Gate 2 Submission: Supporting Technical Report

Annex 3: Havant Thicket Technical

6 December 2021

from Southern Water

Contents

Please refer to Strategic Solution Gate 2 Navigation and Glossary for the glossary of terms, definitions and abbreviations for this document.

Executive Summary

This Concept Design Report (CDR) describes the stage of work completed to analyse the feasibility and viability of Havant Thicket-based Options, in response to Southern Water's (SW) Water Resource Management Plan 2019 (WRMP19) and Section (s20) agreement obligations, to deliver the Strategic Resource Option (SRO) by 2027, through the Regulatory Alliance for Progressing Infrastructure Development (RAPID) Gated process. The SRO is part of the wider Water for Life Hampshire (WfLH) programme, which across a series of projects aims to reduce Southern Water's reliance on river abstraction and increase the resilience of supply sources during droughts.

The purpose of the CDR is to outline the detailed analysis that has been undertaken related to the Alternative, or Havant Thicket-based options considered at Gate 2. The analysis completed covers multiple technical areas, including design, site selection, network infrastructure, environmental, planning and consenting, risk management, customer and stakeholder engagement, procurement, schedule and cost modelling. The information presented in this document is the underpinning basis and evidence that informs the overall recommendations and decisions presented in other Gate 2 submission documents. For clarity, this document does not include any overall recommendations and conclusions, please refer to the Concept Design Report – Havant Thicket document and Submission Summary as part of this Gate 2 Submission for details on recommendations and conclusions.

Since Gate 1, SW has progressed analysis into the feasibility and viability of the Alternative options carried forward from SW's Gate 1 submission. These options were considered to be strategic alternatives to the Base Case in WRMP19. At Gate 1, a total of two strategic alternative options were considered, water recycling or water transfer. A summary of the water transfer options, known as Havant Thicket- based options considered within this document is included in the table below.

Option no.	Option Name	Technical Analysis location
D.1	40 Ml/d Desalination for industry use at Fawley, with 41Ml/d recycled water sent to Upper Itchen / Environmental Buffer (EB) - treated at Otterbourne Water Supply Works (WSW). Re-purposing of the Knapps Mill transfer from South West Water to Testwood WSW	Discontinued prior to Gate 2 – Not included in this document
D.2	61Ml/d direct water transfer from Havant Thicket Reservoir (HTR) to Otterbourne WSW	Technical detailed included in this document
B.4	75Ml/d direct water transfer from Havant Thicket Reservoir to Otterbourne WSW, supplemented by 15Ml/d Water Recycling Plant (WRP)	Previously considered a water recycling-based option, now Havant Thicket-based and technical detail now included in this document

Key Findings

- Reservoir storage and raw water transfers are well-understood and regularly utilised across the UK market.
- Water Recycling is understood and utilised internationally, however, the limited UK market for Water Recycling systems may present challenges for this solution from several perspectives
- Site selection work identified a preferred site close to the proposed HTR as a suitable location for the HLPS. However, in addition to consenting factors, the siting of the High Lift Pumping Station (HLPS) will also be driven by the hydraulic modelling associated with the actual pipeline routing.
- Regarding the Pipeline Options, for D.2, Pipeline 3 and Pipeline 4, and Parcel 5 were recommended to be taken forward to Stage 5 as the preferred configuration. For B.4 this was Parcel WRP 72 (with Parcel WRP71 retained as a backup), Pipeline 3 and Pipeline 4, Parcel 5 (as a baseline only against which future alternative locations, if different can be compared against and original assumptions and judgements reviewed accordingly), and both potential connections (WRP to HTR Route 1 and WRP to HTR Route 2) between the WRP and HTR.

- Stage 4 of the site selection process concluded that there remained a number of consenting risks that needed to be considered further in Stage 5, including:
  - There remain risks associated with HRA and watercourse crossings that require further design and assessment
  - There needs to be further consideration of how to manage potential impacts on the South Downs National Park
  - The routeing of the pipeline corridors needs to be reviewed to avoid direct and indirect effects on ancient woodland
  - There remain risks associated with HRA and watercourse crossings that require further design and assessment
  - There needs to be further consideration of how to manage potential impacts on the South Downs National Park.
- Both Havant Thicket-based options are expected to cause adverse environmental impacts, such as biodiversity, flora and fauna, and air and climate impacts, good opportunities to offset these impacts exist.
- Stakeholders and customers were typically more in favour of the Havant Thicket-based Options, although customer perception of water recycling is a high-risk item that will need to be managed closely throughout project delivery.
- The preferred consenting strategy reaffirms SW's initial view at Gate 1 that a DCO is the preferred route for the HTR-based Options. Access into the DCO consenting regime would not be automatic, i.e. the project does not currently meet the thresholds for being defined as a NSIP. Projects can however be directed into the DCO regime through a s35 direction by the Secretary of State – SW's consideration of the factors to support such a direction suggest that a comprehensive case can be made.
- We have used best practice and benchmarking to optimise delivery schedules. Notwithstanding both Havant Thicket-based Options are expected to be completed and operational in Q1 2030.
- The estimated Capital Expenditure (CAPEX) for the two Havant Thicket-based Options is £491m for Option B.4, and £284m for Option D.2, while the estimated 108-year OPEX and 108-year Net Present Values for the two Havant Thicket-based Options is £486m for Option B.4 and £231m for Option D.2.

1. Background and objectives

This report details key technical information that underpins the analysis completed to assess the feasibility and viability of Havant Thicket Reservoir-based Options. This information substantiates submission recommendations and decision made via the Option Appraisal Process (OAP), included in the Submission Summary and Detailed Feasibility & Conceptual Design Report (CDR).

This document is a ‘level 3’ document, which focuses on the detailed technical information specifically related to Regulatory Alliance for Progressing Infrastructure Development’s (RAPID) Gate 2 information requests. Key technical information included in this document is highlighted in the level 2 of the Gate 2 submission hierarchy, illustrated in Figure 1.

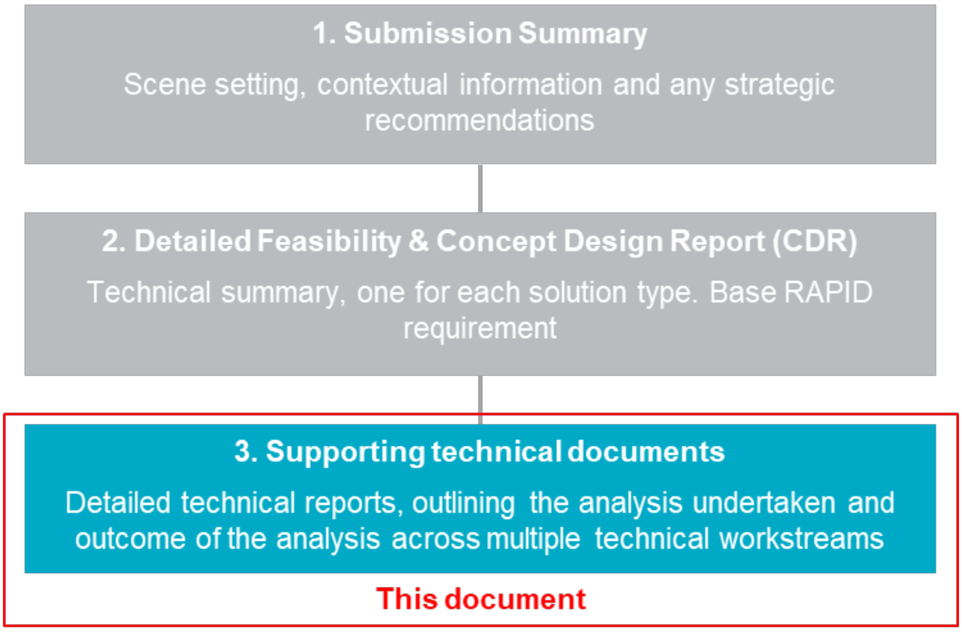


Figure 1 – Accelerated Gate 2 submission document structure

Throughout this Level 3 Havant Thicket Reservoir (HTR) report two Options, Options B.4 and D.2 have been considered and technical information for each of the Options have been detailed. The Options included within this report are detailed in Table 1.

Table 1 – Havant Thicket Reservoir-based Options

Option no.	Option Name
B.4	75Ml/d direct water transfer from Havant Thicket Reservoir to Otterbourne WSW, supplemented by 15Ml/d Water Recycling Plant (WRP)
D.2	61Ml/d direct water transfer from Havant Thicket Reservoir (HTR) to Otterbourne WSW

Key objectives of this HTR Report are:

1. Detail technical information that underpins the assessment of Options B.4 and D.2
2. Provide technical detail that is specifically aligned to RAPID information requests of the Gate 2 submission
3. Provide technical detail that is specifically aligned to recommendations made by RAPID as part of the Gate 1 submission final determination
4. Provide substantive detailed information that supports the Level 2 HTR Detailed Design & CDR

Document Structure

This report includes specific sections covering ten separate technical areas, all of which are specifically focused to the HTR-based Options considered at Gate 2. Specific sections include:

1. Engineering Design
2. Network Infrastructure
3. Site Selection
4. Environmental
5. Planning and Consenting
6. Risk Management
7. Stakeholder and Customer
8. Schedule
9. Cost Modelling
10. Commercial and Procurement

In each of these areas, content is specifically aligned to the RAPID information requirements for the Gate 2 submission.

2. Conceptual Design

2.1. Overview of Solutions D.2 and B.4

A number of Strategic Resource Options (SROs) to meet the potential supply-demand deficit in a 1-in-200-year drought event have been investigated by Southern Water (SW) including desalination, water recycling and the use of Havant Thicket Reservoir (HTR).

This report focuses on the Options that consider the use of HTR in 1-in-200-year drought scenario by optimising the use of the available 8700 ML volume of raw water for treatment at PW's [redacted] and additional pipeline connectivity with SW's Otterbourne WSW. Under both scenarios, the existing [redacted] will be executed. The two Options described in SW's Gate 1 report are summarised below:

- **Option D.2**: This Option considers an abstraction of raw water from HTR up to a peak flow of 75 Ml/d and transfer via a new proposed pipeline to Otterbourne WSW for treatment
- **Option B.4**: This Option augments Option D.2 with a supplementary 15 Ml/d of recycled (raw) water from SW's proposed Water Recycling Plant (WRP). Note, the size of the WRP has reduced from 61 Ml/d to 15 Ml/d since RAPID Gate 1. This is detailed in Annex 4, Water Resource Modelling.

Figure 2 - Schematic of Option D.2 & B.4

The below sections include the conceptual designs for the common elements to Options D.2 and B.4, as both Options involve pipelines from HTR to Otterbourne WSW. B.4 also includes a 15 Ml/d stream of recycled water transferred from the proposed WRP to HTR, the design of the WRP is described in Section 2.2 below. Water Safety Planning discussions applicable to both Options are presented in Section 3.

The current PW HTR outline design proposes filling the reservoir with up to 40 Ml/d of water from [redacted] during winter months and the abstraction of 25 Ml/d of raw water from the reservoir during the summer. This has been modelled as part of the Aquator Water Resources modelling. The design makes provision for a common inlet / outlet main such that the reservoir can be operated in a fill and draw mode, but not simultaneously. The reservoir design will also include an area reserved for wetlands, with weir control to ensure for water levels are maintained.

Extensive Water Quality (WQ) sampling of [redacted] has been undertaken as part of the development of Portsmouth Water's planning application for the construction and operation of Havant Thicket Reservoir (HTR). Sampling of the spring sources has not been repeated as part of SW's Water for Life – Hampshire (WfLH) project. HTR alternatives are being jointly developed by PW and SW therefore, all pre-existing water quality (WQ) data using sampling data from the spring sources, the proposed capacity of the HTR (8700 ML) as well as any assumptions, such as algae formation potential, among other input parameters, have been used to develop a water quality model. This report was made available to SW.

An investigation on the impact of the changes in water quality downstream of the reservoir on the Water Framework Directive (WFD) Status was carried out by PW and the main findings are as follows (ref: PW's Water Quality Study – Water Quality Modelling Report, Atkins, 2020):

- An overall improvement in water quality
- No change in WFD chemical status in the receiving water courses
- The large volume of water in the reservoir will ensure greater stability in water quality and any changes will occur slowly
- This data provides a "baseline" position for consideration of SW's Options D.2 and B.4

2.1.1. Direct Raw Water Transfer HTR to Otterbourne WSW (Option D.2)

In the direct raw water transfer mode of operation, the reservoir, currently expected to be completed 2029 will allow SW to transfer a minimum sweetening flow of 5 Ml/d to Otterbourne WSW. It will operate concurrently with a separate BSA that abstracts up to 25 Ml/d of raw water (inclusive of process losses) from the reservoir for treatment at [redacted] which is expected to undergo additional upgrade works. The pre-treatment at [redacted] is modelled on spring Water only and will need to be reviewed to determine suitability for a blend of spring and recycled water. This provides up to 21 Ml/d of treated water to SW's distribution network, as illustrated in Figure 3 below.

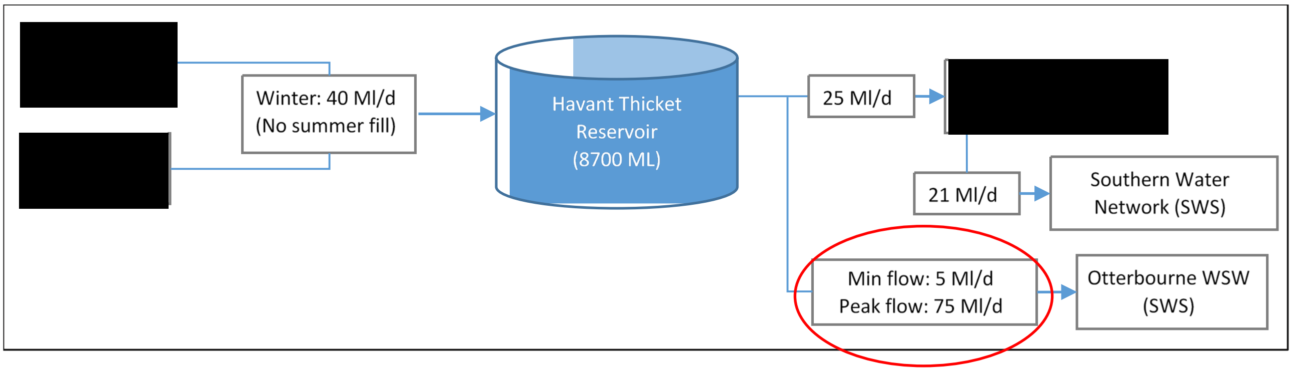


Figure 3 - High level Process Flow Diagram (PFD) of Option D.2, circled component denotes infrastructure specific to Option D.2

Following modelling work undertaken by SW, it is anticipated that during a drought scenario, up to 75 Ml/d peak flow could be abstracted from the reservoir for transfer to Otterbourne WSW for treatment. Further detail on the operating regime and pipeline design configuration is detailed in the following sections.

The water quality from HTR has been modelled by PW, as referenced above for Havant Thicket classic, and the data from the model has been used as basis to inform an upgrade of the [redacted] A summary of the model output that was also considered by SW to inform a jointly produced Water Safety Plan (WSP) is as follows (ref: PW's Water Quality Study – Water Quality Modelling Report, Atkins, 2020):

1. The model output shows the importance of reservoir drawdown and refill on water quality
2. Concentrations of nutrients and algal risk increase substantially during drought periods when the reservoir is drawn down and afterwards when the reservoir is refilled
3. Inputs of phosphorus from birds are estimated to make up a large proportion of all inputs, at least comparable to inputs from the [redacted] A large gull roost would result in a substantial increase in nutrient inputs to the reservoir.
4. In contrast inputs of nitrogen are dominated by inputs from the [redacted] Concentrations would be well below the drinking water standard.
5. Another key area of uncertainty flagged up by the model is the exchange of phosphorus from the sediment. High rates of release in the summer would offset the losses of phosphorus in the reservoir and increase the trophic state. It is difficult to predict these interactions with the sediment as they vary greatly between reservoirs. As the average depth of the reservoir is 10 m this should mean that sediment exchange is less likely than in more typical shallow reservoirs.

The additional impact of D.2 on Havant Thicket is being reviewed as follows:

- The variable raw water quality due to seasonal changes; nutrient load from the presence of bird population; depth of the reservoir, the presence of wetlands including sediments carry over during transfer has been considered during the evaluation for a proposed pre-disinfection treatment process at Otterbourne WSW.
- SW and PW are working collaboratively to develop a [redacted] model to increase confidence in the natural mixing that may occur due to varying ground level in the reservoir and therefore reduction of any dead zones that could compromise the quality of the raw water. However, SW understands that PW's reservoir design includes the opportunity to add in mechanical mixing at a later stage if required.

2.1.2. HTR Augmentation with Recycled Water – Option B.4

In Option B.4, SW is proposing to increase resilience for both PW and SW customers during a drought scenario by augmenting the flows from [redacted] with a 15 Ml/d of raw water supplied from a proposed WRP operated by SW, as illustrated in Figure 4.

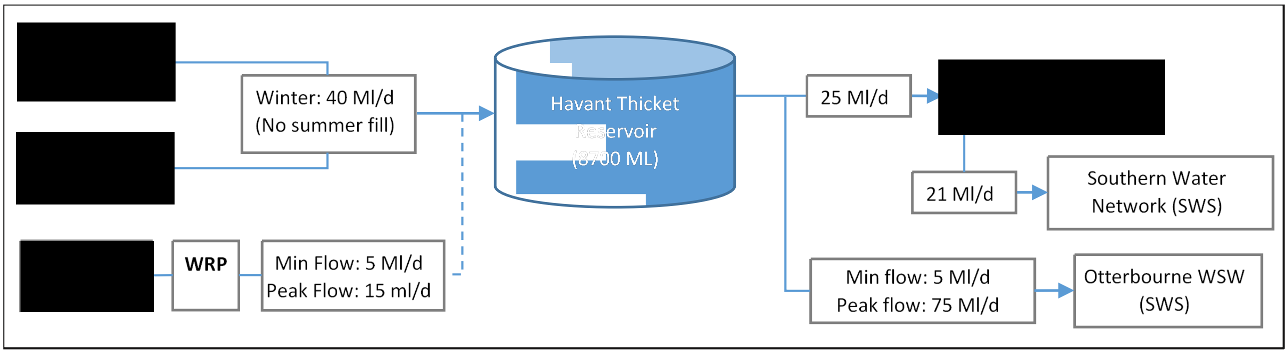


Figure 4 - High level PFD for Option B.4

It is noteworthy that the throughput from the WRP was sized at 61 Ml/d during the Gate 1 submission and has been re-sized following additional water resource modelling that has included the impact of using water stored in HTR during the drought period. The proposed donor wastewater treatment plant will be [redacted] SW has carried extensive wastewater and river catchment sampling to understand the risks with using treated sewage, or Final Effluent (FE), from a predominantly domestic catchment.

This section does not include, in detail, the water quality of the blended recycled and springs flows in the reservoir. The section below describes the water recycling technology that will be used in the treatment of FE. It has been assumed for the design of Otterbourne WSW, under the B.4 Option in a non-drought scenario, will predominantly be akin to the HTR water without a recycled stream as the component of recycled stream into HTR will be c.5 Ml/d. The total abstraction from HTR in a drought scenario is a combined flow of 100 Ml/d (75 Ml/d) additional new abstraction and Havant Thicket classic (25 Ml/d). This applies to both D.2 and B.4.

2.1.3. Water Recycling Approach

Wastewater effluent, or FE, generated from sewage treatment is commonly discharged into rivers or the sea. When discharged into rivers, due to blending and dilution, wastewater effluent becomes part of the source water for drinking purposes. This is commonly known as de facto reuse (or recycling) or unplanned recycling. Recycling water through the use of technology to produce a high-quality purified water that serves as raw water for drinking purposes is known as planned water recycling. Water recycling through the use of technology can be simply described as an acceleration and an improvement to the bio-chemical attenuation process that rivers and lakes currently achieve. Direct water recycling in the UK context entails transferring recycled water directly into a public water supply system whereas indirect water recycling includes the use of an Environmental Buffer (EB) prior to treatment and distribution. The scheme discussed within this report is an indirect recycling process and HTR acts as an EB for B.4.

An EB provides some potential benefits namely:

- Provides time to respond to potential treatment failures or upsets
- Allows an additional opportunity for attenuation of microbial and chemical contaminants
- In some cases, it also helps with public perception

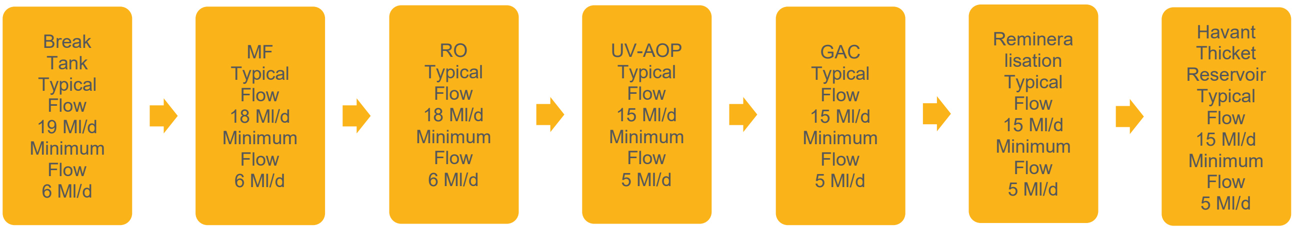
The need for an EB and its importance to public health largely depends on the influent water quality and the buffer's specific design characteristics. It is therefore key that mixing in HTR is investigated when blending springs water with recycled water due to a potential risks with e.g. temperature of the different water causing stratification and to ensure a normalised chemical and biological composition of the blended water at the point of abstraction. The detail will be covered in the Gate 3 submission – detailed analysis to be undertaken prior to Gate 3 as part of design development.. SW will also carry out in Gate 3, a Quantitative Microbial Risk Assessment (QMRA) and Chemical Risk assessment of the blended flows that will be used to refine the WSP submitted at Gate 2. A computational fluid dynamic model will be developed post Gate 2 to model mixing of the water sources in the reservoir.

2.1.4. Technology Selection and Proposed PFD

Various treatment methods and their efficacy have been assessed for Water Reuse in AMP6 Phase 1 Report (November 2018). [redacted] is a coastal facility and is impacted by saline intrusion, therefore a Reverse Osmosis (RO) based treatment system will be necessary. The globally proven Full Advanced Treatment (FAT) approach is to use RO membranes, followed by Ultraviolet with Advanced Oxidation Process (UV-AOP), using hydrogen peroxide. SW has proposed to adopt a similar process for the full scale and a pilot trial. The [redacted] is designed to treat 0.1 Ml/d and is equipped with Microfiltration / Ultrafiltration (MF / UF), RO and UV-AOP (hydrogen peroxide).

The Process Block Diagram in Figure 5 illustrates proposed full-scale design with the new abstraction flows starting from BF WTW into a new break tank at the WRP followed by treatment train and process flows. The rejected waste stream, produced from the RO system, returned to BF WTW discharged to the Solent via the Long Sea Outfall (LSO).

Figure 5 - Diagram showing flow leaving each process area in the WRP



2.2. Engineering Technical Design for Option B.4

The sections below describe the approach that SW has adopted to develop the water recycling design.

2.2.1. Source Water Characterisation

2.2.1.1. Catchment and Pilot Sampling

The sampling plan to develop the water recycling scheme includes a catchment and pilot sampling components designed to meet the following objectives:

1. Establish presence of *de facto* recycling occurring in the rivers Itchen and Test in Hampshire and set a 'baseline' for comparison with recycled water produced from the pilot trial at Peel Common (PC) WTW, as discussed in the Gate 1 report.
2. Prepare a risk based WSP from source to tap, starting with the risk in the wastewater catchment that could impact the performance of the proposed WRP and the water quality transferred to HTR.
3. Use the data from the pilot trial to run a water quality model that would consider blended recycled flows and spring water sources in HTR (this was not carried out in Gate 2 but will be developed in Gate 3). The model output will confirm the process selection at both [redacted] and Otterbourne WSW.

Since Gate 1, four additional sampling events have taken place, illustrated in Figure 6 below, and key catchment data, site specific water quality and pilot trial data, has been gathered to meet the Gate 2 objectives. The sampling events, particularly the river and wastewater catchment, were designed to capture the seasonal changes and this is critical to ensure that a comprehensive review of water quality risks to inform the WSP planning process. Due to the pandemic, SW was unable to collect samples during the summer of 2020, however, from the schematic below, sampling event number 6 will meet this objective for Gate 3.

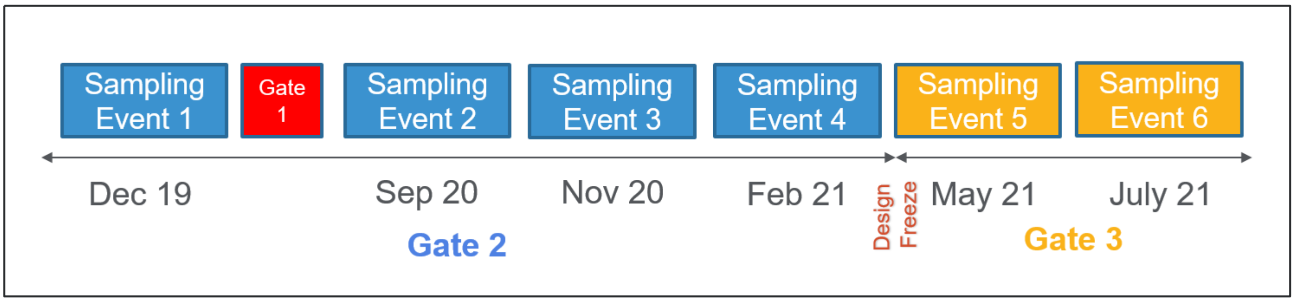


Figure 6 - Catchment and pilot sampling events from December 2019 to July 2021, and the relevant gate stage where sampling results will be included in design aligned to each RAPID gate

Samples were taken at the following frequency as illustrated in Figure 6 and note that December 2019 samples did not include duplicates or river water control samples however, the September 2020 onwards included duplicates and control samples.

Sampling events from September 2020 sampling events and onwards was enhanced by undertaking more sampling to include the following measures:

- Sample duplicates of the [redacted] FE sample point and the Otterbourne finished water sample point. These duplicates were collected at the same time using the same sampling device by the same sampler and stored and shipped in the same way.
- Field blanks for Pharmaceuticals and Personal Care Products (PPCP) analysis – one on a wastewater sampling trip and one on a clean water sampling trip. Field blanks consist of LCMS water provided by

[redacted] which is taken to the sampling sites and used to fill the sample bottles for analysis using the same method as is used to fill the other samples.
- River water control samples (sample point 0A and 0B)

Stakeholder feedback was incorporated and from the November 20 sampling event onwards the sample points at the recycling [redacted] at PC WTW were included in the catchment sampling event. From the February 21 sampling event onwards, composite samples were included in the [redacted] catchment sampling event. The May 21 sampling event included duplicate samples on all spot samples for those analysis conducted at [redacted] laboratories. Additional routine sampling was also carried out 3 times a week.

2.2.1.2. Catchment Sampling Locations

The wastewater and river catchment sampling locations are illustrated in Figure 7 and the locations detailed in Table 2. The design of the B.4 Option does not include the use of PC WTW as a donor site; however, the map illustrated in Figure 7 has been presented to show the extent of sampling carried out to cover the PC WTW catchment where the [redacted] is currently installed.

[redacted]

Figure 7 - Map of catchment study locations

Table 2 - Catchment study locations

[redacted]

2.2.1.3. Source Control Programme

To develop an enhanced source control programme, post Gate 2, the wastewater catchment sampling data and WSPs will be used to identify significant risks. The source of these risks, to BF WTW is, for example, trade effluent transferred to BF WTW. Other imports which could be controlled are Sludge Treatment Centre imports of cake and sludge. Additionally, as part of the source control programme, recalcitrant pollutants could potentially be monitored, in a similar approach to catchment management when mitigating risks to water quality. This is important as discharging high loads of metals or other chemical or organic compounds (for example) could impact on the treatment at BF WTW thereby producing a poor-quality effluent for further treatment at the WRP. At the moment, the risks of non-compliant FE being discharged into the Solent are negative impacts on the environment. However, in the context of its use as a feed for water recycling, this FE could pose public health risks in addition to environmental risks if not controlled at source. Ongoing sampling would occur at source to reduce risk. The process for undertaking this sampling will be detailed at later stages of design process (post Gate 2).

2.2.1.4. [redacted] Sampling Data Validation

[redacted] have designed their [redacted] to meet the requirements of BS EN ISO / IEC 17025. The majority of the tests being undertaken for the project by [redacted] are done so at the [redacted] where most of their tests are accredited for a wide range of matrix as specified in the documentation provided by UK Accreditation Service (UKAS). For some of the tests there are no UK accredited laboratories however the methods are fully documented and carried out by competent and trained staff who operate under the same management system requirements. SW is in conversation with [redacted] to develop a strategy for obtaining accreditation for key determinants that will be part of a WSP for water recycling, the list of determinants that require accreditation will also be discussed with the Drinking Water Inspectorate (DWI) to obtain agreement on SW proposed approach.

A range of quality assurance methods are employed at [redacted] such as:

- Analytical Quality Control samples (matrix matched spiked reference samples) run with each batch of samples
- Process blanks (matrix matched) included in each batch
- Instrument blanks run to check contamination within the instrument
- Independent check standard included with every instrumental run of samples (using a different standard source to that used for calibration)

- Ongoing checks on competence of analysts - monitored using the proficiency testing samples described below and comparing Analysts results to those expected by the PT provider
- Proficiency testing, undertaken where available for every accredited component. All PT scheme results are audited, and investigations and root-cause analysis are carried out and recorded where unsatisfactory 'Z' scores are reported.
- Internal Audit Schedule, four yearly internal audits on each quality management section

2.2.2. Option B.4 Water Recycling Plant Design & Operation

2.2.2.1. Water Recycling Treatment Plant Capacity

As discussed in Gate 1, the WRP will be built to house a multi-barrier treatment process plant comprising membranes (MF-RO) and disinfection using UV-AOP prior to remineralisation and transfer to an EB.

The WRP will receive a near constant flow from BF WTW of approximately 19 Ml/d to produce 15 Ml/d of recycled water under maximum flow conditions. The plant was also designed to provide the capability of running at a minimum flow of 5 Ml/d production, to align with the direct pipeline sweetening flow. Neutralised MF and RO Clean in Place (CIP) wastes will be blended with MF backwash and RO concentrate waste and discharged to the LSO at BF WTW.

Table 3 - Process losses from the WRP at max and min flows

Process	Maximum flow (Ml/d)	Minimum flow (Ml/d)
MF feed	19	7
MF filtrate	18	6
RO feed	18	6
RO concentrate	3	1
Design RO permeate	15[a]	5
UV-AOP	15	5
Remineralisation	15	5
Total production	15	5

[a] Design RO Permeate includes 0.2 Ml/d in process losses

2.2.2.2. Feed Water Quality

The WRP will receive treated wastewater effluent from BF WTW. Due to space constraints at BF WTW, a pilot trial at PC WTW was installed. Further evidence to support the equivalence of qualitative characteristic and variability of the FE from both sites was raised in Annex 2, Strategy B: Water Recycling, Drinking Water Inspectorate (DWI) feedback report.

As outlined above, additional sampling campaigns have been completed since Gate 1 and the results are detailed in Table 4. There is a significantly greater amount of data for PC compared to BF. This is due to the regular samples taken at the [redacted] More frequent samples will be taken at BF and [redacted] in Gate 3 to capture the suite of determinants listed below.

