; • Non-toxic contamination – increased sediments in suspension due to construction activities likely to result in increased turbidity, siltation and river substrate smothering; • Biological disturbance – potential for invasive species and pathogen spread; • Habitat loss and habitat degradation can result in habitat fragmentation with potential consequences for the completion of fish life cycle particular for brook lamprey if it prevents upstream migration to reach spawning grounds. Bullhead is vulnerable to water quality changes and substrate modification. In addition, changes to habitats has the potential to affect food resources such as macroinvertebrates communities. 	<ul style="list-style-type: none"> • The structure and function of the habitats. <p>The following measures will be implemented to avoid or reduce significant effects:</p> <ul style="list-style-type: none"> • Pipejack or micro tunnel crossings will be undertaken where the pipeline crosses the River Lambourn SAC to avoid direct impacts on the banks and riverbed. The length of pipejack or micro tunnel crossings should be determined through on site survey; • CIRIA Environmental good practice on site guide (C741 (CIRIA, C741) and Environment Agency’s PPGs (PPG1: General Guide to Prevention of Pollution; PPG5: Works and maintenance in or near water) will be followed to avoid or minimise significant toxic contamination; • Sediment traps near or in watercourses or the use of cofferdams will be implemented to control sediment runoff; • Biosecurity measures will be implemented; • Best practice such as BS 5228-1:2009+A1:2014 (The British Standards Institute, 2008) will be followed to avoid significant effects due to noise; • ‘Guidance Notes for the Reduction of Obtrusive Light’ (Institute of Lighting Professionals, 2011) will be followed to avoid significant effects due to increased light (if works are programmed at night); and • Development of a Construction and Environmental Management Plan which will include all the above proposed mitigation measures and any further measures identified at project level. 	<p>No adverse effect on integrity. Any residual effects are considered negligible.</p>	
		<p>The impacts are considered to be temporary and localised. The identified effects have the potential to reduce the extent and distribution of the qualifying species as well as affecting its structure and function compromising the integrity of the River Lambourn SAC.</p> <p>No significant effects are identified during operation.</p>		

Designated sites	Qualifying features	Potential adverse effect on integrity before mitigation	Mitigation measures	Adverse effect on integrity after mitigation
Kennet and Lambourn Floodplain SAC (0.23km east of option and 0.46km northwest of option)	<ul style="list-style-type: none"> Desmoulin's whorl snail <i>Vertigo moulinsiana</i> 	<p>During construction, where the proposed pipeline route lies in close proximity to the Kennet and Lambourn Floodplain SAC, there is potential for significant changes to the habitats that support this species. These changes may include:</p> <ul style="list-style-type: none"> Physical loss/damage – significant localised habitat loss and/or habitat degradation leading to reduction of habitat extent; Changes to water quality and water table – changes to the water table during construction due to pipeline laying activities; Toxic contamination- potential for pollution from contaminants due to the use of heavy machinery; Non-toxic contamination – air pollution may also affect habitat vegetation due to dust deposition; and Biological disturbance – mortality during pipeline laying activities within the Habitats Site <p>This species is particularly affected by changes in water table. The Desmoulin's whorl snail inhabits a particular 'zone' in the transition between truly aquatic habitat and terrestrial habitat where ground conditions are permanently wet and humid therefore changes in the water table level may significantly affect the conditions of this species habitat. Inappropriate water levels are currently a pressure affecting this SAC's habitats.</p> <p>Impacts resulting from this option would be temporary and would affect one unit of the Habitats Site.</p>	<p>Assuming all proposed mitigation is implemented it is considered there will not be a significant change in:</p> <ul style="list-style-type: none"> The extent and distribution of habitats of qualifying species; The structure and function of the habitats of qualifying species; and The supporting processes on which habitats of qualifying species rely. <p>The following measures will be implemented to avoid or reduce significant effects:</p> <ul style="list-style-type: none"> Pipejack or micro tunnel crossings will be undertaken where the pipeline crosses the River Lambourn SAC to avoid habitat loss and direct mortality. The length of pipejack or micro tunnel crossings should be determined through on site survey; CIRIA Environmental good practice on site guide (C741 (CIRIA, C741) and Environment Agency's PPGs (PPG1: General Guide to Prevention of Pollution; PPG5: Works and maintenance in or near water) will be followed to avoid or minimise significant toxic contamination; Natural England SAC objective guidance regarding soil saturation and composition for <i>Vertigo moulinsiana</i> will be followed to protect the integrity of populations where appropriate; Biosecurity measures will be implemented; and Development of a Construction and Environmental Management Plan which will include all the above proposed mitigation measures and any further measures identified at project level. 	<p>No adverse effect on integrity. Any residual effects are considered negligible.</p>

