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SEA

Severn Trent Sources SRO

Severn Trent Water

Creating a world fit for the future

Severn Trent Water Sources SRO
Draft Environmental report

Report for Severn Trent Water

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1 Introduction

1.1 Background and purpose of report

Ofwat, through the PR19 Final Determination, has identified the potential for companies to jointly deliver strategic regional water resources solutions to secure long-term resilience on behalf of customers while protecting the environment and benefiting wider society. As part of the assessment of companies' PR19 business plans, Ofwat introduced proposals to support the delivery of Strategic Regional Water Resource Options over the next 5 to 15 years with solutions required to be 'construction ready' for the 2025-2030 period. Ofwat's Final Determination[1] in December 2019 set out a gated process for development of Strategic Resource Options (SROs) for the co-ordination and development of a consistent set of SROs.

This gated process provides a mechanism for the industry, regulators, stakeholders and customers to input into the development and scheduling of these strategic solutions, through a combined set of statutory and regulatory processes. These include the National Framework, Drinking Water Safety Plans, Business Plans and Water Resource Management Plans (WRMPs). The strategic regional working group (consisting of Affinity Water, Anglian Water, Severn Trent Water, Southern Water, South West Water, Thames Water, United Utilities and Wessex Water) published a joint company statement reiterating a commitment to continue working with the Regulators' Alliance for Progressing Infrastructure Development (RAPID), the Environment Agency (EA), Natural Resources Wales (NRW), Ofwat and the Drinking Water Inspectorate (DWI) to make all of the planning processes and statutory timetables a success.

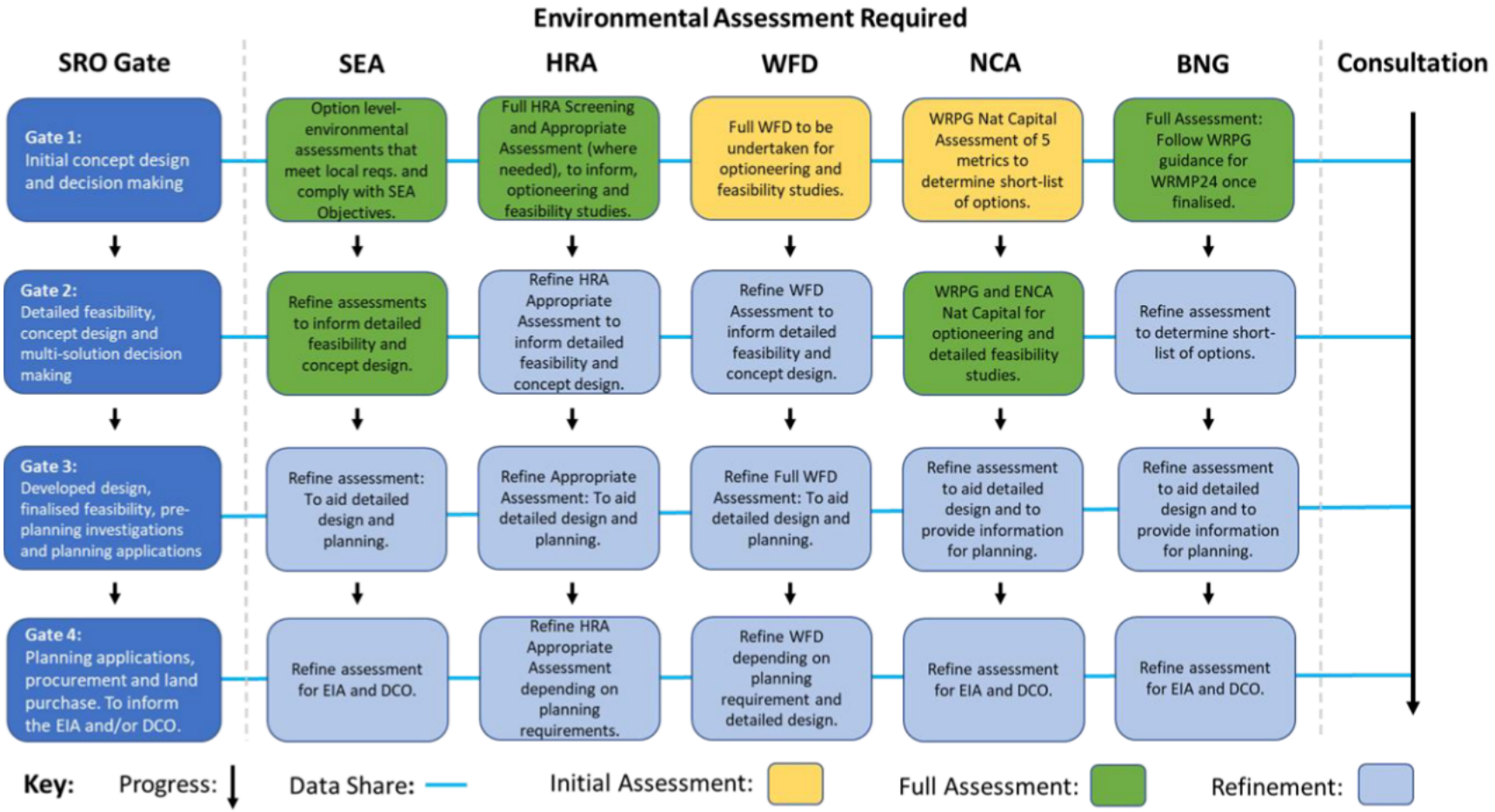
The Severn Trent Water (STW) Sources has been identified as an SRO in the PR19 Final Determination, with funding provided to STW as an individual company. Although the STW Sources SRO is considered a company solution with no identified partner this has potential to benefit other companies and interact with joint solutions, therefore its delivery will benefit from development funding and RAPID facilitation.

In October 2020, the group of Water Companies involved in developing SROs (known as the All Company Working Group - ACWG), published guidance[2] for environmental assessment methods for SROs which is aligned to the draft Water Resources Planning Guideline (WRPG): Working Version for Water Resource Management Plan 2024 (WRMP24) to increase the consistency of environmental assessment and the evaluation of impacts on environmental water quality in particular.

The ACWG guidelines indicate that the process requires Water Companies to provide the following information related to each SRO at the stage outlined (see Figure 1.1).

[1] Ofwat (2019), PR19 Final Determinations, Strategic regional water resource solutions appendix
[2] Mott MacDonald Limited (2020). All Companies Working Group WRMP environmental assessment guidance and applicability with SROs. Published October 2020

Figure 1.1 Environmental Assessment Integration with SRO Gates



In line with Ofwat's PR19 Final Determination the following is required at gate-1:

- "*Initial option-level Strategic Environmental Assessment and Habitat Risks Assessments*[3] *requirements, including consideration of in-combination effects and identification of environmental risks that need mitigating through the solution design and costing*"

It was confirmed in the RAPID letter dated April 2019[4], that a full statutory Strategic Environmental Assessment (SEA) is not required for gate-1. In consequence, a formal statutory SEA for submission at gate-1 has not been undertaken, and this report does not include a formal SEA Scoping Report, initial assessments, or associated public consultation.

At gate-1, the principles of SEA have been applied to the STW Sources SRO to inform an overall assessment of the environmental feasibility and deliverability of the solution. A statutory SEA is not required.

This report provides this initial option-level SEA of the STW Sources SRO. The report sets out the objectives and methodologies that will be used for SEA at later stages of the process and uses the principles of SEA to inform an overall assessment of the feasibility of the schemes, from an environmental perspective.

The environmental assessment of the STW Sources SRO schemes has been undertaken in the context of the ACWG guidance. This approach has been adopted to assess the various schemes within the STW Sources SRO thus determining the environmental risk of the STW Sources SRO in a manner consistent with the assessments that will be undertaken for the regional and individual water company WRMPs.

1.1.1 Area under consideration

The area under consideration for the assessment reflects the spatial scope of the ST Sources SRO schemes which includes specific areas of the River Severn catchment area. This comprises the River Severn corridor, from the existing STW abstraction licence at its Mythe intake in the lower River Severn to the Severn Estuary.

1.2 Structure of this report

The report is divided into the following sections:

- Section 1: This introduction
- Section 2: Provides a background to the STW Sources SRO
- Section 3: Provides the methodology adopted for the SEA
- Section 4: Provides the results of the scheme assessments
- Section 5: Conclusions and recommendations to inform gate-2 assessments.

[3] Clarified by RAPID as being Habitats Regulations Assessment.
[4] Ofwat 3 April 2019 Strategic Regional Water Resource Solutions: Gate one assessment. Letter issued via email to Regulatory Directors of companies with strategic regional water resource solutions.

2 Severn Trent Water Sources SRO

2.1 Introduction

The STW Sources SRO schemes are considered integral to a Severn to Thames Transfer (STT) System.

A STT conveying raw water from the lower River Severn into the upper or middle River Thames via an interconnector would increase the catchment area from which water resources can be drawn to the south-east of England. In addition to any flows that may be available to be abstracted under licence from the River Severn, a range of raw water Source Support Elements for the STT System are under consideration to provide additional resource.

The STT SRO comprises 2 principal aspects:

1. Severn to Thames Conveyance – Deerhurst to Culham pipeline or Cotswold canal conveyance, including piping to Culham – to convey the water from the River Severn to the River Thames; and
2. STT Source Support Elements, these comprise water resources that can be added, or not abstracted (redeployed), from the rivers Vyrnwy, Severn and Avon.

In order for some of the STT Source Support Elements to be able to deliver the water into the STT System, there is a requirement for these water supplies to be replaced with other water sources. The provision of this additional water is covered under separate SROs that provide the facilities to enable supporting flows for the STT. These SROs are: STW Sources SRO, STW Minworth SRO, UU Sources SRO and UU Vyrnwy Aqueduct SRO.

STW Sources SRO include three schemes:

1. Mythe abstraction licence transfer (15 Ml/d)

2A. Netheridge Wastewater Treatment Works (WwTW) discharge diversion, Deerhurst pipeline (35 Ml/d)

2B. Netheridge WwTW discharge diversion, Cotswold canals (35 Ml/d)

A more detailed description of each scheme is provided in the sections below.

2.2 Mythe abstraction licence transfer (15 Ml/d)

This scheme provides support to STT abstraction from the Severn catchment by redeploying 15 Ml/d of the existing STW abstraction licence at its Mythe intake in the lower River Severn. This infrequently used licensed volume would remain in the River Severn for abstraction downstream at Deerhurst or Gloucester Docks. The Mythe intake is located on the River Severn near Tewkesbury, 5km northeast of Deerhurst. STW has advised that no construction works would be required to redeploy the spare licence volume for abstraction downstream at Deerhurst or Gloucester Docks.

It is understood from STW that no specific additional resource to replace this current abstraction licence volume has been determined to date and would require consideration at gate-2.

2.3 Netheridge WwTW discharge diversion, Deerhurst Pipeline (35 Ml/d)

Currently treated discharge from the Netheridge WwTW is input to the upper Severn Estuary. It is proposed to divert a 35 Ml/d portion of this treated discharge to a new outfall on the freshwater River Severn to support STT abstraction from the River Severn at Deerhurst. The outfall location to the River Severn has been identified, during studies undertaken at gate-1, to be located just downstream of the proposed intake from the River Severn at Deerhurst. The discharge diversion from Netheridge WwTW would be pumped by a new pumping station, located at the WwTW via [redacted]

WwTW discharge transfer for STT support would not be continuous, only discharging to the freshwater river outfall according to an operating regime when support is required to enable abstraction from the

River Severn. The discharge would be a flow replacement for river water abstracted locally upstream. The scheme will result in a relocation of discharge of up to 35 Ml/d.

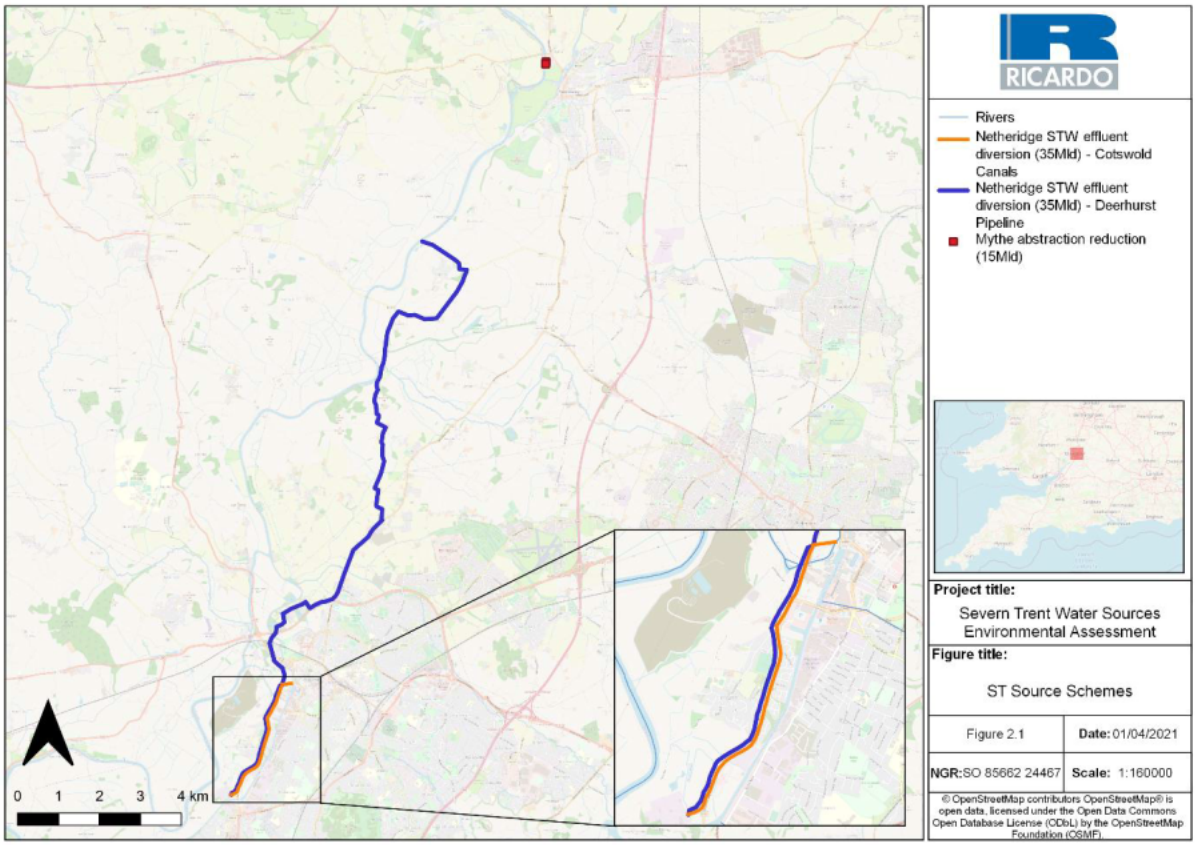
2.4 Netheridge WwTW discharge diversion, Cotswold Canals (35 Ml/d)

Currently treated discharge from Netheridge WwTW is input to the upper Severn Estuary. It is proposed to divert a 35 Ml/d portion to a new outfall on the freshwater River Severn to support STT abstraction from the River Severn at Gloucester and Sharpness Canal. The discharge location is into the East Channel of the River Severn, just downstream of the proposed abstraction discharging to Gloucester & Sharpness Canal. The diversion from Netheridge WwTWs would be pumped by a new pumping station, located at the WwTWs via [redacted]

WwTW discharge transfer for STT support would not be continuous, only discharging to the freshwater river outfall according to an operating regime when support is required to enable abstraction from the River Severn. The discharge would be a flow replacement for river water abstracted locally upstream. The scheme will result in a relocation of up to 35 Ml/d.

The locations of these three schemes are shown on Figure 2.1.

Figure 2.1 Location of STW Sources SRO Schemes



3 Methodology

3.1 Methodology for Gate-1

3.1.1 Overall approach

The objective of SEA is to provide a high level of protection of the environment and to contribute to the integration of environmental considerations into the preparation and adoption of plans with a view to promoting sustainable development.

The requirement for SEA was brought into legislation by the SEA Regulations[5]. These regulations transposed the requirements of EU Directive 2001/42/EC (the SEA Directive) into English legislation. Following Brexit, minor amendments, to correct deficiencies and terminology, were made to the SEA Regulations through the Environmental Assessments and Miscellaneous Planning (Amendment) (EU Exit) Regulations 2018.

It is recognised that the SEA approach can assist in the identification of likely significant environmental effects (positive and negative) of water resource components, both individually and in-combination, and that knowledge of these effects can help to identify preferred options and programmes of options.

Whilst it is acknowledged that there is no requirement for a statutory SEA with respect to SROs, adoption of some of the principles of SEA in the assessment of SROs can help inform decision-making by bringing different environmental considerations into one place. In the same way that a statutory SEA, is informed by the HRA and WFD assessments, the approach adopted to the environmental assessment approach for gate-1 has equally had regard to the assessment conclusions of the HRA and WFD assessment work that has been undertaken to inform the submission at gate-1.

3.1.2 Assessment Methodology

An objectives-led approach to SEA has become standard practice in the assessment of both WRMPs and Drought Plan (DPs). An objective-led approach to this environmental assessment has therefore been adopted. The establishment of SEA objectives are commonly derived from a review of baseline conditions and of relevant plans, programmes and policies. Key issues that were identified from a review of baseline conditions and of relevant plans, programmes and policies undertaken during the development of STW's WRMP24 SEA Scoping Report have been reviewed as part of this assessment. These are summarised in **Appendix A1**.

In undertaking this environmental assessment work the list of SEA objectives set out in Table 6.1 of the ACWG Strategic Environmental Assessment: Core Objective Identification report (October 2020) have been adopted. These SEA objectives were identified by the ACWG following a review of Water Company approaches to SEA and an updated assessment of legislation, policies and guidance.

Regarding the STW Sources SRO for gate-1, the principles of SEA, HRA and WFD have been adopted. The ACWG guidelines have been followed with regard to the approach to SEA. The approach adopted included for updates, such as in relation to carbon levels for assessing climatic factors, that were subsequently advised by the authors to the ACWG SEA methodology.

The key issues identified in **Appendix A1** have been used to create a number of key guide questions related to each SEA topic. These key guide questions have been used as prompts in the assessments to help ensure consistent and robust assessment for each of the SEA topic areas. As with the development of the SEA objectives the development of the guide questions has also drawn upon other sources of information including:

- the SEA guide questions set out in the WRSE Regional Plan SEA Scoping Report September 2020; and
- the SEA guide questions included in the SEAs of recent WRMPs.

[5] The Environmental Assessment of Plans and Programmes Regulations 2004 (Statutory Instrument 2004 No. 1633) apply to any plan or programme which relates solely or in part to England.

The list of SEA topics, SEA objectives and associated key guide questions adopted for the SEA undertaken for the ST Sources SRO are set out in **Table 3.1** below.

Table 3.1 SEA objectives and key guide questions

SEA topic	SEA objective	Key guide questions
Biodiversity, flora and fauna	1.1 To protect designated sites and their qualifying features	• Is the option likely to affect the conservation status of any SPAs, SACs, Ramsar sites, SSSIs or National Nature Reserves? • Will it affect HRA compliance (taken from HRA assessment results)? • Will the option affect the marine environment, habitats and species (including MCZs and MPAs)? • Is the option likely to affect ancient woodland?
	1.2 To avoid a net reduction, and where possible enhance, in non-monetised natural capital assets	• Are there any opportunities for habitat creation or restoration and a net benefit/gain for biodiversity? • Will the option contribute to the loss or gain in habitat connectivity? • Does it protect, conserve and enhance biodiversity natural capital and the ecosystem services the natural capital provides (taken from the natural capital assessment results)?
	1.3 To protect and enhance biodiversity, priority habitats and species	• Will the option protect and enhance priority habitats and species? • Will the option affect a priority habitat on the priority habitat inventory?
	1.4 To avoid and, where required, manage invasive and non-native species (INNS)	• Is there a possibility for INNS to be spread/ introduced? • Is there an opportunity to improve biodiversity value through removal of INNS?
	1.5 To meet WFD objectives relating to biodiversity	• Will it affect WFD compliance e.g. good ecological potential/status?
Soil	2.1 To protect and enhance the functionality, quantity and quality of soils, including the protection of high-grade agricultural land	• Will the option affect high grade agricultural land? • Will the option promote the efficient use of land? • Will the option prevent soil erosion and retain soil stocks as a natural resource? • Will the option involve use of brownfield or greenfield land? • Is the option likely to affect SSSIs of geological importance?
Water	3.1 To minimise or manage flood risk, taking climate change into account	• Is the option vulnerable to flood risk? • Will the option contribute to the risk of flooding? • Will the option protect and enhance the environmental resilience of the water environment to climate change, flood risk and drought?
	3.2 To enhance or maintain groundwater quality and resources	• Will the option affect groundwater quality or quantity?
	3.3 To enhance or maintain surface water quality, flows and quantity	• Will the option affect surface water quality or quantity?
	3.4 To meet WFD objectives	• Is the option likely to contribute to or conflict with the achievement of WFD objectives (taken from the WFD assessment results)?
	3.5 To improve water efficiency through provision of access to a resilient and sustainable supply of water.	• Does the option provide a reliable and sustainable water supply which meets changing demand?
Air	4.1 To minimise air emissions during construction and operation	• Is the option in an air quality management area (AQMA)? • Will the option affect local air quality?
Climatic Factors	5.1 To introduce climate mitigation where required and improve the climate resilience of assets and natural systems	• Is there potential for the option to incorporate climate mitigation measures to reduce its carbon footprint, such as lower embodied carbon or incorporating renewable energy? • Is the option vulnerable to climate change effects? • Does the option include climate resilience measures?