Table 4 - Final effluent concentration from Peel Common and [redacted] to demonstrate the similarities in effluent quality

Parameter	Unit	PC Final Effluent		BF Final Effluent	
		Avg	Number of samples	Avg	Number of samples
Alkalinity, total	mg/L as CaCO3	248.33	229	240.14	7
Ammonia	mg/L as N	2.25	251	0.19	7
Biochemical oxygen demand	mg/L	6.65	220	2.72	7
Barium	ug/L	15.48	132	22.91	7
Calcium	ug/L	103265.91	132	129428.57	7
Chemical oxygen demand	mg/L	38.65	254	49.30	6
Chloride	mg/L	229.16	164	1013.00	7
Dissolved organic carbon	mg/L	9.63	274	8.16	7
Dissolved oxygen	mg/L	7.92	66	11.57	3
E. coli	#/100mL	14990.83	84	7857.14	7
Enterococci	#/100mL	6399.22	91	3714.29	7
F+ coliphage	pfu/100mL	6.73	106	2.14	7
Iron	ug/L	104.37	13	88.54	7
Lead	ug/L	0.22	9	0.99	7
Manganese	ug/L	40.87	132	25.37	7
Mercury	ug/L	ND	9	ND	7
Nickel	ug/L	2.71	9	2.94	7
Nitrate	mg/L as N	2.52	250	6.00	7
Nitrite	mg/L as N	0.27	251	0.03	7
Phosphorus, total	mg/L as P	3.14	281	2.49	7
Silica	mg/L	11.20	1	13.80	1
Sulphate	mg/L	63.68	164	179.71	7
Total Kjeldahl Nitrogen (TKN)	mg/L as N	2.70	243	2.68	7

Parameter	Unit	PC Final Effluent		BF Final Effluent	
Total nitrogen (TN)	mg/L as N	3.93	32	7.28	7
Total organic carbon	mg/L	9.88	274	8.42	7
Total dissolved solids (TDS)	mg/L	740.07	227	2278.57	7
Total suspended solids (TSS)	mg/L	11.91	254	8.23	7
Turbidity	NTU	4.02	252	2.49	7
Atrazine	ng/L	ND	8	ND	6
Isoproturon	ng/L	ND	8	ND	6
Metolachlor	ng/L	1.50	8	ND	9
Estradiol	ng/L	ND	8	ND	9
Estriol	ng/L	ND	8	ND	9
Caffeine	ng/L	12.75	8	110.67	9
Acetaminophen	ng/L	8.88	8	42.78	9
Ibuprofen	ng/L	ND	8	ND	9
Progesterone	ng/L	ND	8	ND	9
Bisphenol A	ng/L	34.25	8	23.22	9
4-nonylphenol (semi-quantitative/qualitative)	ng/L	741.25	8	691.11	9
Sucralose	ng/L	68750.00	8	68666.67	9

SW acknowledges some differences in the data for parameters such as chloride, lead, nitrates, TN and ammonia. These differences can be attributed to, in the case of chloride, greater saline intrusion in the BF WTW catchment compared to PC WTWs catchment, in the case of nutrient data (ammonia, nitrates and TN) the disparities may be associated with the number of sampling data collected for PC WTW compared to BF WTW, however it should be noted that the TN concentration in both BF FE and PC FE are below the discharge permit into the LSO and the pilot at PC has been designed to treat TN up to the permit concentration (TN permit at [redacted] 9.7 mg/l and PC WTW 9.0 mg/l). For parameters generally defined to as contaminants of emerging concern (such as sucralose, bisphenol A, ibuprofen and estriol), the FE quality for PC and BF are comparable when a similar sample size is considered (e.g. eight samples taken at PC compared to nine taken at BF).

The pilot testing programme included a suit of regulated compounds as well as a suite of unregulated compounds in each of the following classes:

- 8 No. Disinfection By-Products (DBPs)
- 15 No. Consumer products and cleaning products
- 54 No. pharmaceutical and medical compounds

- 7 No. sterols and hormones
- 20 No. pesticides, herbicides and fungicides
- 3 No. Flame retardants
- 62 No. volatile organic compounds
- 16 No. Metals

2.2.2.3. [redacted] Objectives

The [redacted] at PC WTW comprises FAT process that includes MF, RO and UV-AOP (hydrogen peroxide), as this treatment process is globally validated for water reuse. The [redacted] consistently delivers a permeate flow of 2.6 m3/h with an overall recovery of 82%. The objectives of the pilot study to develop data critical to a comprehensive evaluation of this planned water recycling scenario include:

- Validation of the performance and water quality produced by the selected full advanced treatment process, which has been used globally for decades, to support regulatory coordination
- Use pilot water quality data to develop WSPs for water recycling
- Provide an opportunity for SW to become familiar with technologies that have not previously been applied
- Serve as an educational platform to support stakeholder engagement

Data from the pilot is not scalable; therefore, a mass balance calculation, including process unit sizing, have been developed using historical data from BF WTW and sampling events described in section 2.3.1. RO permeate quality and chemical usage data was derived using projection data from the Hydranautics RO software. The full-scale plant hydraulics are not confirmed therefore the pumping requirements to generate Operational Expenditure (OPEX) estimates will be developed during detailed design.

[redacted]

Figure 8 – Process Flow Diagram (PFD) of WRP

2.2.2.4. Proposed Treatment Process

Figure 8 illustrates the overall PFD of the water recycling scheme. A brief summary of the process units included in the multi-barrier FAT process is as follows:

1. A break tank will mitigate diurnal flow variations BF WTW and will be designed with a 2-hour retention time
2. MF feed pumps take suction from the buffer tank to the MF plant. The MF system provides necessary pre-treatment upstream of RO by reducing the turbidity to <0.1 NTU and primarily filters particulate (including pathogens) for which RO is not designed for. MF trains include racks with membrane modules that provide filtration as well as a backwash and chemical CIP system to mitigate fouling. The proposed flux for the design of the MF is at 62 l/m2/hr (lmh). MF control system will automatically initiate a pressure decay test on each MF train to monitor membrane integrity on a daily basis. MF filtrate tank is used to provide suction for RO transfer pumps.
3. RO removes metals, inorganics, dissolved organic compounds, pathogens, contaminants of emerging concern and minerals from water. Cartridge filters also help protect the RO membranes. The RO train is designed to operate at an assumed 82% recovery. To prevent fouling of the RO membranes, acid and anti-scalant are dosed. Using a sequential chemical cleaning process where each stage of the RO train is cleaned individually, the RO CIP utilises different cleaning agents depending upon the type of foulant
4. Typically, full scale UV-AOP systems in water recycling applications inject hydrogen peroxide or sodium hypochlorite upstream of the UV reactors as oxidants. UV-AOP is used for removal of pesticides, taste and odour and oxidisable constituents that are poorly removed by RO, small low molecular weight organics and non-polar compounds and disinfection credits.
5. GAC to remove any excess hydrogen peroxide. The design also allows SW to increase the Empty Bed Contact Time (EBCT) by increasing the volume of media in the proposed GAC vessels. GACs are often used to remove any other potential by-products from the UV-AOP process if required.
6. The remineralisation process employs a side-stream limewater process for the reintroduction of calcium hardness to the RO permeate, carbon dioxide as a source of inorganic carbon to restore alkalinity and sodium hydroxide to raise the treated water pH. Remineralisation to ensure chemical stability for transfers within pipelines.
7. RO Concentrate (ROC) will discharge to the ROC wet well, where it will be blended with MF Reject (MFR) waste. The wet well was sized to accommodate both flows for up to 15 minutes at peak flow.

Process design assumptions were used to prepare a mass balance calculation for the WRP. The assumptions made include RO recovery rate based on the membrane supplier, Hydranautics' RO projection data, process losses and literature data where appropriate. As SW is running a 0.1 Ml/d pilot using the FAT process, the assumptions were compared from the projected data used in the mass balance for the full design. These are detailed in Table 5.

Table 5 - Assumptions in the development of mass balance

Parameter	Extent of Removal %	Process	Median pilot removal observed
Recovery rate	95	MF	C.95%
Bacteria	99.99	MF	4.4 log based on total coliform reduction

Parameter	Extent of Removal %	Process	Median pilot removal observed
TSS	100	MF	100%
Biological Oxygen Demand (BOD) / Chemical Oxygen Demand (COD)	70	MF	82% / 34%. The COD is a lot lower than expected, more investigation will be carried out at Gate 3 but COD is mostly removed in RO
Dissolved oxygen	0	MF	20%
Ammonia, nitrate, nitrite and TKN	0	MF	Respective removal in the MF are: 7%, 1%, -14%, and 11%
Total Organic Carbon (TOC)	0	MF	31%
Recovery from process	82	RO	Currently piloting in 82% recovery (previously tested up to 85% and as low as 75%)
Permeate loss	1	RO	Based on full-scale designs of similar facilities
Bacteria	99	RO	2 based on TOC reduction across RO
DO / TOC	95	RO	1% / 99%
BOD / COD	95	RO	100% / 99%
Arsenic and selenium	90	RO	100%
Nitrite	87	RO	92%
Ammonia	96	RO	89% [basis of removal on RO projections is more valid than pilot value]
Antiscalant	100	RO	100% (per Avista projections)
TKN	66	RO	97%
Organic nitrogen	60	RO	No data

In Gate 3, the mass balance and process design generally will be refined to include the following:

1. Use more representative sampling data gathered from the routine and catchment sampling events carried out thus far
2. Where literature data was used to estimate % removal, e.g., Ammonia and Nitrite removal, use pilot trial data to confirm actual removal performance

3. Use the pilot trial cleaning regime to refine the CIP cleaning frequency and therefore chemical consumption
4. GACs have been included in the design to quench residual peroxide, however, the design will be updated to determine the volume of carbon that will be needed to quench peroxide and to remove any unwanted DBPs
5. Use the ROC and MFR pilot data to confirm the environmental permitting requirements
6. Loop testing to establish the impact of recycled water on the network will be carried (B.4 Option only)
7. CFD modelling and water quality modelling to consider a blended flow will be completed
8. QMRA and Chemical Risk Assessment on blend of the HTR from [redacted] and WRP
9. Mass balance from the data gathering in the sampling programme
10. Update the WSP based on sampling data and CFD model including blended WQ model
11. HTR outline compliance and commission plan

2.2.3. Redundancy and Operational Strategy

Redundancy requirements are established by the function of the facility and criticality of continuous full capacity operations. To reliably produce 5-15 Ml/d, the design includes fully redundant trains for all processes. The MF racks include 2 standby units to provide maximum redundancy in the system, this approach assumes one rack is in backwash mode while another enters MF cleaning or CIP mode. In typical RO system design, continuous operation is recommended to avoid RO membrane fouling, so only one redundant unit was provided.

[redacted]

Figure 9 - Site layout with proposed instrumentation and monitoring

Figure 9 above illustrates the plant layout complete with the proposed configurations of the instrumentation and monitoring control systems which will be used onsite.

A high-level overview of the control system designed is detailed below:

- Chemical dosing systems will operate with duty / standby configuration with respect to the metering pumps and there will be appropriate cycling of the operational pumps. The metering pumps will dose based on a set point concentration; flow paced based on the upstream flow with a trim from an upstream monitoring analyser (expect for antiscalant which will be flow paced based on the RO feed flow).
- High lift pumps will operate in a duty / assist / standby configuration with appropriate cycling of the duty and standby pumps based on run time. Pressure alarms at the discharge manifold of the pumps will shut down the high lift pumps and level alarms and sensors will determine the number of operational pumps as well as the operation of the RO train.
- Within the remineralisation process, the duty lime slurry metering pump will dose lime at a setpoint concentration, flow paced based on the UV effluent flow with trim from a recycled water pH analyser. Low-low level in the lime slurry storage tank will shut down the lime slurry metering pumps.
- The UV-AOP system will include one reactor in a duty / standby configuration with appropriate cycling of the duty and standby reactor based on run time. The control system for the UV-AOP system will be governed by the control philosophy of the vendor however will ensure that log removal setpoints for virus, N-nitrosodimethylamine (NDMA) and a selected number of chemical constituents are set. Shutdown of the UV reactors will occur if the reactor becomes unhealthy due to chamber temperature or low water level, feed flow rate exceeding the validated range or if the UV Transmittance (UVT) drops below the validated range. If no UV reactor is available, RO permeate will be diverted to the MFR / ROC blend tank.
- The RO system will include two duty trains and one standby train, to avoid offline membrane fouling, the WRP control system will track RO runtime and cycle the trains such that none are offline for more than a setpoint operator interval. Frequent duty / standby rotation (cycling) will be carried out to prevent the need to do a permeate flush beyond that required upon train shutdown.
  - High pressure (defined by an acceptable level of membrane fouling or by maximum design feed pressure) and low flow alarms will shut down the RO system
  - Differential pressure across the cartridge filter will generate alarms
  - Combined and free chlorine residual will be measured upstream of the RO system to protect the membrane
  - Feed temperature and discharge pressures will be monitored
- The MF net production setpoint will be determined by the RO production setpoint. Pressure decay tests on each MF train will monitor the membrane integrity daily. MF backwashes will be initiated automatically if a train exceeds its run time, transmembrane pressure or filtrate volume produced.
- Strainer System will prevent larger solids and other debris from entering the MF system. High differential pressure across each strainer triggers an automatic backwash.

The break tank which buffers flow from BF WTW and PC WTW will operate in a duty / duty configuration with a periodic drain to prevent the build-up of microbial matter as well as monitoring level to ensure the tanks are within the operating band.

2.2.3.1. WRP Shutdown

Shutdown of the WRP will be performed by an automatically initiated sequence once the RO train flowrate setpoint is zero. UV-AOP shutdown sequence will be as per the manufacturers process control narrative for a drain and rinse of the reactors.

Shutdown of the RO system will:

- Ensure that the control system will prevent upstream processes from shutting down until the RO system has completed its flushing sequence

- Potentially divert permeate water to the MFR / ROC blend tank until the system is fully shutdown

MF shutdown sequence:

- Following completion of all RO system flush sequences, the control system will adjust the permeate flow rate set point for each RO train to zero
- The control system shall place all MF trains offline

Ancillary system such as the chemical dosing lines will have an appropriate shutdown sequence.

In the event of a non-routine operation whereby the membranes have to be taken out of operation a membrane preservation operation will be undertaken whereby the membrane modules will be filled will a 1% NaHSO3 solution. To bring the membranes back into operation the membranes will be drained, and full flushing and CIP cycled will be initiated.

2.2.3.2. WRP Start-up

To ensure a safe start up sequence checks will be made such that all MF and RO trains are offline as well as the UV reactors being off. The start-up sequence for the rest of the site follows:

1. Microfiltration
   - Water quality from the break tank is adequate
   - MF system will run until the MF filtrate tank reaches a minimum level for a MF backwash
   - MF filtrate turbidity is confirmed to be 0.15 NTU or less
   - Confirm Log-Removal Values (LRV) of all operating trains (via pressure decay tests) are sufficient to meet the Critical Control Point (CCP) setpoint
2. Reverse Osmosis
   - A selection of trains is brought online to reflect the number of trains required for the production setpoint.
   - RO trains are placed in a start-up stabilisation mode.
   - RO permeate TOC is confirmed to be 0.5 mg/l or less. Other parameters in the CCP verification will include Electrical Conductivity (EC).
3. UV-AOP
   - Gooseneck downstream of UV system is confirmed to be full
   - Once RO permeate is flowing to the MFR / ROC blend tank the UV reactors shall be brought online
   - Confirmation the UV PLC is achieving its setpoint contaminant log reduction and oxidant dose, the influent UVT analysers are greater than 95% and hydrogen peroxide systems are on
4. Ancillary system such as the chemical dosing lines will have an appropriate start-up sequence in conjunction with RO and UV-AOP systems
5. Final start-up sequence
   - Clear water tanks are at the high level setpoint
   - WRP is confirmed to be meeting its total pathogen log removal required as per the subsequent section

2.2.3.3. Waste Streams

Waste Characterisation and Disposal Pathways

As summarised in Table 6 below and illustrated in the PFD in Figure 8, the WRP includes several liquid waste streams that require disposal. To help meet existing discharge requirements, MF reject will be blended with RO concentrate and pumped to the LSO at [redacted] Other waste that includes chemicals, such as MF Maintenance Clean (MF MC), CIP or RO CIP waste, requires neutralisation prior to disposal.

The design includes neutralisation either within the MF or the RO CIP tanks. Although unlikely, there is potential for large flows such as process tank overflows and off-specification water to be returned to the WRP MF feed tank.

The WRP will also produce the following waste flows:

- Following quenching of any residual chlorine with sodium bisulphite, the RO system brine will be blended with MF backwash waste and discharged to the Solent
- Minor waste flows such as compressor cooling water, sample drains, and trench / slab drains will be discharged to the sanitary sewer
- Chemical sumps will be truck tankered off site in case of chemical spill

Waste Discharge Impact Assessment

SW currently has a FE discharge permit from PC and BF WTWs via LSOs and include a TN limit of 9.0 mg/l and 9.7 mg/l respectively.

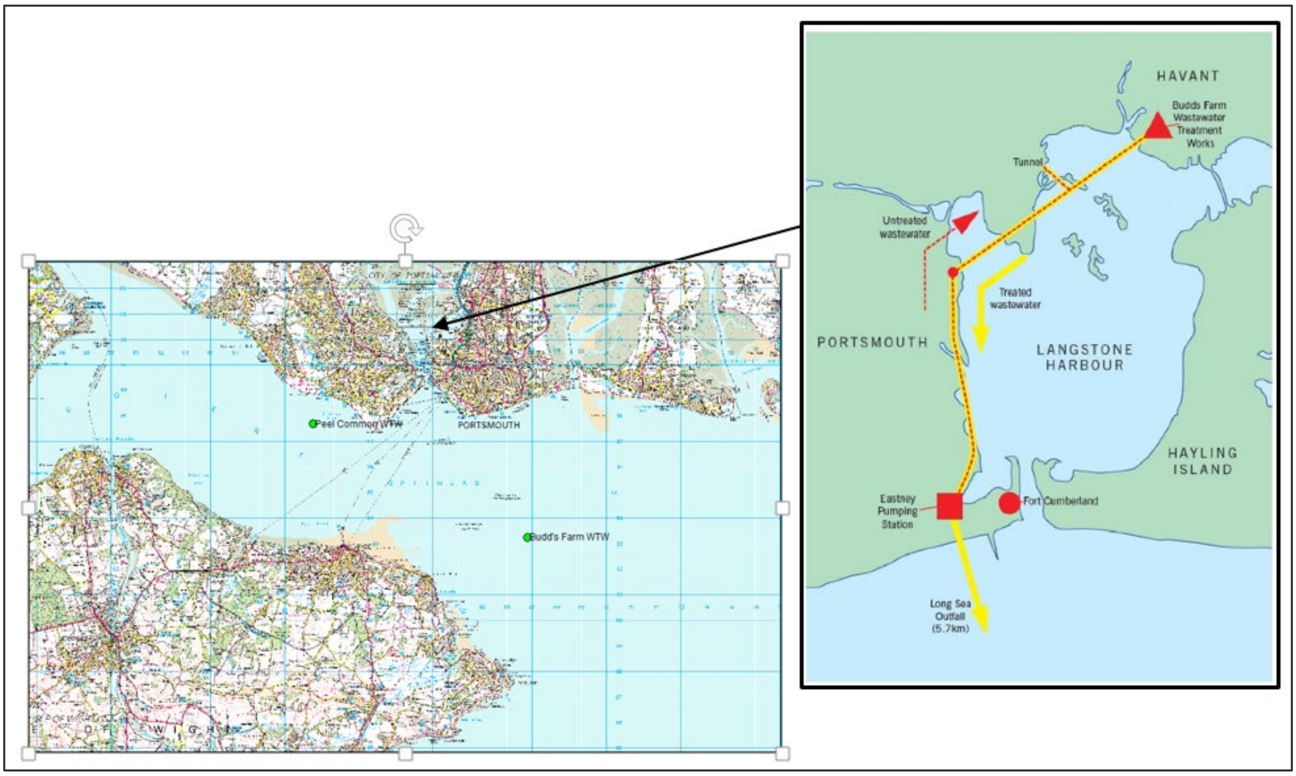


Figure 10 - PC and BF LSO (or Eastney LSO)

For context, Figure 11 below illustrates the current discharge arrangement at BF WTW.

[redacted]

The FE from BF WTW will be abstracted from the WTW outlet channel (prior to discharge into the [redacted] transfer tunnel) and transferred offsite for further treatment. All waste discharges from the WRP will be transferred back to the [redacted] system and will be discharged downstream of the BF WTW FE outlet channel and directly into the [redacted] transfer tunnel.

The key parameters within the waste stream returned to BF WTW's LSO are TN, TDS and change in salinity levels expressed in Point Salinity Unit (PSU). The data detailed in Table 6 was used in CORMIX modelling exercise to evaluate any potential changes (negative or positive) to the discharge point into the Solent. The findings show that a 15 Ml/d WRP plant will have a lower impact on the current situation as illustrated in Figure 12 and Figure 13.

Table 6 - TN and TDS estimated in discharge into the Solent from [redacted] and WRP waste stream

	Existing							Future Scenario -15 Ml/d						
Discharge	Flow (Ml/d)	Flow (m3/s)	TN Load (kg/d)	TN Conc (mg/l)	TDS Load (kg/d)	TDS Conc (mg/l)	Salinity (psu)	Flow (Ml/d)	Flow (m3/s)	TN Load (kg/d)	TN Conc (mg/l)	TDS Load (kg/d)	TDS Conc (mg/l)	Salinity (psu)
BF WTW	92.6	1.07	898.22	9.7	253724	2740	2.74	67.12	0.78	651	9.66	183903	2740	2.74
PC WTW	58.1	0.67	522.9	9	54614	940	0.94	54.03	0.63	486	9	50791	940	0.94
ROC+ MFR from WRP								4.5	0.05	250	56	38369	11928	11.9
ROC+ MFR from WRP+ [redacted] FE								71.62	0.83	901	12.58	222299	3317	3.32
Total to Solent (from PC & BF FE & WRP reject)	150.7	1.74	1421.12	9.43	308338			125.65	1.45	1387	11.04	273090	2,173.40	N/A

The conclusions on the excess TN discharged in the Solent from PC and BF WTWs are illustrated in Figure 12 and summarised as follows:

1. Overall excess TN concentrations in the area is reduced by 2% for the 15 Ml/d scenario. However, the geographical distribution of the excess TN is changed when compared to the existing scenario.
2. Over most of the model area TN concentrations change very little between the existing and future scenario
3. In both future scenarios, concentrations in the Portsmouth, Langstone and Chichester Harbours are reduced as a result of the reduction in overall TN load to the Solent

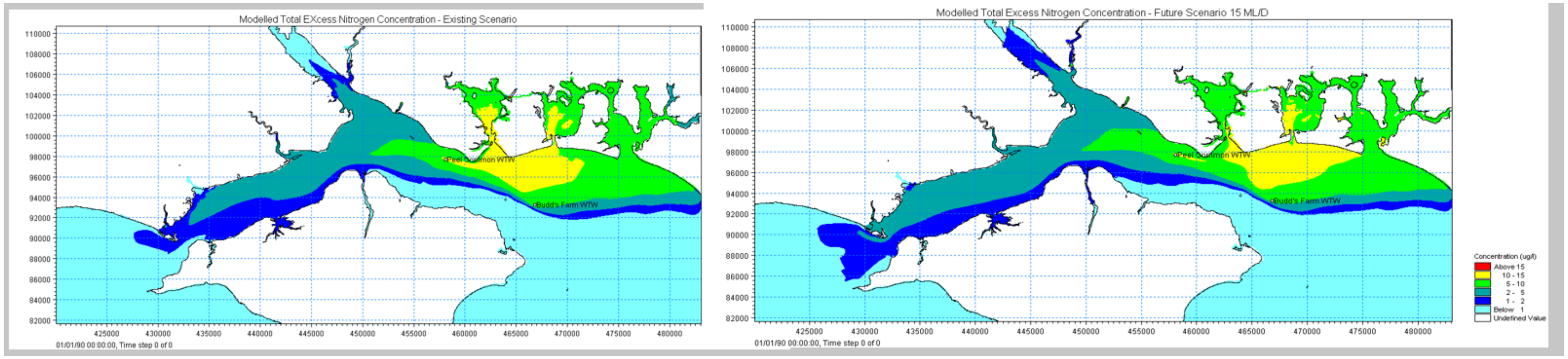


Figure 12 - Difference in modelled excess existing TN v Excess TN using a 15 Ml/d WRP

The findings from the salinity deficit modelling indicate that changes to salinity concentrations in the Solent will only be very marginal in relation to the existing scenario.

Table 7 - Salinity deficit in the Solent existing v future scenario (15 Ml/d)

Discharge Point	Existing	Future 15 Ml/d scenario
BF WTW (Eastney) LSO	0.28 psu	0.20 psu
PC WTW LSO	0.24 psu	0.10 psu.

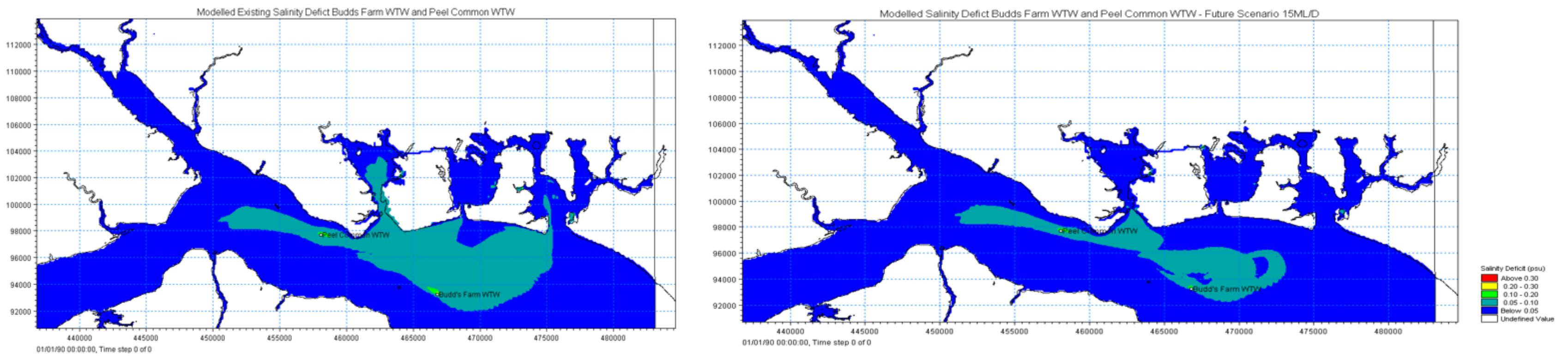


Figure 13 - Salinity deficit at BF & PC LSO existing v running a 15 Ml/d WRP

2.2.3.4. Control of Process Performance

The following describes regulatory compliance calculations and WRP control system screens required for WRP. Note that the requirements of this section ultimately must comply with DWI or World Health Organization (WHO) guidelines on water reuse and therefore are subject to refinement until approval by the Regulators.

Pathogenic Microorganism Control

- The WRP control system will display the virus, *Giardia*, and *Cryptosporidium* LRVs, where applicable, from each of the process units and the overall WRP treatment process on a common control screen. For continuously monitored inputs, the control system will update the information on the control screen every 15 minutes with the lowest value over that period.
- The control system shall use the value calculated by the following LRV_{Total} equation based on the Membrane Integrity Test (MIT) values for any MF train in PRODUCTION mode for any given time within the past 24 hours.

  LRV calculation: $\mathrm{LRV_{Total}} = \log_{10}\left(\frac{1}{\left(\frac{1}{10^{\mathrm{LRV1}}}*\frac{1}{\mathrm{n\ duty\ units}}\right)+\left(\frac{1}{10^{\mathrm{LRV2}}}*\frac{1}{\mathrm{n\ duty\ units}}\right)\ldots+\left(\frac{1}{10^{\mathrm{LRV\ n^{th}duty\ unit}}}*\frac{1}{\mathrm{n\ duty\ units}}\right)}\right)$
- The control system shall report the same value for all measured columns of the RO row using a tiered approach, as follows:
  - Tier 1: Continuous calculated TOC Reduction of overall RO system.
  - Tier 2: Continuous calculated conductivity (EC) reduction of each RO train. Use if no value for TOC reduction is available.
- LRV calculation for the RO system
- The control system shall total the values in the MF, RO, and UV-AOP for each of the Measured Virus, Protozoa, and Bacteria columns and display the results graphically or otherwise

Off-Specification Strategy

As detailed in the section above, control of WRP will employ a CCP approach to manage off-spec water and maintain achievement of pathogen LRVs. If an individual process or monitor fails, the facility will have provisions to divert off-spec water and prevent flow to HTR.

Diversion points include:

- Membrane filtration feed tank - Should the MF Feed not meet feed water quality requirements for the membrane filtration system, the membrane filtration feed pumps can be shut off and the feed can be diverted through the tank overflow, or via a sump pump placed into the tank and sent to the Solent.
- RO feed tank - Off-spec water that may have entered the tertiary pipeline can be diverted at the overflow of the RO feed tank. The overflow will be sent to the ROC tank for discharge to the Solent.
- RO permeate - Based on continuous indirect integrity testing via conductivity and TOC, a CCP diversion point will be located on the RO permeate header between the RO systems and hydrogen peroxide feed point. The off-spec water will be sent to the MFR / ROC blend tank for discharge to the Solent.
- Recycled water storage tank - Based on monitoring of log removal by the UV Control Centre (UVCC) (calculated with input from flow rate, UVT, lamp intensity, and oxidant dosing), a CCP diversion point will be located on the UV-AOP effluent header from the recycled water storage tank. The off-spec water will be sent to the ROC wet well for discharge to the Solent.

2.2.4. Non-Infrastructure

2.2.4.1. Option B.4 Water Recycling Plant Site Location

Due to ABE obligations of programme timescales two locations for the WRP have been investigated as part of this submission, informed by the site selection process. Land parcels referred to as WRP_72 and WRP_71 in Figure 14 below are situated in the Langstone Harbour area of Havant, in close proximity to [redacted] Both land parcels comfortably meet the spatial requirements of the WRP. Further details of the site selection process can be found in the site selection section of this annex.

[redacted]

Figure 14 - Aerial photo of land parcels WRP_72 and WRP_71

Land Parcel WRP_72 and Land Parcel WRP_71

[redacted]

A pumping station located adjacent to the FE channel at BF WTW will receive flow under gravity from a new offtake from the FE channel and pump it to the WRP via a DN400 rising main installed under Langstone Harbour using the Horizontal Directional Drilling (HDD) trenchless technique. To discharge waste flows to the Eastney LSO, a pumping station located on the WRP site will pump a combined waste stream from the MFR / ROC buffer tank via a DN350 rising main to discharge into the existing Eastney Tunnel shaft located at [redacted] As with the feed pipeline, the waste return will be installed using HDD.

Figure 15 illustrates the proposed WRP site layout. Incoming flows from BF WTW will discharge into above ground buffer tanks, and these will feed the main process train, which is predominantly located inside a building. Flows will be conveyed from South to North, with clear water tanks providing holding volume before being pumped to HTR. Liquid chemical storage is located on the West face of the building, ensuring segregation of incompatible chemicals and appropriate delivery bunding. Carbon dioxide and lime are stored in the North East corner of the site to suit the process flow. The above has been discussed at site layout configuration workshops, with representatives from the design team and operations to ensure all needs are met. Permanent administration facilities will be provided on site to act as meeting space and temporary remote working.

The same principles as discussed above have been applied to land parcel WRP_71 which is adjacent to WRP_72 with similar access from the A27.

[redacted]

Figure 15 - WRP_72 site layout

2.2.4.2. Approach to Earthworks, Roads, Drainage

Land Parcel WRP_72

The geotechnical desk study identified that the site was formerly used for domestic landfill. From aerial images, it would appear this was capped in the early 1990’s. At this time no details of the extents and capping/lining of the landfill have been sought from the current landowner. Considering the likelihood of contaminated material, the design considers raising ground profiles with imported material to create areas suitable to construct the proposed buildings and process units. A retaining wall will therefore be required for large areas of the site. The site is outside of Flood Zone 1, and it is anticipated that surface water drainage will be attenuated utilising below ground storage or above ground basin, designed to Sustainable Urban Drainage Systems (SUDS) principles where appropriate. Chemical delivery areas and bunds will be interlocked during delivery to ensure the risk of chemicals spills is minimised. All run to waste and overflows are assumed to be diverted to the LSO at this stage and a CORMIX modelling exercise has been carried out to show marginal changes to the current mixing profile. The current discharge permit (in yearly kg/d) will not be breached while using the WRP, however, this will be discussed with the EA to ascertain no change in the permit conditions will be required.