Designated sites	Qualifying features	Potential adverse effect on integrity before mitigation	Mitigation measures	Adverse effect on integrity after mitigation
		No pathways have been identified during operation that could lead to adverse effects to the integrity of this SAC.	Assuming all proposed mitigation is implemented it is considered there will not be a significant change in: <ul style="list-style-type: none"> • The extent and distribution of habitats of qualifying species; • The structure and function of the habitats of qualifying species; • The supporting processes on which habitats of qualifying species rely; and • The populations and distribution of qualifying species. 	
Kennet Valley Alderwoods SAC (0.04km west of option)	<ul style="list-style-type: none"> • Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (<i>Alno-Padion</i>, <i>Alnion incanae</i>, <i>Salicion albae</i>) * Priority feature 	<p>Inappropriate water level is identified as a threat to this habitat. The proposed pipeline route would be located less than 50m from the site boundary. The River Kennet runs through the site and the pipeline would cross the river downstream of the site, consequently direct effects due to the construction of the pipeline where it crosses the River Kennet are not considered. Given the nature of the work at this location and distance from the designated site it is considered that water levels in the designated site will not be significantly affected.</p> <p>Other effects during construction could include effects from light and dust deposition; however, following UKWIR (2021) guidance (Table 3.2) the site is considered to be sufficiently distant from works, relating with the pipeline layout, to result in significant effects from dust. The works would be located within 500m from the site boundary and therefore effects from light pollution need to be considered.</p> <p>No pathways have been identified during operation that could lead to adverse effects to the integrity of this SAC.</p>	<p>The following measures will be implemented to avoid or reduce significant effects:</p> <ul style="list-style-type: none"> • ‘Guidance Notes for the Reduction of Obtrusive Light’ (Institute of Lighting Professionals, 2011) will be followed to avoid significant effects due to increased light (if works are programmed at night); and • Development of a Construction and Environmental Management Plan which will include all the above proposed mitigation measures and any further measures identified at project level. <p>Assuming all proposed mitigation is implemented it is considered there will not be a significant change in:</p> <ul style="list-style-type: none"> • The extent and distribution of habitats of qualifying species; • The structure and function of the habitats of qualifying species; and <p>The supporting processes on which habitats of qualifying species rely.</p>	No adverse effect on integrity. Any residual effects are considered negligible.
Mottisfont Bats SAC	<ul style="list-style-type: none"> • Barbastelle Barbastella barbastellus 	The site is designated for the presence of a colony of barbastelle bats, <i>Barbastella barbastellus</i> which use trees in the woodlands as summer maternity roost. The bats also	Any mature tree lines or hedgerows that might be traversed by the route are either preserved in situ (such as through pipe jacking beneath the hedge)	No adverse effect on integrity. Any residual

Designated sites	Qualifying features	Potential adverse effect on integrity before mitigation	Mitigation measures	Adverse effect on integrity after mitigation
(12.0km W of option)		<p>use the site as a foraging area and have known navigation routes through the woodlands to (predominantly) riverine areas and subsequent feeding areas in the surrounding landscape. A target has been to support off-site habitat (foraging areas) by restoring any core areas of feeding habitat outside of the SAC boundary that are critical to Barbastelles during their breeding period.</p> <p>The proposed works in relation with the laying of the pipeline is more than 12km away from this designated site and although no direct or indirect effects are expected to impact the site, Barbastelle bats are known to travel long distances to forage. The River Test and River Dun located close to the site (within 1km), along with the fens, marshy areas, wet grassland and flowing ditches found in the surrounding valley floors are identified as the main foraging habitats for Barbastelle bats. It is therefore unlikely that the areas surrounding the proposed pipeline route located much further away will be of importance to this population of bats.</p> <p>The proposed option is therefore unlikely to affect the structure and function of the habitats (outside the Habitats Site boundary) that support this species.</p>	<p>or are immediately reinstated. The use of pipejacking beneath hedges should be used to avoid temporary effects from hedge removal. The length of pipejack or micro tunnel crossings should be determined through on site survey.</p>	<p>effects are considered negligible.</p>

5.2.3 In-combination effects

The following plans, programmes and projects have been considered within the in-combination effects assessment:

- Other Strategic Resource Options (SROs);
- Other water company schemes;
- Local Development Frameworks;
- Relevant planning applications; and
- NSIP/DCOs (none identified as relevant within the study area).