	5.2 To minimise embodied and operational emissions	• Will the option affect carbon or other greenhouse gas (GHG) emissions? • Will the option minimise energy demand during construction and operation?
Landscape	6.1 To conserve, protect and enhance landscape and townscape character and visual amenity	• Will the option have an effect on the character of the landscape or townscape, including views? • Will the option improve access to the countryside? • Will the option create or improve green infrastructure which contributes to access to the landscape? • Will the option protect and enhance designated landscapes and features? • Will the option affect visual amenity?
Historic Environment	7.1 To conserve/protect and enhance historic assets/cultural heritage and their setting, including archaeological important sites	• Will the option affect designated historic assets, sites and features? • Will the option affect the setting and/or significance of a historic asset? • Will the option affect archaeological important sites?
Population and Human Health	8.1 To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing	• Will the option allow for economic development? • Will the option provide employment opportunities? • Will the option affect road or rail infrastructure? • Will the option minimise disturbance from noise, light, visual, and transport? • Will the option affect the local area in terms of noise emissions?
	8.2 To maintain and enhance tourism and recreation	• Will the option have an effect on active lifestyles, such as impacts on active travel through disruption to pedestrian and cycle routes? • Will the option affect Public Rights of Way? • Will the option maintain or enhance tourism? • Will the option affect water resources that are used to provide tourist facilities?
	8.3 To secure resilient water supplies for the health and wellbeing of customers	• Will the option secure resilient water supplies for the health and wellbeing of customers? • Does the option promote water efficiency and encourage a reduction in water consumption?
	8.4 To increase access and connect customers to the natural environment, provide education or information resources for the public	• Does the option improve access to the natural environment for recreation, including those living within deprived areas?
Material Assets	9.1 To minimise resource use and waste production	• Will the option minimise the use of resources? • Will the option minimise the production of waste?
	9.2 To avoid negative effects on major built assets and infrastructure	• Will the option reuse existing infrastructure? • Will the option affect major built assets and infrastructure, including transport infrastructure?

As can be seen from **Table 3.1** the SEA is informed by the results of the HRA and WFD assessments undertaken. In particular the HRA assessment results help inform the assessment of objectives related to biodiversity, flora and fauna whilst the WFD assessment results help to inform the assessment of objectives 1.5 and 3.4. Furthermore, the natural capital and biodiversity assessments undertaken as part of the SRO have assisted the conclusions reached in terms of the SEA topic area of biodiversity, flora and fauna.

As well as the baseline being used to inform the SEA objectives it is also important in helping to determine the effects of the proposed options. The ACWG document entitled 'WRMP environmental assessment guidance and applicability with SROs' states that: "*it is envisaged that, the majority of the front-end SRO environmental assessment(s) required for gate-1 would be carried out using a GIS-based system to allow for rapid assessment of multiple options*". The gate-1 option-level environmental assessment has utilised a GIS-based system to help identify and map environmental constraints within the study area. The datasets used in this detailed assessment, as provided in **Appendix A2**, have been

updated from those used in the WRMP19 assessments to reflect the current baseline. Figures that illustrate the baseline environment with regard to key environmental constraints in proximity to the STW Sources SRO schemes are provided in **Appendix A3**.

The results of the SEA scheme assessments are presented in output tables, which reflects the SEA outputs set out in Table A.1 of the ACWG guidelines. The SEA assessment table that has been adopted in the assessment of the STW Sources SRO is provided in **Appendix A4**. Further details and explanation on the content of the detailed SEA assessment output tables is provided below.

The first and second columns of the assessment output table set out the SEA topics and objectives. The third and fourth columns provide the assessment results, positive and negative effects, during the construction phase and the fifth and sixth columns provide the positive and negative effects, during the operational phase. These assessment results have regard to embedded mitigation (mitigation measures identified as part of the proposed scheme subject to assessment) that have been costed into the design of the scheme. For assessment purposes embedded mitigation includes best practice mitigation and any additional specific mitigation included as part of option design as set out in the conceptual design reports (CDR) for each of the STW Sources SRO schemes.

In line with best practice the negative and positive effects are assessed separately for each objective and are not aggregated or "netted off" in any way. This approach has been adopted to maintain transparency of negative and positive effects.

The seventh column provides commentary and evaluation of the effects of the element on the SEA objective, with reference to the guide questions (outlined in **Table 3.1**). This commentary is split into construction and operational aspects and outlines the key details that underpin the assessment against that SEA objective, providing transparency as to how the significance of effects has been determined.

The eighth column provides details of any further measures to mitigate adverse effects or enhance beneficial effects that are recommended but not committed to as part of the proposed scheme. The residual negative and positive effects (after application of further mitigation measures) during construction are identified in the ninth and tenth columns respectively. Whilst the eleventh and twelfth columns provide the residual positive and negative effects, during the operational phase.

The assessment of the elements has been carried out applying the SEA assessment significance ratings shown in **Table 3.2** below.

Table 3.2 Significance ratings

Effect	Description
+++	Major Positive
++	Moderate Positive
+	Minor Positive
0	Neutral
-	Minor Negative
--	Moderate Negative
---	Major Negative
?	Uncertain

The definitions for the significance of effects are provided in **Appendix A5**, and have had regard both to those set out in Table B.1 of the ACWG guidance, although in order to be consistent with the WRSE regional plan have been updated, for example, to reflect consideration of INNS and a revised carbon threshold scale. The assessment conclusions also consider the sensitivity of the environmental receptor and magnitude of the effect, the latter of which is a factor of the scale of effect, whether the effects arise in the short, medium or long term, and whether the effects are permanent or temporary.

Where qualitative and/or quantitative information was available (e.g. as identified by the HRA or WFD assessment process, conceptual design information, public domain datasets including GIS datasets), this has been used to inform the assessment. Objectives or key guide questions that were not

supported by available data or information have been evaluated using spatial analysis, professional judgement and applicable assessment guidelines relating to that topic/objective.

3.1.3 Limitations of the study

SEA is a strategic assessment aimed at highlighting potential environmental concerns. The environmental data used in this assessment are based on those that are readily available from existing sources. Limitations in undertaking this SEA included the requirement to rely on conceptual designs appropriate to the development of the SRO scheme for gate-1 and which therefore have a lower level of detail to inform assessment of very specific impacts on specific receptors. Assessment of impacts is necessarily limited when, for example, pipeline routes are at the outline conceptual design stage only.

The level of detail used in the environmental assessments produced for gate-1 submission is consistent with the strategic nature of SEA and the outline level of detail of the ST sources elements at gate-1. The scope of the assessment has not strayed into the statutory Environmental Impact Assessment (EIA) process which is a detailed project-level assessment using detailed design information. Such detailed information will not be available for the STW Sources SRO until later in the RAPID gated process. For example, assessment of the potential impacts on protected species will be carried out as the option is taken forward for detailed design and environmental surveys are carried out for protected species to inform the assessments. This approach is supported in national guidance[6] on SEA. It is recognised that if schemes are progressed, there would be more detailed assessment work (including EIA where relevant) to support the detailed design as well as any subsequent planning application and that further engagement with stakeholders would be undertaken during this period.

Where particular limitations or outstanding issues are known, these are described in the SEA output assessment table for the relevant element concerned.

3.2 Assessment Purpose and Scope

The SEA process has been applied to test the performance of the STW Sources SRO schemes against environmental objectives to see how far they meet these objectives. This approach enables the environmental performance of these STW Sources SRO schemes to be used to inform decision-making.

With regard to in-combination effects, there is no specific requirement to undertake a full cumulative effects assessment at gate-1, and indeed at this stage in the absence of outputs from the regional plans and clarity as to which SRO schemes may proceed or not through to gate-2 such an assessment would be of limited value. An assessment of the likely significant environmental effects of the STW Sources SRO in combination with those of other relevant plans, programmes or projects, including the regional water resource plans, WRMPs, DPs and other major plans, programmes and projects will be undertaken for gate-2.

[6] For example the ODPM guidance on SEA.

4 Assessments

4.1.1 Introduction

The STW Source SRO schemes are presented in **Table 4.1**.

Table 4.1 Severn Trent Water Sources SRO Schemes

Reference Number	Scheme Name
Mythe_15	Mythe abstraction licence transfer (15 Mld)
NetheridgePipelineDeerhurst_35	Netheridge WwTW discharge diversion (35 Mld) - Deerhurst Pipeline
NetheridgePipelineCotswold_35	Netheridge WwTW discharge diversion (35 Mld) - Cotswold Canals

4.2 Assessment results

The SEA assessment tables for each of the three schemes are provided in **Appendix A6**.

The assessment conclusions during construction and operation for each objective have been determined firstly after application of embedded mitigation measures included in the conceptual design (and cost) of each scheme and then subsequently having regard to the application of potential further mitigation measures.

The mitigation included as embedded mitigation in the assessments has been developed through the work undertaken leading to the gate-1 submission. The mitigation measures identified as embedded mitigation have been included in the CDRs. These mitigation measures have been costed for in the design and thus have been taken into account in the assessment of likely environmental effects. Where, even after the consideration of these embedded mitigation measures, these assessments have identified potential environmental effects regard has been given to further mitigation measures. These are measures that, although have not been costed for as yet, could be undertaken and implemented in order to reduce or overcome negative effects or increase positive effects.

The assessment conclusions during the construction and operational phases of each scheme after consideration of embedded mitigation are summarised below using a colour-coded visual evaluation summary matrix (**Table 4.2**). The colours in the table reflect the level of significance of the effect as set out in **Table 3.2**. The assessment conclusions during the construction and operational phases of each scheme after consideration of further potential mitigation measures are summarised below using a colour-coded visual evaluation summary matrix (**Table 4.3**).

Table 4.2 SEA Assessment Summary Matrix after embedded mitigation

Scheme			SEA Topics and Objectives																					
			Biodiversity, flora & fauna					Soil	Water					Air	Climatic Factors		Landscape	Historic	Population and Human Health				Material Assets	
			1.1	1.2	1.3	1.4	1.5	2.1	3.1	3.2	3.3	3.4	3.5	4.1	5.1	5.2	6.1	7.1	8.1	8.2	8.3	8.4	9.1	9.2
Mythe abstraction licence transfer	Construction Effects	+ve																						
		-ve																						
	Operational Effects	+ve																						
		-ve																						
Netheridge WwTW discharge diversion - Deerhurst Pipeline	Construction Effects	+ve																						
		-ve																						
	Operational Effects	+ve																						
		-ve																						
Netheridge WwTW discharge diversion - Cotswold Canals	Construction Effects	+ve																						
		-ve																						
	Operational Effects	+ve																						
		-ve																						

Table 4.3 SEA Assessment Summary Matrix after further mitigation

Scheme			SEA Topics and Objectives																					
			Biodiversity, flora & fauna					Soil	Water					Air	Climatic Factors		Landscape	Historic	Population and Human Health				Material Assets	
			1.1	1.2	1.3	1.4	1.5	2.1	3.1	3.2	3.3	3.4	3.5	4.1	5.1	5.2	6.1	7.1	8.1	8.2	8.3	8.4	9.1	9.2
Mythe abstraction licence transfer	Construction Effects	+ve																						
		-ve																						
	Operational Effects	+ve																						
		-ve																						
Netheridge WwTW discharge diversion - Deerhurst Pipeline	Construction Effects	+ve																						
		-ve																						
	Operational Effects	+ve																						
		-ve																						
Netheridge WwTW discharge diversion - Cotswold Canals	Construction Effects	+ve																						
		-ve																						
	Operational Effects	+ve																						
		-ve																						

A summary of the key environmental effects of each of the schemes after embedded mitigation measures have been considered are provided below. The potential effects of undertaking the further mitigation measures identified in the SEA assessment output tables is discussed at the end of each assessment.

4.2.1 Mythe abstraction licence transfer (15 Mld)

This scheme does not have any major or moderate positive of negative effects associated with it. The scheme has some uncertain effects associated with operational carbon emissions and resource use. Effects are otherwise neutral with a few minor positives identified during operation resulting from leaving water in the river for abstraction further downstream and the scheme contributing to a resilient water supply.

4.2.2 Netheridge WwTW discharge diversion (35 Mld) - Deerhurst Pipeline

This scheme has some major and moderate negative and moderate positive effects after consideration of currently embedded mitigation measures.

Major negative effects include:

- Effects associated with soil as the route crosses a landfill site and is within proximity of others therefore there exists the potential for contaminated land and associated risks to health and environment during construction.

Moderate negative effects include:

- Effects on heritage assets during construction due to the proximity of scheduled monuments, listed buildings and conservation areas; and
- Potential effects on the health and well-being of the local community during construction of the proposed development.

Moderate positive effects are identified in respect of the scheme contributing to a resilient water supply. The additional water resource from this scheme will provide essential water supply infrastructure to help support a sustainable socio-economy. Furthermore, with respect to climatic factors this scheme provides additional water resource and will during operation assist the reliable transfer of water, therefore reducing the vulnerability to drought risks associated with climate change and improving resilience to the likely effects of climate change. A further moderate positive effect was identified with respect to potential economic opportunities during construction.

The major and moderate negative effects identified with the currently costed for embedded mitigation measures could potentially be further mitigated to reduce effects to a minor negative or neutral effect through the implementation of further mitigation measures. These measures, which are proposed to be investigated further during gate-2, include:

- Re-routing the pipeline away from the historic landfill and undertaking investigations/remediation for land contamination. This could mitigate the potential negative effects relating to soil;
- Consideration of heritage aspects when further developing the alignment of the pipeline. This should be done during design development and in consultation with Historic England and Council officers; and
- Sensitive siting of construction compounds, routing of construction traffic and limiting hours of working. This could reduce effects on the environment and amenity to a minor negative effect.

4.2.3 Netheridge WwTW discharge diversion (35 Mld) - Cotswold Canals

This scheme has some major and moderate negative and moderate positive effects after consideration of currently embedded mitigation measures.

Major negative effects include:

- Potential effects on WFD compliance during operation in terms of impacts on water quality and available wetted habitat;

- Effects associated with soil as the route crosses a landfill site and is within proximity of others therefore there exists the potential for contaminated land and associated risks to health and environment during construction;
- Potential effects on surface water quality in the eastern channel of the lower River Severn during operation due to the unknown dilution capacity at this location to manage inputs; and
- Potential effects on WFD compliance during operation in terms of water quality, aquatic ecology and chemical status targets in the eastern channel of the lower River Severn.

Moderate negative effects include:

- Effects on heritage assets during construction due to the proximity of scheduled monuments, listed buildings and conservation areas.

Moderate positive effects are identified in respect of the option contributing to a resilient water supply. The additional water resource from this scheme will provide essential water supply infrastructure to help support a sustainable socio-economy. Furthermore, with respect to climatic factors this scheme provides additional water resource and will during operation assist the reliable transfer of water, therefore reducing the vulnerability to drought risks associated with climate change and improving resilience to the likely effects of climate change.

The major and moderate negative effects identified with the currently costed for embedded mitigation measures could potentially be further mitigated to reduce effects to a minor negative or neutral effect through the implementation of further mitigation measures. These measures, which are proposed to be investigated further during gate-2, include:

- Advanced water treatment and attainment of water quality discharge levels. These would help meet permitting requirements and minimise potential effects relating to WFD compliance and water quality concerns;
- Re-routing the pipeline away from the historic landfill and investigations/remediation for land contamination. This could mitigate the potential negative effects relating to soil;
- Consideration of heritage aspects when further developing the alignment of the pipeline. This should be done during design development and in consultation with Historic England and Council officers; and
- Sensitive siting of construction compounds, routing of construction traffic and limiting hours of working. These could reduce effects on the environment and amenity to a minor negative effect.

5 Conclusions and recommendations

5.1 Introduction

As set out in section 4, some major and moderate negative and positive effects have been identified for each of the three schemes assessed within the STW Sources SRO, which is to be expected given both the scale of the schemes and the early stage of their design and development.

The negative effects, in particular, are dependent on the specific geographical setting of the option and its proximity (or otherwise) to sensitive environmental, human and built receptors. Some of these major negative effects identified are temporary in nature and largely unavoidable while construction works take place. Some exist as a consequence of the scale of the proposed works, whilst others may be able to be mitigated with investigation of further measures.

Beneficial effects have been identified in respect of providing additional water resource, contributing to a resilient water supply, helping to support a sustainable socio-economy and reducing the vulnerability to drought risks associated with climate change and improving resilience to the likely effects of climate change.

In discussions with WRSE it is understood that their SEA assessments have been unable to have regard to the impacts of undertaking embedded mitigation measures. In addition, it is understood that consideration of positive effects during construction such as employment and economic benefits have not been included in their assessments. Both of these factors are considered relevant, in particular for the larger scale potential developments. As set out in Section 4 and in the SEA assessment output tables in **Appendix A6** the STW Sources SRO schemes have included for, and costed, a number of embedded mitigation measures that have reduced potential negative environmental effects.

Section 4 sets out the key major and moderate effects, prior to the adoption of potential further mitigation measures. Section 5.2 sets out proposed gate-2 works, which includes a summary of key further investigations and works proposed during gate-2 that will help to identify further mitigation measures to potentially reduce the identified effects further. It should be noted that the further mitigation measures identified have not been costed for or integrated into detailed design at this stage. In consequence, these measures are subject to more detailed assessment and, at this stage, the effectiveness of these measures has still to be fully determined.

In addition to identifying and assessing the effectiveness of further mitigation measures, the gate-2 activities will also confirm the effectiveness of the embedded mitigation measures identified within the assessments contained in **Appendix A6**. Co-ordination between the SRO activities and the regional plan assessments will also continue during the works through to gate-2.

5.2 Gate 2 works

The environmental assessment work will be iterative throughout the gated process drawing on additional engineering design, modelling and data available as work progresses.

It is recommended that gate-2 works should both confirm the proposed embedded mitigation measures set out in the assessment tables in **Appendix A6** and CDRs and include the consideration of the recommended further mitigation measures. These recommended further mitigation measures are identified within each of the SEA output tables in **Appendix A6.** Whilst no further mitigation measures are recommended for the Mythe abstraction licence transfer scheme a number of these measures are identified for both the Netheridge Canal and Netheridge Pipeline discharge diversion schemes.

Consideration of potential cumulative effects and interactions with other major projects identified in programmes and plans should also be assessed during gate-2.

Key gate-2 works for the Mythe abstraction licence transfer and the Netheridge Canal and Netheridge Pipeline discharge diversion STW Source SRO schemes, during construction and operation, are outlined below.

5.2.1 Key gate-2 works for Mythe abstraction licence transfer

Key gate-2 works during construction for the Mythe abstraction licence transfer scheme include:

- Review and confirm the proposed embedded mitigation measures set out in the SEA assessment output tables and CDRs.

Key gate-2 works during operation for the Mythe abstraction licence transfer scheme include:

- Review and confirm of the proposed embedded mitigation measures set out in the SEA assessment output tables and CDRs.

5.2.2 Key gate-2 works for Netheridge Canal discharge diversion

Key gate-2 works during construction of the Netheridge Canal discharge diversion scheme include:

- Review and confirm the proposed embedded mitigation measures set out in the SEA assessment output tables and CDRs.
- Consideration of the adoption of the recommended further mitigation measures identified in the SEA assessment table for the Netheridge Canal discharge diversion scheme in **Appendix A6**. These include measures such as:
    - Consultation with NE and HE to review route alignment and working areas.
    - Ecological surveys and any mitigation measures arising from these prior to construction.
    - Review of working areas.
    - Soil storage and reinstatement.
    - Tunnelling through priority habitat and for watercourses and A roads.
    - Re-routing the pipeline away from the historic landfill. Investigations/remediation for land contamination.
    - Further mitigation measures to be set out in the applications for Flood Defence Consents where these are required for the river crossing construction works.
    - Consider use of rail for transporting materials.
    - Investigate use of renewables.
    - The development of an archaeological programme of works including archaeological monitoring is proposed.
    - Construction compounds to be sited sensitively and away from residential areas and along the pipeline next to a main road, so that there is least disturbance to local traffic.
    - The hours of working associated with the construction of the treatment works, other sites and pipeline route limited to minimise amenity and environmental impacts.
    - Consider reviewing route to avoid recreational areas.
    - Adoption of waste minimisation measures where practicable.
    - Source materials locally and reinstate excavated materials where possible.
    - Minimise works on infrastructure where open cut during peak periods

Key gate-2 works during operation for Netheridge Canal discharge diversion scheme include:

- Review and confirm of the proposed embedded mitigation measures set out in the SEA assessment output tables and CDRs.
- Consideration of the adoption of the recommended further mitigation measures identified in the SEA assessment table for Netheridge Canal discharge diversion scheme in **Appendix A6**. These include measures such as:
    - Delivery of required Biodiversity net gain (BNG) to offset construction losses. Potential benefits to recreation are dependent on design of BNG mitigation.
    - Precautionary monitoring for INNS
    - Advanced water treatment
    - Discharge would be subject to regulatory permitting of water quality to ensure no effect on WFD status and subject to review this could mitigate impacts, but this level of treatment is currently not included in design.
    - Screening where settings of heritage assets would be affected.