Land Parcel WRP_71

Land parcel WRP_71 is located to the East of Land Parcel WRP_72. The site is already developed and comprises existing / active warehousing and office units, it has been assumed that the same development as explained for Land Parcel 71 will be required to accommodate a WRP on this site.

2.2.4.3. Building Structures & Foundations

Several large holding tanks are required (inlet buffer volume, MF / RO waste, treated water), and the design currently assumes that these tanks will be above ground, glass fused to steel construction. Reinforced concrete base slabs will be founded on Continuous Flight Auger (CFA) piles. A particular requirement for the piling, on site WRP_72, will be to ensure that the integrity of the landfill is not affected.

The on-site buildings (inlet / outlet pumping stations, main process building, admin building) are expected to be steel portal framed construction with steel cladding. The building will be equipped with overhead lifting facilities, with suitable laydown areas for maintenance and removal of equipment.

2.2.4.4. Security & Security & Emergency Measures Direction (SEMD)

It is assumed that the following will be provided, but will be confirmed at the next design stage:

- Site security fence, as per the SW standard detail, and security-controlled access gates
- Security doors and alarm system on all buildings

[redacted]

2.2.4.5. MEICA and Power

Power supply to the WRP will be obtained from [redacted]. The installed power has been calculated at 3,500 kW, and maximum absorbed power of 2,000 kW. Power Supply to the different process areas of the WRP will be obtained from the SW High Voltage (HV) Switchboard provided in two identical halves. The HV Switchboards will each have Voltage Circuit Breakers (VCB). Each half of the Switchboards will have its own building / kiosk. The distance between the switchboards should be a minimum of 3 m apart to provide a fire break. [redacted]

The Programmable Logic Controller (PLC) and Human Machine Interface (HMI) will be connected through Managed Ethernet Switches and routers for providing network security for connection to external communications network for in cooperation into WRP Supervisory Control and Data Acquisition (SCADA) system. Pumping stations, Break Pressure Tank (BPT) and WRP SCADA will be integrated together. All integrated SCADA at WRP will be connected back to Otterbourne WSW. The site will consist of road lighting, external task lighting and internal lighting within kiosk and buildings which will all be Light Emitting Diode (LED) to provide the best Whole Life Cost (WLC). Illuminance levels shall be in accordance with standards.

The external road and access lighting is photocell controlled with SCADA override. All other lighting will be manually switched.

2.2.4.6. WRP Constructability

In broad constructability terms, both Land Parcel WRP_72 and Land Parcel WRP_71 present the opportunity to employ both traditional building methods as well as offsite modular approaches. The area is typified by light industrial units, commercial and office space using steel framed construction and various cladding systems to suit the desired appearance. A similar approach to the buildings for the plant have been assumed with smaller mechanical and electrical equipment being housed in kiosks in the location where it is required.

Land Parcel 72 increases in complexity due to the land, in part, containing a former domestic landfill site. This presents the following risks:

- Excavation to profile the site and to install shallow foundations may interfere with the landfill capping layers.
- Unknown landfill material – the site is anticipated to contain domestic land fill material however it is unclear at this stage if the material would be classed as contaminated and therefore require more costly disposal with potentially fewer site accepting more highly contaminated waste.
- Landfill leachate – managing surface water on the site will need to take due consideration of interactions with landfill materials and potential impacts on groundwater and the adjacent Hermitage Stream.
- Landfill Gas – it is unclear how gas is managed on the currently undeveloped site. SW's proposals will need to ensure that a landfill gas management plan is developed and implemented.

The following broad mitigations have been included at this stage:

- Costs estimates assume the site will be raised rather than lowered using imported fill to limit potential impact on the landfill capping layers.
- Surface water will be collected and managed in either detention basins of below ground storage tanks. At this stage it is assumed these will be outside the footprint of the landfill.
- Piled foundations which breach the landfill capping and lining are assumed to be cast in-situ. This method will ensure a seal is formed between the pile and capping / lining to prevent leachate.

Both Land Parcel WRP_72 and Land Parcel WRP_71 present challenges to transferring FE, treated raw water and combined waste streams being returned to the LSO waste due to the constrained access to the location on the BF WTW site where take off and return "cut ins" can be made as well as the environmental sensitivities of the adjacent Langstone Harbour. As a result, the concept design and costing assume trenchless connections to both sites, broadly summarised as follows:

- Land Parcel 72 – DN400 feed and DN350 waste rising mains installed using horizontal directional drilling. An additional DN400 and DN350 have also been costed for installation to allow redundancy and therefore increased resilience.

Further details can be found within the concept design drawings, available on request.

2.2.4.7. Havant Thicket Reservoir Connections

This report will only discuss the new assets required for Options D.2 and B.4 to meet the SRO supply needs. [redacted].

[redacted]

Figure 16 - Proposed outlet connection for Option D.2 / B.4 and inlet location for Option B.4

Reservoir Off-Take (D.2 and B.4)

Option D.2 proposes a connection to the HTR permanent works common inlet / outlet / emergency draw down main. It is envisaged that a tee piece will be installed, along with a double isolation (double block and bleed) arrangement. This will allow future isolation for operational and maintenance activities.

Downstream of the connecting tee and isolation valves, a motorised valve will control the flow of water into the proposed pumping station. A non-return valve is proposed at the same location to prevent any backflow. Immediately downstream, an inline flowmeter would be provided to record abstraction via the direct pipe, ensuring SW and PW can accurately record bulk volumes of raw water transferred to Otterbourne. An operational protocol will be developed to control direction of flow to either High-Lift Pumping Station (HLPS) or the [redacted] pumps. All valves and flow metering will be installed below ground. A new sampling point would also be provided.

Power and communication cables will be explored in more detail during Gate 3 works.

Connection between Off-take and HLPS

The HLPS location will be determined following hydraulic modelling and land evaluations on the preferred pipeline route. Given the congested location surrounding the reservoir there may be a requirement for a tunnel to connect the HLPS.

Havant Thicket Feed from WRP (Option B.4 only)

A separate inlet to the HTR is proposed to enable a maximum constant flow of up to 15 Ml/d of recycled water from the WRP. Prior to discharge into the reservoir, a sampling chamber is proposed to ensure water quality can been monitored and to allow for regular maintenance of the pipeline.

There is limited clarity in the mixing that occurs in the HTR in the D.2 Option and it is critical that both PW and SW understand the ramifications of blending recycled water with natural Springs water in the HTR. Therefore, CFD modelling is required to identify potential dead zones or imperfect mixing zones that could affect the raw water quality to be treated at both SW's Otterbourne WSW and PW's [redacted] This modelling work will be undertaken to optimise the design and will include consideration of an additional inlet from the WRP for Option B.4. It is currently assumed that air mixing using a perforated pipe at a low level in the reservoir will be adopted and that the changing ground levels at various points in the reservoir will enable some degree of mixing. The mixing design for B.4 will build on the final agreed design for the reservoir.

2.2.4.8. Havant Thicket Reservoir Connections Constructability D.2 and B.4

It is assumed at this stage that any required construction of pipeline connecting infrastructure can be completed "offline" before reservoir filling.

Havant Thicket Outlet Connection

Connection to the reservoir inlet / outlet pipeline is assumed to be via a tee and associated control valves using open trench techniques during reservoir construction.

Havant Thicket Connection to HLPS

Should tunnelling be necessary, shafts to launch and receive the tunnel boring machine will be required at HTR and the HLPS respectively. When tunnel construction is complete, the shaft at the HLPS could act as a storage well for the pumping station.

Option B.4 Only - Havant Thicket Inlet Construction

In the interests of mitigating any impact on the reservoir embankments and environmentally sensitive land surrounding the reservoir, it is envisaged that once the pipeline enters the reservoir boundary it will be routed along the HTR Western access road, entering the reservoir past the slipway. The inlet pipe is then proposed to be laid along the bed of the reservoir, discharging at a location and level to be determined by the CFD analysis. The discharge point will optimised as part of the reservoir CFD modelling exercise.

2.2.5. Transfer Pipelines

2.2.5.1. Indicative Routes

At this stage all routes discussed are indicative corridors and are dependent on future route development. See Site Selection Chapter for further information regarding the methodology followed. In order to provide costs for the Multi Criteria Decision Analysis (MCDA) process, a single route has been selected to cost, however the risks and opportunities for all routes have also been captured, see Risk chapters of this annex.

[redacted]

Figure 17 - Option D.2 indicative Concept Routes and Infrastructure Locations

[redacted]

Figure 18 - Option B.4 indicative Concept Routes and Infrastructure Locations

2.2.5.2. Transfer Pipeline Infrastructure (Key elements)

System Design & Hydraulics

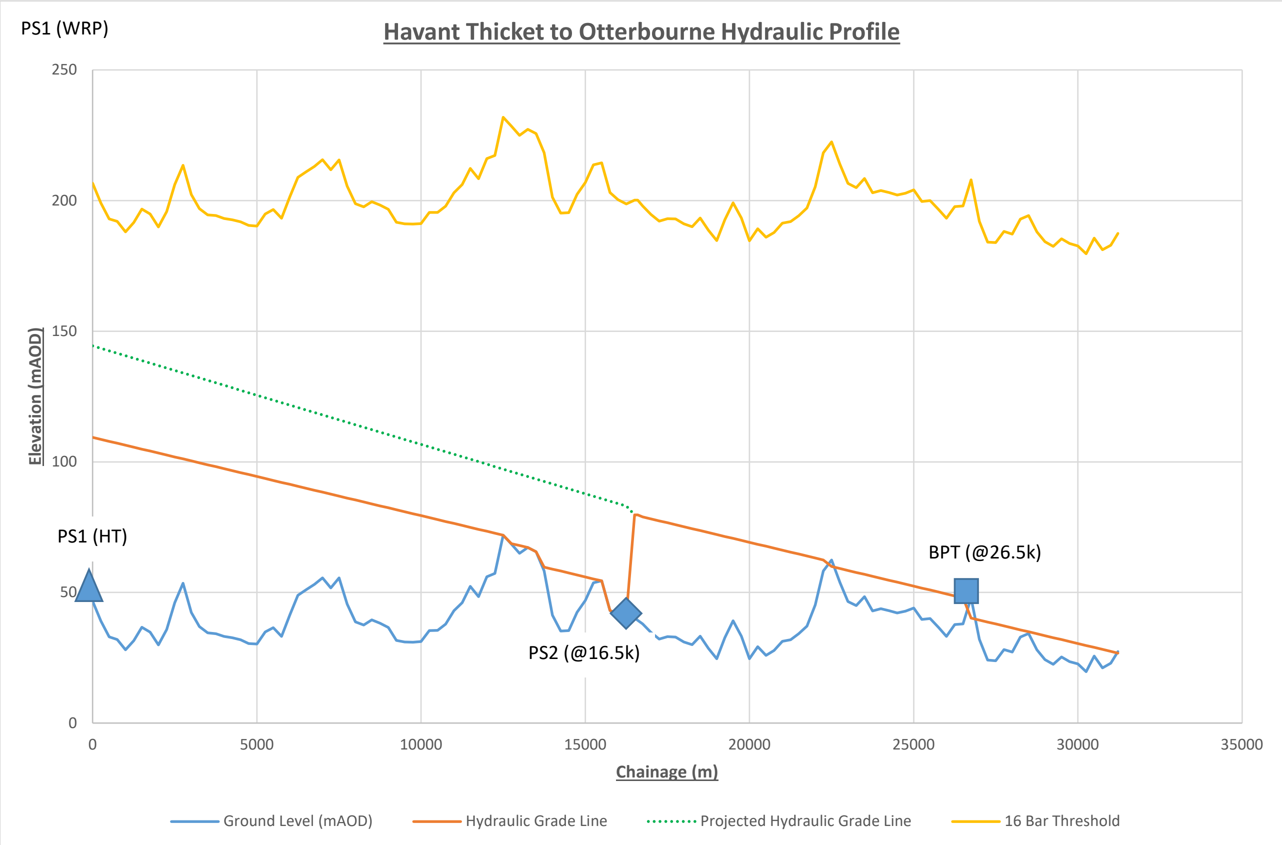


Figure 19 - Havant Thicket to Otterbourne Route 4 - Hydraulic Profile

Havant Thicket HLPS to Otterbourne WSW

Due the significant distance and / or large amount of static head to overcome, dual stage pumping stations have been proposed between HT HLPS and Otterbourne WSW. This would ensure a single pumping station would not need to generate over 16 bar pressure (as this is a standard pressure rating for pipework / valves fittings etc.) The pumping stations would operate in series along the pumping route, splitting the head to be generated across the two pumping stations.

WLC analysis of efficacy of dual pumping stages vs single pumping stage and pipe diameter will be undertaken during design development. Single stage pumping / smaller diameter pipelines may result in the requirement for higher rated (PN26) pipes / fittings and operating costs but could provide a lower WLC due to the infrequency of pumping at peak flow rates during drought periods. It may also be possible to install pumps without the need for water storage compartments.

A BPT has been proposed on the pipeline route from HT High-Lift Pumping Station (HLPS) to Otterbourne WSW to mitigate potential surge issues. However, due to the topography and distances of pumping, it is likely that surge vessels will also be necessary at both pumping stations to maintain transient pressures within acceptable limits.

Option B.4 WRP to Havant Thicket Reservoir

Due to the short pumping distance and low static head, single stage pumping is proposed between WRP and HTR.

Pumping Station Design

The location and system design of HT HLPS and second stage pumping station will be determined following hydraulic modelling and land evaluations on the preferred pipeline route.

A typical pumping station will include the following items:

- High-lift pumps
- Fully isolatable dual water storage compartments
- Pump house
- Motor Control Centre (MCC) kiosk to house electrical system
- Surge vessel system
- Power supply consisting of: Generator (including emergency / standby power generation), Low Voltage (LV) switchboard with mains and generator incomers, motor starters, feeders and ICA section
- Step-up and step-down transformers
- Control instrumentation
- Telemetry outstation
- Heating, Ventilation and Air Conditioning (HVAC) system for heating / cooling
- Site welfare facilities
- Access road
- Security gate and perimeter fencing

The estimated footprint required is around 6200 m2.

Option B.4

The WRP HLPS will be contained within the WRP footprint, see Figure 17.

Havant Thicket HLPS

For the concept design location, the power supply to the HLPS is estimated as a single Distribution Network Operator (DNO) supply at 11 kV at 1500 kVA and [redacted] The site would also need a transformer substation estimated at 1000 kVA. The PLC and HMI will be connected through Managed Ethernet Switches and routers for providing network security for connection to external communications network for in cooperation into WRP SCADA system. Pumping stations, BPT and WRP SCADA will be integrated together. All integrated SCADA at WRP will be connected back to Otterbourne WSW and will be integrated with PW's control system.

At the pumping station there would also be a telemetry outstation with separate offsite communications providing alarms to the RCC. A PLC will provide control and monitoring of the pumps plus supervisory function of all plant in the pumping station, with a UPS providing power back-up of 1 hour.

2nd Stage Pumping Station - Havant Thicket HLPS to Otterbourne WSW

A second stage pumping station has been provided for the concept design, it is likely a similar footprint and arrangement to the HLPS. For the concept design location (baseline route), the power supply to the 2nd stage pumping station is estimated as a single DNO supply at 11 kV at 800 kVA and [redacted] The site would also have the similar PLC and SCADA arrangement as above.

Break Pressure Tank - Havant Thicket HLPS to Otterbourne WSW

The BPT concept design provides 2 fully isolatable water storage compartments. The tanks will be surrounded by embankment screening supported by a retaining wall, to provide permanent access for future inspection and maintenance of the tank walls.

The estimated footprint required is 4350 m2.

For the concept design location (baseline route), a 3 phase DNO will be required and is estimated at 415 V 100 A supply to provide power to the site and control functions. The site will require a PLC, telemetry outstation arrangement and an Uninterruptable Power Supply (UPS) system.

Ancillary Equipment

The standard transfer system includes isolation valves, flow meters, sampling, washouts etc. and have been included in the concept design to facilitate maintenance and monitoring of the transfer asset and water quality.

Provisions under the Security & Emergency Measures Direction (SEMD)

It is assumed that the following will be provided, but will be confirmed at the next design stage:

- Site security fence as per the SW standard detail c/w vibration sensors
- Security cameras
- Covers with a minimum SR3 security rating certified by the Loss Prevention Certification Board (LPCB)
- Security doors to all buildings
- Alarm system on all buildings

The alarms and cameras will be monitored offsite [redacted]. There will be multiple alarm systems within the multiple building around the water recycling site.

2.2.5.3. Pipeline Construction

Open Cut Construction

At this stage it is assumed that open cut excavation will be used for the majority of the route. The depth of the trench will vary, depending on the ground conditions but will be a minimum of 0.9 m to crown in open fields.

A working corridor of c.25 m between perimeter fences will be required for the pipeline installation. This will allow sufficient room for open excavation, storage of excavated material, construction plant transit and handing of pipelines. The working corridor will be reduced, where construction allows, and in order to minimise impact, for example when crossing hedgerows and ditches.

Trenchless Construction

No-dig techniques will be employed at critical crossings of main river; motorway; railways; at locations where this will reduce the impact on environmentally sensitive areas or where construction is otherwise restricted.

The construction methodology selected will be dependent on pipe diameter, length of trenchless crossing and ground conditions.

Tunnelling

Segmental tunnelling will be utilised, if the design requires it, under the following conditions:

1. Specific locations where the length of drive exceeds the maximum capability or
2. Where other methodologies are not suitable due to ground conditions / constraints and
3. Where there is an opportunity to house two pipelines within a tunnel

Pumping Stations & Break Pressure Tank

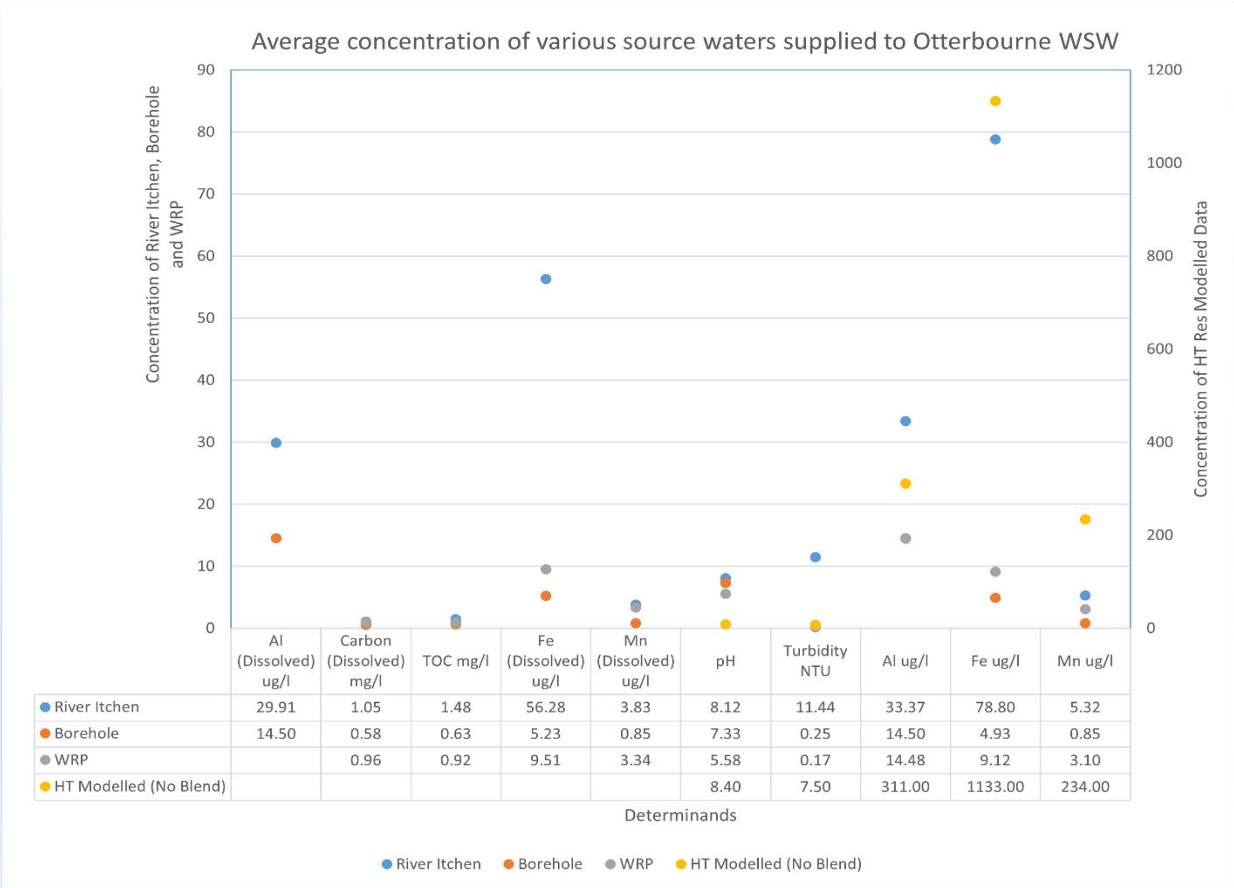
Hard and soft earthworks solutions will be employed to resolve any topographical variations, ensuring that the site can be terraced into flat areas suitable to accommodate kiosks and buildings. If the sites contain contaminated land, site remediation and / or removal of contaminated material for offsite for disposal will be undertaken. Overlying deposits are assumed to suitable for supporting smaller site structures, larger assets could be founded on bedrock deposits using bored or CFA piling.

2.2.6. Otterbourne WSW Proposed Pre-treatment Design

Otterbourne WSW is currently undergoing refurbishment to address issues identified by a notice from the DWI to reconfigure a new combined disinfection stream comprising of UV and chlorination of the surface water and ground water stream by 30th June 2020. The DWI have given SW a target date of the 31 December 2026 to construct and commission a long term pre-disinfection treatment at Otterbourne WSW which will replace the old clarification and rapid gravity filtration plant (surface water works) and the membrane plant (groundwater works). Due to the uncertainty in the development of the Preferred Option under the WFLH programme, several water quality profiles, described below, had to be investigated prior to deciding on the most appropriate pre-disinfection technology for Otterbourne WSW as follows:

- A blend of the river and ground water
- Recycled water blended with HTR raw water

The turbidity of the combined ground and river water quality is approximately 10 NTU (maximum) and 3.0 NTU (average) and TOC of 2.0 mg/l (maximum) and 1.0 mg/l (average) ([redacted]). The range in varying raw water quality from the new sources (blend of river and groundwater as well as HT raw water) is illustrated in Figure 20. This quality of raw water is effectively outside the proven treatment ranges of conventional clarification processes such as Dissolved Air Flotation (DAF), flat bottom clarified and Actiflo and more in the range of MF / UF membranes. However, based on the known challenges of the existing Memcor MF groundwater plant in conjunction with the lack of space at the WSW, the evaluation of ceramic membranes to provide an effective and compact long-term front-end treatment solution has been identified.



	Al (Dissolved) ug/l	Carbon (Dissolved) mg/l	TOC mg/l	Fe (Dissolved) ug/l	Mn (Dissolved) ug/l	pH	Turbidity NTU	Al ug/l	Fe ug/l	Mn ug/l
River Itchen	29.91	1.05	1.48	56.28	3.83	8.12	11.44	33.37	78.80	5.32
Borehole	14.50	0.58	0.63	5.23	0.85	7.33	0.25	14.50	4.93	0.85
WRP		0.96	0.92	9.51	3.34	5.58	0.17	14.48	9.12	3.10
HT Modelled (No Blend)						8.40	7.50	311.00	1133.00	234.00

Figure 20 - Graph showing the average WQ for a range of determinants across the River Itchen, Combined Boreholes at Otterbourne WSW and from the WRP

Figure 21 below illustrates a summary of modelled raw water quality from HTR. This data was provided by PW and was used to establish the worst-case water quality that Otterbourne WSW may have to treat if Option D.2 or B.4 is selected.

Table 2-1 Observed water quality data and predicted reservoir concentration after mixing (2011–2019)

		Modelled[1]	Observed							
		HTSR	Springs (data from 2011–2019)		Feeder streams (2018 – 2019 – see section 1.4)					
			Bedhampton		HT 1		HT 2		HT 3	
Determinand	Unit	Avg[1]	Avg	95%	Avg	95%	Avg	95%	Avg	95%
Aluminium (total) as Al	µg/l	311	35.2	164	1288	3069	1250	3206	990	3540
Colour	mg/l Pt/Co	9	1.30	4.13	55.3	98.6	43.8	94.4	48.0	83.1
Iron (total) as Fe	µg/l	1133	37.1	145	4663	2539	3463	9941	8325	36027
Manganese (total) as Mn	µg/l	234	0.47	1.40	706	1182	345	942	670	2540
Turbidity	NTU	7.5[3]	0.60	2.11	376	90.2	87.7	437	67.6	413.2
Total Organic Carbon	mg/l	ND[4]	0.99	2.09	13.22	21.70	10.69	21.48	12.63	31.25
Total Dissolved Solids (TDS)	mg/l	247	250	353	116	119	95	117.4	110	124
Temperature	degC	10	11.1	12.1	8.54	13.67	9.96	16.0	10.6	19.1
pH	-	8.4[2]	7.22	7.38	5.52	6.49	5.63	7.24	5.56	6.49
Alkalinity, as $CaCO_3$	mg/l	179	239	251	13.8	14.7	21.1	48.2	15.0	30.8
Calcium hardness, as $CaCO_3$	mg/l	ND[4]	112	117	52.8	87.7	83.3	261	53.3	149
Chloride	mg/l	27.2	21.7	24.3	46.5	77.9	35.3	49.7	36.7	42.4
Sulphate SO_4	mg/l	18	16.9	22.7	35.4	70.6	39.6	104	37.1	106
Total P[5]	mg/l	0.013	21.5	31.0	19.8	50.5	29.4	80.3	21.7	57.7
Nitrate N		6.4	33.3	38.6	0.95	3.43	0.78	1.90	1.02	2.41
Calcium Ca	mg/l	89	112	117	13.6	25.4	21.5	83.5	9.9	25.1
Conductivity	µS/cm	438	525	576	316	370	266	493	242	432

1 Mixed concentration calculated by annual spreadsheet model unless stated otherwise
2 Cannot be calculated by the mixing model so expert judgement applied
3 Derived from trophic status model, chlorophyll data for source waters not available
4 Not included in spreadsheet model
5 Modelled TP using reservoir model (median values)

Figure 21 - Modelled raw water quality data from HTR (ref: PW's Water Quality Study – Water Quality Modelling Report, Atkins, 2020)

SW aims to launch a [redacted] initiative in 2021 to prove the efficacy of ceramic membrane technology. The cost estimate and site layout has been based on the inclusion of a ceramic membrane technology from [redacted] given this is the only supplier in the UK with Regulation 31 approval at this stage and represents a worst-case WLC. It is worth highlighting that unless the pilot trial is successful, SW will consider other pre-disinfection technologies to meet the Notice requirement to identify a solution by December 2022.

The initial concept design has been undertaken prior to the results from any pilot trials therefore the process block diagram illustrated in Figure 22 below is based on assumptions regarding treatability and performance expectations. The following assumptions have been made:

- Backwash water for the Ceramic Membrane Plant (CeraMac) shall be obtained from the membrane backwash tank
- Backwash water for the GAC Contactors shall use GAC treated water from a GAC backwash tank
- The chemicals identified are based on previous membrane treatment design experience. Pilot trials shall confirm actual chemical and dose rates to reflect the raw water treatment challenges.

- With losses and returns the pre-treatment and membrane filtration units will need to treat a throughput of c.100 Ml/d therefore 14 x CeraMac units are considered appropriate until pilot trials have been concluded
- To provide resilience there are a minimum of 2 process streams operating in parallel with one stream able to treat a flow of 75 Ml/d
- Each CeraMac uses a dedicated local backwash tank to discharge and wash the membranes which uses compressed air as motive energy source
- Backwashing, enhanced chemical backwashing and CIP processes work automatically based on pilot trial findings
- Backwash water can be treated (settlement and thickening) with sludge disposed to sewer and reclaimed water recycled to the head of the works

The output of the membrane plant will pass through to the revised disinfection plant currently being developed during Asset Management Plan 7 (AMP7). The available land for the treatment plant is small with access road bounding the land that is used by neighbours adjacent to the allocated area.

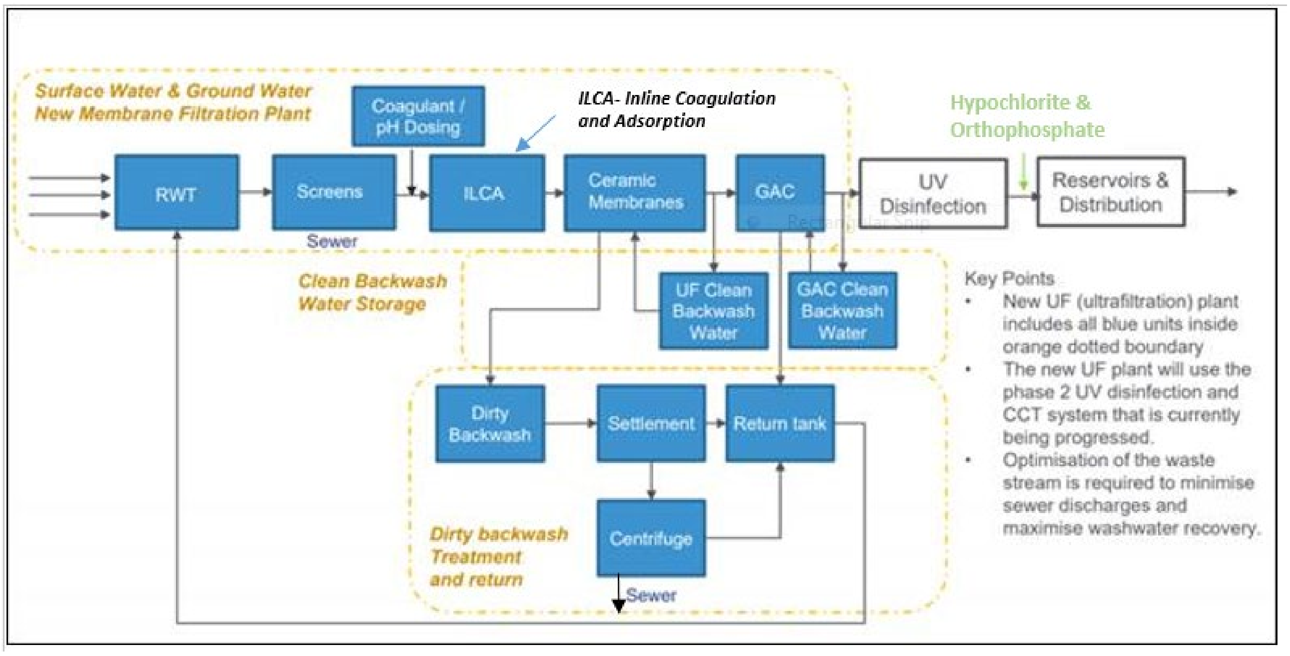


Figure 22 - Simplified process flow diagram, spatial general arrangement has been based on the proposed new process units, including three feed types to head of works

The proposed layout of the changes at Otterbourne WSW are illustrated in Figure 23.

[redacted]

Figure 23 - Otterbourne WSW proposed pre-disinfection plant

2.2.6.1. Otterbourne WSW Pre-disinfection Plant Constructability

In broad constructability terms, the construction would be similar to the WRP, and also presents the opportunity to employ both traditional building methods as well as offsite modular approaches. The area is within the existing WSW, adjacent to other commercial users and also residential properties on the access route. Various cladding systems to suit the desired appearance could be used. A similar approach to the buildings for the plant have been assumed with smaller mechanical and electrical equipment being housed in kiosks in the location where it is required.