As such, the following projects or plans have been considered for T2ST in-combination effects assessment:

- SESRO
- STT
- Southampton Link Main and Andover Link Main schemes (Southern Water)
- Winchester District Local Plan Part 1 – Joint Core Strategy Policy WT2 - Strategic Housing Allocation – North Winchester
- Winchester District Local Plan Part 1 – Joint Core Strategy Policy WT3 - Bushfield Camp Employment Site
- Vale of White Horse District Local Plan 2031 Part 2 Core Policy 15b: Harwell Campus - Harwell Campus Comprehensive Development Framework
- Test Valley Borough - The land is not currently allocated in the Local Plan but is being promoted for residential development
- Vale of White Horse District Council (planning application: P22/V0599/O)

An in-combination assessment is required when adverse effects to the site integrity and/or low level effects that would not result in adverse effects alone are identified (UKWIR, 2021).

As per the programme assumptions in Section 2.5, the draft WRSE regional plan has determined a need for a T2ST scheme of up to 120Ml/d by 2040-2053 depending on the scenario in the adaptive plan. Therefore, at this stage, it is envisaged the project will not be operational until at least 2040.

No adverse effects to the site integrity have been identified resulting from the implementation of Option C, any potential residual effects are considered negligible and consequently an in-combination assessment is not required for this option. The requirement for a further in-combination assessment will be reviewed as part of a future project level HRA.

5.2.4 Stage 2 Outcomes for Option C

No adverse effects resulting from the implementation of this option (alone and in-combination) are reasonably foreseeable on the integrity of the following Habitats Sites, if the suggested mitigation measures are observed:

- River Lambourn SAC
- Kennet and Lambourn Floodplain
- Kennet Valley Alderwoods SAC
- Mottisfont Bats SAC

In conclusion, provided that the proposed mitigation measures are taken forward at appropriate stages of the project development, no adverse effects on the integrity of the Habitats Sites are likely to occur, and therefore no further stages in the HRA process are necessary for Option C.

6 Summary and next steps

This informal Habitats Regulation Assessment Stage 2 Appropriate Assessment, undertaken at plan level, finds that no adverse effects resulting from the implementation of Option B (alone and in-combination), or Option C (alone and in-combination) are reasonably foreseeable on the integrity of the Habitats Sites if the suggested mitigation measures are observed.

The current design includes a pipeline route that will cross watercourses that are either designated as a Habitats Site (River Lambourn SAC) or that feed into Habitats Sites. The identified result of no adverse effects to the site integrity depends on the use of pipejack or micro tunnel crossings in all options, in order to avoid impacts on main watercourses.

The pipeline will lie in proximity to the Mottisfont Bats SAC. The identified result of adverse effects to the site integrity depends on the mitigation that any mature tree lines or hedgerows that might be traversed by the route are either preserved in situ (such as through pipe jacking beneath the hedge) or are immediately reinstated.

Other mitigation measures proposed aim to avoid impacts mostly at construction phase including pollution control measures, biosecurity and disturbance mitigations. It is also recommended that a Construction Environmental Management Plan (CEMP) is developed at the appropriate stage in the SRO development that will include the proposed mitigation measures in this AA as well as any other specific measures identified following further HRA activities or formal HRA.

This HRA is based on currently available desk-based information and no specific surveys have been undertaken. This is appropriate for the current stage of the process, however, this assessment must be revised if further design iterations result in changes to potential impact pathways and potential significant effects upon Habitats Sites. This would be undertaken as part of a formal HRA to be completed at the appropriate stage of design, pursuant to the consenting stage.