5.2.3 Key gate-2 works for Netheridge Pipeline discharge diversion

Key gate-2 works during construction for Netheridge Pipeline discharge diversion scheme include:

- Review and confirm the proposed embedded mitigation measures set out in the SEA assessment output tables and CDRs.
- Consideration of the adoption of the recommended further mitigation measures identified in the SEA assessment table for Netheridge Pipeline discharge diversion scheme in **Appendix A6**. These include measures such as:
    - Discussions with NE regarding SSSI and ancient woodland protection measures.
    - Habitat surveys.
    - Consultation with NE and HE and Council officers to review route alignment and working areas.
    - Soil storage and reinstatement,
    - Ecological surveys and any mitigation measures arising from these prior to construction.
    - Tunnelling through priority habitat and for crossings of watercourses, rail and A roads.
    - Re-routing the pipeline away from the historic landfill. Investigations/remediation for land contamination.
    - Limiting the extent of pipeline construction at any one time will minimise the time period for soil disturbance.
    - Further mitigation measures will be set out in the applications for Flood Defence Consents where these are required for the river crossing construction works.
    - Consult with regulators for groundwater further mitigation measures.
    - Further mitigation measures will be set out in the applications for Flood Defence Consents where these are required for the river crossing construction works.
    - Consider use of rail for transporting materials.
    - Investigate use of renewables
    - Consider minimising the extent of construction works in proximity of the greenbelt. Use of trenchless techniques for pipeline construction
    - The development of an archaeological programme of works including archaeological monitoring is proposed.
    - Sensitive location of construction compounds to avoid heritage assets and retain a buffer around them to be defined further in consultation with Historic England.
    - Construction compounds to be sited sensitively and away from residential areas and along the pipeline next to a main road, so that there is least disturbance to local traffic.
    - The hours of working associated with the construction of the treatment works, other sites and pipeline route limited to minimise amenity and environmental impacts.
    - Consider reviewing route to avoid recreational areas. Avoid temporary closure of public rights of way and diversions. Public rights of way reinstated following construction completion. Careful siting and use of screening where work locations are in proximity to public rights of way.
    - Adoption of waste minimisation measures where practicable.
    - Source materials locally and reinstate excavated materials where possible.
    - Minimise works on infrastructure where open cut during peak periods

Key gate-2 works during construction for Netheridge Pipeline discharge diversion scheme include:

- Review and confirm the proposed embedded mitigation measures set out in the SEA assessment output tables and CDRs.
- Consideration of the adoption of the recommended further mitigation measures identified in the SEA assessment table for Netheridge Pipeline discharge diversion scheme in **Appendix A6**. These include measures such as:
    - Delivery of required BNG to offset construction losses.

- Potential benefits to recreation are dependent on design of BNG mitigation.
- Precautionary monitoring for INNS.
- Screening where settings of heritage assets would be affected.
- There is the opportunity to improve footpaths and connections in and around proposed pipeline route as part of the construction work.

Appendices

A1 Summary of Key Issues

A summary of the issues associated with the SEA topic areas that has helped inform the development of the SEA objectives and associated indicator questions is set out below.

Biodiversity, Flora and Fauna Key Issues

The key sustainability issues arising from the baseline assessment for biodiversity are :

- The need to protect or enhance the region's biodiversity, particularly protected sites designated for nature conservation.
- The need to avoid activities likely to cause irreversible damage to natural heritage.
- The need to take opportunities to improve connectivity between fragmented habitats.
- The need to control the spread of Invasive Non-Native Species (INNS).
- The need to engage more people in biodiversity issues so that they personally value biodiversity and know what they can do to help, including through recognising the value of the ecosystem services.

Soil Key Issues

The key sustainability issues arising from the baseline assessment for soil are:

- The need to protect geological features of importance and maintain and enhance soil function and health.
- The need to manage the land more holistically at the catchment level, benefitting landowners, other stakeholders, the environment and sustainability of natural resources (including water resources).
- The need to make use of previously developed land (brownfield land) and to reduce the prevalence of derelict land in the region.

Water Key Issues

The key sustainability issues arising from the baseline assessment for water are:

- The need to maintain the quantity and quality of groundwater resources taking into account WFD status targets.
- The need to improve the resilience, flexibility and sustainability of water resources in the region, particularly in light of potential climate change impacts on surface waters and groundwaters.
- The need to ensure sustainable abstraction.
- The need to ensure that people understand the value of water.
- The need to reduce and manage flood risk.

Air Key Issues

The key sustainability issue arising from the baseline assessment for air quality is:

- The need to reduce air pollutant and greenhouse emissions and limit air emissions to comply with air quality standards.

Climatic Key Issues

The key issues arising from the baseline assessment for climate are:

- The need to reduce greenhouse gas emissions (industrial processes and transport).
- The need to mitigate against climate change through the reduction in greenhouse gas emissions in order to contribute to risk reduction over the long term.
- The need to adapt to the impacts of climate change for example through, sustainable water resource management, water use efficiencies, specific aspects of natural ecosystems (e.g. connectivity), as well as accommodating potential opportunities afforded by climate change.

Landscape and Visual Amenity Key Issues

The key issue arising from the baseline assessment for landscape and visual amenity is:

- The need to protect and improve the natural beauty of the region's AONBs, National Parks and other areas of natural beauty.

Historic Environment Key Issues

The key issue arising from the baseline assessment for the historic environment is:

- The need to conserve or enhance sites of archaeological importance and cultural heritage interest, and their settings, particularly those which are sensitive to the water environment.

Population and Human Health Key Issues

The key sustainability issues arising from the baseline assessment for population and human health are:

- The need to ensure water supplies remain affordable especially for deprived or vulnerable communities
- The need to ensure public awareness of drought conditions and importance of maintaining security of supply without the need for emergency drought measures.
- The need to ensure water quantity and quality is maintained for other users including tourists, recreational users and other users such as farmers.
- The need to ensure a balance between different aspects of the built and natural environment that will help to provide opportunities local residents and tourists, including opportunities for access to recreation resources and the natural and historic environment.
- The need to accommodate an increasing population
- Sites of nature conservation importance, heritage assets, water resources, important landscapes and public rights of way contribute to recreation and tourism opportunities and subsequently health and well-being and the economy.

Material Assets Key Issues

The key sustainability issues arising from the baseline assessment for material assets are:

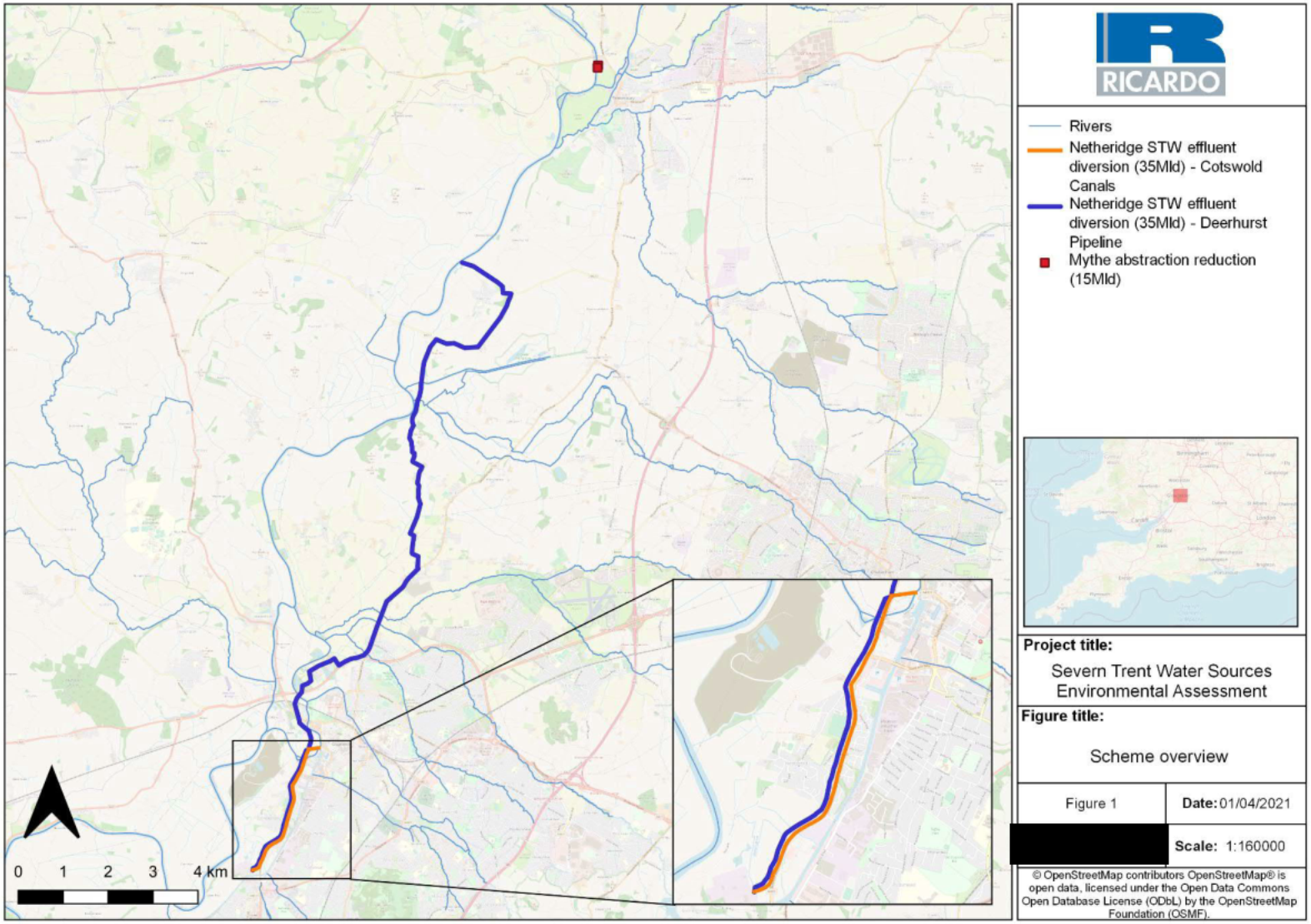
- The need to minimise the consumption of resources, including water and energy.
- Need to reduce leakage from the water supply system.
- Daily consumption of water resources is higher than the national average in the area and there is a need to encourage more efficient use.
- The need to reduce the total amount of waste produced in the region, from all sources, and to reduce the proportion of this waste sent to landfill.

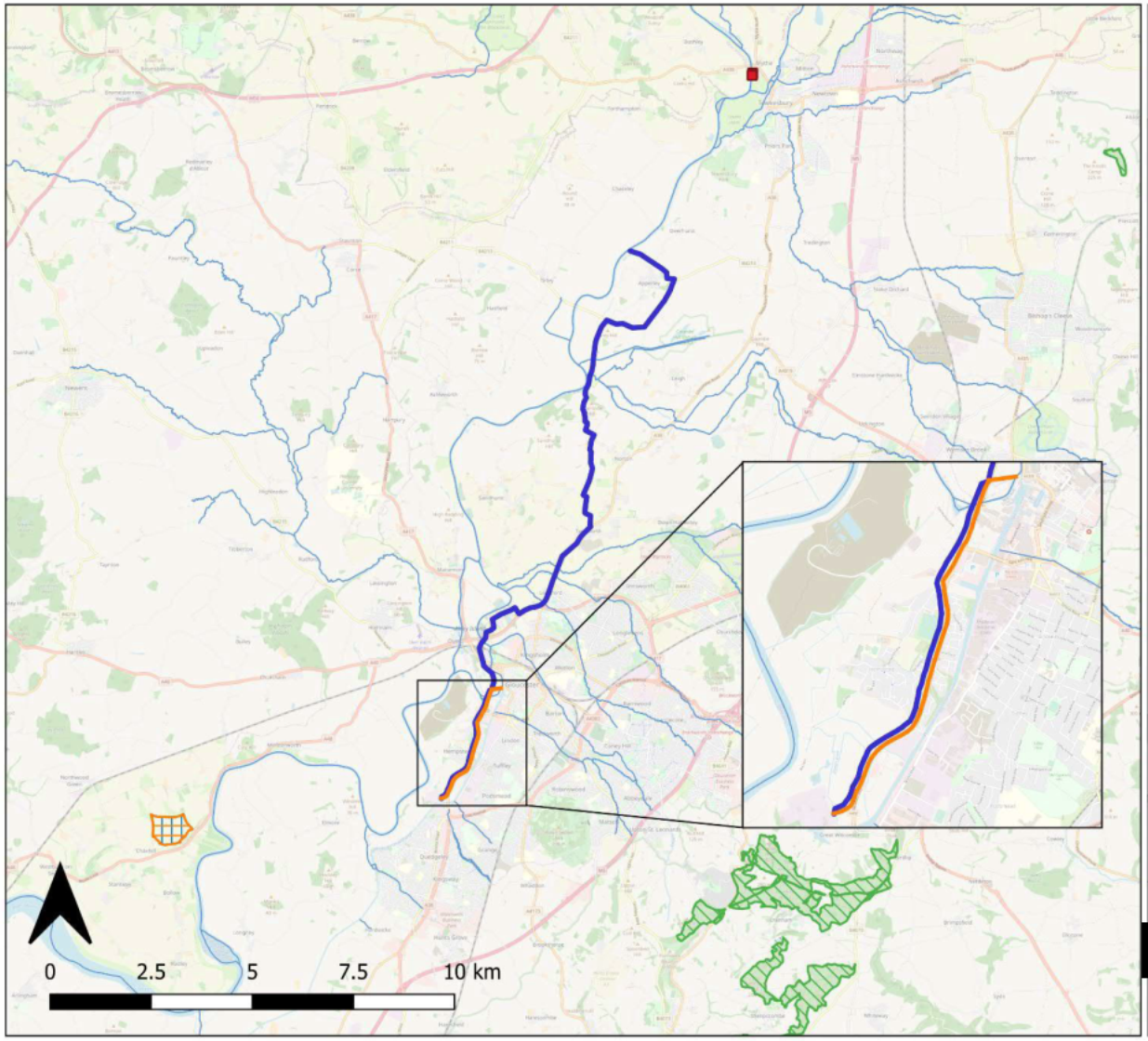
A2 List of datasets

Data Source	Publisher	Year	Date Downloaded
Air Quality Management Areas	DEFRA	2020	01/10/2020
Noise Action Planning Important Areas Round 2 England	DEFRA	2020	06/10/2020
Special Protection Areas (England)	Natural England	2020	12/10/2020
Special Areas for Conservation (England)	Natural England	2020	12/10/2020
Ramsar	Natural England	2020	12/10/2020
Sites of Special Scientific Interest (England)	Natural England	2020	12/10/2020
SSSI Impact Risk Zones (England)	Natural England	2020	06/11/2020
Special Areas of Conservation (SACs) with marine components (all UK waters)	JNCC	2020	02/11/2020
Possible Special Areas of Conservation (England)	Natural England	2020	06/11/2020
Special Protection Areas (SPAs) with marine components (all UK waters)	JNCC	2020	02/11/2020
Potential Special Protection Areas (England)	Natural England	2020	06/11/2020
Marine Conservation Zones (England)	Natural England	2020	05/05/2020
National Nature Reserves (England)	Natural England	2020	12/10/2020
Ancient Woodland (England)	Natural England	2020	12/10/2020
Local Nature Reserves (England)	Natural England	2020	12/10/2020
Priority Habitat Inventory (England)	Natural England	2020	12/10/2020
Ancient Woodland (England)	Natural England	2020	12/10/2020
Nature Improvement Areas	Natural England	2020	02/11/2020
National Priority Focus Areas	Natural England	2020	02/11/2020
OS Open Greenspace	Ordnance Survey	2020	30/10/2020
Country Parks (England)	Natural England	2020	12/10/2020
CRoW Act 2000 - Section 4 Conclusive Registered Common Land	Natural England	2020	12/10/2020
CRoW Act 2000 - Section 15 Land	Natural England	2020	12/10/2020
OS OpenMap - Roads	Ordnance Survey	2020	04/10/2020
OS OpenMap - Railways	Ordnance Survey	2020	04/10/2020
OS OpenMap Local - Buildings	Ordnance Survey	2020	04/10/2020
National Cycle Network (Public)	Sustrans	2020	02/11/2020
English indices of deprivation 2015	Ministry of Housing, Communities and Local Government	2015	02/11/2020
Agricultural Land Classification (ALC) Grades - Post 1988 Survey (polygons)	Natural England	2020	12/10/2020
Permitted Waste Sites - Authorised Landfill Site Boundaries	Environment Agency	2020	12/10/2020
Historic Landfill Sites	Environment Agency	2020	12/10/2020
LVMF protected vistas - GIS files	Greater London Authority	2018	02/11/2020
English Local Authority Green Belt Dataset	Ministry of Housing, Communities and Local Government	2019	29/09/2020
Areas of Outstanding Natural Beauty (England)	Natural England	2020	12/10/2020
National Character Areas (England)	Natural England	2020	02/11/2020
Flood Map for Planning (Rivers and Sea) - Flood Zone 2	Environment Agency	2020	12/10/2020
Flood Map for Planning (Rivers and Sea) - Flood Zone 3	Environment Agency	2020	12/10/2020
Statutory Main River Map	Environment Agency	2020	12/10/2020
OS Open Rivers	Ordnance Survey	2020	15/10/2020
Source Protection Zones	Environment Agency	2020	12/10/2020

Data Source	Publisher	Year	Date Downloaded
WFD River Canal and Surface Water Transfer Cycle 2	Environment Agency	2020	12/10/2020
WFD Groundwater Bodies Cycle 2	Environment Agency	2020	12/10/2020
Listed Buildings	Historic England	2020	12/10/2020
Registered Parks and Gardens	Historic England	2020	12/10/2020
Protected Wrecks	Historic England	2020	12/10/2020
Registered Battlefields	Historic England	2020	12/10/2020
Scheduled Monuments	Historic England	2020	12/10/2020
World Heritage Sites	Historic England	2020	12/10/2020
Built-up Areas (December 2011) Boundaries V2 - 350 metre buffer used	Office for National Statistics	2017	04/10/2020
National Trails	Natural England	2020	29/09/2020

A3 Environmental Baseline





RICARDO

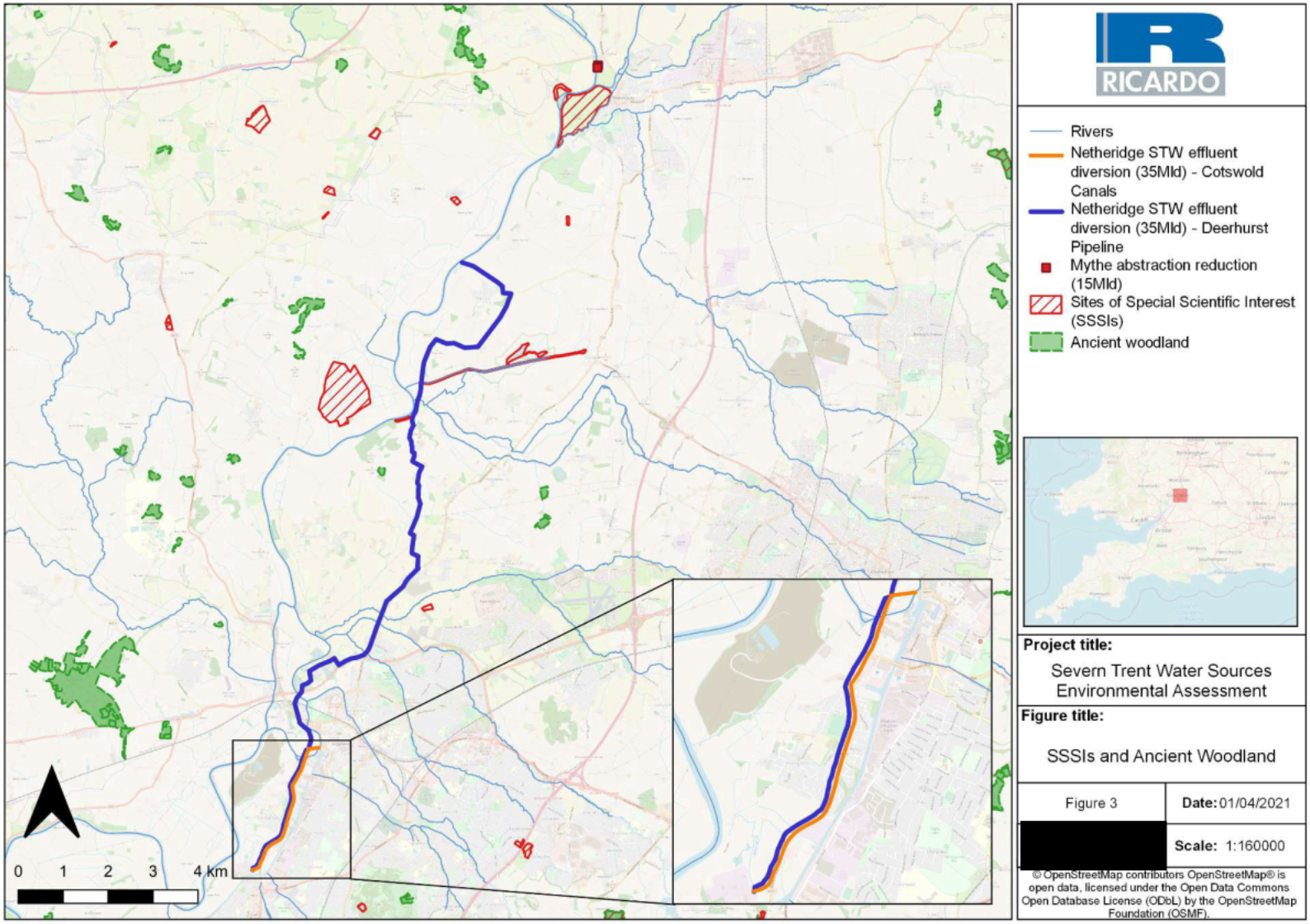
Rivers
Netheridge STW effluent diversion (35Mld) - Cotswold Canals
Netheridge STW effluent diversion (35Mld) - Deerhurst Pipeline
Mythe abstraction reduction (15Mld)
Special Areas of Conservation (SACs)
Special Protection Areas (SPAs)
Ramsar sites