As the proposed location is within the existing WSW, there are complications:

- The existing works will need to be operational during construction. This limits working areas and imposes logistical development challenges.
- There are often unknown or historic buried asset within older WSW sites that need to be located and potentially diverted
- For such a significant build there is limited space and sequencing of the re-development will be required to produce an optimal facility

Key Engineering Risks and Opportunities

SWIFT (Structured SWIFT (Structured What If Technique) workshops have been undertaken for both the infra and non infra elements of the project. The actions identified have been addressed, risks included in the project Risk Register. Key engineering, construction risks and opportunities critical to the deliverability of the Option have been captured in this section. Further information can be found in Section 2.7 Risk Management and 2.5 Environment.

Process Plant Risk and Opportunities

- Risk that the estimated electrical upgrade scope as provided by the DNO is not sufficient for the final scheme design, leading to additional costs and a programme extension
- Risk that the ground conditions encountered are worse than those assumed, leading to a change in foundation design, increased costs and delays to the programme
- Risk of having to install further pre-treatment infrastructure in order to ensure FE quality does not impact on the operation of the WRP, leading to additional assets being required at additional cost

2.2.7. Havant Thicket Reservoir Connections Risk and Opportunities

SW and PW are working together to identify opportunities to optimise the existing designs for HTR to facilitate the future enhanced used of the reservoir via SW's Havant Thicket alternatives (Options B.4 and D.2). There are many advantages of early work to optimise the design including: minimising the impact on delivery and the surrounding environment and enhancing future resilience. As the design develops the following areas should be further tested and understood for both Option B.4 and D.2:

- Installation of a tee to supply the HLPS from the existing reservoir combined supply / abstraction point or
- Changing of the reservoir operational regime, from a winter storage model to a model which allows for continuous abstraction (to cover the sweetening flow for the pipeline transfer to Otterbourne)
- Potential to utilise PW inlet / outlet pipeline as common drawdown from reservoir, eliminating requirements for an additional pipeline through Havant
- Network integration and interface management at both Otterbourne and [redacted]

The following apply to Option B.4 only for enhanced understanding:

- Infrastructure design to enable adequate mixing of the spring water with the recycled water
- Provision of a raw water blending tank at [redacted] and combined transfer to HTR via dedicated inlet pipeline
- Viability of a tunnel through Havant to house both the WRP inlet pipeline and HT raw water transfer pipeline to Otterbourne WSW.

2.2.8. Pipeline Transfers Risk and Opportunities

SWIFT workshops have been undertaken for both the infra and non-infra elements of the project. The actions identified have been addressed risks included in the project Risk Register. Key engineering, construction risks and opportunities critical to the deliverability of the Option have been captured in this section. Further information can be found in Chapters 2.7 Risk and 2.5 Environmental of this annex.

2.2.8.1. Option D.2

The pipeline routes represent a large proportion of the scope of works for Option D.2 and a significant part of the scope of Option B.4, with the longest pipe, c.35 km, being between HTR and Otterbourne WSW. All routes considered interface with main rivers, main roads, railways, the Aquind Interconnector and Esso Pipeline Nationally Significant Infrastructure Projects. Where possible techniques will be deployed to minimise risk of these interfaces.

This section describes specific areas where further understanding is required to inform the design:

1. The pipeline route into Otterbourne WSW is common to all route corridors and presents multiple constraints, including crossing the South West Mainline railway and the River Itchen valley and associated environmental designations, illustrated in Figure 24 below. The pipeline route will also be in close proximity to existing SW strategic mains and a number of SW boreholes and wells, which feed Otterbourne WSW and [redacted].
    - A detailed desk study has been undertaken at this location, including review of SW existing utilities, geotechnical desk study and a constructability review. Two potential trenchless method were identified, one to pass under all constraints, the other to use a combination of trenchless construction and open cut through an existing Railway underpass.
    - There is an opportunity to consider a larger diameter tunnel to negotiate the constraints around Otterbourne WSW. Tunnelling presents less risks during construction and could be used as a conduit to house additional pipelines (including or example [redacted] AMP7 Scheme) or for future resilience – to facilitate larger diameter / additional pipelines.
    - Further assessment and consultation regarding the alignment and construction methodology will be undertaken to inform the design should this Option be taken forward.

[redacted]

Figure 24 - Option D.2 Constraints Corridor Map

2. Pipeline corridor 3 is proposed to follow the local road network through Havant. This presents significant risks in regard to constructability and construction impact on the local community.
    - A desk study has been undertaken to consider both a trenchless method for the 800 mm ID transfer pipeline and an alternative larger diameter tunnelling route.
    - The tunnelling Option presents less risks during construction and could be used to house additional pipelines or for future resilience.

3. Corridor route 3 presents significant risks in the [redacted] area, multiple constraints including PW [redacted], Aquind Interconnector Nationally Significant Infrastructure Project to the south and [redacted], Portsmouth golf course, a nearby Ministry of Defence (MOD) facility and service reservoir to the north. There are also a significant number of high-risk services located within the carriageway and PW plans to install cross connections on its existing raw water mains.
   - A desk study is being undertaken to consider alternative routes and construction methods, including micro-tunnelling and installing a larger segmental tunnel. Collaboration with PW is also underway to understand the location and time scale of their proposed works to maximise opportunity for joint working.
4. Pipeline corridor 4 proposes a route west from HTR through Waterlooville utilising open cut methodology within the dual carriage way of the B2150. This route is high risk, due to permissions that need to be sought significant traffic management requirements and the disruption to the local community.
   - Desk studies to investigate alternative trenchless techniques / tunnelling have been undertaken. If this Option is pursued, consultation with the HA will be undertaken and alternative road network routes investigated.
5. Pipeline corridor 4 has a significant length routed though Creech Woods, a Local Wildlife Site, part of which is also along the alignment of a [redacted], this route is not believed to be feasible but alternative routing to the north or south is possible.

2.2.8.2. Option B.4

In addition to the risks and opportunities related to Option D.2, Option B.4 includes additional considerations described and illustrated in Figure 25 below. All pipeline routes from the WRP to HT will require a trenchless crossing of a main river, main roads and the West Coastway railway line, further key engineering risks and opportunities, are as follows:

1. If the preferred pipeline alignment from the offtake at HTR is routed south through Havant (Route 3) two pipelines through Havant will be required. It is unlikely that both of these pipelines could follow the local road network due to limited working space and number of existing utilities, significant traffic management challenges managing two schools and local health care centre. SW, in collaboration with PW carrying out further investigations and development of alternative solutions.
2. Proximity of pipeline to PW [redacted] Site and PW strategic mains / planned upgrade works. SW, in collaboration with PW is carrying out further investigations and development of alternative solutions to optimise potential pipeline routes.

[redacted]

Figure 25 - Option B.4 Constraints Corridor Map

2.2.9. Water Safety Planning

2.2.9.1. Water Recycling Plant WSP Development Plan

The following section defines the methodology for the development of the WSP, how gaps within the data have been resolved as well as limitations in the sampling data.

The DWI expects any water company to adopt a drink WSP approach, a derivation of WHO approach, to identify the inherent risk to the source water. The systematic nature of the water safety planning strategy has allowed for the suitability in ensuring the safety of water in the supply system. SW's Risk & Resilience Team is the expert team in the organisation, and the current WSP methodology is defined by WSP Risk Assessment & Monitoring Methodology (WSP301), a methodology aligned with the specifications of British Standards document BS EN 15975-2:2013 (BS15975-2).

At Gate 1 it was not possible to complete a WSP for the system due to this being an on-going project with site selection, detailed design, and operating plans to still be confirmed, and the limited availability of water quality data. Since Gate 1 the following progress has been made:

1. A Water Recycling Pilot System has been commissioned at PC WTW alongside a sampling plan to gather extensive water quality data.
2. Hazards have been identified in the water supply system that impact microbial and chemical parameters that are required as part of compliance with water quality standards.

3. Donor site selection has been conducted to confirm the source water for the water recycling plant.
4. WSP have been developed, with a committee of water treatment practitioners and experts with knowledge and experience in public health.
5. Several meetings with the DWI were undertaken on [redacted] to share findings and gather implications of findings from a regulatory standpoint and to resolve issues and concerns arising from the findings.

The key inputs at Gate 2, building on the Gate 1 work, was the definition of the system and the catchment sampling plan that was used for the analysis. The WSP has already been provided to, and discussed with, the DWI.

2.2.9.2. Definition of Water Supply System

SW's WSP risk assessment follows a source-to-tap process whereby assets are risk assessed and the controlled risk scores are cascaded down to the downstream assets. There are six asset sub-system type, illustrated in order of occurrence in the source-to-tap process. Due to the water from HTR being fed into Otterbourne WSW rather than being supplied into the distribution system, WSPs were created up to the storage sub-system, HTR, as the downstream sub-system are covered by existing assets which will be updated based on the new source of water, with new WSPs.

As mentioned in section 2.1 above, PW's water quality modelling data was used to understand the proposed raw water quality from the HTR; this data was provided by PW and is illustrated in Figure 25 above. It has been assumed that the sampling carried out to allow modelling of HTR was representative and covered seasonal changes in yield and therefore potentially raw water quality as well. However, the model has not been updated to produce a blended water quality profile that may help refine the pre-disinfection design at both [redacted] and Otterbourne WSW.

There is one source which feeds into the WRP, hence individual WSPs have been made for the catchment and abstraction at BF WTW (Figure 26). Boundaries were defined for each of the sub-systems as stated:

1. Catchment has been defined as all the influent into the WTW, including domestic sewage, trade effluent, infiltration flow and surface run-off
2. Abstraction has been defined as the WTW as the FE is the influent of the WRP
3. Treatment is the WRP
4. Storage is defined as the HTR which is blended with water from the HT Catchment and [redacted]

A hazard and hazardous event identification session was carried out at Gate 1 and the participants included SW's water quality and public health team, water risk team, external participants included [redacted] as well as technical experts from A[redacted]. This panel enabled SW to develop the framework for the WSPs and consider hazards directly linked to the compliance-based parameters within the Water Supply & Water Quality Regulations 2018 with the addition of several other hazards such as Cryptosporidium, Somatic Coliphage and Loss of Supply hazards. In addition to regulated constituents being sampled, a range of unregulated chemical compounds, including pharmaceuticals and personal care products, endocrine disrupting compounds and non-regulated disinfection by-products have been considered in the WSPs to demonstrate the wholesomeness of the water to protect both public and environmental health.

Hazards at each stage of the water recycling supply system were adequately risk assessed to ensure protection of public health, compliance with regulated parameters and to ensure a continuous water supply. For these hazards an implemented sampling plan has allowed for the collection of a large dataset at various points described below. Assessment of specific determinants has been determined at a sub-system level. Determinants assessed have been decided based on existing permits (where applicable), removal rates expected across treatment processes, sampling data, Prescribed Concentration Values (PCVs) and WHO guidelines.

Consequences scores are aligned to the DWI's parameter-based scoring mechanism, with suitable scores designated by SW's experts where data is not available. Likewise, likelihood ratings were scored through a range of different metrics, based on comparing the sampling data to the PCV and WHO guideline values where a PCV was not available, the rate of removal across treatment and comparing the blending scenarios downstream of the water recycling plant. For consistency in the source-to-tap system, the risk scoring has cascaded from upstream processes to downstream WSPs i.e. the controlled risk scoring for the [redacted] Catchment became the uncontrolled risk score for the [redacted] Catchment FE.

Limitations arose in the development of the WSP such as:

- The identification of a few determinants (e.g. vinyl chloride) whereby the Minimum Detection Limit (MDL) was greater than the PCV therefore further investigations are required to determine more representative sampling results to determine the risk
- Several determinants tested did not have a DWI code assigned, as a result holding codes were assigned to the list of determinants to include the additional compounds being tested as part of the catchment sampling plan
- The risk customer acceptance associated with the changes in the taste of water is not yet determined. This aspect of the delivery of the project can be considered through the "Risk Management and Communication" component of the WHO's WSP Framework.

A draft of the WSPs has since been submitted to the DWI for review and no comments received. The WSPs have been reviewed and authorised for issue by SW's water risk team.

2.2.9.3. WSP Summary

The following section will summarise risks identified in the WSPs. A selection including metals, organics, inorganic and bacteriological risks has been selected to illustrate the risks from source, i.e., wastewater catchment, through to the multi-barrier system in place at the wastewater treatment plant, the water recycling plant and the drinking water supply works as an overall system, to eliminate the risks.

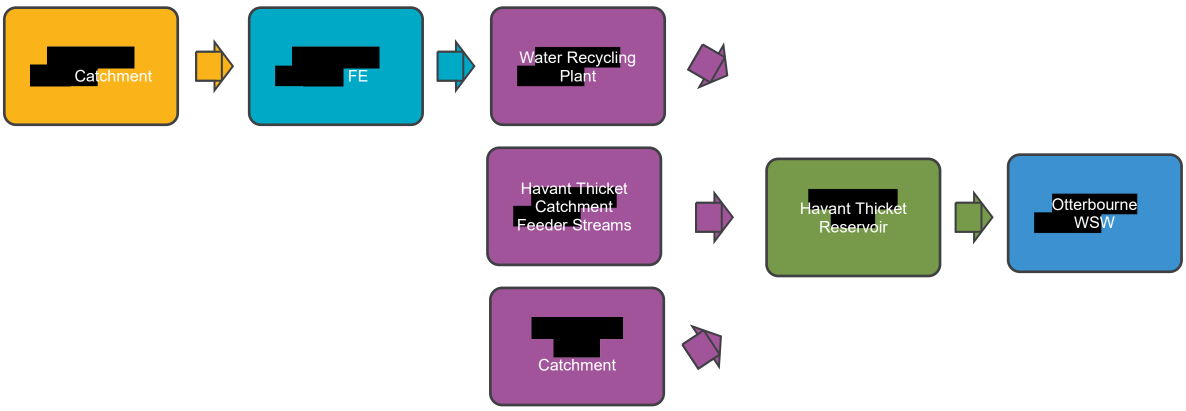


Figure 26 - Water supply sub-system used for WSP

2.2.9.4. [redacted] Catchment

The development of the catchment WSP considered sampling data as well as control measures such as trade discharge permits existing within the respective catchments. Based on the source of wastewater coming into the catchment ranging from domestic sewage, industrial waste and surface run-off, the likelihood of pathogenic, faecal contamination, microbial and chemical concentration is expected to be high when comparing the quality of water to drinking water standards. It was identified that the sampled water quality exceeds the PCV for drinking water hence a rating of 10 was given as the pre-likelihood score for those that showed a high risk. However, not all determinants were given a pre-likelihood score of 10. This is due to comparing the water quality sampling results to the PCV; in the context of Chromium the amount of dilution as well as the maximum detected value being less than the PCV by several magnitudes led to the pre-likelihood rating of 5. In addition, as there are trade discharge permits in place due to the presence of metal plating and chrome electroplating companies in the catchment, the post likelihood was reduced to a 3 as the detected values are not close to the upper consensual limits for trade discharges. Chloroform was detected at levels less than the PCV however as there are no control measures in place to control the presence of this determinant in the catchment the risk scoring for the likelihood has remained the same.

2.2.9.5. [redacted] Catchment and FE from [redacted]

Evaluation of the post likelihood scoring was based on the effectiveness of removal from the respective WTW as well as comparing the sampling results to the PCV. As expected, the microbial and inorganic contents remain high within the FE when comparing the drinking water PCV but the risk when compared to the influent has reduced due to the treatment. Therefore, the WTW are able to reduce the concentration of what is being fed from the catchment but there is still residual chemical and biological load leading to the high residual risk being maintained. Results indicate that the post likelihood from the catchment WSP cascade into to the pre likelihood for the FE WSP detailed in Table 8 and Table 9.

Table 8 - Example of WSP for [redacted] Catchment

Asset Name	Stage	Hazard	Pre-Likelihood	Pre-Consequence	Risk	Control Measure Details	Post Likelihood	Residual Risk
[redacted]	Catchment	A002 - Turbidity	10 - Almost Certain	5 - Health Risk	50		10 - Almost Certain	50
[redacted]	Catchment	A022 - Iron (Total)	10 - Almost Certain	4 - Health Risk Indicator	40	Trade discharge permit is present for this hazard	3 - Medium	12
[redacted]	Catchment	B004 - Chromium (Total)	5 - Probable	5 - Health Risk	25	Trade discharge permit is present for this hazard	3 - Medium	15
[redacted]	Catchment	C001 - Total Coliforms (Confirmed)	10 - Almost Certain	5 - Health Risk	50		10 - Almost Certain	50
[redacted]	Catchment	C002 - E. coli (faecal coliforms Confirmed)	10 - Almost Certain	5 - Health Risk	50		10 - Almost Certain	50
[redacted]	Catchment	D011A - Trichloromethane-Chloroform (Total)	3 - Medium	5 - Health Risk	15		3 - Medium	15

The development of the WSP for the FE from BF WTW demonstrates the need for a treatment process that can remove salinity and microbiological pathogens as well as removing organics and metals from the FE stream to produce water of a similar quality to what is currently being abstracted at Otterbourne WSW. Hence, there is a need for membranes, disinfection and remineralisation treatment to treat the FE.

Table 9 - WSP for [redacted] Final Effluent

Asset Name	Stage	Hazard	Pre-Likelihood	Pre-Consequence	Risk	Control Measure Details	Post Likelihood	Residual Risk
[redacted]	Abstraction	A002 - Turbidity	10 - Almost Certain	5 - Health Risk	50	PST>ASP>FST	5 - Probable	25
[redacted]	Abstraction	A022 - Iron (Total)	3 - Medium	4 - Health Risk Indicator	12	PST>ASP>FST	3 - Medium	12
[redacted]	Abstraction	B004 - Chromium (Total)	3 - Medium	5 - Health Risk	15	PST>ASP>FST	3 - Medium	15
[redacted]	Abstraction	C001 - Total Coliforms (Confirmed)	10 - Almost Certain	5 - Health Risk	50	PST>ASP>FST	10 - Almost Certain	50
[redacted]	Abstraction	C002 - E. coli (faecal coliforms Confirmed)	10 - Almost Certain	5 - Health Risk	50	PST>ASP>FST	10 - Almost Certain	50
[redacted]	Abstraction	D011A - Trichloromethane-Chloroform (Total)	3 - Medium	5 - Health Risk	15	PST>ASP>FST	3 - Medium	15

2.2.9.6. Water Recycling Plant

The WSP across the WRP determined the effectiveness of the multi-barrier controls in place to produce drinking water. The presence of membranes, disinfection and remineralisation has resulted in water that is significant cleaner than the FE from the WTW. This can be seen by the reduction in risk before and after the control measures are considered.

Table 10 - WSP for the WRP

Asset Name	Stage	Hazard	Pre-Likelihood	Pre-Consequence	Risk	Control Measure Details	Post Likelihood	Residual Risk
WRP	Treatment	A002 - Turbidity	5 - Probable	5 - Health Risk	25	MF>RO>UV>Remin	1 - Most Unlikely	5
WRP	Treatment	A022 - Iron (Total)	3 - Medium	4 - Health Risk Indicator	12	MF>RO>UV>Remin	1 - Most Unlikely	4
WRP	Treatment	B004 - Chromium (Total)	3 - Medium	5 - Health Risk	15	MF>RO>UV>Remin	1 - Most Unlikely	5
WRP	Treatment	C001 - Total Coliforms (Confirmed)	10 - Almost Certain	5 - Health Risk	50	MF>RO>UV>Remin	1 - Most Unlikely	5
WRP	Treatment	C002 - E. coli (faecal coliforms Confirmed)	10 - Almost Certain	5 - Health Risk	50	MF>RO>UV>Remin	1 - Most Unlikely	5
WRP	Treatment	D011A - Trichloromethane-Chloroform (Total)	3 - Medium	5 - Health Risk	15	MF>RO>UV>Remin	1 - Most Unlikely	5

The sampling data from the pilot effluent shows that the risk across the treatment stage would not increase for determinants such as organic compounds, therefore the risk of forming DBPs is very low for this system. In addition, the pilot effluent data shows that for most compounds that have a PCV associated with them the sampled results do not exceed this value. However, 1, 4-Dioxane in the FE exceeded the PCV of 100,000 ng/l; given this concentration is less than data measured in the River Test (160,000 ng/l) and equal to River Itchen (100,000 ng/l) data, this is not a greater risk than the current scenario. Noticeably, pharmaceuticals measured in the WRP effluent had a concentration of below the MDL. The maximum concentration across all pesticides tested was 20 ng/l, Microbial determinants were undetected.

2.2.9.7. Havant Thicket Reservoir

The WSP across the reservoir determines the risk of the water when abstracted to Otterbourne WSW, as this becomes the new Regulation 15 point. The WSP for this sub-system was conducted by use of the catchment WSP provided by PW for the [redacted] Catchment, this data became the uncontrolled risk. Using modelled water quality data of HTR raw water, the post-likelihood ratings were generated based on the risk of sedimentation, mixing and an increase in contaminants from uncontrollable sources such as birds. Based on the volume of water that is feeding the reservoir in comparison to the spring sources, there is a greater dilution on determinants as the quality of recycled water is significantly greater than the spring water. The assumptions made to produce the WSP for HTR include:

1. Long residence time (days instead of hours) to allow for sedimentation of metals and a reduction in turbidity
2. Adequate mixing to prevent short circuiting during fill and draw

The WSPs for the D.2 and B.4 Options were developed in consultation with PW and the tables below detail the risk scores for a selected number of compounds. HTR is an open body of water with risks associated with birds, flora and fauna that will potentially develop in the system, therefore, the residual risk on compounds like E-coli have been rated as probable and the risk with metals such as Iron has been reduced, as dilution is in a large volume of water is expected to reduce the risk. Note that these risk estimates will be revisited once the HTR is operational.

Table 11 - WSP for HTR D.2 Option

Asset Name	Stage	Hazard	Pre-Likelihood	Pre-Consequence	Risk	Control Measure Details	Post Likelihood	Residual Risk
HTR	Storage	A022 - Iron (Total)	10 - Almost Certain	3 - Aesthetic	30	Large reservoir with sufficient mixing and settling time included in the design	5 - Probable	15
HTR	Storage	B004 - Chromium (Total)	1 - Most Unlikely	5 - Health Risk	5	Large reservoir with sufficient mixing and settling time included in the design	1 - Most Unlikely	5
HTR	Storage	C001P - Total Coliforms (Presumptive)	3 - Medium	5 - Health Risk	15	Large reservoir with sufficient mixing and settling time included in the design	3 - Medium	15
HTR	Storage	C002P - E.Coli (faecal coliforms Presumptive)	5 - Probable	5 - Health Risk	25	Large reservoir with sufficient mixing and settling time included in the design	5 - Probable	25
HTR	Storage	D011A - Trichloromethane-Chloroform (Total)	1 - Most Unlikely	5 - Health Risk	5	Large reservoir with sufficient mixing and settling time included in the design	1 - Most Unlikely	5

Table 12 - WSP for HTR B.4 Option

Asset Name	Stage	Hazard	Pre-Likelihood	Pre-Consequence	Risk	Control Measure Details	Post Likelihood	Residual Risk
HTR	Storage	A022 - Iron (Total)	10 - Almost Certain	3 - Aesthetic	30	Spring water blended with recycled water in a large volume with a high residence time and mixing within the reservoir to prevent short-circuiting of flows during fill and draw	5 - Probable	15
HTR	Storage	B004 - Chromium (Total)	1 - Most Unlikely	5 - Health Risk	5	Spring water blended with recycled water in a large volume with a high residence time and mixing within the reservoir to prevent short-circuiting of flows during fill and draw	1 - Most Unlikely	5
HTR	Storage	C001P - Total Coliforms (Presumptive)	3 - Medium	5 - Health Risk	15	Spring water blended with recycled water in a large volume with a high residence time and mixing within the reservoir to prevent short-circuiting of flows during fill and draw	3 - Medium	10
HTR	Storage	C002P - E.Coli (faecal coliforms Presumptive)	5 - Probable	5 - Health Risk	25	Spring water blended with recycled water in a large volume with a high residence time and mixing within the reservoir to prevent short-circuiting of flows during fill and draw	5 - Probable	25
HTR	Storage	D011A - Trichloromethane-Chloroform (Total)	1 - Most Unlikely	5 - Health Risk	5	Spring water blended with recycled water in a large volume with a high residence time and mixing within the reservoir to prevent short-circuiting of flows during fill and draw	1 - Most Unlikely	5

2.2.10. Resilience Benefits

2.2.10.1. Background

A quantitative assessment of resilience for the Options progressed at Gate 2, which built on the methodology presented at Gate 1, and is based on SW's [redacted]. The tool is designed to assess a number of factors which constitute resilience, hence providing quantified resilience scores for comparison. The tool assesses risk drivers (Impact, Duration, Likelihood, and Vulnerability) and resilience control factors (Redundancy, Response & Recovery, Resistance, and Reliability) for each site. These control factors align to both Ofwat's resilience expectations and the resilience criteria defined by both RAPID and WRSE.

The use of the SW [redacted] has further ensured that the approach is focused on the ability of our key assets and sites to cope with and recover from shocks and stresses. It assesses the ability of sites within a water supply zone or catchment to endure these shocks through the controls already in place. The approach is consequence led in that a resilience assessment tool is used to quantify the potential consequence to customers, drawing out the risk drivers / causes and the strength of each control factor. This in turn enables the prioritisation of site improvement.

2.2.10.2. Approach

Testwood and Otterbourne WSW account for half of the total zonal risk in the Hampshire region. [redacted]

For the purpose of this assessment, resilience has been assessed from two perspectives:

1. The non-drought resilience benefit provided by the SRO in a Business as Usual (BAU) situation
2. The resilience benefit provided by the SRO in the event of a 1-in-200-year (stressed) drought

This assessment will enable SW to:

1. Understand how the number of properties that will lose supply will change in the event of non-operation of either site in a drought or in a non-drought condition in comparison to a baseline situation in which no SRO is implemented
2. Quantify how much more resilient Otterbourne will be when facing the four key shocks and stresses; raw water loss, severe flood, contamination and critical asset failure
3. Align to Ofwat's resilience expectations and assess against the resilience criteria defined by both RAPID and WRSE in the Gate 2 resilience criteria

For the resilience assessment there is no difference between the peak flow between D.2 and B.4 as the transfer main from HT to Otterbourne WSW is the same.

2.2.10.3. Results

To assess the resilience benefit of the SRO Options using the SW [redacted] a number of assumptions were made and a number of key steps were taken in assessing the resilience to ensure that RAPID and WRSE resilience criteria would be met. This included the following:

1. Assessing the impact on the number of properties served
2. Assessing the impact on Redundancy of Testwood WSW and Otterbourne WSW
3. Assessing the impact on Response & Recovery, Resistance and Reliability for Testwood WSW and Otterbourne WSW
4. Assessing the impact on the risk drivers (Impact, Duration, Likelihood, and Vulnerability), where applicable, for Testwood and Otterbourne WSW

Theoretically it was realised, in undertaking the resilience assessment, that the Redundancy element was the significant difference between the SRO Options in the BAU and stressed scenarios. Table 13 below details the peak output flows, average daily flows and the calculated headroom flows that were used to assess for Redundancy and provide the rationale for assessing the Redundancy scores in the SW [redacted].

Table 13 - Summary of flows used to assess the redundancy for the Havant Thicket Options

[redacted]

Table 14 details the high level and quantitative resilience benefits for the SRO Options as well as the Baseline - BAU (i.e. a no SRO Option in place).

Table 14 - High level and quantitative resilience benefits for Options

[redacted]

The Consequence Score is an absolute measure of customer risk to loss of supply and is also known as Properties at Risk. Whereas the Resilience Score is a ratio between the total number of properties and the Consequence Score. The closer to 1, the greater the resilience.

[redacted]

It is important to note that the SW approach to resilience is developed and evaluated on the basis of assessing the resilience of the overall system, rather than simply the resilience of each individual asset or SRO. Resilience of each individual asset or SRO is done via analysing the resilience contribution of each asset or SRO to the overall system. Table 15 summaries the resilience impact for the HT based SRO Options via Otterbourne WSW.

Table 15 – Havant Thicket based Options D.2 and B.4 resilience impact summary

Resilience Criteria	Assessment
Integration with existing network strengthening solutions / plans	As these Options do not operate as WSW in their own right and are dependent on Otterbourne WSW and are limited by the resilience of Otterbourne WSW. Nevertheless, they still significantly increase the zonal resilience when compared to the baseline BAU scenario.
Adaptability of operation emergency response in a stressed situation (e.g. peak week demand)	In a stressed scenario the SROs can be leveraged to increase resource availability to the maximum possible that can be processed at Otterbourne. [redacted] Nevertheless, the increase in raw water sources and the decrease in critical points of failure at Otterbourne following upgrades contribute to a lower likelihood of this occurring. Therefore, only 8,402 more properties are at risk of losing supply in a drought where Otterbourne dependent SROs are chosen.
Regional resilience	The zonal resilience score is more than doubled in BAU and stressed conditions. This highlights that the resilience of Otterbourne is crucial to the zone as a whole. Building redundancy and reliability into the system through the extra headroom and new raw water sources brings positive benefit to the region overall. As stated, the lower zonal resilience score for the Otterbourne dependent SROs is due to the increase in asset criticality of Otterbourne WSW.

2.2.11. Preferred Model of Ownership and Operation Expectation

2.2.11.1. Model of Ownership

The model of ownership is covered under the Procurement & Commercial Section 2.11.

2.2.11.2. Operational Utilisation

The operational utilisation is covered under the Section 2.2.3 Redundancy and Operational Strategy.

2.3. Network Infrastructure – Hydraulic Modelling

The Water Resources Management Plan 2019 (WRMP19) sets out SW's response to the water supply challenge in the Western region. The response consists of a strategic new supply source, new and increased bulk supplies from neighbouring water companies, demand management, and new strategic transfer pipelines across the region. SW commissioned a modelling study to confirm the impact of licence reductions (via water resource modelling), and develop a strategic network model to:

- Simulate the connection of a new strategic source to the SW distribution network
- Develop a network infrastructure scheme to transmit the new supply and other proposed WRMP19 additional transfers
- Identify how to integrate this new network with existing water distribution systems

The network model inputs incorporate the outputs from the water resource model, which includes all elements of the WRMP19, including new sources, licence restrictions of existing sources, new and existing bulk transfers and demand management schemes. The model is demand-driven and, in alignment with the water resources model, only uses the capacity of the new raw water source required to meet demand. In alignment with the revised residual deficit identified in an earlier phase of the study, and reported in the Gate 1 submission, this is modelled as 61 Ml/d. The outputs from the water resource model are described separately in the Annex 4 Water Resources Modelling report.

This section describes how the strategic network model was developed to simulate the new water transfer system and its integration with SW's existing distribution network as an aid to the design process. A key output from the study is a set of Options for infrastructure elements that will form the interface between the new bulk transfer network and the existing distribution system; these Options will be developed further in a subsequent phase of the study. The objective of the study is not making comparisons between desalination, water recycling or Havant Thicket SROs (the preference for this is being determined in a separate, wider, process), but to inform the optimal preference for transmission network infrastructure elements within each SROs. This section describes how advanced modelling software was used to develop a set of optimised solutions for the new integration infrastructure and how this can be controlled effectively. It also outlines how a holistic real-time control system can be deployed to control the proposed new network and identifies the associated Information Technology / Operational Technology (IT / OT) requirements. This section also summarises engineering and environmental feasibility studies undertaken at the network integration sites to ensure the concept designs are feasible to install, and identifies the steps required in a subsequent phase of the study to determine the Preferred Option for the new interfacing infrastructure.

2.3.1. Overview of Pipeline Routes

Pipeline routes included in the hydraulic modelling study are illustrated schematically in Figure 27. The transfer routes included are:

[redacted]

[redacted]

[redacted]

Figure 27 - Pipeline schematic

The raw water pipeline from HT to Otterbourne WSW was not included in the study due to the hydraulic disconnect between it and the distribution network at Otterbourne WSW, as indicated by the dotted line in the schematic below. This disconnect means the main will not affect the hydraulics of Grid network. The hydraulic performance of the raw water main, and how it is to be controlled, will be studied separately once the preferred route has been determined.