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

7 References

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

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

Managing Natura 2000 Sites - The provisions of Article 6 of the 'Habitats' Directive 92/43/CEE (European Communities 2020)

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

The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019

Managing Natura 2000 Sites - The provisions of Article 6 of the 'Habitats' Directive 92/43/CEE (European Communities 2020)

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

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

People over Wind/Sweetman v Coillte Teorante, European Court of Justice Case C-323/17 'People over Wind 2017'

Environmental Assessment Guidance for Water Resources Management Plans and Drought Plans (21/WR/02/15)

GOV.UK (2019) Appropriate Assessment - Guidance on the use of Habitats Regulations Assessment. Published 22 July 2019

Waterbird Disturbance and Mitigation Toolkit, (TIDE Tidal River Development 2022)

A. Designated Sites

A.1 River Lambourn SAC

A.1.1 Conservation Objectives

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

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

A.1.2 Qualifying Features

- Annex I habitats that are a primary reason for selection of this site;
 - Watercourses of plain to montane levels with the *Ranunculus fluitans* and *Callitriche-Batrachion* vegetation;
- Annex II species that are a primary reason for selection of this site
 - Bullhead *Cottus gobio*
- Annex II species present as a qualifying feature, but not a primary reason for site selection
 - Brook lamprey *Lampetra planeri*

A.1.3 Site Description

The River Lambourn is a classic example of a lowland chalk river. It rises in Lynch Wood, north of Lambourn and flows down to a confluence with the River Kennet east of Newbury. The catchment is almost entirely chalk which results in a predominantly gravelly river bed. A key feature is the ephemeral nature of the upper section which generally flows from February through to the autumn. This is known as a 'winterbourne'. Any flora or fauna occurring in these stretches must be adapted to wide variations in flow, thus winterbourne sections tend to be less species-rich than the lower reaches which hold water all year round. Species characteristic of these conditions include pond water-crowfoot *Ranunculus peltatus* which is the dominant aquatic plant, as well as fool's-water-cress *Apium nodiflorum* and the moss *Fontinalis antipyretica*. Further down the river where there are perennial flows, the aquatic plants are typical of shallow, gravel-bedded watercourses. Stream water-crowfoot *Ranunculus penicillatus* ssp. *pseudofluitans*, lesser water-parsnip *Berula erecta* and water-cress *Rorippa nasturtiumaquaticum* are abundant; blunt-fruited water-starwort *Callitriche obtusangula* is also characteristic in the channel. The good water quality, coarse sediments and extensive beds of submerged plants provide excellent habitat for bullhead *Cottus gobio* and brook lamprey *Lampetra planeri*.

A.1.4 Pressures and Threats

The River Lambourn currently suffers from a number of pressures and threats including siltation, water quality, invasive species, hydrological changes, inappropriate cutting and mowing, inland flood defence works.

A.2 Kennet and Lambourn Floodplain SAC

A.2.1 Conservation Objectives

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

- The extent and distribution of the habitats of qualifying species;
- The structure and function of the habitats of qualifying species;
- The supporting processes on which the habitats of qualifying species rely;
- The populations of qualifying species; and
- The distribution of qualifying species within the site.

A.2.2 Qualifying Features

- Desmoulin's whorl snail *Vertigo moulinsiana*

A.2.3 Site Description

The cluster of sites in the Kennet and Lambourn valleys supports an extensive population of Desmoulin's whorl snail in association with chalk stream habitat. The habitat occupied at this site differs from the 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.

A.2.4 Pressures and Threats

The Kennet and Lambourn Floodplain SAC currently suffers from a number of pressures and threats including siltation, water quality, invasive species, hydrological changes, inappropriate cutting and mowing, inland flood defence works, and changes in land management.

A.3 Kennet Valley Alderwoods SAC

A.3.1 Conservation Objectives

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

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

A.3.2 Qualifying Features

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

A.3.3 Site 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. 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).

A.3.4 Pressures and Threats

Inappropriate water levels and game management are considered major threats to this site.

A.4 Mottisfont Bats SAC

A.4.1 Conservation Objectives

- The extent and distribution of the habitats of qualifying species
- The structure and function of the habitats of qualifying species
- The supporting processes on which the habitats of qualifying species rely
- The populations of qualifying species, and,
- The distribution of qualifying species within the site.

A.4.2 Qualifying Features

- Barbastelle *Barbastella barbastellus*

A.4.3 Site Description

The Mottisfont woodland supports an important population of the rare Barbastelle bat *Barbastella barbastellus*. Mottisfont contains a mix of woodland types including hazel *Corylus avellana* coppice with standards, broadleaved plantation and coniferous plantation which the bats use for breeding, roosting, commuting and feeding.

A.4.4 Pressures and Threats

The site currently suffers from offsite habitat availability/ management, forestry and woodland management.

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