Project title:
Severn Trent Water Sources Environmental Assessment

Figure title:
SACs, SPAs and Ramsar Sites

Figure 2 | **Date:** 01/04/2021

[redacted] | **Scale:** 1:200000


RICARDO
Rivers
Netheridge STW effluent diversion (35Mld) - Cotswold Canals
Netheridge STW effluent diversion (35Mld) - Deerhurst Pipeline
Mythe abstraction reduction (15Mld)
Sites of Special Scientific Interest (SSSIs)
Ancient woodland
0 1 2 3 4 km
Project title:
Severn Trent Water Sources Environmental Assessment
Figure title:
SSSIs and Ancient Woodland
Figure 3
Date: 01/04/2021
[redacted]
Scale: 1:160000
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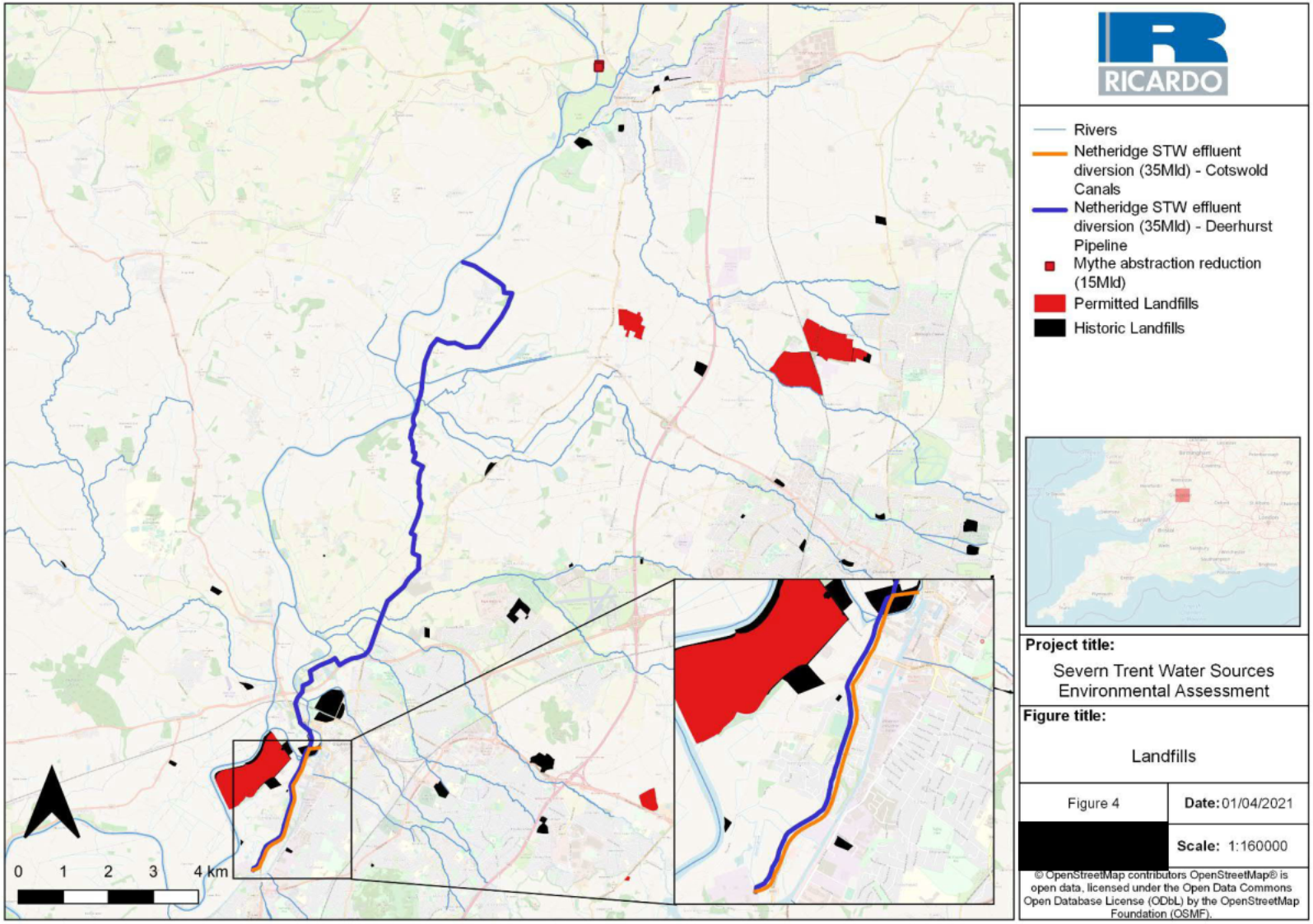
RICARDO
Rivers
Netheridge STW effluent diversion (35Mld) - Cotswold Canals
Netheridge STW effluent diversion (35Mld) - Deerhurst Pipeline
Mythe abstraction reduction (15Mld)
Permitted Landfills
Historic Landfills
0 1 2 3 4 km
Project title:
Severn Trent Water Sources Environmental Assessment
Figure title:
Landfills
Figure 4
Date: 01/04/2021
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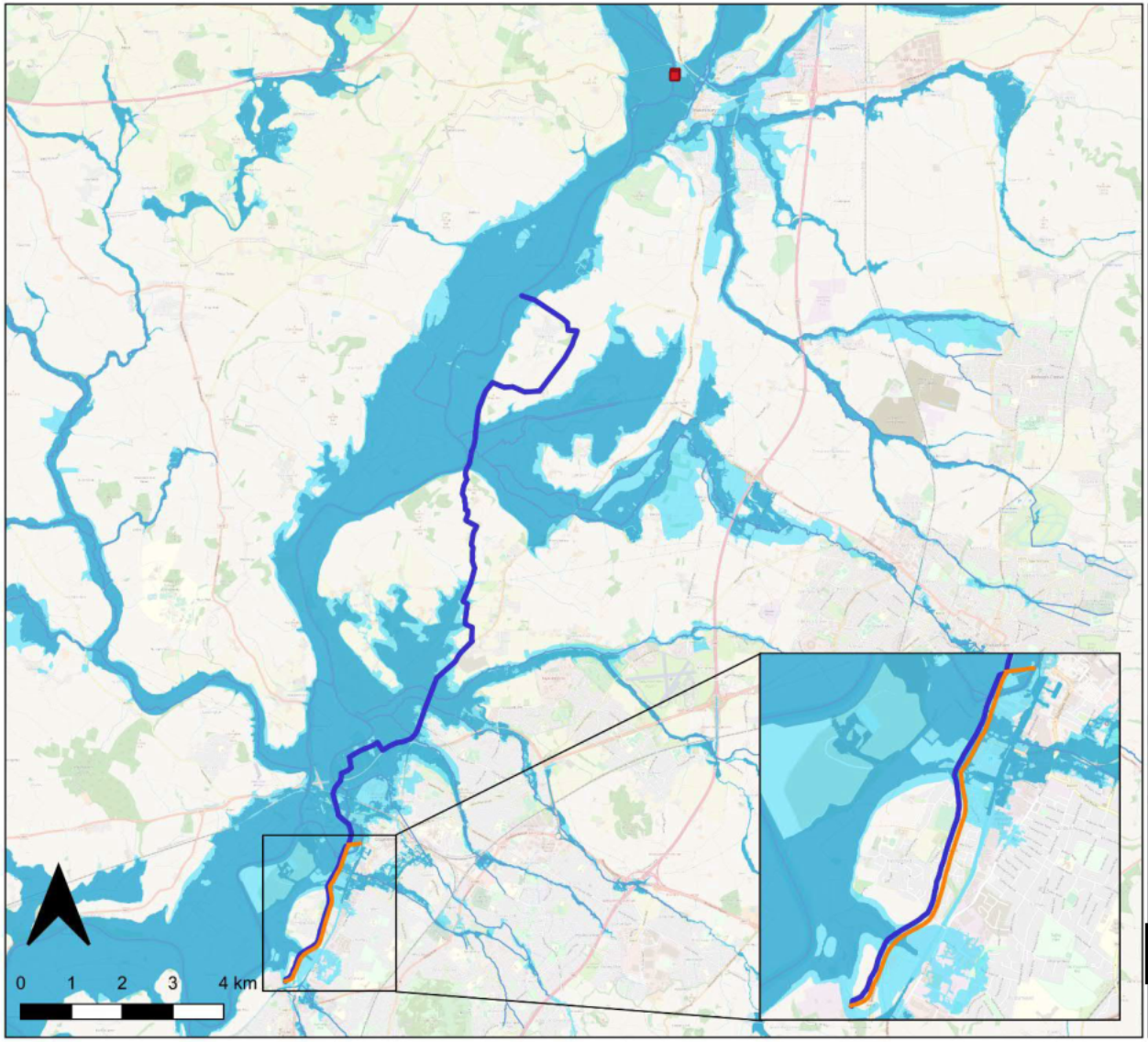

RICARDO

Rivers
Netheridge STW effluent diversion (35Mld) - Cotswold Canals
Netheridge STW effluent diversion (35Mld) - Deerhurst Pipeline
Mythe abstraction reduction (15Mld)
Flood Zone 2
Flood Zone 3

Project title:
Severn Trent Water Sources Environmental Assessment

Figure title:
Flood Zones

Figure 5	**Date:** 01/04/2021
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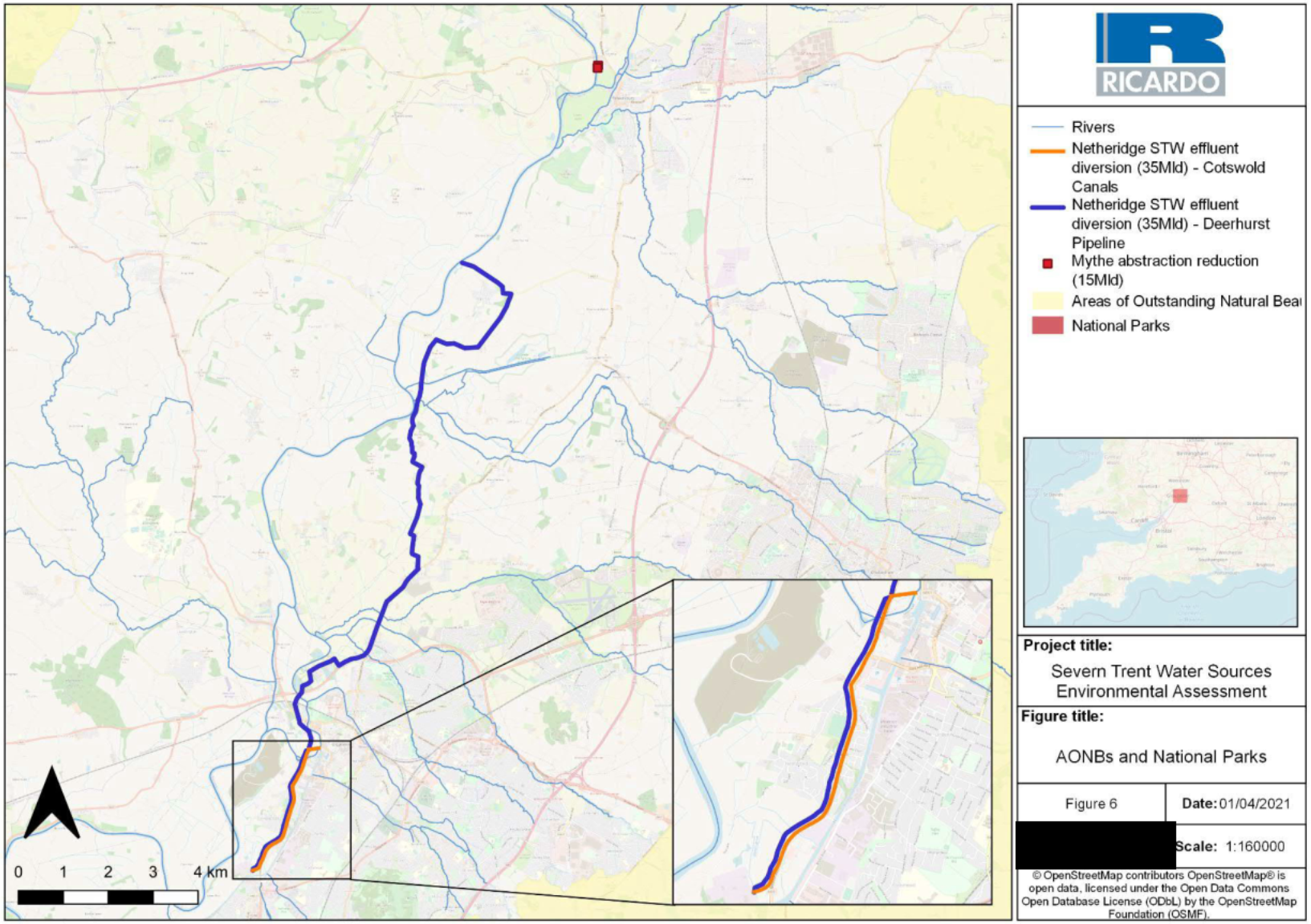
RICARDO
Rivers
Netheridge STW effluent diversion (35Mld) - Cotswold Canals
Netheridge STW effluent diversion (35Mld) - Deerhurst Pipeline
Mythe abstraction reduction (15Mld)
Areas of Outstanding Natural Beau
National Parks
0 1 2 3 4 km
Project title:
Severn Trent Water Sources Environmental Assessment
Figure title:
AONBs and National Parks
Figure 6
Date: 01/04/2021
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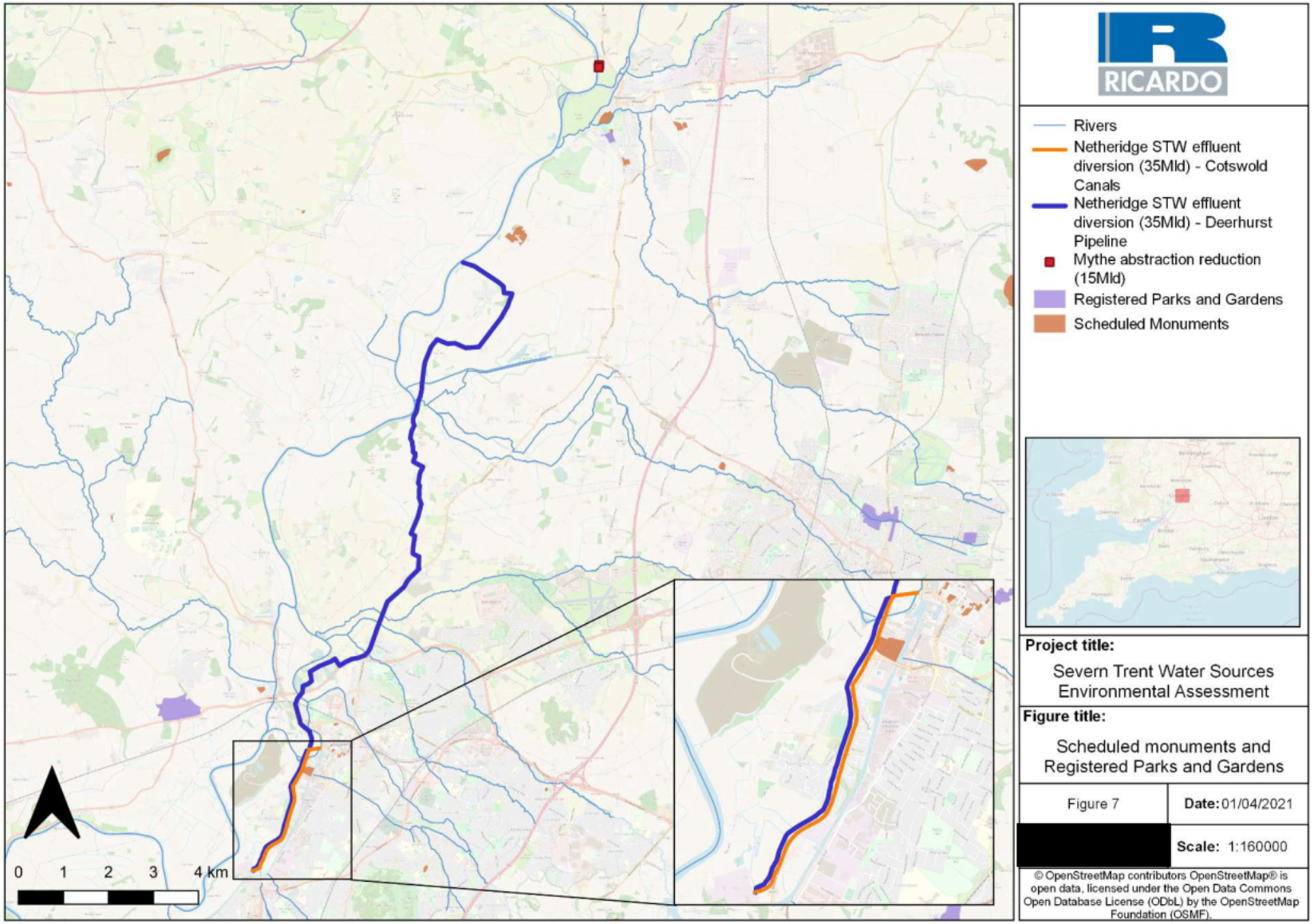
RICARDO
Rivers
Netheridge STW effluent diversion (35Mld) - Cotswold Canals
Netheridge STW effluent diversion (35Mld) - Deerhurst Pipeline
Mythe abstraction reduction (15Mld)
Registered Parks and Gardens
Scheduled Monuments
0 1 2 3 4 km
Project title:
Severn Trent Water Sources Environmental Assessment
Figure title:
Scheduled monuments and Registered Parks and Gardens
Figure 7
Date: 01/04/2021
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A4 SEA Output Table

Scheme Name	
Scheme Reference	
Description	

3.1 SEA topic	SEA objective	Construction Effects +ve	Construction Effects -ve	Operational Effects +ve	Operational Effects -ve	Effect Description (including embedded mitigation)	Further Mitigation	Residual Construction Effects +ve	Residual Construction Effects -ve	Residual Operational Effects +ve	Residual Operational Effects -ve
Biodiversity, flora and fauna	1.1To protect designated sites and their qualifying features					Construction effects: Operation effects:	Construction mitigation: Operation mitigation:				
	1.2To avoid a net reduction, and where possible enhance, in non-monetised natural capital assets					Construction effects: Operation effects:	Construction mitigation: Operation mitigation:				
	1.3To protect and enhance biodiversity, priority habitats and species					Construction effects: Operation effects:	Construction mitigation: Operation mitigation:				
	1.4To avoid and, where required, manage invasive and non-native species (INNS)					Construction effects: Operation effects:	Construction mitigation: Operation mitigation:				
	1.5To meet WFD objectives relating to biodiversity					Construction effects: Operation effects:	Construction mitigation: Operation mitigation:				
Soil	2.1To protect and enhance the functionality, quantity and quality					Construction effects:	Construction mitigation:				

3.1 SEA topic	SEA objective	Construction Effects +ve	Construction Effects -ve	Operational Effects +ve	Operational Effects -ve	Effect Description (including embedded mitigation)	Further Mitigation	Residual Construction Effects +ve	Residual Construction Effects -ve	Residual Operational Effects +ve	Residual Operational Effects -ve
	of soils, including the protection of high-grade agricultural land					Operation effects:	Operation mitigation:				
Water	3.1To minimise or manage flood risk, taking climate change into account					Construction effects: Operation effects:	Construction mitigation: Operation mitigation:				
	3.2To enhance or maintain groundwater quality and resources					Construction effects: Operation effects:	Construction mitigation: Operation mitigation:				
	3.3To enhance or maintain surface water quality, flows and quantity					Construction effects: Operation effects:	Construction mitigation: Operation mitigation:				
	3.4 To meet WFD objectives					Construction effects: Operation effects:	Construction mitigation: Operation mitigation:				
	3.5 To improve water efficiency through provision of access to a resilient and sustainable supply of water.					Construction effects: Operation effects:	Construction mitigation: Operation mitigation:				
Air	4.1 To minimise air emissions during construction and operation					Construction effects: Operation effects:	Construction mitigation: Operation mitigation:				
Climatic Factors	5.1 To introduce climate mitigation where required and improve the climate resilience of assets and natural systems					Construction effects: Operation effects:	Construction mitigation: Operation mitigation:				