Key routes in the existing distribution network were also modelled to ensure that derived solutions maintain acceptable levels of service. A diagrammatic overview of the entire model is illustrated in

Figure 28. These key routes included:

[redacted]

[redacted]

2.3.2. Methodology

2.3.2.1. Aim

The aim of the hydraulic modelling project was to identify the optimal configuration and operation of assets to answer the question “What are we going to build?” with respect to infrastructure elements at interface sites between the new grid and the existing distribution network. This is dependent on factors such as operational constraints, capital and operational cost as well as technical and environmental complexities. As such, the study involves close collaboration with other stakeholders such as design teams and Operations.

Studies of the grid interface sites have been undertaken to verify the proposals were feasible with respect to constructability and operation, and in terms of environmental impact. Close liaison and cooperation was required between the modelling, design, enabling and operations teams to ensure the Options are of acceptable complexity with respect to constructability, and can be operated within current operational constraints.

The design process is illustrated diagrammatically in Figure 29. The high-level solution was developed by the modelling team and fed to the design team, who liaised with Operations and Capital Maintenance design teams regarding control and planned works at the sites. Feedback from this was recorded and shared with the modelling team for amendment. Amendments were then confirmed and verified with the Operations and Capital Maintenance teams.

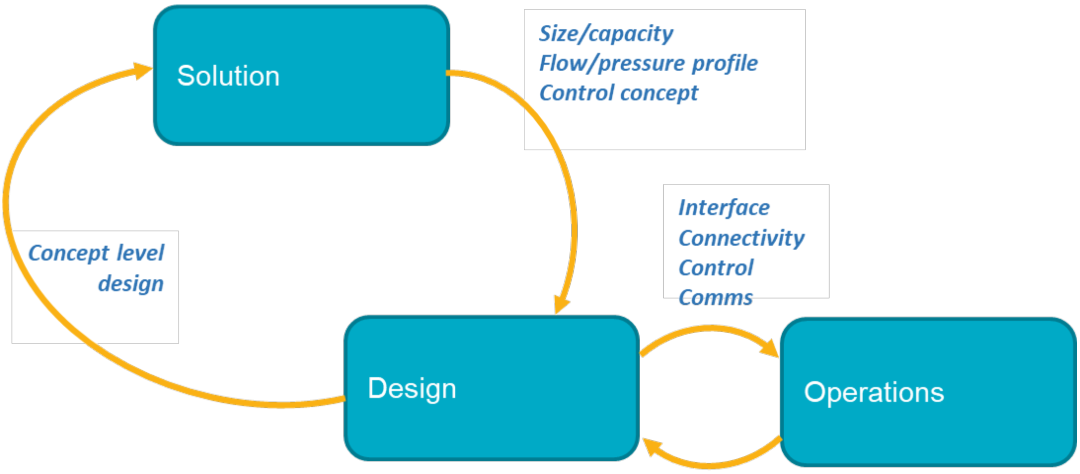


Figure 29 - Iterative modelling / design process

2.3.2.2. Approach

The project used a [redacted] to develop optimal asset configurations, and was chosen to bring efficiencies to the project in terms of program and expenditure. A traditional approach would typically involve a team of hydraulic modellers using an iterative “trial and error” method, but the large number of sites included would mean it would be impossible to evaluate all potential Options, and consequently the most efficient outcome might not be identified. Using [redacted] with which the InfoWorks WS Pro network model was linked as an embedded hydraulic engine, enabled the automatic evaluation of many thousands of trial options computing cost and performance, and incorporating operating constraints and design criteria.

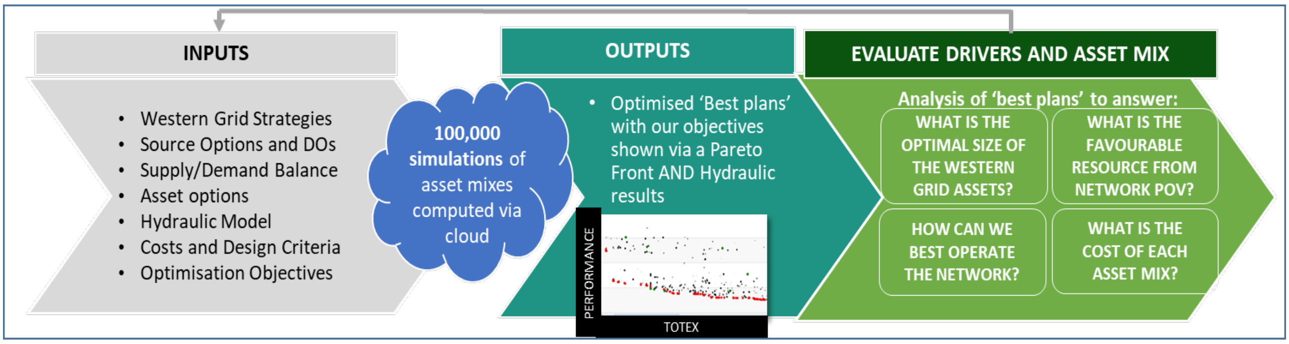


Figure 30 - Modelling approach

The [redacted] model produces a range of least-cost network Options, including asset sizes (such as Grid tanks (potable water storage reservoirs) to balance inlet and outlet flows, and pipeline diameters) and maximising the efficiency of network operational performance, and considers both “normal day”, in a non-drought, and “severe drought day” supply / demand scenarios. The severe drought scenario reflects the 1-in-200-year drought described in WRMP19. Through the simultaneous assessment of cost and hydraulic performance based on data in the hydraulic model, [redacted] models a Pareto curve of plans of prioritised interventions, enabling informed choices about resource and asset allocation. The tool produces a set of plans along a Pareto front that represents the optimal-performing configuration for a budget cost, and therefore quickly identifies Options to be analysed in further detail in the context of risk and operational requirements.

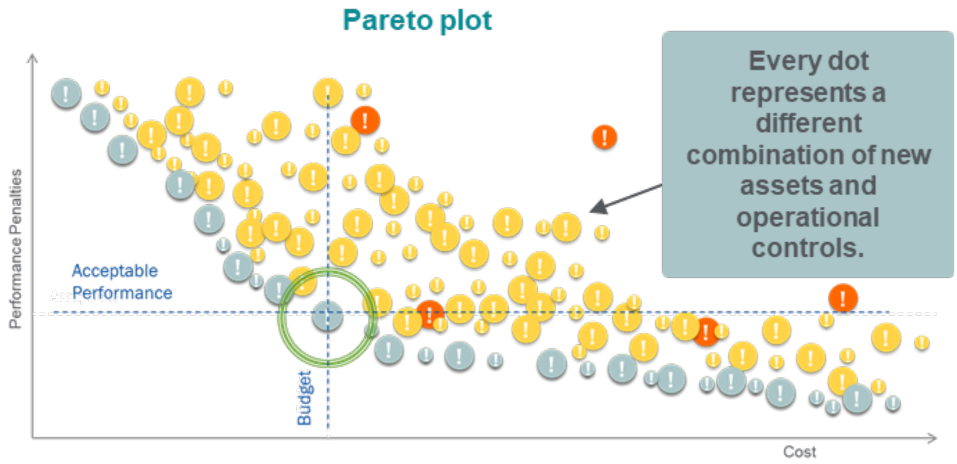


Figure 31 - Example Pareto graph

Developments in Phase 2

Phase 2 has been a refinement to the deliverables in Phase 1, with the key output being a set of results in which there is now a significantly higher level of confidence. Key developments have been the incorporation of the major [redacted] at Testwood WSW and Otterbourne WSW, with the configuration of the hydraulic model updated to reflect these, and there has been further refinement of the operational controls. Phase 2 included model builds of more of the distribution network, which had been previously simplified in Phase 1, and also included the refinement of defined cost and performance metrics.

2.3.2.3. Setting up the Optimisation Model

The optimisation model includes three main components: inputs, decisions and criteria, and the WfLH elements of these are illustrated in Figure 32. The objectives of the optimisation were to find the optimal asset configuration which will minimise cost and maximise hydraulic performance. A key development in Phase 2 was the incorporation of dynamic controls to enable the hydraulic model to react to different operational scenarios.

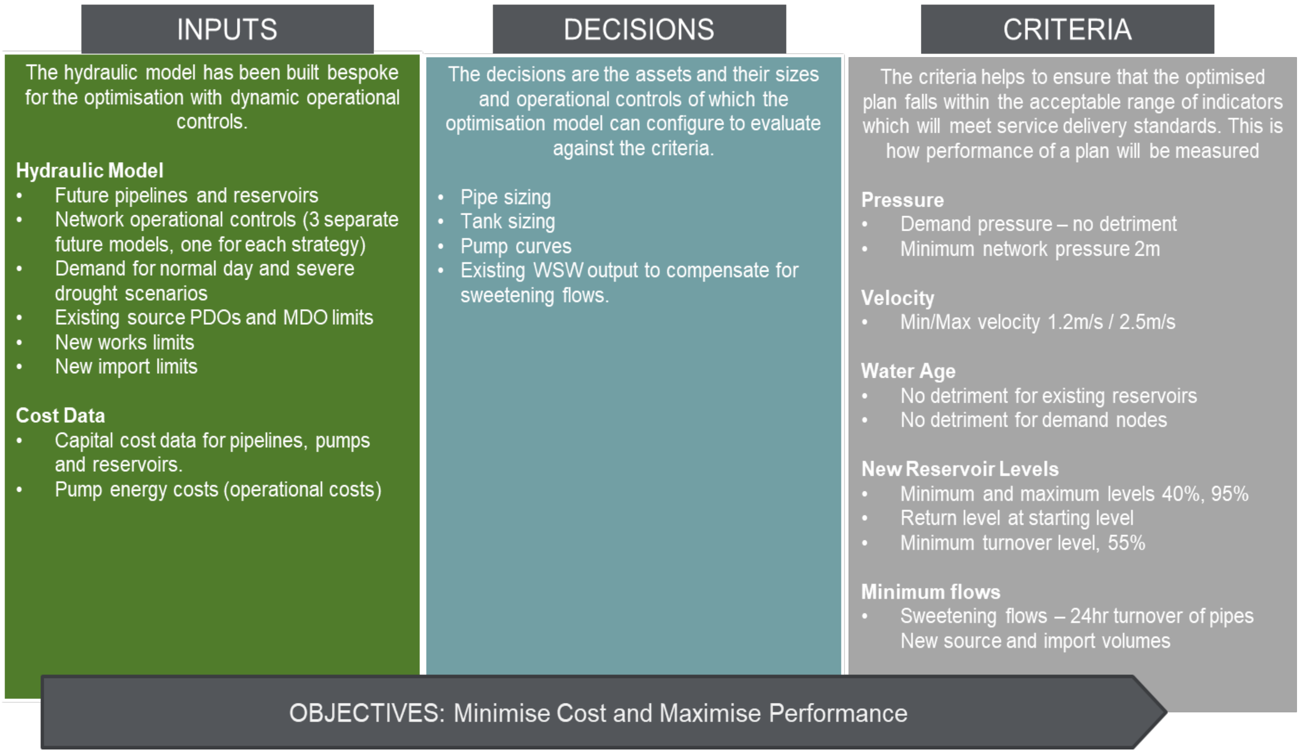


Figure 32 - Optimisation model components

2.3.2.4. Optimising for Both Normal Day and Severe Drought Day

Assets and operational controls were optimised for both ‘normal day’ scenario ‘severe drought day’ scenarios. The hydraulic model was set up for a single 48-hour model run so that the ‘normal day’ is for the first 24 hours and ‘severe drought day’ operations are for the second 24 hours. Figure 33 illustrates the input elements of the model, the differences to the model set up over the 2 periods, and what is being optimised.

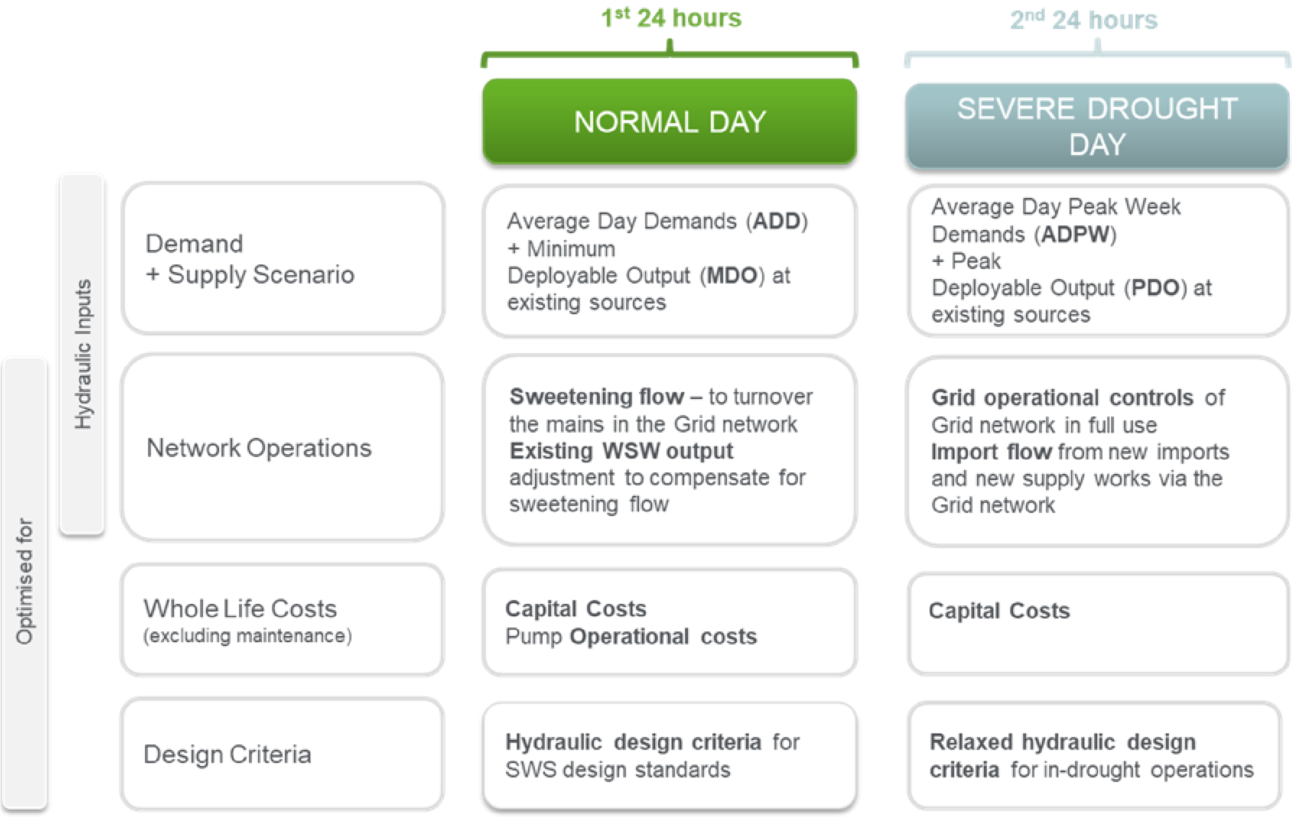


Figure 33 - Normal day and severe drought day optimisation

2.3.2.5. Costs and Penalties

Cost Data

Indicative capital cost data was obtained from SW's Cost Intelligence Team (CIT). This was based on SW's capital cost curves but omitted elements such as contractor risk and internal and external overheads due to commercial sensitivities. The costs also excluded some ancillary elements such as cabling, fencing, landscaping, land purchase, access roads etc. and so do not represent the true cost of constructing such assets. As such the model does not give a true estimate of cost but provides a comparative cost assessment of different Options based on consistent data.

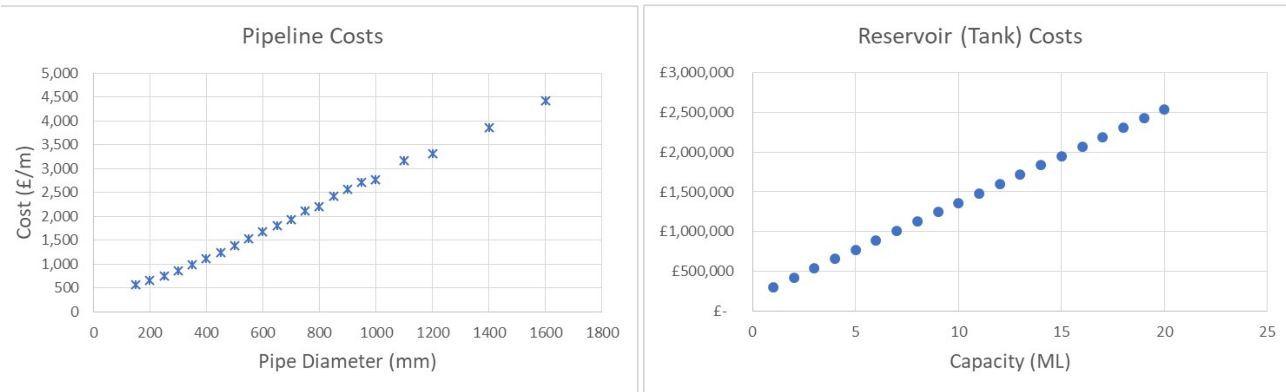


Figure 34 - Indicative capital costs

OPEX costs (pumping energy) were calculated using the formulas below and extrapolated to reflect a 60-year design horizon. Base electricity tariff data was obtained from the SW energy team.

Annual Operating Cost (Energy)
=
Q*H*eP*A/(e*C)

Design Life Energy Cost
=
Annual Operating Cost / $(1+r)^N$

Q = flow (L/s)
H = pump head (m)
eP = Energy Price = 0.1kWh
e = efficiency = 1
C = units conversion factor = 102.2
A = annual conversion = 365 days
R = nominal discount rate = 2.4%
N = design life = 60 years

Performance Penalties

The hydraulic performance of a solution is determined by penalties (monetised into £ units) applied when specified constraint criteria are violated; hence the optimisation model seeks to minimise cost penalties and therefore maximise hydraulic performance. The penalties were designed to drive the solutions towards balancing all network storage reservoirs. The higher the penalties applied; the more violations of the constraints have occurred which equates to a poorer network performance. Penalty criteria have been set by capturing operational constraints at existing WSW and WSR sites from operations teams, and from SW's technical standards documents. Different penalty criteria were set for new Grid tanks, to reflect their lower level of criticality to customer supply resilience (as customers are not supplied directly from the Grid tanks, but from existing WSRs). Constraints have also been set to pressures in existing distribution networks so that customers will not experience any detriment. Penalties were set to encourage existing WSRs to return to their level at the start of the model run, and Grid tanks to return to a set depth of 67% - this approach will be reviewed in the next phase to ensure adequate levels of resilience are being maintained.

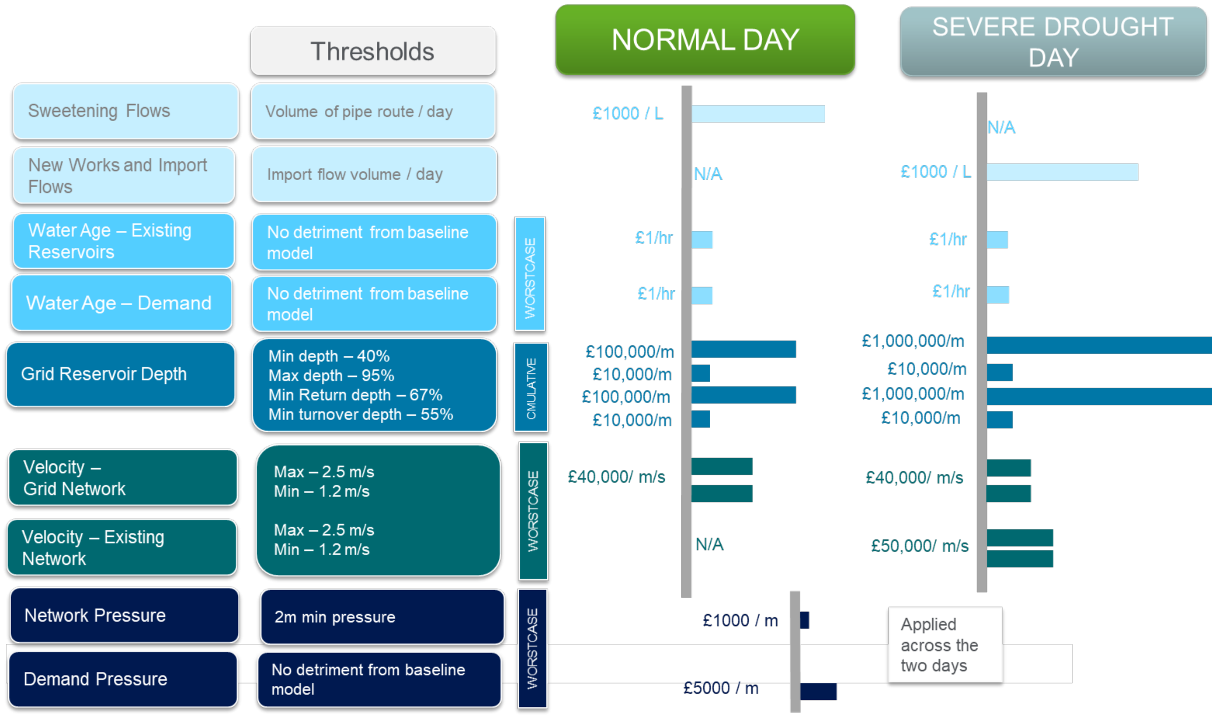


Figure 35 - Performance penalties

2.3.3. Results

Applicable to both Options D.2 and B.4, the Pareto curve presents results for 197 potential solutions, representing the best performance for a particular cost. On inspection of the hydraulic performance of the model results (not shown here) it can be seen that not all Options present a solution that could be considered potentially feasible, with many results showing hydraulic performance (such as tanks or service reservoirs draining to empty or over-topping due to imbalances in the model controls) that would not be acceptable in terms of operational constraints. It has consequently been decided that the Phase 2 results require further development before being considered as part of any optioneering analysis.

The results reported here, therefore, should be considered as indicative and not as defining the potential solution to be constructed and commissioned. The results have, however, highlighted a number of aspects to be further investigated as part of the modelling and design process and can be considered as a key milestone to defining the infrastructure required as part of the WfLH solution (see Section 2.3.8 Next Steps).

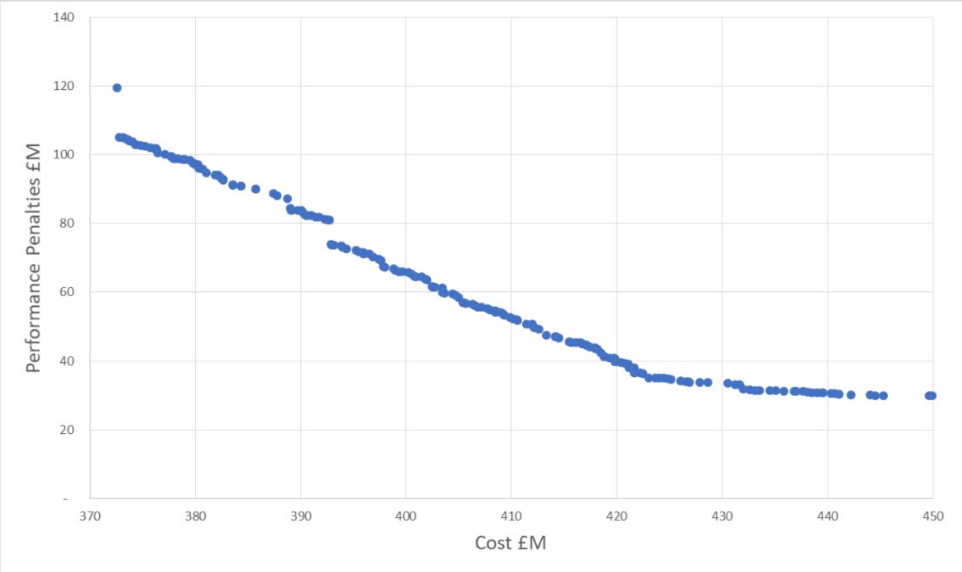


Figure 36 - Pareto curve of Option D results

The results present a selection of infrastructure elements of different sizes. Typically, Options with larger infrastructure elements will have better performance (i.e. lower performance penalties) and higher costs. Figure 37 illustrates results for a selection of Options comparing key infrastructure elements (Grid reservoir tanks) at Testwood, Otterbourne and River Way Andover, as well as the SLM that transfers water between Testwood WSW and Otterbourne WSW. The graph shows the modelled volume of grid reservoir tanks (left-hand vertical axis) and the diameter of the Southampton (Soton) Link Main on the right-hand vertical axis. WLC for the model solutions is also shown on the right-hand vertical axis. On the horizontal axis model solution D.1 represents the least-cost (and worst-performing) Option, and model solution D.197 represents the highest-cost and best-performing Option. A review of the relationship between performance sacrificed verses cost saved is planned for the next phase.

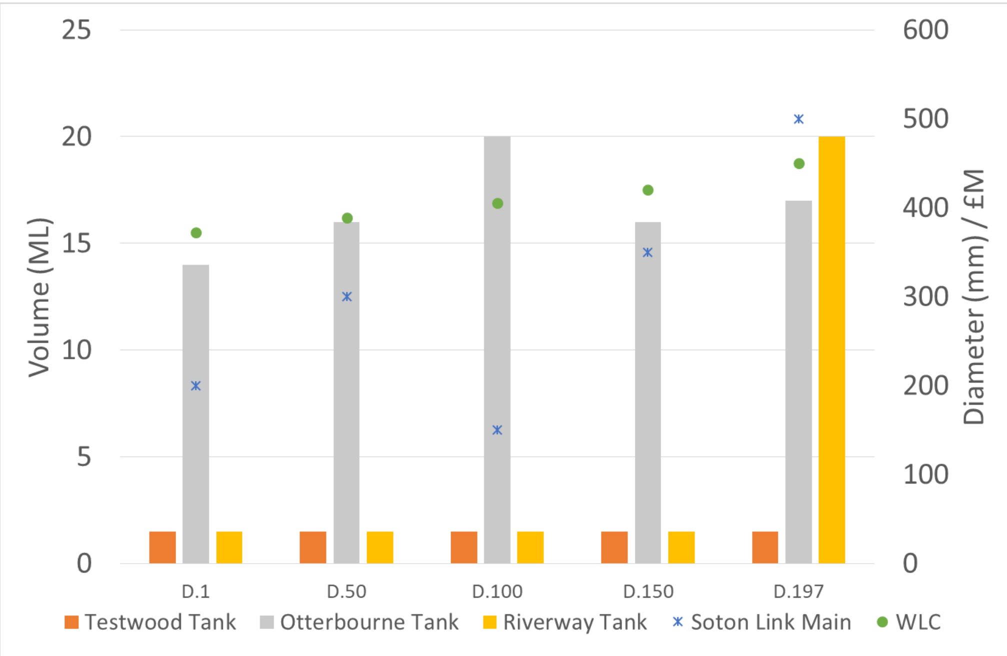


Figure 37 - Selection of results from the Pareto curve

Commentary

Results for all Options show that there is adequate capacity in the existing infrastructure network from Otterbourne WSW to Yew Hill WSR and Crab Wood WSR, and that installing new transfer pipelines would not be required. Similarly, the model indicates that extra storage in terms of new Grid balancing tanks is not required at Yew Hill WSR or Crab wood WSR. The model also selects transferring directly to River Way Andover WSW rather than interfacing at Micheldever Road Andover WSR – this is a probable consequence of including an operational constraint that blending of different source waters is to be in a tank rather than directly into the pipeline network.

Results indicate that a very large tank is required at Otterbourne WSW. Infrastructure feasibility studies (see Section 2.3.7) have shown this site to be highly congested and constructing such a tank there will involve significant complexities. Figure 37 suggests that mitigating this would involve constructing a similarly large tank at Testwood WSW, and the model solutions present the outcome of a “trade” between the comparative costs of pipelines and reservoirs (with pipelines having a larger impact on costs than reservoirs). It is noted that no Option includes additional storage at Yew Hill WSR or Crab Wood WSR (where more space is available) to mitigate this. Aspects relating to this interaction will be investigated further in Phase 3 of the study (see 812.3.8 Next Steps).

The assessment has been limited to providing adequate storage to balance the network, and no allowance has been included for resilience, at this stage.

Example results are illustrated as charts in Figure 38 and Figure 39. The charts show inlet & outlet flows and tank and WSR levels around Otterbourne WSW. The charts show how pump operations are controlled to maintain reservoir and tank storage levels within defined constraint levels (not shown), and how reservoir and tank levels react to differing inflows and outflows.

The chart titled “Otterbourne (In)” in Figure 38 (Normal Day Operation) shows how inlet flows to Otterbourne Grid tank from the SLM and the Gater’s Mill transfer appear to control the tank level within its level constraints of 40%-95%. However, it can be seen that the tank level at the end of the day’s model run is considerably higher than at the beginning (80% versus 55%) which might indicate issues with balancing the tank over a longer period. This is due to immaturity in the development of pump controls and not due to any disparity in the supply-demand balance. Issues such as this will be investigated in the next phase by running the model over a period of several days instead of just one.

The chart titled “Otterbourne (Out)” in Figure 38 (Normal Day Operation) shows the flow from Otterbourne WSW to Yew Hill WSR successfully controlling levels in the reservoir within set its constraints. Levels in Otterbourne Hill and Twyford WSRs are controlled as per the original SW InfoWorks network model and not by controls introduced for the wider WfLH transmission grid operation. It can be seen that reservoir levels remain within constraints, but do not balance their end of day level with that of the beginning. In the case of Otterbourne Hill WSR in particular (75% versus 60%) this could result in the reservoir over-filling over a longer model run time. The control of this reservoir has been copied directly from the existing network model and has not yet been further developed in this modelling study but will be addressed in a future phase.

The chart titled “Otterbourne (In)” in Figure 39 (Severe Drought Operation) shows that output from Otterbourne WSW falls to zero to reflect restrictions on its abstraction under the severe drought scenario, and that this output is substituted by the flow from the WRP to Otterbourne. Inlet flows from the SLM and Gater’s Mill successfully maintain levels in Otterbourne Grid tank within constraints, although it can be observed that the level falls from 80% to 60% over the course of the 24-hour model run, indicating that the reservoir might drain to unacceptable levels over a longer period. This is due to immaturity in the development of pump controls and not due to any disparity in the supply-demand balance and will be investigated in the next phase.

The chart titled “Otterbourne (Out)” in Figure 39 (Severe Drought Operation) shows the Otterbourne to Yew Hill inlet main controlling levels in Yew Hill WSR adequately, and Twyford WSR remaining within constraints and balancing reasonably well over the 24-hour model run period. However, it can be seen that [redacted] which is a level of performance that would not be considered acceptable. It was noted above that Otterbourne Hill WSR did not balance in the 24-hour Normal Day operation model run (that precedes the Severe Drought Operation run), and this is an issue that requires resolving as part of the next phase of solution development.

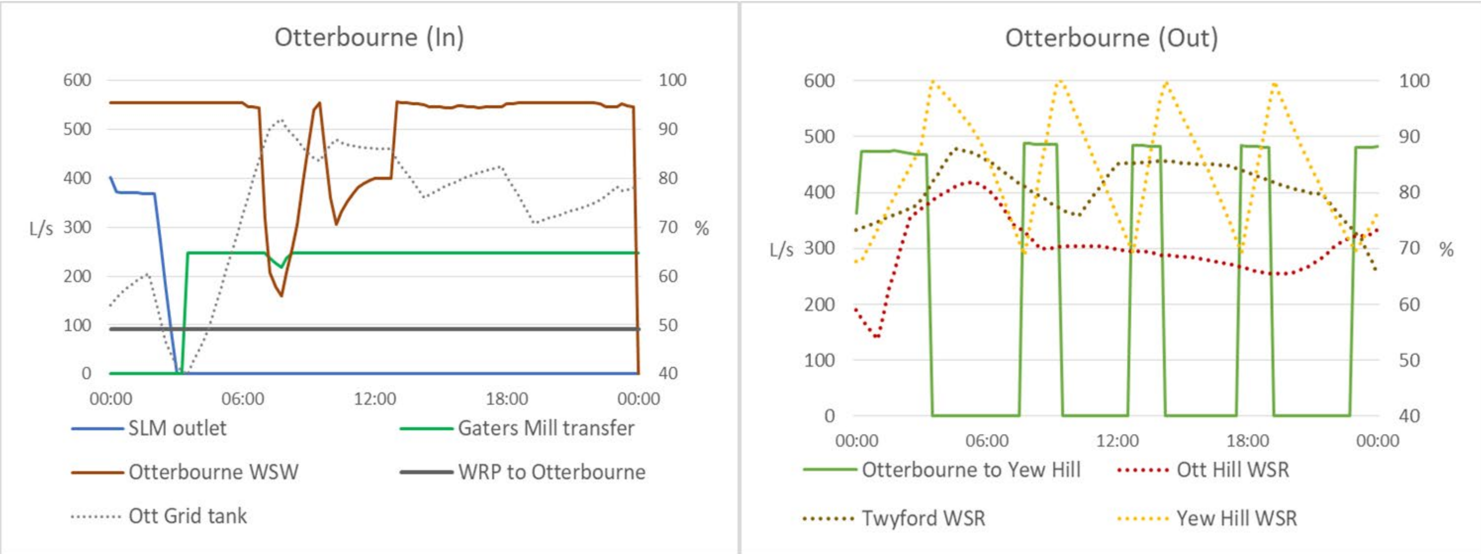


Figure 38 - Model solution D.197 Normal Operation

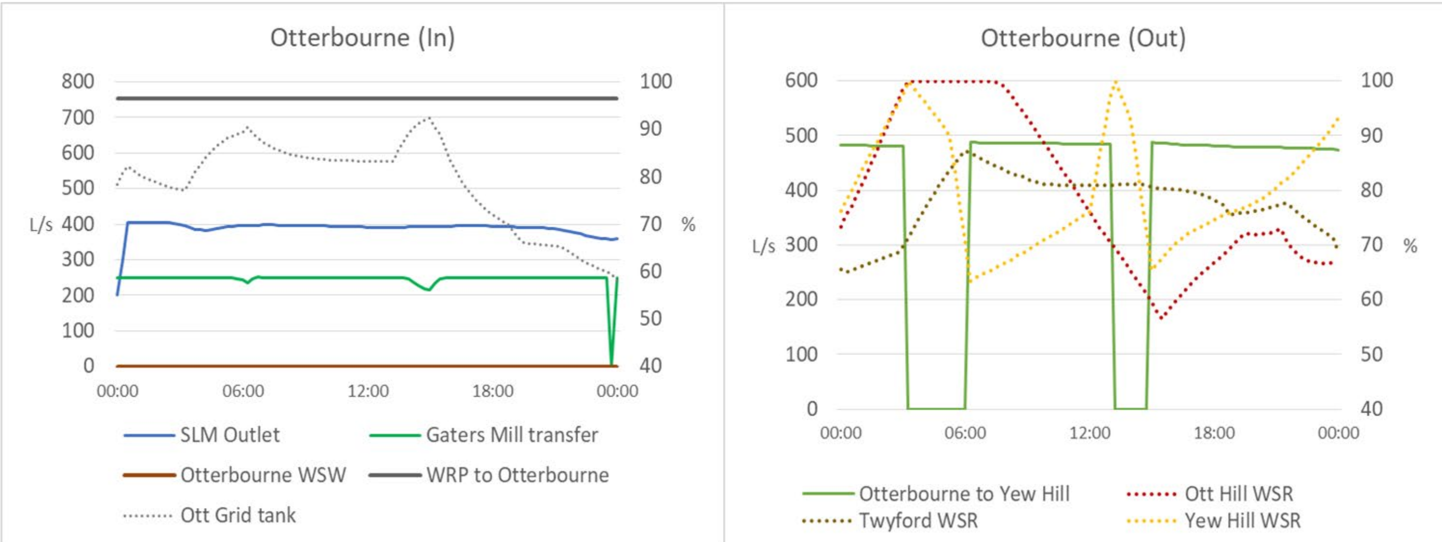


Figure 39 - Model solution D.197 Severe Drought Operation

2.3.4. New Transfer Infrastructure

Details of the design of the transfer pipeline from the proposed new source to SW’s distribution network are given in the technical document and not presented here.

2.3.4.1. Interface Site Infrastructure

Studies have been undertaken to determine the feasibility of installing new infrastructure within existing site boundaries at the following sites that are interfaces between the proposed new Grid and existing distribution networks:

- Testwood WSW
- Otterbourne WSW
- Yew Hill WSR
- Crab Wood WSR
- Micheldever Road Andover WSR
- River Way Andover WSW

The scope of the feasibility studies included:

- Layout of the existing site
- Pipeline route corridors into / out of the site
- Existing utilities
- Geotechnical study
- Interaction with other SW projects
- Environmental impact
- Land availability
- Constructability

2.3.5. Key Findings

Testwood WSW

- The inlet pipeline routes from [redacted] boundary are feasible with respect to engineering and environmental complexities.
- The SLM must cross the River Test [redacted]. The Preferred Option is to utilise the existing 800 mm dia. pipeline under the river. The existing pipe bridge could also provide feasible solutions.
- For the SLM route through the site, the most feasible Option is to run underground, using conventional buried pipeline construction.
- A feasible location for the Grid tank up to 20 ML volume has been established and aligns with the separate Phase 2 WSW capital works.
- Groundwater is known to be an issue on site, and construction methods that limit groundworks should be considered.

Otterbourne WSW

- The pipeline route into [redacted] is feasible but will be slow to construct and presents challenges to ensure access can be maintained.
- The pipeline route into [redacted], which is heavily designated, and is highly challenging in terms on engineering and environmental complexities.
- Feasible locations for raw and potable water assets have been established that align with Phase 2 capital works.
- A Grid balancing tank volume of up to 12 ML can be feasibly sited on ground to the northern end of the supply works site. A tank larger than this will need to be located to the southern end of the site

where the solar farm is currently located; this Option will require additional pumping to transfer water to the site high-lift pumps.

Yew Hill WSR

There are no works proposed within sensitive designated areas, no conflicts with other utilities and the pipeline routes can be accommodated within existing sites.

Crab Wood WSR

There are no works proposed within sensitive designated areas, no conflicts with other utilities and the pipeline routes can be accommodated within existing sites.

Micheldever Road Andover WSR

There are no works proposed within sensitive designated areas, no conflicts with other utilities and the pipeline routes can be accommodated within existing sites.

River Way Andover WSW

There are no works proposed within sensitive designated areas, no conflicts with other utilities and the pipeline routes can be accommodated within existing sites.

2.3.5.1. Southampton Link Main

In 2016 an outline design was prepared, and information collected for Environmental Impact Assessment (EIA) for a raw water pipeline from Testwood WSW to Otterbourne WSW, and WfLH incorporated this route as its proposed strategic bi-directional potable water transfer linking the two sites. A review of the design outputs was undertaken to identify where further development is required to meet the needs of the project and to ensure the pipeline route is still feasible. As the design of the route is historical and based on different needs, it was concluded that a further reassessment of the design as part of a wider optioneering study was required, and this will be undertaken in a future phase of the project.

Key findings of the design outputs review are:

- River Test Valley - alternative routes and construction methods to limit the impact on internationally designated sites
- New pipe bridge to cross the Little River Test - alternative trenchless construction methods
- A27 routing within the carriageway - potential to partially route through open land to the south
- M3 crossing - location and length of directional drill crossing
- A gap analysis of the Environmental Statement (ES) has identified a number of the technical assessments and surveys completed in support of the ES have now expired
- New requests for statutory utilities, land referencing, permissions for rail, motorway and main river crossings will also be required

2.3.6. Operational Control Concept

The Grid will have multiple points of interaction with the distribution networks, each requiring operating decisions to be made in a timely manner and to consider the effect of that decision on the wider connected Grid network. Traditional manual control of more localised supply and distribution networks will not be able to achieve such an optimised and efficient outcome. A holistic control system is therefore proposed that will coordinate operations across the whole Grid, from end to end, according to the optimised schedule.

To undertake these multiple calculations and decisions in real time, which a traditional manual operation system would not be able to achieve. The integrated Grid is a significantly different type of network to the existing network of numerous separate distribution systems, as actions in one area will affect operations throughout the whole region.

Holistic real-time control has advantages of being able to use advanced analytics to predict demand and hence schedule transmissions in a planned and optimal way, rather than simply reacting to changes as they occur. This results in significantly lower pumping costs (a key element of whole life costing) as cheaper electricity tariff bands can be better exploited. It will also lead to more optimal asset sizes as constraints can be more accurately adhered to, meaning less headroom is required as a factor of safety. Such a system, predicting and analysing multiple alternate scenarios over a wide network, requires the optimisation of very high numbers of options, which can only be carried out by centralised control system.

Holistic, real-time control systems can show operational benefits such as calm networks, reservoir turnover and water quality, as well as providing significant cost savings by optimising operations around energy tariff periods. Holistic real-time control will enable the Grid to be operated proactively – predicting network changes and planning the optimal way to respond – rather than a traditional, reactive system that typically responds to in a less efficient manner.

Holistic real-time control operates as a closed-loop process:

1. **Predict**

   Predict demand and associated storage levels over 24-48 hour period based on historical data around seasons, weather, weekday / weekend patterns, events (festivals etc.), using advanced analytics
2. **Plan**

   Plan optimal response to predicted demands around operational constraints, utilising best mix of pumping tariff periods, least-cost sources of water, most efficient pumps and cheapest transfer routes
3. **Monitor**

   Monitor changes to predicted demands in real time, refresh predicted storage levels and adjust response with a new, optimal solution every 30 minutes

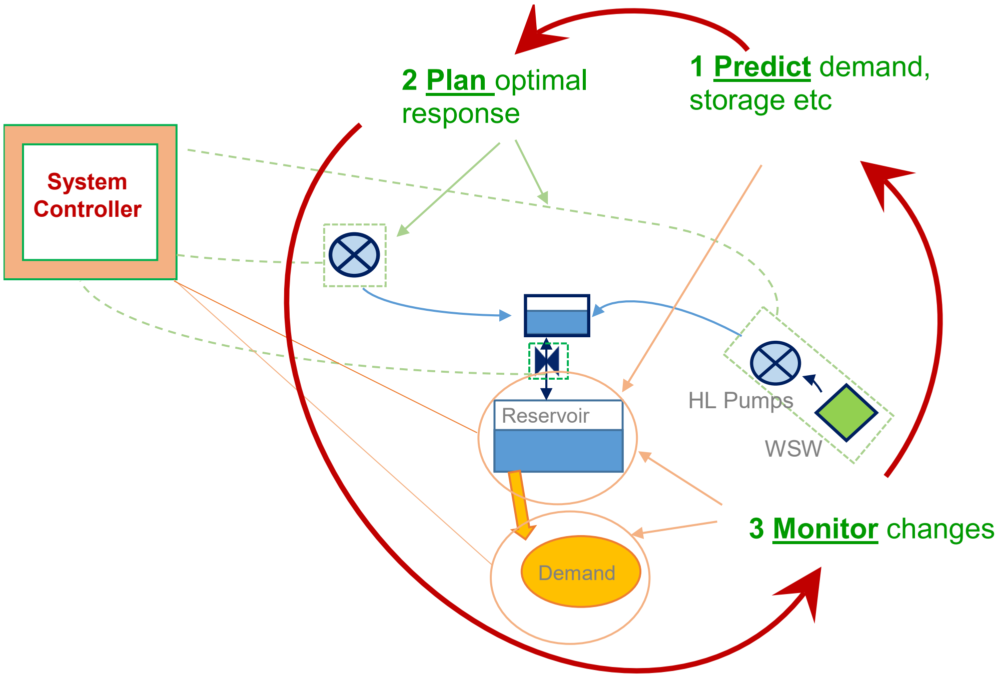


Figure 40 - Closed-loop holistic control

The holistic control system will operate the whole Grid network as a single coordinated system, scheduling pump and flow valve operations to meet operational constraints (such as reservoir storage levels and supply works outputs) and customer demand whilst minimising power costs. The system also selects pumps to operate at their best efficiency point to reduce energy usage and hence carbon impact.

The control system will ensure the network operates consistently within defined operational constraints, whilst ensuring supplies are transmitted to areas of demand or where there would otherwise be deficits. A study has been undertaken to assess the IT / OT capabilities required to support such an integrated monitoring and control process, as well as wider WfLH IT / OT needs and the risks associated with these, and the key outputs of this study are described in Section 2.3.7.

To minimise interference with the operation of the existing distribution system the Grid infrastructure will have controlled interfaces at a limited number of strategic locations. These are currently envisaged to be at Testwood WSW, Otterbourne WSW, Yew Hill WSR, Crab Wood WSR and River Way Andover WSW, and are locations where bulk transfers of water between the Grid and distribution networks will be required.

As an example of potential operation, if the control system detected a deficit in Andover (to the north of the network) and needed to provide the supply from the proposed WRP or desalination plant (in the south), it would plan the optimal transfer operation required to transfer the water while keeping within BAU operational constraints at WSRs in the distribution system and also maintaining flow, velocity and reservoir level constraints in the Grid infrastructure. This would be undertaken while optimising the pump operation to minimise cost and carbon footprint whilst complying with other requirements such as reservoir turnover, water quality blending requirements and so on. In this way the Grid can be operated in optimal fashion without interfering with the manually controlled operation of the existing distribution network.

2.3.7. IT/OT Assessment

2.3.7.1. Overview

SW's IT team has undertaken an assessment to identify IT / OT requirements to enable the WfLH programme objectives. This section describes the key outputs of the assessment, which built upon the initial technology assessment conducted during Gate 1 to establish the Information Technology and Operational Technology requirements to enable the WfLH grid operating philosophy as part of a phased approach to IT / OT design. The IT / OT requirements, and their associated costs and benefits for different solutions, will be included in the optioneering process when determining the preferred solution.

The following key business needs were identified and evaluated to determine the IT and OT impact:

- The integrated Grid, made up of multiple assets, requires simultaneous calculations and coordinated decisions to be made in real-time (unlike traditional manual control of localised supply and distribution networks) to balance the end-to-end network, as actions in one area will affect operations throughout the whole region
- Data driven, closed feedback loop-enabled intelligent monitoring and control of field assets is required to drive minimal manual intervention and ensure optimum asset performance within stipulated system constraints
- The network should be designed to operate bi-directionally in all the transfer routes between Testwood and Otterbourne and between Otterbourne and Andover
- The design should enable the ability to drive cost efficiencies and minimise carbon footprint by utilising the best mix of pumping tariff periods, lowest cost sources of water, most efficient pumps and cheapest transfer routes
- The design should enable the remote capability to monitor water quality at water sources and at various points of the grid, with an ability to remotely isolate the affected network and re-route water transfer
- The design should enable the ability to source water from supply that may not be owned or managed by SW into the existing network operations, e.g., Desalination plant or HT
- The design should enable the accurate prediction of demand and supply across the Hampshire region using historical data as well as inputs related to planned outages, rainfall, water level etc. and create appropriate production schedules in advance (in the order of days or weeks)
- The design should enable the ability to monitor the network to proactively locate leakages across the faulty pipeline with a view to minimise water loss

To address the business needs and corresponding IT / OT requirements for WfLH, a high-level view of the required solution components has been depicted in the IT / OT functional landscape diagram illustrated in Figure 41. The layer model of technology and business systems is informed by ISA-95 standards (international standard from the International Society of Automation for developing an automated interface between enterprise and control systems). Some of these components are dependent on ongoing or planned SW transformation programmes within AMP7 whereas other components will require either enhancements to existing programmes or new initiatives unique to WfLH.

Site / Field Assets

a) New Assets - For the proposed SRO and the grid network, a distributed network of new PLCs, HMIs, new remote communication devices (such as Remote Terminal Units (RTU), Edge Gates and sensors) is required. These control system components will be connected to local site SCADA systems.

b) Existing Assets – To enable the operating philosophy of an integrated grid, the RTUs, SCADA, PLCs, HMIs and OT communications / instrumentation of existing assets that require uplifting to support integration of control systems between existing and new assets will be assessed as part of the holistic control system feasibility study.

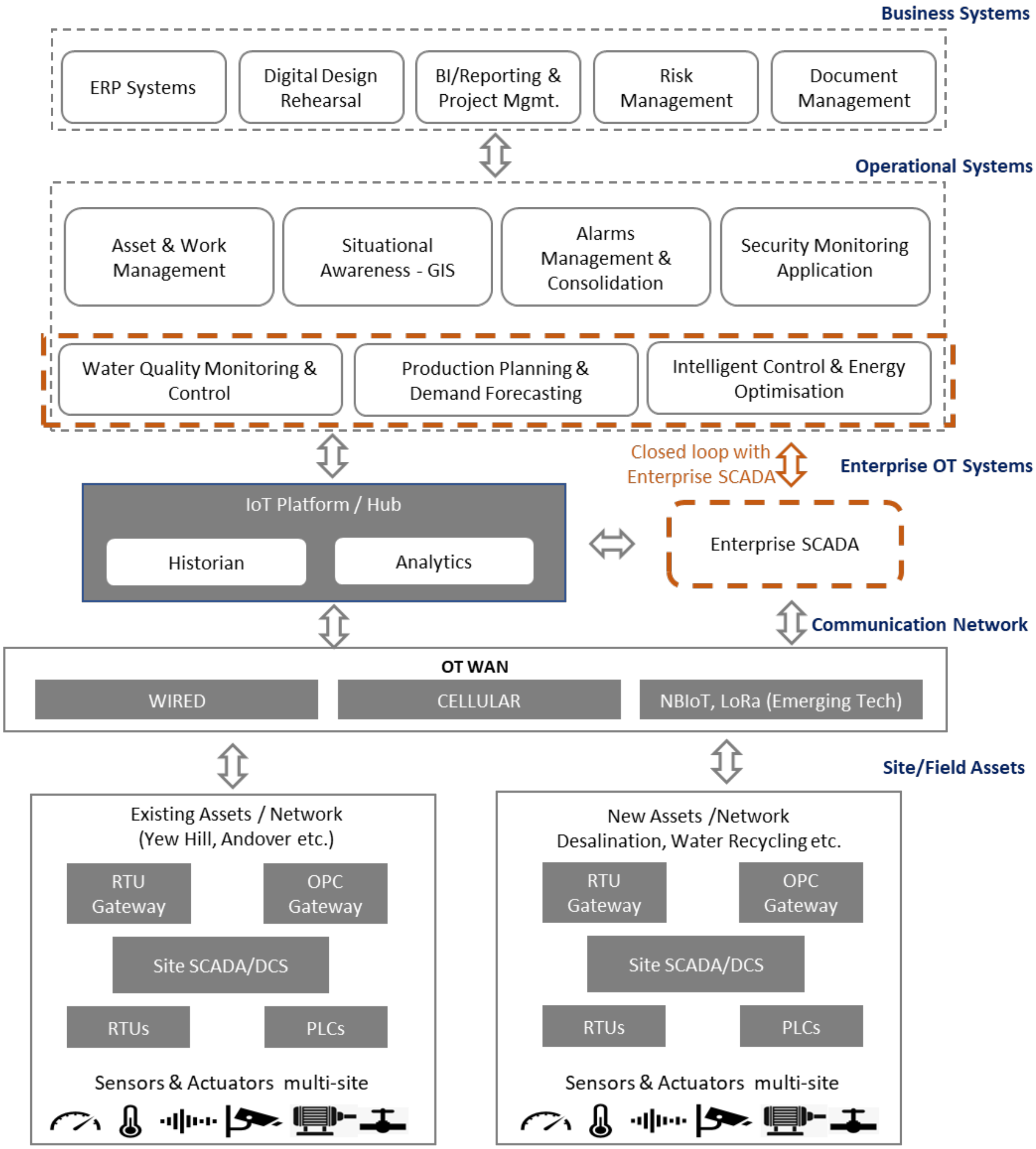


Figure 41 – IT / OT Solution Components across the ISA95 model

Communication Networks

WfLH will require the addition of a large volume of new and upgraded remote communication sensors / devices which will require integration with enterprise OT components. WfLH is dependent upon the ongoing OT Transformation programme in AMP7. This programme covers the implementation of technical standards, architecture and approved OT devices to establish resilient and secure OT Wide Area Network (WAN) integration with remote OT components via wired and wireless approaches.

Additionally, to ensure the design of the control system network is compliant to the NIS standards and National Cyber Security Centre (NCSC) cyber security principles, the detailed design of WfLH plant control solutions is dependent upon the secure OT network blueprint architecture currently being put in place as part of the OT Transformation programme.

Enterprise OT systems - Alarm Management and Enterprise IoT Hub

The functionality to monitor the SW owned / operated assets under WfLH programme will be reliant on SW's planned upgrade programme for the current Enterprise Alarm Management system. The upgrade programme is essential to incorporate additional monitoring / control points on new WfLH assets. Data will also be utilised within other SW OT systems and new enterprise asset management systems (OAM) for ongoing operational management. A subset of the control system data will be extracted from the plant control system via an Open Platform Communications (OPC) gateway and securely transmitted to the enterprise Alarm Management system hosted within SW Enterprise Data Centres.

The Enterprise IoT Hub platform implementation currently being trialled for the existing SW network will be extended to include WfLH requirements to acquire, store and analyse the field sensor data for analytics and operations. The historian / database within the Enterprise IoT Platform / Hub will be able to store and manage data acquired from sensors on the field assets and publish to operational systems for further analysis and provision of management information.

Operational Systems

The decision-making related to the operational aspects of WfLH will be managed by solution components within 'Operational Systems'.

a) A combination of solutions within the Operational Systems layer act as the integration and management point for the supply works control system, the telemetry outstations and remote sensors. These solutions with integration to Enterprise SCADA and Control systems will enable the closed loop system. As a closed loop system, the systems will monitor water quality at various points on the grid, prepare production plans based on demand forecasts or other operational factors to determine decision logic for automatic grid control actions. The control system will send these control actions to the sensors and RTUs / PLCs in the field, for example the optimal scheduling for pumps based upon multiple factors including energy tariffs, demand, etc. The integration of the Grid Control System and SW Enterprise Control System will require additional investment to pro-actively manage the water balance of the end-to-end network
b) Leverage a combination of existing and planned SW Enterprise Asset Management solutions to host core asset information for SW owned and operated WfLH assets to enable asset compliance, condition-based monitoring, incident management, and asset specific work management records.
c) The existing solution components entailing Enterprise Alarm Management, Network and Security Monitoring with their corresponding visualisation suites will be enhanced to consolidate, monitor and report alarms / events generated by the new SW owned and operated WfLH assets.

Business Systems

As subsequent phases of the WfLH programme will entail 3rd party and delivery partner involvement, it is imperative to have aligned business capabilities, stakeholder governance and streamlined business process management between the organisations. To support business operations and enable effective decision-making, existing SW enterprise systems as identified in the landscape will be leveraged to support.

2.3.7.2. Key Findings

The key findings from the assessment are summarised below:

- Further work is required to validate and understand the IT / OT impact on the future business operating model of the Grid (involving third party as well as SW owned and operated assets).
- The OT on the existing downstream network assets may require a significant uplift to enable integration of existing SW network assets with the new Grid assets, and this may impact the scope of planned or ongoing IT / OT initiatives.
- A holistic enterprise control system is required to manage the new bi-directional Grid network to enable end-to-end balance with the existing SW network.
- The proposed IT / OT landscape for the Grid builds upon the strategic SW initiatives including OT Transformation, Strategic Projects Digitalisation, and Operational Asset Management. However, additional investments are required to either enhance the existing initiatives or mobilise new initiatives to enable the operating vision of the Grid. This will include potential changes to the Southern Water operating model.
- As business needs evolve in the subsequent stages of the WfLH programme, additional IT / OT impact may need to be considered.

2.3.7.3. Summary of Key Risks

Outlined below are the potential key risks that could delay delivery of IT / OT enablers thereby impacting WfLH programme objectives:

- There is dependency on the successful delivery of some of the foundational capabilities delivered via strategic and planned AMP7 initiatives. Any delay in implementation timelines or change in scope of these initiatives may have an impact on delivering to WfLH programme timelines.
- Additional system enhancements may be required beyond the planned scope of some of the ongoing or planned AMP7 transformation programmes. Without these additional enhancements or capabilities, the planned IT and OT capabilities would fall short of delivering to WfLH programme's envisioned operating philosophy.
- As the WfLH programme is currently at concept stage, there is a risk that further business needs may evolve during subsequent design and build phases of the programme. These incremental business needs may not be considered in scope for current planned or existing transformation initiatives and would need to be retrospectively developed leading to additional change implementation costs.
- Significant uplift maybe required to OT components of the existing network such as field instrumentation, sensors, communication networks and existing site-level SCADA / telemetry systems. Without this OT uplift, the integration required between existing network and new supply solutions or new network assets to deliver end to end balanced network management might not be possible.
- The proposed WfLH grid includes new water supply solutions to be owned / operated by 3rd party and new network assets to be owned / operated by SW. Without an overarching governance and clear operating model that includes new WfLH and existing SW network assets, it would lead to disparate operational system processes causing overheads and inefficiencies in managing the network.
- Due to the long-term horizon of the WfLH programme, there is a potential risk that the technology being proposed or considered might become obsolete at the time of commissioning the grid and additional investments for uplift, refresh or upgrade might be required.

2.3.8. Next Steps

2.3.8.1. Network Control and Optimisation

The next phase of the network infrastructure integration project (Phase 3) will develop the initial network solutions identified in Phase 2 into a short list of Options, which will then be considered in more detail, to determine the Preferred Option that will be proposed as part of the WfLH solution. The short list Options must therefore be developed to a sufficient level of detail and confidence that will enable the successful design of the assets. A high level of liaison with operations, environmental and engineering teams will therefore be needed as part of the solution development. Pipeline routing will not be defined in this study but will be included in the engineering design phase, where considerations of planning and environmental implications will be addressed.

2.3.8.2. Model Review

The optimisation model will be reviewed with respect to the impact of penalties and capital costs. The current model results include options in which reservoirs empty or overflow which clearly cannot be considered feasible. Some solutions contain balancing reservoirs that are now understood to be too large to be easily constructed at congested sites (particularly Otterbourne WSW), and solutions will be developed that reflect engineering constraints identified in the site feasibility studies, while also considering the impacts of future resilience to support additional supplies in future.

Capital Costs

The [redacted] model configuration and inputs will be reviewed to ensure results are representative and have a higher level of confidence than at present. For example, capital costs will be reviewed with the CIT to ensure they accurately represent the balance between pipeline and reservoir capital costs as there is a possibility that the current set-up might be underestimating the cost of storage infrastructure. The engineering team has recently commissioned a number of detailed CIT estimates for WfLH infrastructure as part of their feasibility studies, it is intended that this more accurate information be used in the study.

Operating Costs

Consideration will be given to better reflecting the energy tariff structure, which will have a significant impact on pumping costs and tariff avoidance. The current solution development regularly sets pumps to be active during peak / TRIAD periods.

Penalties

[redacted] penalties will be reviewed to ensure that the relative consequences of breached constraints are being captured. For example, the current solution development shows reservoirs or tanks breaching constraints at some points during the day which is clearly not acceptable in any solution, and it might be that [redacted] considers the penalty for this to be more beneficial than building more storage volume or the hydraulic model controls need to be adjusted. [redacted] results inform the decision-making process with respect to infrastructure choices, but SW will determine the preferred configuration by considering a number of varied factors. The review will ensure that penalties applied for breaching key constraints have sufficient impact on the solution such that the breach is avoided altogether.

2.3.8.3. Model Configuration

The following tasks will be undertaken as a combination of both manual network modelling tasks and as part of the optimisation approach using [redacted]

Reservoir Volumes

Grid tank sizes will be limited to reflect the outcome of the engineering feasibility studies – especially at Otterbourne WSW. This might result in the [redacted] solutions placing storage at other sites where construction is more feasible, such as Yew Hill WSR or Crab Wood WSR.

Gater's Mill (Lower Itchen) Transfer

The current solution development assumes this transfer connects with the SW network at Otterbourne WSW. However, it might be beneficial to transfer the water to Twyford WSR or Moorhill WSR, and a study will be undertaken to investigate.

Otterbourne to Yew Hill main

The current solutions use the existing mains for the WfLH transfer. The feasibility of this needs to be confirmed, and in particular to include the operating regime which at present is for a number of short transfers at high flow rates.

Southampton Link Main

The route of this main was developed for an earlier project (not commissioned) to transfer raw water from Testwood WSW to Otterbourne WSW and might not be optimal for the WfLH solution. Alternative routes will be considered, especially the concept of transferring via Rownhams WSR and Yew Hill WSR using a combination of new and existing infrastructure. This might result in Grid tank storage being selected at Rownhams WSR or Yew Hill WSR instead of at Testwood or Otterbourne WSW.

2.3.8.4. Solution Development

Initial solutions identified in the Phase 2 modelling study will be further developed to a level of detail and confidence so that they can be considered as feasible solutions. The level of detail developed in Phase 2 is not yet sufficient to achieve this with respect to operational constraints and engineering and environmental feasibility.

Operational Control

Pump Operations

The current solutions sometimes include multiple changes to pump status as flows react to reservoir levels. Consideration will be given to the feasibility of this, particularly when using older existing infrastructure. Smoother operation of pumps is more desirable and could also help reduce the required volumes of the new Grid tanks.

Sweetening Flows

Sweetening flows are currently operated at a fixed flow rate to reflect the daily turnover volume. This has the disadvantage of leaving the main unconditioned to higher, drought-scenario flows, and a mains conditioning process would need to be designed as part of the commissioning plan. This added complexity can be avoided by pumping sweetening flows for a shorter duration at higher, drought-scenario flows (and hence keeping the main conditioned to that flow), but at the detriment of more variance in reservoir levels and less calm networks. Consideration will be given to developing a solution that can maintain conditioning flows as the normal day operating scenario.

Bi-directional Flows

For reasons of improved resilience, the WfLH network is to be designed so it can operate bi-directionally in all the transfer routes (i.e., Testwood / Otterbourne and Otterbourne / Andover). The current solutions have not yet been developed to incorporate this. Bi-directional flow does not need to be optimised but must be shown to be feasible.

2.3.8.5. Operating & Commissioning Plan

A formal, approved Operating & Commissioning Plan will be developed for the Preferred Option. This will detail how the solution is to be operated on a 'normal' daily scenario and in a 'severe drought' stressed scenario, including the diurnal scheduling and flows of bulk transfers. Information on the strategic utilisation of the transfers (in terms of duration and frequency of use) is described in the Annex 4 Water Resources Modelling report. The plan will also detail how the network is safely transitioned (i.e., commissioned) from one state to the other. Approval of the plan will be by the [redacted].

Bulk Transfer Imports

The current model optimises the operation of bulk transfer imports according to the need to meet demand, and without consideration of any supply and / or operational constraints at the supply point. Recognising that these constraints need to be included in the network control and optimisation model, the next phase of the project will include liaison with PW and SWW to identify any constraints to the availability of the bulk transfer imports and will incorporate these constraints into the wider solution. The network control and optimisation model will then identify the diurnal usage profile of the bulk transfer import, incorporating constraints and operational requirements, as a key output.

2.3.8.6. Holistic Control

A study will be undertaken to determine the feasibility and requirements of using real-time, holistic control to operate the network identified in the Preferred Option. It will specify infrastructure and hardware requirements and identify cost benefits associated with such a system.

2.3.8.7. IT / OT Assessment

To validate assumptions and mitigate risks identified as part of the IT / OT assessment, the following activities will be carried out between Gate 2 and Gate 3:

1. Perform detailed design analysis of IT / OT changes based on ongoing engagement with broader stakeholder groups from across the WfLH programme and SW functions to continuously align with delivery timelines and scope of planned / ongoing transformation initiatives.
2. Review the impact of and identify additional IT / OT changes based upon conclusion of the feasibility study to determine the OT uplift required on the downstream SW network assets due to integration constraints on the current legacy asset estate.
3. Establish the extent to which asset and site-specific OT requirements will be delivered by delivery partners or 3rd parties. Additional detailed assessment will be required to identify handoffs of site / asset specific OT into SW IT and OT systems for appropriate integration.
4. Analysis of business operating models, capability needs and impact assessment of operational handoffs between 3rd party owned / operated assets and SW owned / operated assets (both new and existing) to review impact and alignment of operating model on technology changes, transitional arrangements, overall ongoing business management and governance.
5. Develop an end-to-end OT business and technical design for the WfLH grid encompassing the water source solutions, the network assets and other WfLH work-streams; subsequently validate the IT / OT changes upon finalisation of the OT design and further refine the IT / OT costs in line with the evolution of technical design for WfLH.