3.1 SEA topic	SEA objective	Construction Effects +ve	Construction Effects -ve	Operational Effects +ve	Operational Effects -ve	Effect Description (including embedded mitigation)	Further Mitigation	Residual Construction Effects +ve	Residual Construction Effects -ve	Residual Operational Effects +ve	Residual Operational Effects -ve
	5.2 To minimise embodied and operational emissions					Construction effects: Operation effects:	Construction mitigation: Operation mitigation:				
Landscape	6.1 To conserve, protect and enhance landscape and townscape character and visual amenity					Construction effects: Operation effects:	Construction mitigation: Operation mitigation:				
Historic Environment	7.1 To conserve/protect and enhance historic assets/cultural heritage and their setting, including archaeological important sites					Construction effects: Operation effects:	Construction mitigation: Operation mitigation:				
Population and Human Health	8.1 To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing					Construction effects: Operation effects:	Construction mitigation: Operation mitigation:				
	8.2 To maintain and enhance tourism and recreation					Construction effects: Operation effects:	Construction mitigation: Operation mitigation:				
	8.3 To secure resilient water supplies for the health and wellbeing of customers					Construction effects: Operation effects:	Construction mitigation: Operation mitigation:				
	8.4 To increase access and connect customers to the natural environment, provide education or information resources for the public					Construction effects: Operation effects:	Construction mitigation: Operation mitigation:				
Material Assets	9.1 To minimise resource use and waste production					Construction effects: Operation effects:	Construction mitigation: Operation mitigation:				

3.1 SEA topic	SEA objective	Construction Effects +ve	Construction Effects -ve	Operational Effects +ve	Operational Effects -ve	Effect Description (including embedded mitigation)	Further Mitigation	Residual Construction Effects +ve	Residual Construction Effects -ve	Residual Operational Effects +ve	Residual Operational Effects -ve
	9.2 To avoid negative effects on built assets and infrastructure					Construction effects: Operation effects:	Construction mitigation: Operation mitigation:				

A5 SEA Scoring Criteria

SEA Objective	Effect	Description	
Biodiversity, Flora, Fauna:	+++	Major Positive	The option would result in a major enhancement on the quality of designated sites / habitats due to changes in flow or groundwater levels, water quality or habitat quality and availability. The option would result in a major increase in the population of a priority species. Effects could be caused by beneficial changes in water flows/water quality, or large amounts of creation or enhancement of habitat, promoting a major increase in ecosystem structure and function. The option would result in a major reduction or management of INNS.
	++	Moderate Positive	The option would result in a moderate enhancement on the quality of designated and/or non-designated sites / habitats due to changes in flow or groundwater levels, water quality or habitat creation and enhancement measures. The option would result in a moderate increase in the population of a priority species. Effects could be caused by beneficial changes in water flows/water quality, or moderate amounts of creation or enhancement of habitat, promoting a moderate increase in ecosystem structure and function. The option would result in a moderate reduction or management of INNS.
	+	Minor Positive	The option would result in a minor enhancement of the quality of designated and/or non-designated sites / habitats due to changes in flow or groundwater levels, water quality or habitat creation and enhancement measures. The option would result in a minor increase in the population of a priority species. Effects could be caused by beneficial changes in water flows/water quality, or small amounts of creation or enhancement of habitat, promoting a minor increase in ecosystem structure and function. The option would result in a minor reduction or management of INNS.
	0	Neutral	The option would not result in any effects on designated or non-designated sites including habitats and/or species). It will not have an effect on INNS.
	-	Minor Negative	The option would result in a minor negative effect on the quality of designated and/or non-designated sites / habitats due to changes in flow or groundwater levels, water quality or habitat loss or degradation. The option would result in a minor decrease in the population of a priority species. Effects could be caused by detrimental changes in flows/water quality, or small losses or degradation of habitat leading to a minor loss of ecosystem structure and function. The option would result in a minor increase or spread of INNS.

SEA Objective	Effect	Description	
	--	Moderate Negative	The option would result in a moderate negative effect on the quality of designated and/or non-designated sites / habitats due to changes in flow or groundwater levels, water quality or habitat loss or degradation. The option would result in a moderate decrease in the population of a priority species. Effects could be caused by detrimental changes in flows/water quality, or moderate loss or degradation of habitat leading to a moderate loss of ecosystem structure and function. The options would result in a moderate increase or spread of INNS.
	---	Major Negative	The option would result in a major negative effect on the quality of designated and/or non-designated sites / habitats due to changes in flow or groundwater levels, water quality or habitat loss or degradation. The option would result in a major decrease in the population of a priority species. Effects could be caused by detrimental changes in flows/water quality, or large losses or degradation of habitat leading to a major loss of ecosystem structure and function. The option would result in a major increase or spread of INNS.
	?	Uncertain	From the level of information available the effect that the option would have on this objective is uncertain
Soil: Protect and enhance the functionality, quantity and quality of soils	+++	Major Positive	The option would result in a major enhancement on the quality of soils through the implementation of catchment approaches, remediation or other measures.
	++	Moderate Positive	The option would result in a moderate enhancement on the quality of soils through the implementation of catchment approaches, remediation or other measures.
	+	Minor Positive	The option is located on a brownfield site and has no effect on soils or existing land use. The option results in the remediation of contaminated land.
	0	Neutral	The option would not result in any effects on soils or land use.
	-	Minor Negative	The option is not located on a brownfield site and/or results in a minor loss of best and most versatile agricultural land or is in conflict with existing land use. The option results in land contamination.
	--	Moderate Negative	The option will result in a moderate loss of best and most versatile agricultural land or is in substantial conflict with existing land use. The option is partially overlying mineral resources leading to partial mineral sterilisation.
	---	Major Negative	The option will result in a major loss of best and most versatile agricultural land or is in substantial conflict with existing land use. The option results in land contamination. The option is directly overlying mineral resources leading to mineral sterilisation.
	?	Uncertain	From the level of information available the effect that the option would have on this objective is uncertain

SEA Objective	Effect	Description	
Water: Increase resilience and reduce flood risk Protect and enhance the quality of the water environment and water resources Deliver reliable and resilient water supplies	+++	Major Positive	The option results in addressing failure of WFD Good Ecological Status / Good Ecological Potential. The option would result in a major improvement to flood risk. The option would result in a major improvement in water efficiency, reduces demand and improves resilience.
	++	Moderate Positive	The option achieves savings through demand management and does not require abstraction to achieve yield. The option contributes to addressing failure of WFD Good Ecological Status / Good Ecological Potential. The option would result in a moderate improvement to flood risk. The option would result in a moderate improvement in water efficiency, reduces demand and improves resilience.
	+	Minor Positive	The option achieves savings through demand management and does not require abstraction to achieve yield. The option would result in a minor improvement to flood risk. The option would result in a minor improvement in water efficiency, reduces demand and improves resilience.
	0	Neutral	The option would have no discernible effect on river flows or surface/coastal water quality or on groundwater quality or levels. The option would not have an effect on or be affected by flood risk.
	-	Minor Negative	The option would result in minor decreases in river flows. River and/or coastal water quality may be affected and lead to short term or intermittent effects on receptors (e.g. designated habitats, protected species or recreational users of rivers and the coastline) that could not be avoided but could be mitigated. The option would result in minor decreases in groundwater quality or levels. The option is located in Flood Zone 2. The option would result in minor decreases in water efficiency, increases demand and reduces resilience.
	--	Moderate Negative	The option would result in moderate decreases in river flows. River and/or coastal water quality may be affected and lead to long term or continuous effects on receptors (e.g. designated habitats, protected species or recreational users of rivers and the coastline) that could not reasonably be mitigated. The option results in the likely deterioration of WFD classification. The option would result in moderate decreases in groundwater quality or levels. The option is located in Flood Zone 3. The option would result in moderate decreases in water efficiency, increases demand and reduces resilience.
	---	Major Negative	The option would result in major decreases in river flows. River and/or coastal water quality may be affected and lead to long term or continuous effects on receptors (e.g. designated habitats, protected species or recreational users of rivers and the coastline) that could not reasonably be mitigated. The option results in the deterioration of WFD classification. The option would result in major decreases in groundwater quality or levels. The option is located in Flood Zone 2 or 3 and further contributes to flood risk. The option would result in major decreases in water efficiency, increases demand and reduces resilience.
	?	Uncertain	From the level of information available the effect that the option would have on this objective is uncertain.

SEA Objective	Effect	Description	
Air: Reduce and minimise air emissions	+++	Major Positive	The option would result in a major enhancement of the air quality within one or more AQMAs.
	++	Moderate Positive	The option would result in a moderate enhancement of the air quality within one or more AQMAs.
	+	Minor Positive	The option would result in an enhancement of the air quality.
	0	Neutral	The option would not result in any effects on Air Quality and AQMAs.
	-	Minor Negative	The option would result in a decrease of the air quality.
	--	Moderate Negative	The option would result in a decrease of the air quality within one or more AQMAs.
	---	Major Negative	The option would result in a major decrease in the air quality within one or more AQMAs.
	?	Uncertain	From the level of information available the effect that the option would have on this objective is uncertain.
Climate Factors: Reduce embodied and operational carbon emissions Reduce vulnerability to climate change risks and hazards	+++	Major Positive	The option will generate significant additional zero carbon energy that can be fed back into the grid/reduce carbon emissions (see carbon scale) The option will result in a major increase in carbon sequestration. The option will increase resilience/decrease vulnerability to climate change effects.
	++	Moderate Positive	The option will increase resilience/decrease vulnerability to climate change effects. The option will result in a moderate increase in carbon sequestration. The option will generate moderate additional zero carbon energy that can be fed back into the grid/reduce carbon emissions (see carbon scale)
	+	Minor Positive	The option will increase resilience/decrease vulnerability to climate change effects. The option will result in a minor increase in carbon sequestration. The option will generate minor additional zero carbon energy that can be fed back into the grid/reduce carbon emissions (see carbon scale)
	0	Neutral	The option would have no discernible effect on greenhouse gas emissions, nor would the option increase resilience/decrease vulnerability to climate change effects.
	-	Minor Negative	The option will have a minor impact on resilience/decrease vulnerability to climate change effects. The option will generate minor construction carbon emissions (1 - 6,964,452 tCO2e) and/or operational carbon emissions (1 - 3,492 tCO2e).

SEA Objective	Effect	Description	
	--	Moderate Negative	The option will have a moderate impact on resilience/significantly decrease vulnerability to climate change effects. The option will generate moderate construction carbon emissions (6,964,453 - 20,000,000 tCO2e) and/or operational carbon emissions (3,493 - 10,000 tCO2e). The option will result in a moderate release of previously sequestered carbon.
	---	Major Negative	The option will have a major impact on resilience/significantly decrease vulnerability to climate change effects. The option will generate significant construction carbon emissions (Above 20,000,000 tCO2e) and/or operational carbon emissions (Above 10,000 tCO2e). The option will result in a major release of previously sequestered carbon.
	?	Uncertain	From the level of information available the effect that the option would have on this objective is uncertain.
Landscape: Conserve, protect and enhance landscape, townscape and seascape character and visual amenity	+++	Major Positive	The option would have a major positive contribution to designated landscape (AONB or National Park) management plan objectives The option results in new, above ground infrastructure that significantly enhances the local landscape, townscape or seascape.
	++	Moderate Positive	The option would have a moderate positive contribution to designated landscape management plan objectives The option results in new, above ground infrastructure that has a moderate positive effect on the local landscape, townscape or seascape.
	+	Minor Positive	The option results in new, above ground infrastructure that has a minor positive effect on the local landscape, townscape or seascape.
	0	Neutral	The option would not result in any effects on the local landscape, townscape or seascape.
	-	Minor Negative	The option results in new, above ground infrastructure that has a minor negative effect on the local landscape, townscape or seascape.
	--	Moderate Negative	The option would have a moderate negative effect on a designated landscape or feature (i.e. significant visually intrusive infrastructure) whose effects could not be reasonably mitigated. The option results in new, above ground infrastructure that has a moderate negative effect on the local landscape, townscape or seascape.
	---	Major Negative	The option would have a negative effect on a designated landscape or feature (i.e. significant visually intrusive infrastructure) whose effects could not be reasonably mitigated. The option results in new, above ground infrastructure that has a major negative effect on the local landscape, townscape or seascape.
	?	Uncertain	From the level of information available the effect that the option would have on this objective is uncertain.
Historic Environment Conserve, protect and enhance the historic environment, including archaeology	+++	Major Positive	The option will result in enhancements to designated heritage assets and/or their setting, fully realising the significance and value of the asset, such as: - Securing repairs or improvements to heritage assets, especially those identified in the Historic England Buildings/Monuments at Risk Register; - Improving interpretation and public access to important heritage assets.

SEA Objective	Effect	Description	
	++	Moderate Positive	The option will result in enhancements to designated heritage assets and/or their setting. Improving interpretation and public access to important heritage assets.
	+	Minor Positive	The option will result in enhancements to non-designated heritage assets and/or their setting.
	0	Neutral	The option will have no effect on cultural heritage assets or archaeology.
	-	Minor Negative	The option will result in the loss of significance of undesignated heritage assets and/or their setting, notwithstanding remedial recording of any elements affected. There will be limited damage to known, undesignated archaeology important sites with a consequent loss of significance only partly mitigated by archaeological investigation.
	--	Moderate Negative	The option will result in the loss of significance of undesignated heritage assets and/or their setting, notwithstanding remedial recording of any elements affected. The option will diminish of significance of designated heritage assets and/or their setting, notwithstanding remedial recording of any elements affected.
	---	Major Negative	The option will diminish the significance of designated heritage assets and/or their setting such as: - Demolition or further deterioration in the condition of designated heritage assets especially those identified in the Historic England Buildings/Monuments at Risk Register. - Loss of public access to important heritage assets and lack of appropriate interpretation. - There will be major damage to known, designated archaeology important sites with a consequent loss of significance only partly mitigated by archaeological investigation.
	?	Uncertain	From the level of information available the effect that the option would have on this objective is uncertain.
Population, Human Health Maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing Maintain and enhance tourism and recreation	+++	Major Positive	The option leads to major positive effect on the health of local communities and will ensure that surface water and bathing water quality is maintained within statutory limits. The option creates new, and significantly enhances existing, recreational facilities, publicly accessible greenspace and/or tourism within the operational area.
	++	Moderate Positive	The option leads to positive effect on the health of local communities and will ensure that surface water and bathing water quality is maintained within statutory limits. The option enhances existing, recreational facilities, publicly accessible greenspace and/or tourism within the operational area
	+	Minor Positive	The option has a temporary positive effect on the health of local communities and will ensure that surface water and bathing water quality is maintained within statutory limits.
	0	Neutral	The option would not result in any effects on human health and existing recreational facilities and/or tourism.

SEA Objective	Effect	Description	
	-	Minor Negative	The option has a temporary effect on human health (e.g. noise or air quality). The option reduces the availability and quality of existing recreational facilities and/or tourism within the operational area.
	--	Moderate Negative	The option results in the permanent removal of existing recreational facilities, publicly accessible greenspace and/or tourism within the operational area.
	---	Major Negative	The option has a significant long-term effect on human health (e.g. noise or air quality). The option results in the removal of existing recreational facilities, publicly accessible greenspace and/or tourism within the operational area.
	?	Uncertain	From the level of information available the effect that the option would have on this objective is uncertain.
Material Assets Minimise resource use and waste production Avoid negative effects on built assets and infrastructure	+++	Major Positive	The option will re-use or recycle substantial quantities of waste materials and any new infrastructure will incorporate substantial sustainable design measures and materials. There will be no increase in energy consumption or energy will be from 100% renewable sources. The option improves national cycle routes or national trails.
	++	Moderate Positive	The option will re-use or recycle moderate quantities of waste materials and any new infrastructure will incorporate some sustainable design measures and materials. There will be no increase in energy consumption or energy will be from 90% renewable sources. The option improves national cycle routes or national trails.
	+	Minor Positive	The option will re-use or recycle a limited quantity of waste materials and any new infrastructure will incorporate some limited sustainable design measures and materials. There will be no increase in energy consumption or energy will be from 80% renewable sources. The option improves national cycle routes or national trails.
	0	Neutral	The option would not result in any effects on material assets.
	-	Minor Negative	The option will require new infrastructure with only limited opportunities for the re-use or recycling of waste materials. There are limited opportunities for sustainable design or the use of sustainable materials. The option results in a minor increase in energy consumption with no renewable energy options. The option results in a minor disruption on built assets and infrastructure, including transport.
	--	Moderate Negative	The option will require new infrastructure with only limited opportunities for the re-use or recycling of waste materials. The option results in a moderate increase in energy consumption with no renewable energy options. The option results in a moderate disruption on built assets and infrastructure, including transport links.
	---	Major Negative	The option will require significant new infrastructure that cannot be provided through the re-use or recycling of waste materials. There are no opportunities for sustainable design or the use of sustainable materials. The option results in a major increase in energy consumption with no renewable energy options. The option results in a major distribution on built assets and infrastructure, including transport links.
	?	Uncertain	From the level of information available the effect that the option would have on this objective is uncertain.

A6 Assessments

Scheme Name	Mythe abstraction licence transfer (15Mld)
Scheme Reference	Mythe_15
Description	15 Ml/d - Mythe Water Treatment Works (WTW) source support element. This element provides support to the River Severn to River Thames Transfer (STT scheme) by using the 15 Ml/d of the infrequently used part of the existing STW abstraction licence at its Mythe intake - the spare licensed volume would be left in the River Severn for abstraction downstream at Deerhurst or Gloucester Docks The Mythe intake is located on the River Severn near Tewkesbury, 5km northeast of Deerhurst No construction works will be involved with this option

SEA topic	SEA objective	Construction Effects		Operational Effects		Effect Description (including embedded mitigation)	Further Mitigation	Residual Construction Effects		Residual Operational Effects	
		+ve	-ve	+ve	-ve			+ve	-ve	+ve	-ve
Biodiversity, flora and fauna	1.1To protect designated sites and their qualifying features	*0*	*0*	*0*	0	**Construction effects:** Potential effects on Dixton Wood SAC and Brendon Hill SAC were considered in HRA screening, which concluded no Likely Significant Effect (LSE) on either of these sites. The Severn Ham Tewkesbury SSSI (~350m) and Old River Severn Upper Lode SSSI (~750m) are located within 1km of the Mythe Intake. There would be no new development associated with this option. **Operational effects:** Potential effects on the Severn Estuary SAC, SPA and Ramsar site were considered in HRA screening, which concluded no LSE on these designated sites. Given the abstraction licence controls at Deerhurst to protect flows to the Severn Estuary, no LSE will arise on the Severn Estuary European Marine Site. In operation, the effect of leaving up to 15 M/d of flow in the 5km stretch of the River Severn between Mythe and Deerhurst is assessed as having a non beneficial effect on aquatic ecology since this flow has been left in the river for many years as the water has not been abstracted historically at Mythe. Minor adverse effects on river flow may arise downstream of the abstraction by Thames Water at Deerhurst due to the removal of the 15 Ml/d from the river at low flows. However, on the basis that abstraction will only be permitted when flows are above the hands-off flow conditions proposed for the new Deerhurst abstraction, protection of the downstream river environment will be provided and impacts will be neutral	**Construction mitigation:** No further mitigation proposed **Operation mitigation:** No further mitigation proposed	*0*	*0*	*0*	*0*
	1 2To avoid a net reduction, and where possible enhance, in non-monetised natural capital assets	*0*	*0*	+	*0*	**Construction Effects:** This assessment assumes minor upgrade works only which will not cause any permanent change to habitats, natural capital or ecosystem services. The Draft Natural Capital Assessment found a neutral effect during construction. **Operational effects:** Minor benefit to biodiversity natural capital is possible as priority habitats along the riverbank may be better supported during low flow conditions due to increased river flow during drought conditions. Potential minor benefits to water purification and carbon regulation ecosystem services due to improved condition of vegetation. The Draft Natural Capital Assessment found a minor positive effect and neutral negative effect during operation.	**Construction mitigation:** No further mitigation proposed **Operation mitigation:** No further mitigation proposed	*0*	*0*	+	*0*
	1 3To protect and enhance biodiversity, priority habitats and species	*0*	*0*	*0*	*0*	**Construction effects:** The intake site and the length of the River Severn waterbody downstream, are located with the Severn and Avon National Priority Focus Areas There are additionally extensive areas of floodplain grazing marsh situated on the western banks of the River Severn, adjacent to the intake and along the length of the River Severn, downstream of the intake. However, there would be no new development associated with this option. **Operational effects:** The abstraction at Mythe is associated with reaches of the River Severn that are known to be a migratory route for a number of fish listed as priority species In operation, the effect of leaving up to 15 Ml/d of flow in the 5km stretch of the River Severn between Mythe and Deerhurst is assessed as having a non-beneficial effect on aquatic ecology, since this flow has been left in the river for many years as the water has not been abstracted historically at Mythe	**Construction mitigation:** No further mitigation proposed **Operation mitigation:** No further mitigation proposed	*0*	*0*	*0*	*0*
	1.4To avoid and, where required, manage invasive and non-native species (INNS)	*0*	0	*0*	*0*	**Construction effects:** There would be no new development associated with this option. **Operational effects:** The small change in river flows and consequent small impact on water quality downstream of the Deerhurst abstraction intake, would suggest that there would be a negligible effect on the risk of spreading INNS in the lower River Severn. No additional/new pathways will be created for the distribution of INNS.	**Construction mitigation:** No further mitigation proposed **Operation mitigation:** No further mitigation proposed	*0*	*0*	*0*	*0*
	1.5To meet WFD objectives relating to biodiversity	*0*	*0*	*0*	0	**Construction effects:** There would be no new development associated with this option **Operational effects:** The option element makes use of an existing licensed source of water and uses a surplus, sustainable abstraction volume. The WFD assessment has indicated no risk of deterioration in WFD status due to the	**Construction mitigation:** No further mitigation proposed	*0*	*0*	*0*	0