6. Determine the overall total cost of ownership and impact across all work-streams of the WfLH from a CAPEX and OPEX perspective, and the overall impact of the wider programme on SW.

2.4. Site Selection

2.4.1. Site Selection Methodology Overview

The site and route selection methodology is provided in Section 2.1 of Annex 5, Options Appraisal Process.

2.4.2. Engagement with Key Stakeholders

The detail of engagement with key stakeholders, for the site and route selection process, is provided in Section 2.1 of Annex 5, Options Appraisal Process.

2.4.3. Site and Route Selection Outcomes for Option D.2 and B.4

Option D.2 comprises abstraction of raw water from HTR and transfer via a new proposed pipeline to Otterbourne WSW. This Option also requires construction of a HLPS.

Option D.2 will also require a secondary pumping station, BPT and booster station that would be driven by pipeline routing, further hydraulic analysis and subsequent siting exercises that would be developed post Gate 2.

The focus of the stage 4 site and route selection was, therefore, the pipeline and HLPS.

Option B.4 uses HTR as the EB for the treated recycled water. It requires direct water transfer from HTR up to a peak capacity of 61 Ml/d and transfer via a new proposed pipeline to Otterbourne WSW (infrastructure per Option D.2), plus, a 15 Ml/d WRP located near and connected to BF WTW, with associated transfer pipelines between BF WTW, the WRP and HTR.

2.4.3.1. Stage 0 Results

The search envelope to identify the location for the HLPS was driven by the proximity to PW's proposed reservoir at HT. This resulted in the identification of parcels of potentially available land to the west of the proposed reservoir.

Figure 42 illustrates the extent of the search area.

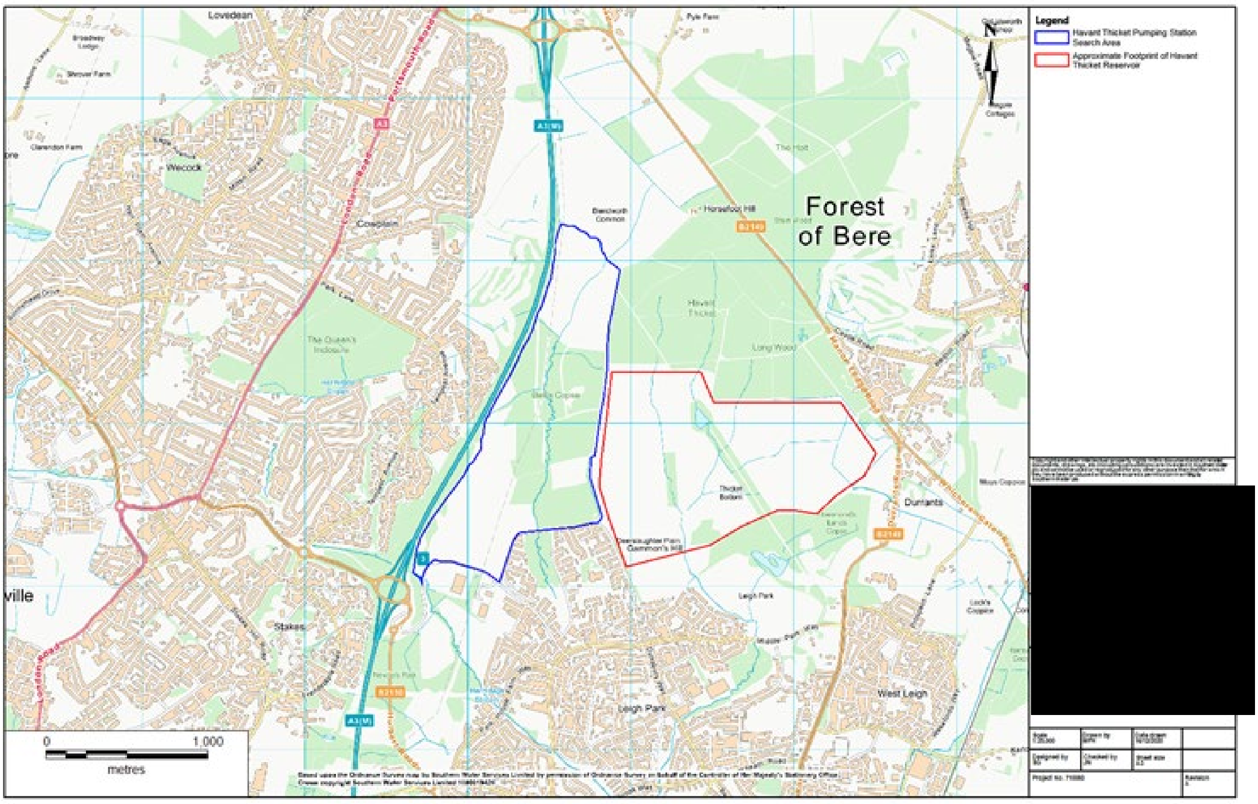


Figure 42 – Search Area for Havant Thicket Raw Water Transfer

2.4.3.2. Stage 1 Site Selection Results

Following the definition of the search area, 18 parcels were identified in Stage 1 all of which were taken forward to Stage 2a. The outcome of Stage 1 of the site selection process is illustrated in Figure 43.

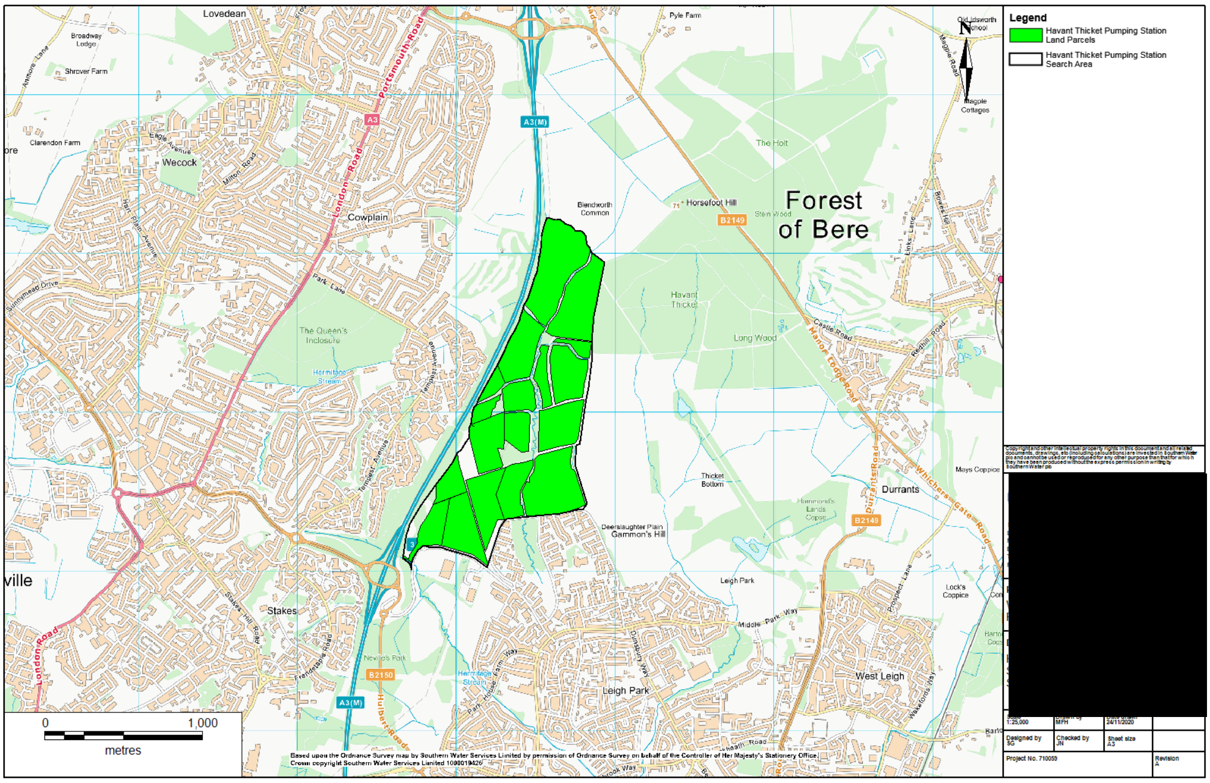


Figure 43 - Water Transfer Site Selection Stage 1 Output

2.4.3.3. Stage 2a Site Selection Results

A score was calculated for each parcel that progressed from Stage 1, the higher the score the better the parcel performed. A total of 18 parcels were scored, with the highest score attributed to a parcel being 28 points and the lowest being 21. To ensure a sufficient cohort of sites could be compared at later stages the top 25% best performing parcels, progressed to Stage 2b.

In this instance, a total of six parcels progressed, this represented 33% of the 18 parcels. The reason a higher percentage than 25% progressed was due to a number of the parcels receiving the same score and as such no quantitative and objective differentiation could be made between these parcels. For these parcels there was no variance between the best performing parcels and the least well performing parcels as all the parcels scored the same, though the parcels were either constrained by proximity to residential or alternatively proximity to amenity spaces. Figure 44 illustrates the output from Stage 2a.

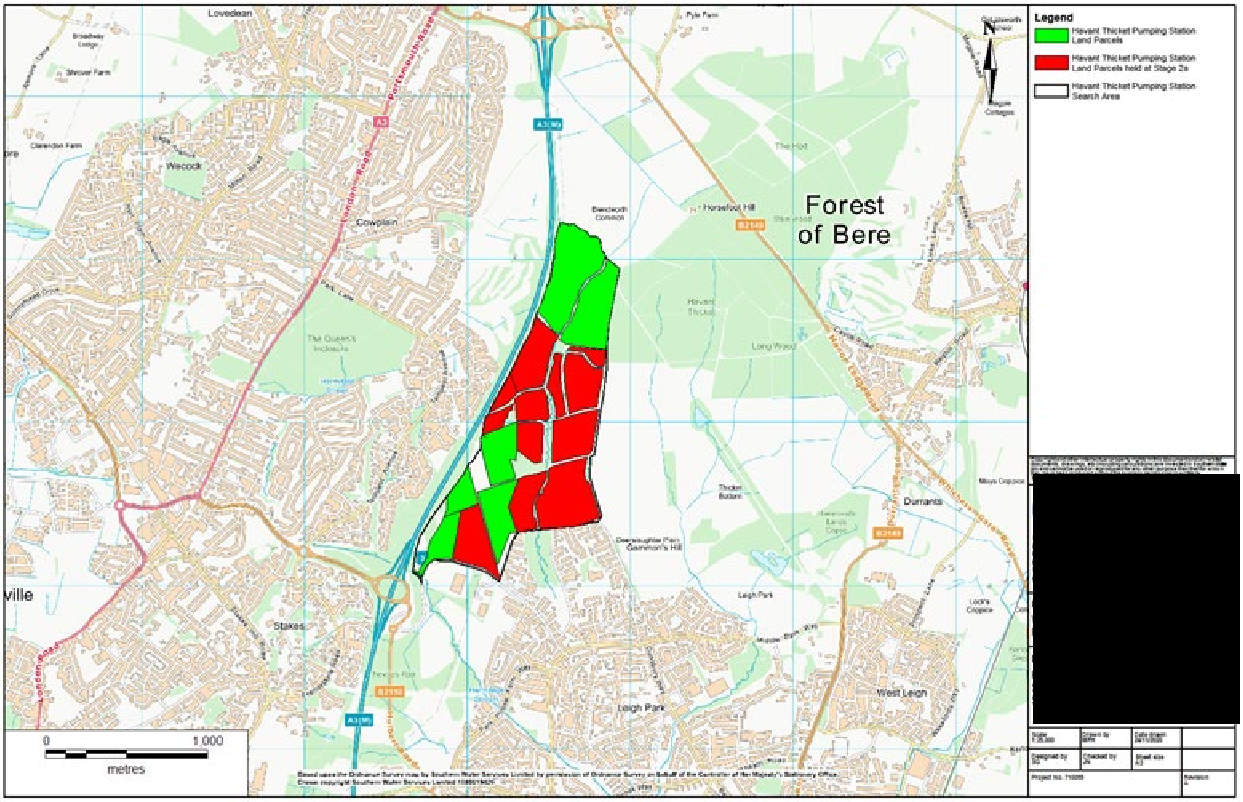


Figure 44 – Water Transfer Site Selection Stage 2a Output

2.4.3.4. Stage 2b Site Selection Results

In this instance two of the six best performing parcels from Stage 2a conflicted with a development that had been screened / scoped or validated and approved EIA development under the appropriate EIA Regulations (within last three years). These parcels were therefore discounted at Stage 2b. Four parcels then progressed from Stage 2b to Stage 3. The output from Stage 2b is illustrated in Figure 45.

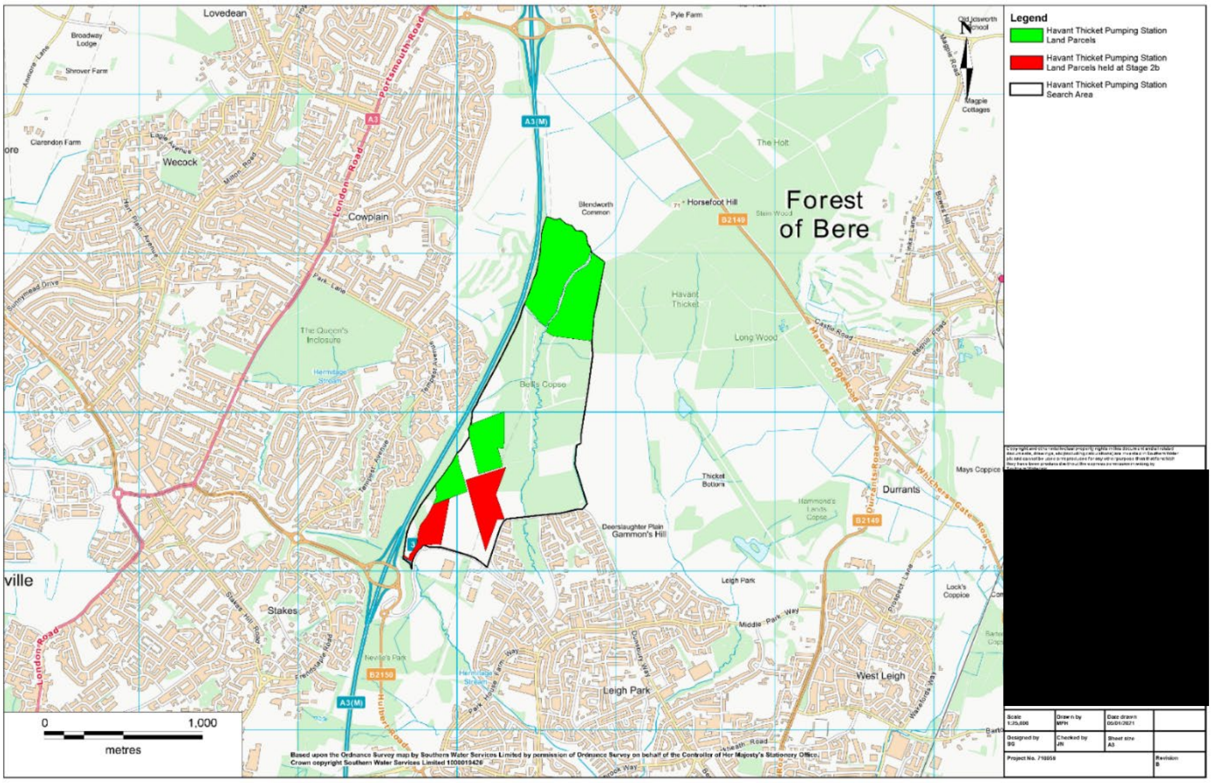


Figure 45 – Water Transfer Site Selection Stage 2b Output

2.4.3.5. Stage 3 Site Selection Results

Four parcels were scored, the highest score attributed to a parcel was 89 points with the lowest being 77. As the parcels were scored against 39 criteria with each criterion awarding a maximum of three and a minimum of zero points, a variance of 12 points between the four parcels illustrated differentiation was possible between the best performing and least well performing parcels through mapping and criteria application.

The outcome of Stage 3 of the site selection process is illustrated in Figure 46, namely Parcels HTPS3, 5 and 8.

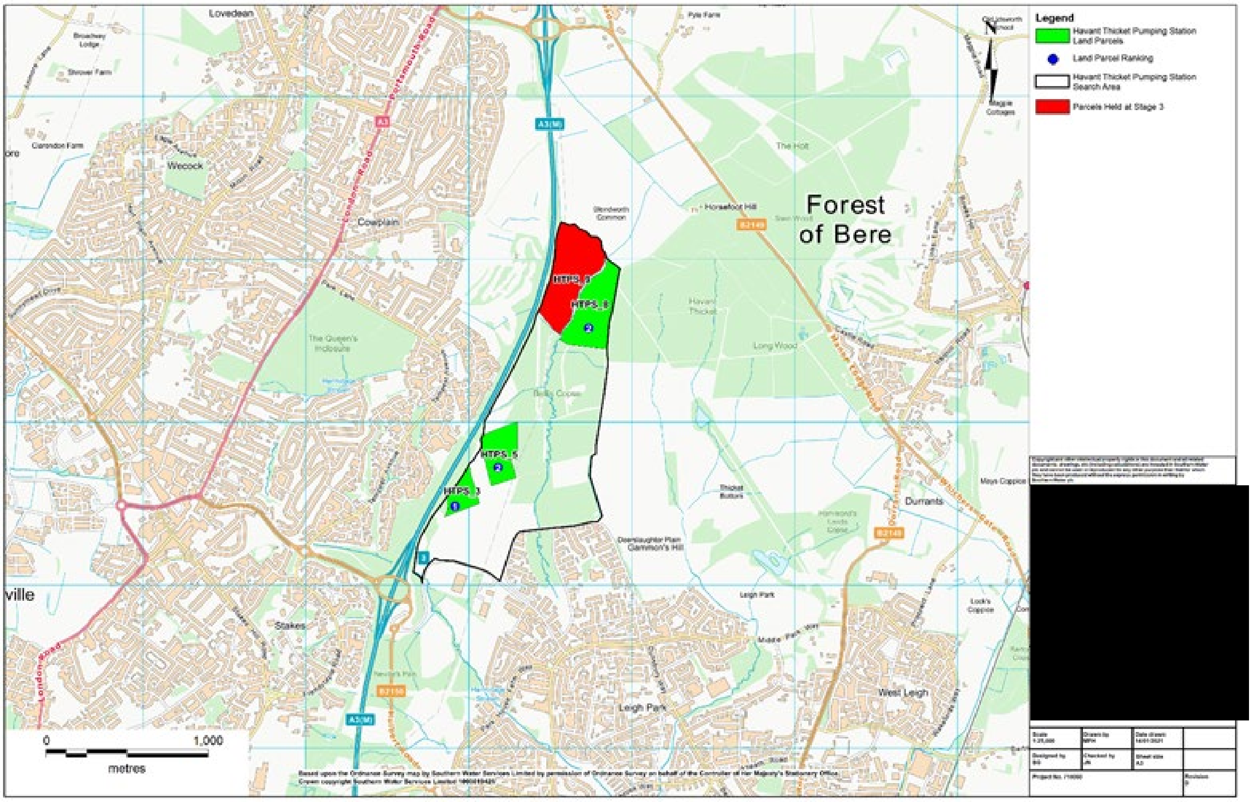


Figure 46 – Water Transfer Site Selection Stage 3 Output

2.4.3.6. Stage 4 Site and Route Selection Results

The Stage 4 site and route selection results for the HLPS and the pipelines are presented below.

Pumping Station Site Selection Results

Parcels HTPS3, 5 and 8 proceeded to Stage 4 of the site selection process. The parcels were evaluated for their consenting risk with the results of this process detailed in Table 16.

Table 16 – Parcels for HLPS - Stage 4 Site Selection Results

Option	Summary of Site Selection Outcomes	Consenting Risk
HTPS 3	Whilst the parcel does not lie within any Habitats Sites, the HTR Appropriate Assessment identified that whilst there is no unequivocal evidence, it is considered more than likely that bats associated with the Singleton and Cocking Tunnels Special Area of Conservation (SAC) are functionally linked to the populations of these species recorded within the proposed reservoir site and surrounding areas. On that basis it is considered that there is potential for impacts to habitats functionally linked to the SAC and therefore in the event of any habitat/woodland loss it would be necessary to provide appropriate mitigation. This parcel is also a habitat	There would be a need for further investigation of the potential mitigation required to ensure no adverse effects on integrity of the SAC and there may be a need to find replacement land for the habitat mitigation associated with the [redacted] mitigation site.

Option	Summary of Site Selection Outcomes	Consenting Risk
	mitigation site for the adjacent [redacted]	
HTPS 5	The same potential consenting issue associated with the Singleton and Cocking Tunnels SAC was identified for this parcel and would also require appropriate mitigation.	There would be a need for further investigation of the potential mitigation required to ensure no adverse effects on integrity of the SAC. However, this parcel has the least consenting risk as it has no specific designations associated with it and it is not designated as mitigation habitat for the [redacted].
HTPS 8	The same potential consenting issue associated with the Singleton and Cocking Tunnels SAC was identified for this parcel and would also require appropriate mitigation. This parcel also lies immediately adjacent to an area of ancient, replanted woodland. As identified in the dNPS, ancient woodland is a valuable biodiversity resource and development consent should not be granted for any development that would result in the loss or deterioration of irreplaceable habitats including ancient woodland. There would need to be appropriate mitigation in place to prevent any potential indirect adverse effects such as appropriate construction practices to minimise impacts on hydrological regimes. It is also located on the Blendworth Common (South) (Site of Importance for Nature Conservation (SINC)).	There would be a need for further investigation of the potential mitigation required to ensure no adverse effects on integrity of the SAC This parcel is considered to have potentially greater consenting risks owing to the proximity of ancient woodland and the designation of the site as a SINC.

All pumping station parcels perform in a similar way against the headline consenting criteria with all potentially requiring mitigation in the event of loss of woodland as a result of the potential for this woodland to be functionally linked to the Singleton and Cocking Tunnels SAC (this would need to be considered further as part of an HRA screening exercise). Parcel HTPS8 was considered to have greater consenting risks owing to the proximity of ancient woodland and priority habitat (immediately adjacent to ancient, replanted woodland) as well as being designated a SINC. HTPS5 was considered to have the least consenting risk as it has no specific designations associated with it and it is not designated as mitigation habitat for the [redacted] development.

2.4.4. Pipeline Selection Results

Following Gate 1, further pipeline development work was undertaken. This comprised the application of the [redacted] Route Planner Tool to back-check the routes developed at Gate 1, further optimise them and ensure that there was a consistent approach to developing all pipeline Options. As a result of this further work four potential pipeline corridors were identified between the HLPS and Otterbourne WSW that were considered in the stage 4 site selection evaluation. Details about the development of these pipeline corridors is provided in Annex 5, Options Appraisal Process of the Gate 2 submission. Figure 47 illustrates the pipeline routes.

[redacted]

Figure 47 – Pipeline Routes

The pipelines were evaluated with the results of this process summarised in Table 17.

Table 17 – Water Transfer Pipeline Corridor Site Selection Results

Option	Summary of Site Selection Outcomes	Consenting Risk
Pipeline 1	This corridor would require a crossing of the River Itchen SAC which is a potential Habitats Regulations Assessment (HRA) risk that would need to be appropriately mitigated to ensure no adverse effects on integrity. There is potential for direct and indirect impact on ancient woodland and this would require an appropriate mitigation / engineering solution. The dNPS states: *"the Secretary of State should not grant development consent for any development that would result in the loss or deterioration of irreplaceable habitats including ancient woodland the loss of ancient or veteran trees found outside ancient woodland…". (Para 4.3.14)* This pipeline corridor runs through approximately 17 km of the South Downs National Park. There is an interface with the Southampton to London Pipeline (SLP) Route and the Aquind Interconnector. Both intersect with the pipeline corridor and there will be a requirement for appropriate re-routeing / construction techniques.	There would be a need for further engineering and environmental assessment work to ensure that there is appropriate routeing and mitigation of the crossing of the River Itchen SAC. This is a potential consenting risk (that applies to all of the pipeline Options). Potential effects on ancient woodland would also need to be further assessed and appropriate mitigation implemented to avoid both direct and indirect effects. Pipeline route 1 would have a significantly greater impact on the National Park than the other pipeline routes and is therefore not considered a consentable Option in view of the availability of other alternatives.

Option	Summary of Site Selection Outcomes	Consenting Risk
Pipeline 2	This corridor would require a crossing of the River Itchen SAC which is a potential HRA risk that would need to be appropriately mitigated to ensure no adverse effects on integrity. It also crosses the River Meon and there is also a high-risk crossing location identified for the River Hamble. These have been identified as high-risk crossing sites and would require mitigation, as detailed in Technical Report 1: Review of Pipeline Watercourse Crossings for Water Recycling and Bulk Supplies. There is potential for direct and indirect impact on ancient woodland and this would require appropriate mitigation / engineering solution. This corridor runs through approximately 2 km of the South Downs National Park. There is an interface with the SLP Route and the Aquind Interconnector. Both intersect with the pipeline corridor and there will be a requirement for appropriate re-routeing / construction techniques.	There would be a need for further engineering and environmental assessment work to ensure that there is appropriate routeing and mitigation of watercourse crossings to reduce potential HRA consenting risks. Potential effects on ancient woodland would also need to be further assessed and appropriate mitigation implemented to avoid both direct and indirect effects. There would be a potentially greater impact on ancient woodland associated with this Option owing to the routing north along the edge of Staunton Country Park. This Option would have a much-reduced impact on the South Downs National Park and would have fewer consenting risks from a landscape perspective compared to Option 1.
Pipeline 3	This corridor would require a crossing of the River Itchen SAC which is a potential HRA risk that would need to be appropriately mitigated to ensure no adverse effects on integrity. It also crosses the River Meon SAC and there is also a high-risk crossing location identified for the River Hamble. These have been identified as high-risk crossing sites and would require mitigation, as detailed in Technical Report 1: Review of Pipeline Watercourse Crossings for Water Recycling and Bulk Supplies. There is potential for direct and indirect impact on ancient woodland and this would require appropriate mitigation / engineering solution. This corridor runs through approximately 4 km of the South Downs National Park. There is an interface with the SLP Route and the Aquind Interconnector. Both intersect with the pipeline corridor and there will be a requirement for appropriate re-routeing / construction techniques.	There would be a need for further engineering and environmental assessment work to ensure that there is appropriate routeing and mitigation of watercourse crossings to reduce potential HRA consenting risks. Potential effects on ancient woodland would also need to be further assessed and appropriate mitigation implemented to avoid both direct and indirect effects, although the risks associated with this pipeline are considered to be lower than for pipelines 1 and 2, including the level of potential impact on ancient woodland. This Option would have a far reduced impact on the South Downs National Park and would have fewer consenting risks from a landscape perspective compared to Option 1.
Pipeline 4	This corridor would require a crossing of the River Itchen SAC which is a potential HRA risk that would need to be appropriately mitigated to ensure no adverse effects on integrity. It also crosses the River Meon SAC and there is also a high-risk crossing location identified for the River Hamble. These have been identified as high-risk crossing sites and would require mitigation. There is potential for direct and indirect impact on ancient woodland and this would require appropriate mitigation / engineering solution. This corridor runs through approximately 2 km of the South Downs National Park. There is an interface with the SLP Route and the Aquind Interconnector. Both intersect with the pipeline corridor and there will be a requirement for appropriate re-routeing / construction techniques.	There would be a need for further engineering and environmental assessment work to ensure that there is appropriate routeing and mitigation of watercourse crossings to reduce potential HRA consenting risks. Effects on ancient woodland would also need to be further assessed and appropriate mitigation implemented to avoid both direct and indirect effects. This Option would have a far reduced impact on the South Downs National Park and would have fewer consenting risks from a landscape perspective compared to Option 1.

All of the pipelines would directly impact the South Downs National Park but route 1 would have a significantly greater impact on the National Park than the other pipeline routes and was therefore not considered a consentable Option in view of the availability of other alternatives. All of the pipeline routes have potential HRA issues associated with the crossings of designated watercourses and for all routes there would need to be appropriate design of the crossings and Appropriate Assessment at the next development stage. All of the Options have the potential to directly and indirectly affect areas of ancient woodland that would again require either avoidance through pipeline routing or appropriate mitigation noting that routes 1 and 2 potentially having a greater impact on ancient woodland where they lie in close proximity to the northern edge of Staunton Country Park.

Following the site selection evaluation, it was recommended that pipelines 3 and 4 should be taken forwards to the stage 5 consenting evaluation. Both were considered potentially consentable and both would encompass the areas previously assessed for a pumping station (see above). Pipeline corridor 1 was not considered consentable owing to the extensive length of the pipeline through the South Downs National Park. There were no specific benefits of route 2 and it would have a potentially greater impact on ancient woodland than routes 3 and 4.

Refined Approach to the Siting of the HLPS

Initial site selection work (as reported above) identified a preferred site close to the proposed HTR as a suitable location for the HLPS. However, in addition to consenting factors, the siting of the HLPS will also be driven by the hydraulic modelling associated with the actual pipeline routing.

In relation to the location of the pumping stations and the break tank for the raw water transfer, the siting of these features is partly dependent on the topographical studies of the land and associated hydraulic modelling which will be produced in the next phase of project development. As a result, the ultimate location of the HLPS could potentially change from that identified indicatively at HTPS 5 as part of the optimisation and development of the scheme design.

Post Gate 2, more detailed site and pipeline route planning will take place as part of further scheme development for the preferred solution to determine land requirements and ultimately inform any application boundary for the project. This will mean that an area of search for the HTPS will need to be established within the recommended pipeline corridors, and further work undertaken to identify a preferred site. This work will also include the siting of the BPT, secondary pumping stations and a possible booster station.

Should the HT Option emerge as the preferred solution, then site selection will closely follow pipeline route studies to determine suitable pumping station locations, and these will be evaluated to ensure judgements and assessment made prior to Gate 2 remain valid. The HTPS5 parcel was nonetheless taken forward into the Stage 5 consenting evaluation to provide a baseline against which future alternative locations, if different, can be compared against and original assumptions and judgements reviewed accordingly.

2.4.5. Site and Route Selection Conclusions for Option D.2

The outcome of the site selection process recommended that the following components were taken forward into Stage 5:

- Pipeline 3 and Pipeline 4 to connect to Otterbourne WSW
- Parcel HTPS 5 (as a baseline only against which future alternative locations, if different can be compared against and original assumptions and judgements reviewed accordingly)

Based on the outcomes of the site selection process the following risks and areas of further action were identified for further consideration in Stage 5:

- There remain risks associated with HRA and watercourse crossings that require further design and assessment
- There needs to be further consideration of how to manage potential impacts on the South Downs National Park
- The routeing of the pipeline corridors needs to be reviewed to avoid direct and indirect effects on ancient woodland

2.4.6. Site and Route Selection Conclusions for Option B.4

Option B.4 comprises both water recycling and water transfer (Option D.2) technology. The results presented for the WRP land parcels for Option B.2 above are the same for Option B.4. The connecting pipeline Options between HT and the Otterbourne WSW and the proposed parcel for a HLPS are reported for Option D.2 in the Site Selection Section of Annex 3, Havant Thicket Technical and are the same for Option B.4.

Initial site selection work for Option D.2 identified a preferred site close to the proposed HTR as a suitable location for the HLPS. However, in addition to consenting factors, the siting of the HLPS will also need to respond to the hydraulic modelling associated with the final pipeline routing. The two elements are interlinked and will need to be optimised in parallel. Whilst a potential site was identified indicatively to allow comparison of Options at Gate 2, it is acknowledged that the final location is likely to change as topographical studies and detailed hydraulic modelling progress beyond Gate 2.