SEA topic	SEA objective	Construction Effects +ve	Construction Effects -ve	Operational Effects +ve	Operational Effects -ve	Effect Description (including embedded mitigation)	Further Mitigation	Residual Construction Effects +ve	Residual Construction Effects -ve	Residual Operational Effects +ve	Residual Operational Effects -ve
						abstraction of the 15 Ml/d at Deerhurst, which would be controlled by the Hands Off Flow condition to protect flows below Deerhurst and to the Severn Estuary Effects on ecosystem functions are assessed as being neutral with in effect water being left in the River Severn for abstraction further downstream	**Operation mitigation:** No further mitigation proposed				
Soil	2 1To protect and enhance the functionality, quantity and quality of soils, including the protection of high-grade agricultural land	*0*	*0*	*0*	*0*	**Construction effects:** The Mythe intake is located on the River Severn near Tewkesbury, within Grade 5 agricultural land There are five historic landfill sites within 3km of the site, including: Near Lowe Load (~1.6km), Priors Park (~1.3km), Old Railway Cutting off Ashchurch Road (~1.3km), Near Newtown (~1.5km) and Twyning Pit (~2.6km) these will not be adversely effected by minor works in an existing operational site There would be no new development associated with this option Construction works would therefore not affect the functionality of soils and geology. **Operational effects:** In operation there would be a 15Ml/d reduction in potential abstraction from the River Severn at Mythe with this water being left in the River to Deerhurst. There are no catchment management practices associated with the scheme and there is no opportunities to directly promote catchment land management, although activities are taking place in various parts of the catchment to help protect the river environment. The operation of the scheme will not affect land use, soils, or geology.	**Construction mitigation:** No further mitigation proposed **Operation mitigation:** No further mitigation proposed	*0*	*0*	*0*	*0*
Water	3.1To minimise or manage flood risk, taking climate change into account	*0*	*0*	*0*	*0*	**Construction effects:** The Mythe intake is located on the western bank of the River Severn near Tewkesbury, within EA Flood Zones 2 and 3 However, there would be no new development associated with this option. **Operational effects:** In operation there would be a 15Ml/d reduction in potential abstraction from the River Severn at Mythe. As this water is not currently abstracted there are no beneficial effects to downstream river flows from licence transfer. Abstraction at the STT intake to the interconnector would be at times of low flows in the lower River Severn however the hands-off flow conditions of any abstraction licence would result in neutral flow effects in the River Severn downstream of the re-abstraction location and neutral change in flows to the Severn Estuary.	**Construction mitigation:** No further mitigation proposed **Operation mitigation:** No further mitigation proposed	*0*	*0*	*0*	*0*
	3.2To enhance or maintain groundwater quality and resources	*0*	*0*	*0*	*0*	**Construction effects:** There would be no new development associated with this option. **Operational effects:** The scheme operational site is not located within a source protection zone No effects on groundwater quality are anticipated.	**Construction mitigation:** No further mitigation proposed **Operation mitigation:** No further mitigation proposed	*0*	*0*	*0*	*0*
	3.3To enhance or maintain surface water quality, flows and quantity	*0*	*0*	*0*	*0*	**Construction effects:** There would be no new development associated with this option **Operational effects:** In operation there would be a 15Ml/d reduction in potential abstraction from the River Severn at Mythe. As this water is not currently abstracted there are no beneficial effects to downstream river flows from licence transfer. Abstraction at the STT intake to the interconnector would be at times of low flows in the lower River Severn however the hands-off flow conditions of any abstraction licence would result in neutral flow effects in the River Severn downstream of the re-abstraction location and neutral change in flows to the Severn Estuary Water quality assessment has identified neutral effects.	**Construction mitigation:** No further mitigation proposed **Operation mitigation:** No further mitigation proposed	*0*	*0*	*0*	*0*
	3.4 To meet WFD objectives	*0*	*0*	*0*	*0*	**Construction effects:** There would be no new development associated with this option. **Operational effects:** In operation there would be a 15Ml/d reduction in potential abstraction from the River Severn at Mythe The tests of constraint of the option against WFD regulations objectives identify no potential non-compliance with aquatic ecology status targets. This is assessed as a neutral effect. As well as the tests of WFD constraint, other WFD objectives relate to whether the option assists the meeting of WFD objectives for the water body, for associated WFD protected areas or reduces the treatment needed to produce drinking water and look to work in partnership with others The option is considered neutral for these during construction and operation	**Construction mitigation:** No further mitigation proposed **Operation mitigation:** No further mitigation proposed	*0*	*0*	*0*	*0*
	3.5 To improve water efficiency through provision of	*0*	*0*	+	*0*	**Construction effects:** There would be no new development associated with this option. **Operational effects:**	**Construction mitigation:** No further mitigation proposed	*0*	*0*	+	*0*

SEA topic	SEA objective	Construction Effects +ve	Construction Effects -ve	Operational Effects +ve	Operational Effects -ve	Effect Description (including embedded mitigation)	Further Mitigation	Residual Construction Effects +ve	Residual Construction Effects -ve	Residual Operational Effects +ve	Residual Operational Effects -ve
	access to a resilient and sustainable supply of water.					The scheme makes use of an existing licensed source of water and uses a surplus, sustainable abstraction volume The scheme would not have direct effects on water efficiency, but would enable the 15 Ml/d to be made available for Thames Water A minor beneficial effect is considered to result from this option	**Operation mitigation:** No further mitigation proposed				
Air	4.1 To minimise air and noise emissions during construction and operation	*0*	*0*	*0*	*0*	**Construction effects:** The scheme construction works will take place within 1km (~550m) of the Tewkesbury Town Centre AQMA and urban area. However, there would be no new development associated with this option **Operational effects:** In operation, the scheme is not anticipated to result in any additional impact on local emissions to air.	**Construction mitigation:** No further mitigation proposed **Operation mitigation:** No further mitigation proposed	*0*	*0*	*0*	*0*
Climatic Factors	5.1 To introduce climate mitigation where required and improve the climate resilience of assets and natural systems	*0*	*0*	+	*0*	**Construction effects:** There would be no new development associated with this option **Operational effects:** The operation of this scheme would provide a DO benefit of 15Ml/d through transfer of flows in the River Thames and increased resource availability in the London and the South East during times of low flow conditions and/or drought conditions, reducing the vulnerability to drought risk associated with climate change A minor beneficial effect is considered to result from this option	**Construction mitigation:** No further mitigation proposed **Operation mitigation:** No further mitigation proposed	*0*	*0*	+	*0*
	5.2 To minimise embodied and operational emissions	*0*	*0*	*0*	*?*	**Construction effects:** There would be no new development associated with this option. **Operational effects:** In operation, the scheme will result in an additional 15 Ml/d being abstracted at Deerhurst and being treated prior to discharge to the River Thames, with a consequential small increase in CO_2 emissions The nature of the increase in CO_2 emissions is however uncertain.	**Construction mitigation:** No further mitigation proposed **Operation mitigation:** Further investigation on levels of emissions and associated mitigation measures	*0*	*0*	*0*	*?*
Landscape	6.1 To conserve, protect and enhance landscape and townscape character and visual amenity	*0*	*0*	*0*	*0*	**Construction effects:** There are no AONBs, national parks, Greenbelt areas or viewpoints within 3km of the scheme There would be no new development associated with this option. **Operational effects:** The option proposes leaving water in the River Severn for abstraction further downstream. No visual effects on surrounding landscapes or townscapes are considered likely	**Construction mitigation:** No further mitigation proposed **Operation mitigation:** No further mitigation proposed	*0*	*0*	*0*	*0*
Historic Environment	7 1 To conserve/protect and enhance historic assets/cultural heritage and their setting, including archaeological important sites	*0*	*0*	*0*	*0*	**Construction effects:** The operational site is located within the Tewkesbury Local Conservation Area and there are numerous listed buildings within 1km of the existing operational site in the Tewkesbury urban areas, of which five are located within 500m of the site. Additional sensitive receptors within 1-3km of the site include the Battle of Tewkesbury 1471 (~1 2km) and three scheduled monuments: Site of St. Mary's Abbey (1km), Holm Castle (~1 4km) and a Deserted Medieval Village (~1.4km) However, there would be no new development associated with this option. **Operational effects:** The option proposes leaving water in the River Severn for abstraction further downstream No effects on heritage assets or their setting are considered likely	**Construction mitigation:** No further mitigation proposed **Operation mitigation:** No further mitigation proposed	*0*	*0*	*0*	*0*
Population and Human Health	8.1 To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing	*0*	*0*	+	*0*	**Construction effects:** The scheme is located in an area with low levels of deprivation for all socio-economic criteria, according to the IMD index of multiple deprivation. However, there would be no new development associated with this option. **Operational effects:** During operation, the scheme will help to support a sustainable socio-economy, through a resilient 15Ml/d benefit associated with water transfer to the River Thames. In turn, this will support economic and population growth generating a minor positive effect on this objective.	**Construction mitigation:** No further mitigation proposed **Operation mitigation:** No further mitigation proposed	*0*	*0*	+	*0*
	8.2 To maintain and enhance	*0*	*0*	*0*	*0*	**Construction effects:** There would be no new development associated with this option.	**Construction mitigation:** No further mitigation proposed	*0*	*0*	*0*	*0*

SEA topic	SEA objective	Construction Effects +ve	Construction Effects -ve	Operational Effects +ve	Operational Effects -ve	Effect Description (including embedded mitigation)	Further Mitigation	Residual Construction Effects +ve	Residual Construction Effects -ve	Residual Operational Effects +ve	Residual Operational Effects -ve
	tourism and recreation					**Operational effects:** In operation, there would be a 15Ml/d reduction in potential abstraction from the River Severn at Mythe As this water is not currently abstracted there are no beneficial effects to downstream river flows from licence transfer The hands-off flow conditions of any abstraction licence would also result in neutral flow effects in the River Severn downstream of the re-abstraction location and neutral change in flows to the Severn Estuary. Therefore, negligible effects are anticipated towards other downstream users of the River Severn	**Operation mitigation:** No further mitigation proposed				
	8.3 To secure resilient water supplies for the health and wellbeing of customers	*0*	*0*	+	*0*	**Construction effects:** There would be no new development associated with this option **Operational effects:** The scheme will support the transfer of raw water supplies into the Thames Water area by up to 15Ml/d and therefore helping to ensure provision of access to a secure resilient water supply to support health and well-being. Thereby generating a moderate positive effect on this objective.	**Construction mitigation:** No further mitigation proposed **Operation mitigation:** No further mitigation proposed	*0*	*0*	+	*0*
	8.4 To increase access and connect customers to the natural environment, provide education or information resources for the public	*0*	*0*	*0*	*0*	**Construction effects:** There would be no new development associated with this option **Operational Effects:** Neutral operational effects are anticipated.	**Construction mitigation:** No further mitigation proposed **Operation mitigation:** No further mitigation proposed	*0*	*0*	*0*	*0*
Material Assets	9.1 To minimise resource use and waste production	*0*	*0*	+	*?*	**Construction Effects:** There would be no new development associated with this option. **Operational Effects:** During operation, a minor increase in energy consumption associated with additional resources will be required to pump the water from the river at Deerhurst and treat it prior to discharge to the River Thames. The nature of the level of resource use is however uncertain. There may also be some beneficial impacts regarding efficient material usage as the scheme makes use of existing intake infrastructure and requires no construction works. Furthermore, the use of an existing licence could be considered a minor positive effect regarding efficient water resources management	**Construction mitigation:** No further mitigation proposed **Operation mitigation:** No further mitigation proposed	*0*	*0*	+	*?*
	9 2 To avoid negative effects on built assets and infrastructure	*0*	*0*	*0*	*0*	**Construction Effects:** There would be no new development associated with this option. **Operational Effects:** During operation effects towards built assets and infrastructure will be neutral	**Construction mitigation:** No further mitigation proposed **Operation mitigation:** No further mitigation proposed	*0*	*0*	*0*	*0*

Scheme Name	Netheridge WwTW discharge diversion (35Mld) - Deerhurst Pipeline
Scheme Reference	NetheridgePipelineDeerhurst_35
Description	Piped diversion of 35 Ml/d of final effluent from Netheridge WwTW for discharge to the River Severn just downstream of the proposed Deerhurst abstraction. Components are: [redacted]

SEA topic	SEA objective	Construction Effects +ve	Construction Effects -ve	Operational Effects +ve	Operational Effects -ve	Effect Description (including embedded mitigation i.e. costed mitigation that is committed to as part of the scheme)	Further Mitigation	Residual Construction Effects +ve	Residual Construction Effects -ve	Residual Operational Effects +ve	Residual Operational Effects -ve
Biodiversity, flora and fauna	1.1To protect designated sites and their qualifying features	*0*	-	+	0	**Construction effects:** The construction areas would comprise flow diversion chamber/high lift PS/chemical dosing within the operational area of the Netheridge WwTW; outfall; and the pipeline route. HRA screening assessed potential effects on Cotswold Beechwoods SAC, Walmore Common SPA and Ramsar and Severn Estuary SAC, SPA and Ramsar site. The following impact pathways were identified: air pollution, water pollution, invasive and non-native species introduction/ spread, physical modification of the banks of the River Severn that could impact on fish migration, increased suspended sediment and disturbance. No likely significant effects (LSE) are anticipated due to the distance between designated sites and proposed works and the short term nature of construction works required. The pipeline route is immediately adjacent to Coombe Hill Canal and Wainlode Cliff SSSIs. Two other SSSIs are within 1km, these being Ashleworth Ham and Innsworth Meadow. The pipeline route crosses two parts of a Local Nature Reserve (LNR), Alney Island and is within 500m of another, Green Farm Orchard. There is an area of ancient woodland approximately 600m away to the west of Norton. Trenchless technology to install the pipeline through the LNR is proposed. Best practice construction techniques are assumed. Protection requirements will be identified to ensure the final pipeline route avoids unnecessary removal of trees, hedgerows or other important vegetation. Due to the pipeline route crossing a LNR and the proximity to other designations, and in consideration of these mitigation measures the effects of these risks are considered minor adverse. **Operational effects:** In operation, there will be a discharge of treated final effluent into the River Severn. The Severn Estuary SAC, SPA and Ramsar site were identified as designated sites that could be potentially affected during operation. Impact pathways include changes in water flow of supporting habitat, salinity regime and water quality. Effects on low flows in the River Severn are likely to be negligible, as an equivalent volume of water will be abstracted immediately upstream for treatment at the Deerhurst Water Treatment Works (WTW). Negligible hydrological impacts are anticipated in the River Severn and therefore, Severn estuary. The water will be treated to address risks of water quality deterioration and also must be within the Water Framework Directive standards before discharge. Water will also be subject to aeration over a flow cascade structure to oxygenate the water prior to discharge into the River Severn. Therefore, no LSE on designated sites and associated qualifying features have been identified. [redacted] An opportunity exists for habitat enhancement when reinstating land as well as biodiversity net gain opportunities resulting in minor positive effect.	**Construction mitigation:** Discussions with NE regarding SSSI and ancient woodland protection measures. Habitat surveys along the route of the pipeline to be undertaken. The detail of the working areas (and in some cases construction areas and pipeline itself) will be reviewed as part of the further detailed design of the scheme. Soils should be stored and reinstated following construction. In the event that site specific ecological assessments identify any permanent impacts on qualifying features from the development, mitigation measures such as relocation of species or provision of compensatory habitat will be undertaken in advance of the works. Use of tunnelling to be investigated. **Operation mitigation:** No further mitigation proposed.	0	-	+	0
	1.2To avoid a net reduction, and where possible enhance, in non-monetised natural capital assets	*0*	-	*0*	-	**Construction Effects:** Construction will lead to loss or degradation of woodland, enclosed farmland and heathland natural capital stock, with potential associated disbenefits to biodiversity, carbon regulation and water purification services. Potential short term impacts to recreation and wellbeing if construction causes loss of access to recreation sites within the zone of influence. The Draft Natural Capital Assessment found a minor negative effect during construction. **Operational effects:** The Draft Natural Capital Assessment found a minor negative effect during operation.	**Construction mitigation:** No further mitigation proposed **Operation mitigation:** Delivery of required BNG to offset construction losses (woodland, traditional orchard and heathland creation) will result in benefits to natural capital stocks and ecosystem service provision, including biodiversity, carbon regulation, natural hazard regulation and water purification. Potential benefits to recreation are dependent on design of BNG mitigation.	*0*	-	+	-
	1.3To protect and enhance biodiversity,	*0*	-	*0*	*0*	**Construction effects:** Construction works at Netheridge WwTW would be located within the operational land of the WwTW. The pipeline route crosses a number of areas of Priority Habitat. All rivers are considered to be priority habitats under the National	**Construction mitigation:** If site specific ecological assessments identify any impacts to protected species or habitats	*0*	*0*	*0*	*0*

SEA topic	SEA objective	Construction Effects +ve	Construction Effects -ve	Operational Effects +ve	Operational Effects -ve	Effect Description (including embedded mitigation i.e. costed mitigation that is committed to as part of the scheme)	Further Mitigation	Residual Construction Effects +ve	Residual Construction Effects -ve	Residual Operational Effects +ve	Residual Operational Effects -ve
	priority habitats and species					Priority Habitats Inventory During construction there is the potential for minor degradation of priority habitats such as freshwater reaches of the River Severn due to increases in sedimentation, noise, dust and vibration. Within the Severn Estuary, priority habitats identified include saltmarsh, seagrass beds and biogenic reef systems; formed by Sabellaria spp. The Severn Estuary SPA, SAC and Ramsar are located >10km from the site so effects on saltmarsh, seagrass and reef systems have been assessed as minor on a precautionary basis Minor degradation of aquatic habitats may happen if inappropriate training is given to construction workers and waste associated with construction is incorrectly managed. Increases to sediment, turbidity and organic pollutants have the potential to disrupt aquatic habitats on a short term basis. Priority species within the construction zone may be subjected to short term, temporary impacts of a minor magnitude. Best practice construction techniques are assumed. Minor impact pathways to priority species include increases in noise and vibration disturbance, and temporary fragmentation of habitat It is unlikely that construction will affect priority species such as birds through noise disruption due to distance and proximity from site. Overall, minor negative effects are anticipated. **Operational effects:** Loss of terrestrial Priority Habitat would have occurred during construction Maintenance activities to avoid Priority Habitat areas. In consequence the impacts on this objective are considered neutral during operation. Littoral sediment/mudlfats are associated with the reaches downstream of the new outfall and the existing outfall. The changes in water quality and discharges is not considered to be of an extent to result in impacts on these habitats. In operation, diversion of Netheridge Wastewater Treatment Works (WwTW) effluent from its current discharge location in the Upper Severn waterbody to downstream of Deerhurst intake in the Severn conf R Avon to conf Upper Parting waterbody (GB109054044404) is not expected to have any detrimental impact to the flow regime of either waterbody. As such, the supporting habitat for priority species will not be impacted.	associated with the construction work, appropriate mitigation measures including (where appropriate) relocation of such species will be undertaken in advance of the works being undertaken Tunnelling for all sections of route which goes through priority habitat. The detail of the working areas (and in some cases construction areas and pipeline itself) will be reviewed with NE as part of the further detailed design of the scheme. **Operation mitigation:** No further mitigation proposed				
	1.4To avoid and, where required, manage invasive and non-native species (INNS)	*0*	*0*	*0*		**Construction effects:** There is a risk or introducing INNS through construction activities. Mitigation measures including best practice construction practices, the identification and removal of invasive species on site in advance of construction and pipeline commissioning with treated water During pipeline commissioning, the risk of the spread of INNS is to be controlled by ensuring the use of treated water only for hydrotesting. Whilst INNS have been identified within the River Severn and Severn Estuary, it is unlikely that aquatic species will be transferred to new areas during construction. In consideration of these mitigation measures the impacts of these risks are considered neutral. **Operational effects:** In operation there would be an additional 35Ml/d transfer to the River Thames at times when transfer is required below Hands off Flow conditions on the River Severn. The new discharge location will provide a new pathway for the distribution of INNS. INNS identified on site include Jenkins spire snail (*Potamopyrgus antipodarum*), Chinese mitten crab (*Eriocheir sinensis*) and killer shrimp (*Dikerogammarus villosus*) In operation, it is unlikely that INNS would be spread, as the treated water is sourced from a WwTW. Invasive species will be removed as far as reasonably practicable before transfer, reducing the risk of accidental release into the River Severn. Overall, the operational impacts are considered minor.	**Construction mitigation:** No further mitigation proposed **Operation mitigation:** Any transfer of such species (unlikely though that is) would be much more noticeable and rapid in a downstream direction so precautionary monitoring for such species immediately downstream of the discharge would act as an early warning and give sufficient time for appropriate treatment.	*0*	*0*	*0*	*0*
	1.5To meet WFD objectives relating to biodiversity	*0*	-	*0*	*0*	**Construction effects:** There will be eight major crossings require tunnelling/pipejacking and a further eight minor crossings during pipeline construction. Construction impacts, including intake, pipeline and outfall headworks construction are assessed as a minor negative effect **Operational effects:** In operation, diversion of Netheridge WwTW effluent from its current discharge location in the Upper Severn waterbody to downstream of Deerhurst intake in the Severn - conf R Avon to conf Upper Parting waterbody (GB109054044404) is not expected to have any detrimental impact to the flow regime of either waterbody The assessment assumes that mitigation measures will be in place to reduce the potential environmental risks, including operational rules to ensure gradual reservoir release start-up and shut-down. This will avoid sudden changes in flow velocities and limitations in the use of the scheme during Severn Regulation releases	**Construction mitigation:** Tunnelling for all water courses where needed in addition to those specified. With further consideration of watercourses to cross without in-channel works, construction impacts would be neutral for WFD compliance. **Operation mitigation:** No further mitigation proposed	*0*	*0*	*0*	*0*
Soil	2 1To protect and enhance the functionality, quantity and quality of soils, including the protection of high-grade agricultural land	*0*	---	*0*	*0*	**Construction effects:** Overall, a small amount of permanent landtake will be required for the outfall in addition to landtake for the Flow diversion chamber/high lift pump station and dosing area within Severn Trent owned land. The pipeline route, which will cause temporary effects, crosses areas of grade 1 and 2 agricultural land as well as large areas of grade 3 agricultural land The pipeline route crosses land that formed part of the Hempsted landfill site near Gloucester and is routed within 500m of six others. Therefore there exists potential for contaminated land and associated risks to health and environment No imports envisaged at this time as excavated material will be used for backfill Excavated material on WwTP site is to remain on site. The construction of the pipeline through land comprising part of a historic landfill results in the construction effects being considered as major negative.	**Construction mitigation:** Re-routing the pipeline away from the historic landfill. Investigations/remediation for land contamination. Limiting the extent of pipeline construction at any one time will minimise the time period for soil disturbance. **Operation mitigation:** No further mitigation proposed	*0*	-	*0*	*0*

SEA topic	SEA objective	Construction Effects +ve	Construction Effects -ve	Operational Effects +ve	Operational Effects -ve	Effect Description (including embedded mitigation i.e. costed mitigation that is committed to as part of the scheme)	Further Mitigation	Residual Construction Effects +ve	Residual Construction Effects -ve	Residual Operational Effects +ve	Residual Operational Effects -ve
						Operational effects: The operation of the scheme will not affect land use, soils, or geology.					
Water	3.1To minimise or manage flood risk, taking climate change into account	*0*		*0*	*0*	**Construction effects:** Construction works at Netheridge WwTW would be located within the operational land of the WwTW The scheme is within large areas of flood zone 2 and 3. It crosses a number of main rivers. Six watercourse crossings would be by tunnelling. Construction compounds would be sited sensitively and away from flood risk zones Adequate methods of construction will be adopted to minimise the impact, including sheet piling, dewatering and treatment of the groundwater prior to discharge. Flood compensation ponds will be constructed as part of the enabling works. Earthworks sequencing will include cofferdam formation to avoid flooding of borrow areas during construction. Given the scope of the construction works a minor negative effect on flood risk has been identified. **Operational effects:** The scheme would not affect flood storage once operational and the necessary flood plain compensation are complete	**Construction mitigation:** Further mitigation measures will be set out in the applications for Flood Defence Consents where these are required for the river crossing construction works. Tunnelling for all watercourse crossings. **Operation mitigation:** No further mitigation proposed	*0*		*0*	*0*
	3.2To enhance or maintain groundwater quality and resources	*0*	-	*0*	*0*	**Construction effects:** Construction works at Netheridge WwTW would be located within the operational land of the WwTW. The scheme is within a WFD water body. During construction of the pipeline, areas with high permeability and high groundwater levels would require permits to be obtained by the contractor from the relevant authorities for the disposal of the groundwater to a suitable location There would also be a need for lagoons to intercept and treat the commissioning wastewater. The lagoons would need to be available prior to pressure testing and land would be reinstated after commissioning. All vehicles and any chemical/oil storage will be fully bunded to prevent any accidental pollution of groundwater. Overall a minor negative effect on groundwater is considered **Operational effects:** The scheme would not affect groundwater quality and resources once operational.	**Construction mitigation:** Further mitigation measures will be developed in consultation with the regulators as part of the detailed design process. **Operation mitigation:** No further mitigation proposed	*0*	*0*	*0*	*0*
	3.3To enhance or maintain surface water quality, flows and quantity	*0*	-	*0*	*0*	**Construction effects:** The scheme crosses a number of main rivers and a risk to water quality therefore exists. Eight major crossings require tunnelling/pipejacking and a further 8 minor crossings are required. Construction of discharge and abstraction points and pipeline river crossings have the potential to effect water quality in the river and downstream. Best practice construction techniques are assumed For construction purposes a temporary commissioning lagoon would be constructed near the outfall location The storage of materials including any topsoil and subsoils removed during construction is to be undertaken to minimise natural drainage flow paths. Pre-construction land drainage will be installed as part of the enabling works and land drainage will be fully re-established during the reinstatement Where land is sloping towards a watercourse, a buffer grass strip and straw bales will be provided as appropriate to stop sediment from the site running off-site untreated. Given the scale of the construction activities required, minor negative effects are anticipated. **Operational effects:** In operation there would be relocation of 35Ml/d treated final effluent from Netheridge WwTW to the lower River Severn locally downstream of the STT intake to the pipe interconnector for intermittent periods of typically 30 days, up to ~100 days, notably in June to November, particularly in the July, August & September period. Overall operation would be in the order of ~15% of dates at times of low flows in the lower River Severn. With a local scale take-and-put arrangement at Deerhurst assessment of hydraulic information has identified neutral flow effects in the freshwater River Severn. The intermittent 35Ml/d reduction in effluent discharge from Netheridge WwTW to the upper Severn Estuary has been reviewed as with neutral flow effects in the estuary. In operation, relocation of Netheridge WwTW effluent into the lower freshwater River Severn would have no detrimental impacts on the water quality due to the river's adequate dilution capacity even at low flows Discharge would be subject to regulatory permitting of water quality to ensure no effect on WFD status.	**Construction mitigation:** Tunnelling for crossings of all main rivers. Further mitigation measures will be set out in the applications for Flood Defence Consents where these are required for the river crossing construction works. **Operation mitigation:** No further mitigation proposed	*0*	-	*0*	*0*
	3.4 To meet WFD objectives	*0*	-	*0*	*0*	**Construction effects:** Option construction impacts, including pipeline and outfall headworks construction are assessed as minor negative effect prior to mitigation. **Operational effects:** The tests of constraint of the option against WFD regulations objectives identify no potential non-compliance with ecology or chemical status targets. This is assessed as a neutral effect	**Construction mitigation:** With further consideration of watercourses to cross without in-channel works, construction impacts would be neutral for WFD compliance. **Operation mitigation:** No further mitigation proposed	*0*	*0*	*0*	*0*

SEA topic	SEA objective	Construction Effects +ve	Construction Effects -ve	Operational Effects +ve	Operational Effects -ve	Effect Description (including embedded mitigation i.e. costed mitigation that is committed to as part of the scheme)	Further Mitigation	Residual Construction Effects +ve	Residual Construction Effects -ve	Residual Operational Effects +ve	Residual Operational Effects -ve
						As well as the tests of WFD constraint, other WFD objectives relate to whether the option assists the meeting of WFD objectives for the water body, for associated WFD protected areas or reduces the treatment needed to produce drinking water and look to work in partnership with others. The option is considered neutral for these during construction and operation.					
	3.5 To improve water efficiency through provision of access to a resilient and sustainable supply of water	*0*	*0*	++	*0*	**Construction effects:** Construction effects are assessed as neutral. **Operational effects:** During operation there would be moderate positive effect due to the option contributing to a resilient water supply The additional water resource from this option will provide essential water supply infrastructure to help support a sustainable socio-economy.	**Construction mitigation:** No further mitigation proposed **Operation mitigation:** No further mitigation proposed	*0*	*0*	++	*0*
Air	4.1 To minimise air emissions during construction and operation	*0*		*0*	*0*	**Construction effects:** The duration of construction would be 60 months. There would be approximately 800 HGV movements during the construction period, which will result in vehicle emissions to air The scheme passes through a number of urban areas and is within 1km of Priory Road AQMA. Therefore there is potential for minor negative effects on air emissions from construction activities. **Operational effects:** Approximately 12 vehicle movements per year for treatment chemicals Given the scale of the activities required, neutral effects are anticipated.	**Construction mitigation:** Consider use of rail for transporting materials. **Operation mitigation:** No further mitigation proposed	*0*		*0*	*0*
Climatic Factors	5.1 To introduce climate mitigation where required and improve the climate resilience of assets and natural systems	*0*	*0*	++	*0*	**Construction effects:** Construction effects are assessed as neutral **Operational effects:** This option provides additional water resource and will during operation assist the reliable transfer of water, therefore reducing the vulnerability to drought risks associated with climate change and improving resilience to the likely effects of climate change. Moderate positive effects are anticipated	**Construction mitigation:** No further mitigation proposed **Operation mitigation:** No further mitigation proposed	*0*	*0*	++	*0*
	5.2 To minimise embodied and operational emissions	*0*	-	*0*	-	**Construction effects:** This option would require raw materials and energy to construct Overall construction carbon is estimated to be 8,579 tCO2e. Overall, during construction this option is considered to have a minor negative environmental effect on this objective. **Operational effects:** The operation of this option will require the use of additional resources Overall operational carbon is estimated to be 1,888 tCO2e / y Annual power consumption at full utilisation is estimated to be 3,673,360 kWh. However, 100 % use of renewable energy is proposed. Overall, during operation this option is considered to have a minor negative environmental effect on this objective	**Construction mitigation:** Investigate use of renewables during construction and operation for energy supply and use of materials with lower embodied carbon. Carbon footprint study could help identify areas for carbon savings or alternative materials. **Operation mitigation:** No further mitigation proposed	*0*	-	*0*	-
Landscape	6.1 To conserve, protect and enhance landscape and townscape character and visual amenity	*0*	*0*	*0*	*0*	**Construction effects:** Overall, minor land-take requirements will be required for the outfall, in addition to landtake for the Flow diversion chamber/high lift pump station and dosing area within Severn Trent owned land The scheme is within 500m of greenbelt designated land to the east of Twigworth. The construction works will be temporary and the potential for adverse effects on the greenbelt during construction has been assessed as neutral. **Operational effects:** Overall, the operational impacts are considered neutral	**Construction mitigation:** Consider minimising the extent of construction works in proximity of the greenbelt Use of trenchless techniques for pipeline construction **Operation mitigation:** No further mitigation proposed	*0*	*0*	*0*	*0*
Historic Environment	7 1 To conserve/protect and enhance historic assets/cultural heritage and their setting, including archaeological important sites	0		*0*		**Construction effects:** Construction works at Netheridge WwTW would be located within the operational land of the WwTW The pipeline route runs along the edge of a scheduled monument near Gloucester Llanthony Secunda Priory There are also four other scheduled monuments within 500m: • Over Bridge • Glevum Roman Colonia • Hempstead village cross • Blackfiars The pipeline route is immediately adjacent to listed buildings to the west of Gloucester, in Longford, in and near Twigworth, near Norton and at Lower Apperley. It is also routed close to conservation areas near Gloucester and	**Construction mitigation:** The alignment of the pipeline should be developed further during design development and further consultation with Historic England and Council officers should be undertaken during this process. This should include refining mitigation measures in particular in relation to the scheduled monuments, listed buildings and conservation areas within proximity of the pipeline route. The	*0*		*0*	*0*

SEA topic	SEA objective	Construction Effects +ve	Construction Effects -ve	Operational Effects +ve	Operational Effects -ve	Effect Description (including embedded mitigation i.e. costed mitigation that is committed to as part of the scheme)	Further Mitigation	Residual Construction Effects +ve	Residual Construction Effects -ve	Residual Operational Effects +ve	Residual Operational Effects -ve
						Hempsted, It is therefore considered that there exists potential moderate negative effects on a number of heritage assets. **Operational effects:** There are a number of heritage assets within 3km of the permanent works that would be visible following construction Therefore minor adverse effects may arise due to potential impacts on the settings of heritage assets	development of an archaeological programme of works including archaeological monitoring is proposed. Sensitive location of construction compounds to avoid heritage assets and retain a buffer around them to be defined further in consultation with Historic England. **Operation mitigation:** Screening where settings of heritage assets would be affected				
Population and Human Health	8.1 To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing	++	--	++	*0*	**Construction effects:** The duration of construction would be 60 months. The construction of this option would represent capital investment which is expected to generate a number of employment opportunities and supply chain benefits The degree of this benefit will be dependent on the contractors' recruitment and supply chain practices and will be temporary. Overall, the benefits are expected to be moderate. There are sensitive buildings within 500m such as places of worship and a school, college and a hospital The pipeline route is within noise action important areas near Hempsted, Twigworth and Longford And within 500m of seven others such areas. The pipeline route crosses one railway line which would be tunnelled. It also crosses roads and four A/B roads and 12 minor roads would be crossed by tunnelling. Crossings could cause local disruptions to the community. The scheme is also located within an area of income deprivation and health deprivation around Gloucester Best practice construction techniques are assumed However, there will be adverse effects such as noise, dust and vibrations during construction associated with construction activities and vehicles which could cause impacts on health and wellbeing at nearby sensitive receptors such as residential properties. Due to the scale and duration of the construction works (60 months) and proximity of sensitive receptors a moderate negative effect is anticipated **Operational effects:** In operation, this scheme will increase regional resilience which may support economic and population growth. It will help to ensure provision of access to a secure resilient supply of drinking water including during times where additional water resources may not be available. Therefore generating a moderate positive effect. Traffic during operation expected to be limited therefore a neutral effect is anticipated during operation	**Construction mitigation:** Tunnelling for all rail and A road crossings Construction compounds to be sited sensitively and away from residential areas. Construction compounds along the pipeline next to a main road, so that there is least disturbance to local traffic. The hours of working associated with the construction of the treatment works, other sites and pipeline route limited to minimise amenity and environmental impacts. **Operation mitigation:** No further mitigation proposed	++	-	++	*0*
	8.2 To maintain and enhance tourism and recreation	*0*	-	*0*	*0*	**Construction effects:** Construction works at Netheridge WwTW would be located within the operational land of the WwTW. There is a Country Park approximately 1.8km from the pipeline route near Robinswood. The route is adjacent to a number of recreational areas such as playing fields and within 500m to other recreational areas. The route also crosses main rivers and there are areas of CRoW Act section 15 land within 500m All reasonable effort will be made to avoid temporary closure of public rights of way and diversions will be provided instead. Public rights of way will be reinstated following construction completion. Careful siting and use of screening where work locations are in proximity to public rights of way will be undertaken. Overall, during construction this option is considered to have a minor negative effect on this objective **Operational effects:** In operation, there will be limited effects on recreational resources	**Construction mitigation:** Consider reviewing route to avoid recreational areas Avoid temporary closure of public rights of way and diversions. Public rights of way reinstated following construction completion Careful siting and use of screening where work locations are in proximity to public rights of way. **Operation mitigation:** There is the opportunity to improve footpaths and connections in and around proposed pipeline route as part of the construction work, giving rise to a permanent minor beneficial effect.	*0*	*0*	+	*0*
	8.3 To secure resilient water supplies for the health and wellbeing of customers	*0*	*0*	++	*0*	**Construction effects:** Construction effects are assessed as neutral **Operational effects:** The option would contribute by providing a resilient water supply. It will provide essential water supply infrastructure to help support a sustainable socio-economy and therefore is considered to have a moderate positive effect	**Construction mitigation:** No further mitigation proposed **Operation mitigation:** No further mitigation proposed	*0*	*0*	++	*0*
	8.4 To increase access and connect customers to the natural environment, provide education or information	0	0	0	0	**Construction effects:** The scheme is not anticipated to increase access to the natural environment or provide education or information sources. Therefore a neutral effect. **Operational Effects:** Operational effects are assessed as neutral for this objective.	**Construction mitigation:** No further mitigation proposed **Operation mitigation:** No further mitigation proposed	0	0	0	0

SEA topic	SEA objective	Construction Effects +ve	Construction Effects -ve	Operational Effects +ve	Operational Effects -ve	Effect Description (including embedded mitigation i.e. costed mitigation that is committed to as part of the scheme)	Further Mitigation	Residual Construction Effects +ve	Residual Construction Effects -ve	Residual Operational Effects +ve	Residual Operational Effects -ve
	resources for the public										
Material Assets	9 1 To minimise resource use and waste production	0	-	0	-	**Construction Effects:** The option would require raw materials and energy to construct (see also embedded carbon for Climate Change above). No imports envisaged at this time as excavated material will be used for backfill and excavated material on the WwTW site is to remain on site. Waste to landfill from construction is expected to total some 12,000m^3. Overall, the construction impacts are considered a minor negative effect. **Operational Effects:** Chemical use for treatment will total 91,980 kg/year. Annual power consumption at full utilisation is anticipated to be 3,673,360 kWh. However, use of 100 % renewable energy is proposed for this option. Overall, the operational impacts are considered a minor negative effect.	**Construction mitigation:** Adoption of waste minimisation measures where practicable. Source materials locally and reinstate excavated materials where possible **Operation mitigation:** No further mitigation proposed	0	-	0	-
	9 2 To avoid negative effects on built assets and infrastructure	*0*	-	*0*	*0*	**Construction Effects:** A number of urban areas are within proximity of the scheme. The pipeline route crosses one railway and a number of roads including A roads One railway crossing, four A/B roads and 12 minor road crossings would be by tunnelling During construction there would be potential disruption to built assets, although this would be mitigated through the use of tunnelling and good construction working practices, which would be set out in the CEMPs. The works will also be temporary in nature. Overall, the construction impacts are considered minor. **Operational effects:** Operational effects are assessed as neutral for this objective.	**Construction mitigation:** Consider tunnelling all A roads Minimise works on infrastructure where open cut during peak periods **Operation mitigation:** No further mitigation proposed	*0*	-	*0*	*0*

Scheme Name	Netheridge WwTW discharge diversion (35Mld) - Cotswold Canals
Scheme Reference	NetheridgePipelineCotswold_35
Description	Discharge location is into the East Channel of the River Severn, just downstream of the proposed abstraction discharging to Gloucester & Sharpness Canal. Discharge diversion from Netheridge WwTW has the capacity to release 35Ml/d into the STT scheme. Components include: [redacted]

SEA topic	SEA objective	Construction Effects +ve	Construction Effects -ve	Operational Effects +ve	Operational Effects -ve	Effect Description (including embedded mitigation i.e. costed mitigation that is committed to as part of the scheme)	Further Mitigation	Residual Construction Effects +ve	Residual Construction Effects -ve	Residual Operational Effects +ve	Residual Operational Effects -ve
Biodiversity, flora and fauna	1.1To protect designated sites and their qualifying features	*0*	-	+	*0*	**Construction effects:** Construction works at Netheridge WwTW would be located within the operational land of the WwTW. HRA screening assessed potential effects on Cotswold Beechwoods SAC, Walmore Common SPA and Ramsar and Severn Estuary SAC, SPA and Ramsar site. The following impact pathways were identified: air pollution, water pollution, invasive and non-native species introduction/ spread, physical modification of the banks of the River Severn that could impact on fish migration, increased suspended sediment and disturbance. No likely significant effects (LSE) are anticipated due to the distance between designated sites and proposed works and the short term nature of construction works required. There is one SSSI within 3km of the transfer pipeline which is Robins Wood Hill Quarry (2.2km). At these distances from construction activities associated with the pipeline, the potential for significant adverse effects on the habitats and associated features of the SSSIs is assessed as negligible. There is no Ancient Woodland within 1km of the pipeline. The pipeline route intersects the Alney Island Local Nature Reserve (LNR). The pipeline route is also within 0.5km of the Green Farm Orchard LNR. Trenchless technology to install the pipeline through the LNR is proposed. Best practice construction techniques are assumed. Protection requirements will be identified to ensure the final pipeline route avoids unnecessary removal of trees, hedgerows or other important vegetation. Due to the pipeline route crossing a LNR and the proximity to other designations, and in consideration of these mitigation measures the effects of these risks are considered minor adverse. **Operational effects:** In operation, there will be a discharge of treated final effluent into the River Severn close to Gloucester Docks. The Severn Estuary SAC, SPA and Ramsar site were identified as designated sites that could be potentially affected during operation. Impact pathways include changes in water flow of supporting habitat, salinity regime and water quality. Negligible hydrological impacts are anticipated in the River Severn and therefore, Severn estuary. The water will be treated to address risks of water quality deterioration and also must be within the Water Framework Directive standards before discharge. Water will also be subject to aeration over a flow cascade structure to oxygenate the water prior to discharge into the River Severn. Therefore, no LSE on designated sites and associated qualifying features have been identified. [redacted]An opportunity exists for habitat enhancement when reinstating land as well as biodiversity net gain opportunities resulting in minor positive effect.	**Construction mitigation:** Habitat surveys along the route of the pipeline to be undertaken. The detail of the working areas (and in some cases construction areas and pipeline itself) will be reviewed as part of the further detailed design of the scheme. Soils should be stored and reinstated following construction. In the event that site specific ecological assessments identify any permanent impacts on qualifying features from the development, mitigation measures such as relocation of species or provision of compensatory habitat will be undertaken in advance of the works. Use of tunnelling under hedgerows to be investigated. **Operation mitigation:** No further mitigation proposed.	*0*	-	+	*0*
	1.2To avoid a net reduction, and where possible enhance, in non-monetised natural capital assets	*0*	-	*0*	-	**Construction Effects:** Construction will lead to loss or degradation of woodland, enclosed farmland and heathland natural capital stock, with potential associated disbenefits to biodiversity, carbon regulation and water purification services. Potential short term impacts to recreation and wellbeing if construction causes loss of access to recreation sites within the zone of influence. The Draft Natural Capital Assessment found a minor negative effect during construction. **Operational effects:** The Draft Natural Capital Assessment found a minor negative effect during operation.	**Construction mitigation:** No further mitigation proposed. **Operation mitigation:** Delivery of required Biodiversity net gain (BNG) to offset construction losses (woodland, traditional orchard and heathland creation) will result in benefits to natural capital stocks and ecosystem service provision, including biodiversity, carbon regulation, natural hazard regulation and water purification. Potential benefits to recreation are dependent on design of BNG mitigation.	*0*	-	+	-

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	1.3To protect and enhance biodiversity, priority habitats and species	*0*	-	*0*	0	**Construction effects:** Construction works at Netheridge WwTW would be located within the operational land of the WwTW. The proposed pipeline is located within the Severn and Avon Vales National Priority Focus Area. All rivers are considered to be priority habitats under the National Priority Habitats Inventory. The Severn Estuary SPA, SAC and Ramsar are located >10km from the site so effects on saltmarsh, seagrass and reef systems have been assessed as minor on a precautionary basis During construction there is the potential for minor degradation of priority habitats such as freshwater reaches of the River Severn due to increases in sedimentation, noise, dust and vibration. Within the Severn Estuary, priority habitats identified include floodplain grazing saltmarsh, seagrass beds and biogenic reef systems; formed by Sabellaria spp Minor degradation of aquatic habitats may happen if inappropriate training is given to construction workers and waste associated with construction is incorrectly managed. Further, increases to sediment, turbidity and organic pollutants have the potential to disrupt aquatic habitats on a short term basis. Priority species within the construction zone may be subjected to short term, temporary impacts of a minor magnitude. Minor impact pathways to priority species include increases in noise and vibration disturbance, and temporary fragmentation of habitat It is unlikely that construction will affect priority species such as birds through noise disruption due to distance and proximity from site. Overall, minor negative effects are anticipated. **Operational effects:** Loss of Priority Habitat would have occurred during construction. Maintenance activities to avoid Priority Habitat areas. In consequence the impacts on this objective are considered neutral during operation Littoral sediment/mudflats are associated with the reaches downstream of the new outfall and the existing outfall. The changes in water quality and discharges is not considered to be of an extent to result in impacts on these habitats In operation, diversion of Netheridge Wastewater Treatment Works (WwTW) effluent from its current discharge location in the Upper Severn waterbody to downstream of Deerhurst intake in the Severn conf R Avon to conf Upper Parting waterbody (GB109054044404) is not expected to have any detrimental impact to the flow regime of either waterbody. As such, the supporting habitat for priority species will not be impacted.	**Construction mitigation:** If site specific ecological assessments identify any impacts to protected species or habitats associated with the construction work, appropriate mitigation measures including (where appropriate) relocation of such species will be undertaken in advance of the works being undertaken Tunnelling for all sections of route which goes through priority habitat. The detail of the working areas (and in some cases construction areas and pipeline itself) will be reviewed with NE as part of the further detailed design of the scheme. **Operation mitigation:** No further mitigation proposed	*0*	*0*	*0*	*0*
	1.4To avoid and, where required, manage invasive and non-native species (INNS)	*0*	*0*	*0*	-	**Construction effects:** During construction, there is the potential for the introduction and spread of a range of terrestrial INNS. As mitigation, invasive species on site will be identified and removed in advance of construction in relation to the pipeline route. During pipeline commissioning, the risk of the spread of INNS is to be controlled by ensuring the use of treated water only for hydrotesting Whilst INNS have been identified within the River Severn and Severn Estuary, it is unlikely that aquatic species will be transferred to new areas during construction. In consideration of these mitigation measures the impacts of these risks are considered neutral. **Operational effects:** The new discharge location will provide a new pathway for the distribution of INNS INNS identified on site include Jenkins spire snail (Potamopyrgus antipodarum), Chinese mitten crab (Eriocheir sinensis) and killer shrimp (Dikerogammarus villosus). In operation, it is unlikely that INNS would be spread, as the treated water is sourced from a WwTW. Invasive species will be removed as far as reasonably practicable before transfer, reducing the risk of accidental release into the River Severn Overall, the operational impacts are considered minor	**Construction mitigation:** No further mitigation proposed **Operation mitigation:** Any transfer of such species (unlikely though that is) would be much more noticeable and rapid in a downstream direction so precautionary monitoring for such species immediately downstream of the discharge would act as an early warning and give sufficient time for appropriate treatment.	*0*	*0*	*0*	*0*
	1 5To meet WFD objectives relating to biodiversity	*0*	-	*0*	--	**Construction effects:** There will be two major and two minor watercourse crossings during pipeline construction. Construction impacts, including intake, pipeline and outfall headworks construction are assessed as a minor negative effect **Operational effects:** In operation, diversion of Netheridge WwTW effluent from its current discharge location in the Upper Severn waterbody to downstream of Deerhurst intake in the Severn (E Channel) - Horsebere Bk to Severn Est waterbody (GB109054032750) would affect the available wetted habitat and water quality in this small watercourse with ecological effects. Overall, the operational impacts are considered major negative.	**Construction mitigation:** Tunnelling for all water courses where needed in addition to those specified. With further consideration of watercourses to cross without in-channel works, construction impacts would be neutral for WFD compliance. **Operation mitigation:** Advanced water treatment	*0*	*0*	*0*	*0*
Soil	2.1To protect and enhance the functionality, quantity and quality of soils, including the protection of high-grade agricultural land	*0*	---	*0*	*0*	**Construction effects:** Overall, a small amount of permanent landtake will be required for the outfall in addition to landtake for the Flow diversion chamber/high lift pump station and dosing area within Severn Trent owned land. The pipeline route, which will cause temporary effects, crosses areas of grade 3 agricultural land The pipeline route crosses land that formed part of the Hempsted landfill site near Gloucester and is routed within 500m of six others. Therefore there exists potential for contaminated land and associated risks to health and environment. No imports envisaged at this time as excavated material will be used for backfill. Excavated material on WwTW site is to remain on site The construction of the pipeline through land comprising part of a historic landfill results in the construction effects being considered as major negative.	**Construction mitigation:** Re-routing the pipeline away from the historic landfill Investigations/remediation for land contamination Limiting the extent of pipeline construction at any one time will minimise the time period for soil disturbance **Operation mitigation:** No further mitigation proposed	*0*	-	*0*	*0*

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						Operational effects: The operation of the scheme will not affect land use, soils, or geology.					
Water	3.1To minimise or manage flood risk, taking climate change into account	*0*	-	*0*	*0*	**Construction effects:** Construction works at Netheridge WwTW would be located within the operational land of the WwTW The pipeline passes through two major and two minor watercourses, including the eastern channel of the lower River Severn (Horsebere Brook), Sud Brook, Daniel's Brook and Whaddon Brook. A large area of the pipeline (1.5km) is within the floodplain of the River Severn and hence within flood zones 2 and 3 upon its approach to Hempsted, with a smaller area (600m) at the approach to the WwTW Best practice construction standards to include necessary floodplain compensation. Construction compounds would be sited sensitively and away from flood risk zones. Adequate methods of construction will be adopted to minimise the impact, including sheet piling, dewatering and treatment of the groundwater prior to discharge. Flood compensation ponds will be constructed as part of the enabling works Earthworks sequencing will include cofferdam formation to avoid flooding of borrow areas during construction Given the scope of the construction works a minor negative effect on flood risk has been identified. **Operational effects:** The scheme would not affect flood storage once operational and the necessary flood plain compensation are complete	**Construction mitigation:** Further mitigation measures will be set out in the applications for Flood Defence Consents where these are required for the river crossing construction works. Tunnelling for all watercourse crossings **Operation mitigation:** No further mitigation proposed	*0*	-	*0*	*0*
	3.2To enhance or maintain groundwater quality and resources	*0*	*0*	*0*	*0*	**Construction effects:** Construction works at Netheridge WwTW would be located within the operational land of the WwTW During construction of the pipeline, areas with high permeability and high groundwater levels would require permits to be obtained by the contractor from the relevant authorities for the disposal of the groundwater to a suitable location. There would also be a need for lagoons to intercept and treat the commissioning wastewater. The lagoons would need to be available prior to pressure testing and land would be reinstated after commissioning All vehicles and any chemical/oil storage will be fully bunded to prevent any accidental pollution of groundwater Neutral effect on groundwater. **Operational effects:** The scheme would not affect groundwater quality and resources once operational	**Construction mitigation:** No further mitigation proposed **Operation mitigation:** No further mitigation proposed	*0*	*0*	*0*	*0*
	3.3To enhance or maintain surface water quality, flows and quantity	*0*	-	*0*	---	**Construction effects:** A total of 2 main river crossings would be crossed via tunnelling and 2 minor river crossings via open-cut. A total of two WFD waterbodies were screened in for further assessment: the Severn (E Channel) - Horsebere Bk to Severn Est waterbody (GB109054032750) and the Severn Upper (GB30905415403). Given the scale of the construction activities required, minor negative effects are anticipated. **Operational effects:** In operation there would be relocation of 35Ml/d treated final effluent from Netheridge WwTW to the eastern channel of lower River Severn locally downstream of Gloucester Docks for intermittent periods of typically 30 days, up to ~100 days, notably in June to November, particularly in the July, August & September period. Overall operation would be in the order of ~15% of dates at times of low flows in the lower River Severn. The intermittent 35Ml/d reduction in effluent discharge from Netheridge WwTW to the upper Severn Estuary has been reviewed as with neutral flow effects in the estuary There are no local data on river flows or tidal influence in the ~570m reach between the outfall and the normal tidal limit at Llanthony Weir. A precautionary local scale take-and-put arrangement at Gloucester Docks has identified a minor negative flow effect at times of operation In operation, a precautionary assessment of the relocation of Netheridge WwTW effluent into the eastern channel of the lower River Severn would have major negative water quality effects due to unknown dilution capacity and no information on flushing into the estuary	**Construction mitigation:** Tunnelling for crossings of all main rivers. Further mitigation measures will be set out in the applications for Flood Defence Consents where these are required for the river crossing construction works. **Operation mitigation:** Discharge would be subject to regulatory permitting of water quality to ensure no effect on WFD status and subject to review this could mitigate impacts, but this level of treatment is currently not included in design.	*0*	-	*0*	*0*
	3.4 To meet WFD objectives	*0*	-	*0*	---	**Construction effects:** Option construction impacts, including pipeline and outfall headworks construction are assessed as minor negative effect. **Operational effects:** The tests of constraint of the option against WFD regulations objectives identify potential non-compliance with physico-chemical water quality, aquatic ecology and chemical status targets in the Severn (E Channel) Horsebere Bk to Severn Est waterbody (GB109054032750) river water body from option operation. This is assessed as a major negative effect. As well as the tests of WFD constraint, other WFD objectives relate to whether the option assists the meeting of WFD objectives for the water body, for associated WFD protected areas or reduces the treatment needed to	**Construction mitigation:** With further consideration of watercourses to cross without in-channel works, construction impacts would be neutral for WFD compliance. **Operation mitigation:** Discharge would be subject to regulatory permitting of water quality to ensure no effect on WFD status and subject to review this could mitigate impacts, but this level of treatment is currently not included in design.	*0*	*0*	*0*	*0*

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						produce drinking water and look to work in partnership with others The option is considered neutral for these during construction and operation.					
	3.5 To improve water efficiency through provision of access to a resilient and sustainable supply of water.	0	0	++	0	**Construction effects:** Construction effects are assessed as neutral. **Operational effects:** During operation there would be moderate positive effect due to the option contributing to a resilient water supply The additional water resource from this option will provide essential water supply infrastructure to help support a sustainable socio-economy.	**Construction mitigation:** No further mitigation proposed **Operation mitigation:** No further mitigation proposed	0	0	++	0
Air	4.1 To minimise air emissions during construction and operation	0	-	0	0	**Construction effects:** The duration of construction would be 60 months Overall HGV movements during construction would be 200 over the construction period, which will result in vehicle emissions to air. There are several of urban areas within 1km of the scheme and there is one AQMA within 1km of the scheme (AQMA Priory Road, in Gloucester) and two within 3km and these are Barton Street and Painswick Road Overall, minor negative effects on air emissions are anticipated from construction activities, due to the small number of SSSI within 3km of the scheme, and the low number of HGV movements required during construction. **Operational effects:** Traffic movements per year likely to be approximately 12 for treatment chemicals. Given the scale of the activities required, neutral effects are anticipated	**Construction mitigation:** Consider use of rail for transporting materials **Operation mitigation:** No further mitigation proposed	0	-	0	0
Climatic Factors	5.1 To introduce climate mitigation where required and improve the climate resilience of assets and natural systems	0	0	++	0	**Construction effects:** Construction effects are assessed as neutral. **Operational effects:** This option provides additional water resource and will during operation assist the reliable transfer of water, therefore reducing the vulnerability to drought risks associated with climate change and improving resilience to the likely effects of climate change. Moderate positive effects are anticipated.	**Construction mitigation:** No further mitigation proposed **Operation mitigation:** No further mitigation proposed	0	0	++	0
	5.2 To minimise embodied and operational emissions	0	-	0	-	**Construction effects:** This option would require raw materials and energy to construct Overall construction carbon is estimated to be 6,348 tCO2e. Overall, during construction this option is considered to have a minor negative environmental effect on this objective. **Operational effects:** In operation, there will be power requirements for various processes including treatment, pumping During operation, the power requirement for the pumping stations at full flow will be 2,724,360 kWh/day) and total carbon emissions of 1,397 tCO2e / year. However, 100% use of renewable energy is proposed. Overall, during operation this option is considered to have a moderate negative environmental effect on this objective Overall, during operation this option is considered to have a minor negative environmental effect on this objective	**Construction mitigation:** Investigate use of renewables during construction and operation for energy supply and use of materials with lower embodied carbon. Carbon footprint study could help identify areas for carbon savings or alternative materials **Operation mitigation:** No further mitigation proposed	0	-	0	-
Landscape	6.1 To conserve, protect and enhance landscape and townscape character and visual amenity	0	0	0	0	**Construction effects:** Overall, minor land-take requirements will be required for the outfall, in addition to landtake for the Flow diversion chamber/high lift pump station and dosing area within Severn Trent owned land There is one country park within 3km of the scheme, including Robinswood Hill (1.9km). However, in light of the scale and duration of construction operations the overall effects on local landscape and townscape are considered neutral. **Operational effects:** Overall, the operational impacts are considered neutral	**Construction mitigation:** No mitigation measures proposed **Operation mitigation:** No mitigation measures proposed	0	0	0	0
Historic Environment	7 1 To conserve/protect and enhance historic assets/cultural heritage and their setting, including archaeological important sites	0	--	0	-	**Construction effects:** Construction works at Netheridge WwTW would be located within the operational land of the WwTW There is one scheduled monument (SAM) adjacent to the proposed pipeline (Lanthony Secunda Priory) at the Gloucester Docks and one further SAM approximately 200m to the east of the outfall, in the centre of Gloucester. There are a numerous listed buildings within 500m of the option, predominantly in the Gloucester urban area and a number of these are immediately adjacent to the pipeline route, including at the Gloucester Docks. There are a number of conservation areas within 500m including some that are immediately adjacent to the proposed pipeline route in the Gloucester urban area and in Hempsted. It is considered that there exists potential moderate negative effects on a number of heritage assets.	**Construction mitigation:** The alignment of the pipeline should be developed further during design development and further consultation with Historic England and Council officers should be undertaken during this process. This should include refining mitigation measures in particular in relation to the scheduled monuments, listed buildings and conservation areas within proximity of the pipeline route. The development of an archaeological programme of works	0	-	0	0

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						Operational effects: There are potential effects on the settings of heritage assets where permanent infrastructure is required, as a result of the construction of the outfall. Given the small landtake required, this will have minor negative effects towards the settings of heritage assets in the surrounding area.	including archaeological monitoring is proposed. Sensitive location of construction compounds to avoid heritage assets and retain a buffer around them to be defined further in consultation with Historic England. **Operation mitigation:** Screening where settings of heritage assets would be affected				
Population and Human Health	8.1 To maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing	+	-	++	*0*	**Construction effects:** The construction of this option would represent a capital investment which is expected to generate a number of employment opportunities and supply chain benefits The degree of this benefit will be dependent on the contractors recruitment and supply chain practices and will be temporary. Overall, the benefits are expected to be minor. There are 10 Noise Action Planning Important Areas within 1km of the scheme. There are areas identified in Indices of Multiple Deprivation for Income, Health and Crime in Gloucester There would be temporary construction areas adjacent to permanent sites at the outfall (250m) and along the pipeline route. Overall, 200 HGV movements are anticipated during the construction period. Construction activities would cause disruption to road infrastructure, as a result of the A-road (tunnelling method) crossings. Best practice construction techniques are assumed. However, there will be adverse effects such as noise, dust and vibrations during construction associated with construction activities and vehicles which could cause impacts on health and wellbeing at nearby sensitive receptors such as residential properties. Due to the scale and duration of the construction works and proximity of sensitive receptors a minor negative effect is anticipated. **Operational effects:** In operation, this scheme will increase regional resilience which may support economic and population growth It will help to ensure provision of access to a secure resilient supply of drinking water including during times where additional water resources may not be available. Therefore generating a moderate positive effect. Traffic during operation expected to be limited therefore a neutral effect is anticipated during operation.	**Construction mitigation:** Tunnelling for all A road crossings. Construction compounds to be sited sensitively and away from residential areas Construction compounds along the pipeline next to a main road, so that there is least disturbance to local traffic. The hours of working associated with the construction of the treatment works, other sites and pipeline route limited to minimise amenity and environmental impacts. **Operation mitigation:** No further mitigation proposed	+	-	++	*0*
	8.2 To maintain and enhance tourism and recreation	*0*	-	*0*	*0*	**Construction effects:** Construction works at Netheridge WwTW would be located within the operational land of the WwTW. Two Sustrans cycle routes would cross the pipeline route at the Gloucester Docks and at Hempsted. There are a number of recreational facilities within 500m of the pipeline, including a playing field and sports facilities in Gloucester, one playing field adjacent to the route and several play spaces in and around Hempsted. The pipeline is within 1km and 500m of areas of CRoW act section 15 land at Gloucester. The pipeline additionally crosses an eastern channel of the River Severn which might be used for recreation. For these two river crossings the route would be tunnelled therefore minimising disruption to these (including two other streams crossed by open cut) Therefore there are potential effects on a number of recreational resources including those that are water based, both direct (due to noise and dust) and those affecting the amenity of those resources. Overall, during construction this option is considered to have a minor negative effect on this objective. **Operational effects:** In operation, there will be limited effects on recreational resources Neutral effects are anticipated	**Construction mitigation:** Consider reviewing route to avoid recreational areas. **Operation mitigation:** No further mitigation proposed	*0*	*0*	*0*	*0*
	8.3 To secure resilient water supplies for the health and wellbeing of customers	*0*	*0*	++	*0*	**Construction effects:** Construction effects are assessed as neutral. **Operational effects:** The option would contribute by providing a resilient water supply It will provide essential water supply infrastructure to help support a sustainable socio-economy and therefore is considered to have a moderate positive effect.	**Construction mitigation:** No further mitigation proposed **Operation mitigation:** No further mitigation proposed	*0*	*0*	++	*0*
	8.4 To increase access and connect customers to the natural environment, provide education or information resources for the public	*0*	*0*	*0*	*0*	**Construction effects:** The scheme is not anticipated to increase access to the natural environment or provide education or information sources. Therefore a neutral effect. **Operational Effects:** Operational effects are assessed as neutral for this objective	**Construction mitigation:** No further mitigation proposed **Operation mitigation:** No further mitigation proposed	*0*	*0*	*0*	*0*

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Material Assets	9.1 To minimise resource use and waste production	*0*	-	*0*	-	**Construction Effects:** The option would require raw materials and energy to construct (see also embedded carbon for Climate Change above). No imports envisaged at this time as excavated material will be used for backfill and excavated material on the WwTW site is to remain on site. [redacted] Given that the option would require minor new infrastructure that cannot be provided through the reuse or recycling of materials, a minor negative effect is anticipated. **Operational Effects:** In operation, there will be power requirements for various processes including treatment and pumping. During operation, the power requirement for the pumping stations at full flow will be 2,724,360 kWh/day) and a low magnitude of treatment chemicals (91,980 kg/year) will be required. However, use of 100 % renewable energy is proposed for this option. Overall, the construction impacts are considered minor.	**Construction mitigation:** Adoption of waste minimisation measures where practicable. Source materials locally and reinstate excavated materials where possible. **Operation mitigation:** No further mitigation proposed	*0*	-	*0*	-
	9.2 To avoid negative effects on built assets and infrastructure	*0*	-	*0*	*0*	**Construction Effects:** A number of urban areas are within proximity of the scheme. The pipeline route crosses a number of roads including A roads. During construction there would be potential disruption to built assets, although this would be mitigated through the use of tunnelling and good construction working practices, which would be set out in the CEMPs. The works will also be temporary in nature. Overall, the construction impacts are considered minor. **Operational effects:** Operational effects are assessed as neutral for this objective.	**Construction mitigation:** Consider tunnelling all A roads. Minimise works on infrastructure where open cut during peak periods **Operation mitigation:** No further mitigation proposed	*0*	-	*0*	*0*

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