Post Gate 2, more detailed site and pipeline route planning will take place as part of further scheme development for the preferred solution to determine land requirements and ultimately inform any application boundary for the project. This will mean that if Option B.4 is selected, an area of search for the HLPS will need to be established within the recommended pipeline corridors, and further work undertaken to identify a preferred site. This work will also include the siting of the BPT, secondary pumping stations and a possible booster station.

Should the Option B.4 emerge as the preferred solution, then site selection will closely follow pipeline route studies to determine suitable pumping station locations, and these will be evaluated to ensure judgements and assessment made prior to Gate 2 remain valid. The HTPS5 parcel was nonetheless taken forward into the Stage 5 planning evaluation to provide a baseline against which future alternative locations, if different, can be compared against and original assumptions and judgements reviewed accordingly.

Details are provided below of the transfer pipelines required between the WRP and HTR which is followed by a summary of the recommended configuration for Option B.4 as a result of the site selection process.

Two Options were identified to provide a connection between the WRP and HTR - WRP to HTR Route 1 and WRP to HTR Route 2. The consenting risks associated with these two Options were very similar. Both would potentially impact ancient woodland although this may be possible to mitigate through the type of construction technique and both would potentially impact Listed Buildings and have an interface with the Staunton Country Park Registered Park and Garden. There were no significant consenting differentiators or reasons why both should not be taken forward to further analysis at Stage 5.

The outcome of the site selection process recommended that the following components were taken forward into Stage 5 for Option B.4:

- Parcel WRP 72 (with Parcel WRP71 retained as a backup)
- Pipeline 3 and Pipeline 4 to connect to Otterbourne WSW
- Parcel HTPS 5 (as a baseline only against which future alternative locations, if different can be compared against and original assumptions and judgements reviewed accordingly)

- Both potential connections (WRP to HTR Route 1 and WRP to HTR Route 2) between the WRP and HTR

Based on the outcomes of the site selection process the following risks and areas of further action were identified for further consideration in Stage 5:

- There remain risks associated with HRA and watercourse crossings that require further design and assessment
- There needs to be further consideration of how to manage potential impacts on the South Downs National Park

The routeing of the pipeline corridors needs to be reviewed to avoid direct and indirect effects on ancient woodland.

2.5. Environmental

2.5.1. Introduction

The Gate 2 Environmental Assessment builds upon the Environmental Assessments presented in the Gate 1 Submission: Annex 10.3 Environmental Assessment (September 2020). The following environmental assessments and activities are summarised in this report for SRO D.2:

- Strategic Environmental Assessment (SEA)
- EIA progress and surveys
- HRA
- WFD Compliance Assessment
- Invasive Non Native Species (INNS) Risk Assessment
- Biodiversity Net Gain (BNG) and Natural Capital (NC) Assessment
- Environmental Mitigation
- Carbon Impact

Option D.2 does not comprise any marine components / impacts, therefore a Marine Conservation Zone Assessment (MCZA) was not completed for this SRO, although Option B.4 is expected to. As a result, assessments related to marine environment have been completed and are applicable only to Option B.4, of the Options covered in this document.

Table 18 details the actions agreed for the Environmental Assessment as part of SW's Gate 1 submission to RAPID, and the information which has been requested by RAPID to accompany the Gate 2 Environmental Assessment. Table 18 confirms where this information is located within this section.

Table 18 - Environmental Assessment actions agreed at Gate 1 / Gate 2 Environmental Assessment requirements

Source	Requirement for Gate 2 Environmental Assessment	Location with Gate 2 Environmental Appraisal
RAPID Gate 2 template section 3.5	Option-level environmental assessments that meet local requirements and provide information consistent with SEA, HRA and other statutory assessment requirements including consideration of in-combination effects and identification of environmental risks that need mitigating through the solution design and costing.	All following subsections The HRA includes a consideration of in-combination effects (e.g. in-combination with other plans and projects).
RAPID Gate 1 Final Decision – Action for Gate 2	Provide summaries of the further development of SEA, HRA, WFD assessment, NC Assessment, Environmental Social and Economic Valuation and Environmental Net Gain, that have been discussed and agreed with the Environment Agency (EA), Natural England (NE) and any other relevant regulators, to meet gate two requirements and timescales.	All following subsections
RAPID Gate 2 template Section 3.5	Environmental, social and economic valuations (or metric benefits) consistent with principles in the National Policy Statement (NPS) and Water Resource Planning Guidelines (WRPG).	2.5.1.3.5
RAPID Gate 1 Final Decision – Action for Gate 2	Undertake site selection process for the preferred pipeline configuration as detailed in Gate 1 submission, Annex 9.1 and 9.2 (of the Gate 1 submission) in consultation with the Environment Agency and Natural England, to meet gate two requirements and timescales.	Section 2.4 (Site Selection)

Source	Requirement for Gate 2 Environmental Assessment	Location with Gate 2 Environmental Appraisal
RAPID G2 template section 3.5	Include main conclusions and issues arising including results of environmental work carried out to date and plan for future work: • How the solution contributes to environmental net gain	2.5.1.3.5 (BNG and NC Assessment)
RAPID G2 template section 3.5	Include main conclusions and issues arising including results of environmental work carried out to date and plan for future work: • The carbon impact of the solution and initial outline of how the solution will take into account the carbon commitments	Section 2.5.2.9
Gate 1 Submission, Annex 20 - Gate 2 delivery plan	Summary of the following (Varying maturity level depending on solution / Option) Activities that have the potential to be accelerated and brought forward from Gate 3 activities into Gate 2 for the Base Case include: • Terrestrial and marine environmental and ecological surveys • Scope and prepare outline Environmental Monitoring Plans • Commencement of work to inform the Preliminary Environmental Information Report (PEIR)	2.5.1.2 Progress on EIA
RAPID Gate 1 Final Decision Action for Gate 2	• Provide details of an 'Evidence Planning Strategy, which has been discussed and agreed with the EA and NE, to meet Gate 2 requirements and timescales. Baseline methodologies and scopes to inform survey work needs to be agreed as a priority.	2.5.1.2 Progress on EIA

The purpose of this section of the CDR is to provide a concise summary of each of the above assessments for D.2 These assessments are reported in detail in the technical documentation which has been prepared in parallel with the Gate 2 submission.

The summaries in this section explain the approach taken to each of the assessments and summarise the key findings. Due to the intended length of the CDR, it is not possible to include full details of every aspect of the assessments in this section.

The environmental assessments undertaken for Gate 2 have been undertaken at strategic level, based on the level of concept design information and evidence base available on each SRO at this stage in the scheme development process. Following Gate 2 and the selection of the Preferred Option project level environmental assessments will be undertaken to support the Development Consent Order (DCO) application. These assessments will be undertaken in compliance with the requirement of the dNPS for Water Resources Infrastructure and supported by a full suite of environmental surveys, further technical appraisal, and further consultation and engagement.

Assessments at this stage are based on a qualitative expert-judgement approach, augmented by high-level quantitative data where appropriate. Where gaps in information (e.g. survey data, modelling etc) have been identified, these are summarised in this section and further detailed in the technical documentation.

Method Statements, outlining the proposed approach to the Gate 2 environmental assessments for the SEA, HRA, MCZA, INNS Assessment and WFD assessment were circulated to NE, the EA and the Marine Management Organisation (MMO) for comment prior to Gate 2. Drafts of the BNG and NC assessments, including details of the applied methodology, were also circulated to relevant regulators for comment.

It is not possible to summarise all comments and responses within the intended length of this CDR document, however a summary of the key themes emerging from consultation are summarised below:

Table 19 - Consultation summary - key themes

Comment Theme	Response
Gaps in baseline information	Several data gaps have been filled since Gate 1 (for example dispersion modelling); however it is recognised that there are some gaps in baseline information (e.g. surveys), and assessments draw upon desk-based information where available. Further surveys are proposed, and data gaps will be filled for the final project level consent application.
Uncertainty over scope of Gate 2 assessments and relationship with project level consent application assessments	The assessments undertaken for Gate 2 have been undertaken at a strategic level and have been used to support and inform site selection and Options appraisal. For example, the principles of WFD, HRA, and SEA have been applied to support Option selection, recognising that full environmental assessments will be required for the project level consent application, following the identification of the Preferred Option.
Specific comments on guidance and best practice to be used in assessments	Assessments have been updated to ensure they reflect specific guidance referenced by stakeholders.

The environmental assessments reported in this section are based on the SROs designed as detailed for Options D.2 and B.4 as detailed in Section 2.2.

The components of D.2 determined through the sites and route process are as follows:

- Pipelines from HT to Otterbourne (Routes 3 and 4)
- HLPS (Parcel 5)
- Ceramic Membrane and washwater recovery area at Otterbourne
- BPT and 2nd stage pumping stations

Infrastructure components of Option B.4 are as per those for Option D.2, plus:

- WRP, site 72
- Effluent transfer from [redacted] to WRP
- Waste-stream to BF and out Eastney LSO
- Transfer pipeline WRP to HTR

The above components are illustrated in Figure 48 and 49.

[redacted]

Figure 48 - D.2 Components

[redacted]

Figure 49 - Key components – B.4

It should be noted that all environmental assessments and appraisals have been completed using the principles of formal HRA and SEA. As a result, all assessments and appraisals completed to date are non-statutory as there has been no formal trigger to initiate formal assessments and appraisals in the project.

2.5.2. Strategic Resource Option D.2

2.5.2.1. Strategic Environmental Assessment

Methodology

As with the approach taken at Gate 1, and in line with the requirements of the RAPID Accelerated Gate 2 Submission Template, environmental assessments that provide information consistent with SEA have been undertaken at option level for each SRO. A statutory SEA is not required for Gate 2.

The first step of Stage B was to undertake a screening exercise, to assess the potential effects of each option against the baseline environment, and to determine whether they are affected by the proposals (in this context 'screening' is used to describe an option level source-pathway-receptor approach taken to identify where impacts may occur, not SEA screening in the sense of deciding whether a whole plan requires an SEA).

The SEA Screening Assessment undertaken at Gate 1 (Appendix 10.3 Environmental Assessment, Alternative Use Appendices: Appendix B to the Gate 1 submission) has been updated to reflect changes in the concept design and potential pipeline routes, and open source data sources have been updated.

In line with approach taken at Gate 1, the principles of SEA assessment have been applied to identify potential impacts for each SRO. The first three steps of the following five steps of SEA have been followed in this assessment:

- Stage A - Setting the context, establishing the baseline and deciding the scope
- Stage B - Developing and refining alternatives and assessing effects
- Stage C - Preparing the environmental report
- Stage D – Consultation
- Stage E - Monitoring implementation of the plan or programme

A summary of the above stages is provided below, with full details available in the technical report.

Stage A – Setting the context, establishing the baseline and deciding on the scope

Baseline information on the study area for each SRO was collated centrally in a GIS and data repository to provide the basis for predicting environmental effects. This included open source data, survey data and environmental assessments conducted in the preparation of other relevant plans and programmes. Baseline information also included the emerging findings of other environmental assessments being completed for the Gate 2 submission (e.g. WFD, HRA and MCZ assessments).

At this stage, the SEA objectives were also defined around a number of key themes including; biodiversity, fauna and flora, population and human health, material assets and resource use, water, soil, geology and land use, air and climate, archaeology and cultural heritage; and landscape. The objectives were consistent with the SEA objectives outlined at WRM19 and Gate 1 to enable consistency and comparison of effects. The purpose of the SEA objectives was to establish a framework for assessing the environmental effects of the SRO, and to enable comparison with other SROs. In this instance, each component of the SRO was assessed separately against the SEA objectives to allow different configurations (e.g. pipeline routes) so be considered.

At this stage, a list of other development was also collated to enable and assessment of cumulative effects during Stage B. This list was consistent with the list used for the HRA cumulative (referred to as 'in-combination

Stage B - Developing and refining alternatives and assessing effects

The first step of Stage B was to undertake a screening exercise, to assess the potential effects of each Option against the baseline environment, and to determine whether they are affected by the proposals. A source-pathway-receptor approach was taken to identify where impacts may occur. Where environmental effects were not predicted (e.g. no source, or no pathway etc), these were 'screened out' from further assessment.

The screening stage was followed by an assessment of environmental effects and consideration against the SEA objectives defined in Stage A. This stage also identifies whether mitigation measures are likely to be required where adverse environmental effects are deemed to be likely.

The environmental assessment stage adheres to a number of guidance documents including ODPM (2005), UK Water Industry Research (UKWIR) (2021) and WRSE (2020) to ensure a fair comparison, across all SROs, for the Gate 2 submission. Each SRO component was assessed against each SEA objective, with positive as well as negative effects being considered. Uncertainties regarding the nature and significance of effects were also recorded.

For each SEA objective, the residual effect is determined using a significance of effect matrix. This considers the value / sensitivity of the receptor and the magnitude of the assessed effect. The significance matrix determines effects on a scale ranging from 'major beneficial' to 'major adverse', as set out below in Table 20.

Table 20 - SEA Appraisal Matrix

		Magnitude					
		Negative Impact			Positive Impact		
		High	Medium	Low	Low	Medium	High
Sensitivity	High	Major	Major	Moderate	Moderate	Major	Major
	Medium	Major	Moderate	Minor	Minor	Moderate	Major
	Low	Moderate	Minor	Negligible	Negligible	Minor	Moderate

Where major adverse effects are predicted, measures envisaged to prevent, reduce (and as far as possible, offset) these effects on the environment (because of implementing the measure) are outlined where relevant / appropriate.

Stages C, D and E

- Stage C: Preparing the environmental report. The SEA has been summarised in the Gate 2 documentation, with the full detail provided in the technical documents.
- Stage D: Consultation. This will be undertaken leading up to, and during the Gate 2 submission.
- Stage E: Requirements for monitoring will be identified and carried forward to the project stage assessment.

A summary of the key SEA impacts identified is provided below.

SEA Screening

Two D.2 components have the potential for major adverse effects to biodiversity. The HTR to Otterbourne WSW (Route 3) has the potential to have a major adverse impact on National Site Network Sites (Chichester and Langstone Harbours SPA and Ramsar, the Solent Maritime SAC and River Itchen SAC) and Site of Special Scientific Interest (SSSIs), during construction. The construction of the CeraMac at Otterbourne WSW (including the washwater recovery area) has the potential to have a major adverse impact on the qualifying species of the River Itchen SAC (and SSSI which underpins this designation). Ancient Woodland also borders the Otterbourne WSW site and therefore there is the potential for adverse effects during construction.

There are a significant number of Scheduled Monuments and Listed Buildings, and a high potential for undiscovered archaeological remains, within the vicinity of the pipeline transfer from HTR to Otterbourne WSW (Routes 3 & 4), the 2nd Stage Pumping stations and BPTs, and the CeraMac at Otterbourne. Therefore, there is the potential for major adverse effects to occur on cultural heritage in relation to the construction of these components. However, during operation the potential for adverse effects on heritage assets to occur is very low as the pipeline components will be buried.

The pipeline transfers from HT to Otterbourne WSW (Route 3 and 4) cross the South Downs National Park, therefore there is the potential of major adverse impacts during construction. The 2nd Stage Pumping stations and BPTs are located outside of the South Downs National Park, however, due to their size there is the potential for adverse landscape and visual impacts to occur. These interactions with the landscape designations have the potential to cause major adverse impacts during construction to landscape and visual receptors, although operational impacts are likely to be negligible as the infrastructure is buried. There is the potential for the pipeline transfer from HTR to Otterbourne WSW (Routes 3 & 4) to have major adverse effects on other SEA topics during construction, including impacts to high grade agricultural land to the west of Purbrook.

the Eastleigh No.1 and 2 Air Quality Management Areas (AQMA) as there is the potential for construction traffic to pass through these AQMAs. The HTR to Otterbourne WSW (Route 3) also has the potential to have a major adverse impact on National Site Network Sites (Chichester and Langstone Harbours SPA and Ramsar, the Solent Maritime SAC and River Itchen SAC) and SSSIs due to direct and indirect construction related impacts (e.g. noise, visual disturbance, dust and disturbance to supporting habitat) on species and habitats within these protected areas.

D.2 Havant Thicket Reservoir to Otterbourne WSW: Route3

Summary of component adverse effects

One major adverse effect has been identified, relating to archaeology and cultural heritage (the high potential for undiscovered archaeological remains during construction and proximity to national designations). Moderate adverse impacts are predicted to biodiversity, flora and fauna (potential dust and air quality impacts of construction works towards National Site Network Sites and national designations), population and human health (impacts towards access to recreational resources including the National Park), material assets and resource use (large quantities of material for construction and waste generated for landfill in addition to a small long-term energy consumption requirement), air and climate (emissions) and landscape and visual (disturbance to a Listed Park and Garden).

Summary of component beneficial effects

Five minor beneficial effects have been identified for this component, relating to population and human heath (more sustainable provision of water during drought conditions), material assets and resources (lessening the pressure on other sources that abstract water from more limited water resources during drought conditions), water (presents an opportunity to reduce impacts to groundwater through water transfer) and air and climate (reduction in vulnerability to climate change), through its contribution to water delivery resourced as part of the overall Direct Water Transfer SRO. The component contributes to a benefit by ensuring water provided by the other components reaches the right customers, communities and businesses. Additionally, the component contributes to reducing the vulnerability to risks (i.e. drought) associated with climate change effects and improves resilience to the likely effects of climate change.

D.2 Havant Thicket Reservoir to Otterbourne WSW: Route 4

Summary of component adverse effects

One major adverse effect has been identified in relation to archaeology and cultural heritage (the high potential for undiscovered archaeological remains during construction and proximity to national designations). Moderate adverse impacts are predicted to biodiversity, flora and fauna (potential dust and air quality impacts of construction works towards National Site Network Sites and national designations), population and human health (impacts towards access to recreational resources including the national park), material assets and resource use (large quantities of material for construction and waste generated for landfill in addition to a small long-term energy consumption requirement), air and climate (emissions) and landscape and visual (disturbance to a Listed Park and Garden).

Summary of component beneficial effects

Five minor beneficial effects have been identified for this component, relating to population and human heath (more sustainable provision of water during drought conditions), material assets and resources (lessening the pressure on other sources that abstract water from more limited water resources during drought conditions), water (presents an opportunity to reduce impacts to groundwater through water transfer) and air and climate (reduction in vulnerability to climate change), through its contribution to water delivery resourced as part of the overall Direct Water Transfer SRO. The component contributes to a benefit by ensuring water provided by the other components reaches the right customers, communities and businesses. Additionally, the component contributes to reducing the vulnerability to risks (i.e. drought) associated with climate change effects and improves resilience to the likely effects of climate change.

D.2 2nd stage pumping stations and break pressure tanks

Summary of component adverse effects

Two major adverse effects have been identified relating to biodiversity, flora and fauna (potential dust, noise and air quality impacts of construction works towards national designations), archaeology and cultural heritage (the high potential for undiscovered archaeological remains during construction and proximity to national designations) and landscape and visual amenity (impacts on the visual amenity of the landscape of a national park during construction).

Summary of component beneficial effects

Five minor beneficial effects have been identified for this component, relating to population and human heath (more sustainable provision of water during drought conditions), material assets and resources (lessening the pressure on other sources that abstract water from more limited water resources during drought conditions), water (presents an opportunity to reduce impacts to groundwater through water transfer) and air and climate (reduction in vulnerability to climate change), through its contribution to water delivery resourced as part of the overall Direct Water Transfer SRO. The component contributes to a benefit by ensuring water provided by the other components reaches the right customers, communities and businesses. Additionally, the component contributes to reducing the vulnerability to risks (i.e. drought) associated with climate change effects and improves resilience to the likely effects of climate change.

D.2 Ceramic membrane plant at Otterbourne WSW, including washwater recovery area

Summary of component adverse effects

Two major adverse effects have been identified, relating to biodiversity, flora and fauna (potential dust, noise and air quality impacts of construction works towards National Site Network Sites and national designations) and archaeology and cultural heritage (the high potential for undiscovered archaeological remains during construction and proximity to national designations).

Summary of component beneficial effects

Five minor beneficial effects have been identified for this component, relating to population and human heath (more sustainable provision of water during drought conditions), material assets and resources (lessening the pressure on other sources that abstract water from more limited water resources during drought conditions), water (presents an opportunity to reduce impacts to groundwater through water transfer) and air and climate (reduction in vulnerability to climate change), through its contribution to water delivery resourced as part of the overall Direct Water Transfer SRO. The component contributes to a benefit by ensuring water provided by the other components reaches the right customers, communities and businesses. Additionally, the component contributes to reducing the vulnerability to risks (i.e. drought) associated with climate change effects and improves resilience to the likely effects of climate change.

D.2 High lift pumping station

Summary of component adverse effects

One major adverse effect has been identified, relating to, archaeology and cultural heritage (the high potential for undiscovered archaeological remains during construction). Five moderate adverse effects have been identified, relating to biodiversity and flora (proximity to ancient woodland), population and human health (wellbeing), resource use and air quality (emissions).

Summary of component beneficial effects

Five minor beneficial effects have been identified for this component, relating to population and human heath (more sustainable provision of water during drought conditions), material assets and resources (lessening the pressure on other sources that abstract water from more limited water resources during drought conditions), water (presents an opportunity to reduce impacts to groundwater through water transfer) and air and climate (reduction in vulnerability to climate change), through its contribution to water delivery resourced as part of the overall Direct Water Transfer SRO. The component contributes to a benefit by ensuring water provided by the other components reaches the right customers, communities and businesses. Additionally, the component contributes to reducing the vulnerability to risks (i.e. drought) associated with climate change effects and improves resilience to the likely effects of climate change.

Summary of D.2 Configuration Effects

Adverse effects

Potential major adverse effects to biodiversity arise from the proximity of ancient woodland to the 2nd Stage Pumping stations, BPTs and CeraMac. Impacts could occur from disturbance issues (noise, visual and lighting) and degradation of habitats through dust dispersion, sediment runoff and localised pollution incidents.

There are a significant number of Listed Buildings, and a high potential for undiscovered archaeological remains, for within the expected footprint of Option D,2. Therefore, there is the potential for major adverse effects to occur on cultural heritage in relation to the construction of all components. However, during operation the potential for adverse effects on heritage assets to occur is very low as these components will be buried.

The pipeline transfers from HT to Otterbourne WSW (Route 3 and 4) cross the South Downs National Park. These interactions have the potential to cause major adverse impacts during construction and in the short-term operational stage to landscape and visual receptors, although long term operational impacts are likely to be negligible as the infrastructure is buried.

Beneficial effects

This SRO would have minor beneficial effects to population and human heath (more sustainable provision of water during drought conditions), material assets and resources (lessening the pressure on other sources that abstract water from more limited water resources during drought conditions), water (presents an opportunity to reduce impacts to groundwater through water recycling) and air and climate (reduction in vulnerability to climate change).

Cumulative effects

Adverse cumulative effects could occur through increased suspended sediment and deposition (smothering) to Solent Maritime SAC and disturbance, and changes in water quality and prey resource to

Solent and Dorset Coast SPA and Chichester and Langstone Harbours SPA and Ramsar in combination with the Aquind interconnector.

Portsmouth coastal management scheme and HTR HRAs have the potential to cause disturbance, and therefore an adverse cumulative effect cannot be ruled out at this stage.

2.5.2.2. Progress on Environmental Impact Assessment

In addition to Gate 2 specific environmental assessments, work has progressed on the EIA process, namely work in relation to the preparation of an EIA Scoping Report. The purpose of thee Scoping Report is to determine the extent of issues to be considered in the assessment and reported in the ES, required as part of the DCO application.

Development of Outline EIA Methodology Document

An outline EIA methodology document has been prepared which sets out a broad approach to EIA which can be applied to all of the SROs currently being considered by WfLH. The EIA methodology document will be made bespoke for the Preferred Option once determined. The document is currently being quality assured, with the intention of submitting to regulators and stakeholders for comment in August / September 2021. As the preferred consenting route for all SROs is a DCO under the Planning Act 2008, the document has been prepared in line with the Planning Inspectorate (PINS) Guidance Notes, including 3 (EIA Notification), 7 (EIA PEIR, Screening and Scoping), 10 (HRA), 17 (Cumulative Effects Assessment) and 18 (WFD Assessment).

The EIA methodology document establishes approaches to:

- Defining baseline
- Assessment of Likely Significant Effects (LSEs)
- Assessment of cumulative and in-combination effects
- Approach to determining and assessment mitigation

Specific assessment methodologies have also been prepared for the following EIA Topics:

- Air Quality and Odour
- Archaeology and Cultural Heritage
- Biodiversity
- Land Quality and Ground Conditions
- Land Use and Agriculture
- Landscape and Visual Impact
- Noise and Vibration
- Traffic and Transport
- Water Resources and Flood Risk
- Benthic and Intertidal Ecology (applicable for Option B.4 only)
- Coastal and Marine Processes (applicable for Option B.4 only)
- Commercial Fisheries (applicable for Option B.4 only)
- Fish and Shellfish Ecology
- Marine Mammals (applicable for Option B.4 only)
- Marine Water Quality (applicable for Option B.4 only)
- Ornithology

- Shipping and Navigation (applicable for Option B.4 only)
- Other Marine Users (applicable for Option B.4 only)
- Carbon and Climate Change
- Human Health
- Major Accidents and Disasters
- Socioeconomics, Tourism and Recreation

Not all of the above topics are likely to be relevant for D.2 (primarily marine EIA topics).

The outline EIA methodology document will provide a framework for the EIA Scoping Report which is due to be submitted shortly after the s35 application (see Section 2.6 of this CDR).

Development of Planning Policy Document

Taking a similar approach to the outline EIA methodology document, a planning policy document has also been developed to provide a high-level summary of the key relevant national, regional and local policies relevant to the proposed SROs. The document has been developed at programme level (i.e. covering all SROs) and will be tailored provide a bespoke planning policy section for the EIA Scoping Report following selection of the Preferred Option.

Environmental Surveys

To support the EIA process and supporting environmental assessments (e.g. HRA and WFD), a wide range of surveys and primary data collection will be required. To ensure that surveys are identified and scoped appropriately with regulators, a number of survey protocols have been developed, as detailed in Table 21 below.

Table 21 - Water for Life Hampshire – Survey Protocols

Survey Protocol	Included Surveys
Terrestrial Ecology	• Badger • Bats • Amphibians • Riparian mammals • Hazel dormice • Birds
Aquatic Ecology	• Aquatic macroinvertebrates • Fish • White Clawed Crayfish • River habitat and corridor surveys
Marine Environment	• Intertidal habitats and species • Subtidal habitats and species • Fish ecology • Marine and coastal ornithology • Glass eel and Ichthyoplankton • Priority marine habitats

Survey Protocol	Included Surveys
	• Sediment quality • Seawater quality

The purpose of the protocols is to ensure a consistent, transparent and standardised approach to the environmental survey methodologies used for WfLH SROs and the provision of a robust baseline to inform the relevant application documents. The collected baseline survey data will be used to inform the scheme development process, EIA process and the identification of appropriate mitigation measures.

As ecological surveys are seasonally constrained, priority has been given to developing the ecology protocols in the first instance, however protocols will also need to be developed for other environmental surveys (e.g. land quality, traffic, historic environment etc) beyond Gate 2.

The survey protocols for those detailed in Table 21 were issued to the EA, NE and the MMO for comment in June 2021. Following agreement of these survey protocols, SRO specific survey specifications will be developed and updated. At the time of preparing this CDR, some comments have now been received from regulators, which SW is currently taking into consideration.

The purpose of the protocols is to identify and agree:

- Types of survey to be undertaken
- Survey methodologies
- Preferred survey windows / seasonal restrictions
- Further desk studies required to inform the development of project level specifications (see below)

Following agreement of the survey protocols, individual specifications will be developed for the Preferred Option, which will:

- Identify suitable study / survey areas
- Provide detailed survey programmes
- Respond to outcomes of desk studies and consultation
- Detailed survey methodologies

A series of desk-studies relating to each of the EIA topics outlined above have also been identified which are due to be procured through SW's Studies and Investigations (S&I) Framework. These desk-studies will be used to further define the survey protocols and baseline chapters of the EIA Scoping Report. The full list of desk studies is available in the Outline EIA Methodology document [redacted].

Once the Preferred Option formally enters the DCO process, following determination of the s35 application, SW proposes to adopt the Evidence Plan Process (EPP). The purpose of the EPP, a non-statutory and voluntary process now established as best practice for DCO applications, is to provide greater certainty to all parties on the amount and range of evidence that SW is required to collect to support the application and to help address and agree issues early in the pre-application process. In advance of formally entering into the EPP, Southern Water is seeking to agree the extent and scope of surveys with regulators as they are developed.

2.5.2.3. Marine Conservation Zone Assessment

A MCZA was not completed for D.2 as there are no marine works or anticipated pathways or impacts.

2.5.2.4. Habitats Regulations Assessment

The principles of HRA have been applied to inform the environmental feasibility and deliverability of each SRO for Gate 2. A statutory HRA is not required for Gate 2, however a project level assessment will be required to support the Preferred Option DCO application.

The purpose of this high-level information on HRA is to test if the SRO could significantly harm the designated features of a Habitats site (SAC, Special Protection Area (SPA) or Ramsar sites). Any possible SAC (pSAC) and potential SPA (pSPA) are also considered in the HRA. These sites are referred to as 'Habitats sites'. In addition, effects on compensatory measures that have been proposed for other plans and projects to maintain coherence of the network have also been assessed.

The high-level information on HRA takes a highly precautionary approach in order to provide conservative conclusions to inform a robust Options appraisal for Gate 2. In accordance with the principles required of HRA, where there is uncertainty at this stage it is stated that an Adverse Effect on Integrity (AEoI) cannot be ruled out.

This section of the CDR summarises the key findings of the high-level information on HRA for D.2, for full details please refer to the technical document.

Gate 2 Methodology

Stage 1: Screening

Screening is the process which initially identifies the likely effects upon a Habitats site or Ramsar site, either alone or in-combination with other projects or plans and considers whether there may be a LSE on the Habitats site or Ramsar site or the interest features of the site. In line with feedback received from NE on the Gate 2 HRA method statement, and in accordance with the 2018 European Court of Justice ruling in the case of People Over Wind, Peter Sweetman v Coillte Teoranta (C-323/17), mitigation has not been taken into account in the HRA screening.

For the purposes of the Gate 2 HRA screening, a worst-case scenario approach is used which considers the distance / pathway to the closest component of the SRO infrastructure. Recognising the relative similarity of the two pipeline route Options (see Section 2.2) and the high-level nature of the HRA at this stage, these two routes are assessed together, with the worst-case scenario used where applicable

The screening follows a two-step process, as set out below.

Stage 1a: Pathway for effect

In line with the Gate 1 HRA Stage 1 Screening Tables (Gate 1 submission document Annex 10.3, Appendix C), a study area using a 10 km buffer, from the closest component of the SRO infrastructure has been used to identify sites for consideration in the HRA Stage 1 screening, as well as consideration of any wider potential effects within 200 m of major roads associated with construction traffic based on an assumption of access via major roads.

This first stage of screening considers the typical range of the designated features (i.e. whether a static or mobile feature) and potential zone of influence from the components of the SRO based on expert judgement to determine any pathway for potential effect. Where there is no potential pathway for effect, the Habitats site or Ramsar site can be screened out from further assessment.

Stage 1b: Likely Significant Effect

For Habitats sites and Ramsar sites with a potential pathway for effect, Stage 1b considers the condition and sensitivity of the designated features, conservation objectives and any management measures for each Habitats / Ramsar site to determine the potential for a LSE.

At this stage, consideration is also given to whether in-combination effects could occur and whether they contribute to or result in any additional LSE on any Habitats sites or Ramsar sites. Where there is no pathway for effect for the SROs there will be no in-combination effects with other plans and projects.

Table 22 - Plans and Projects Screened-in to in-combination assessment

Project Name	Status	Description	Expected Construction Date	Distance
AQUIND Interconnector	Awaiting decision	Development of AQUIND Interconnector with a nominal net capacity of 2000 MW between Great Britain and France located off the coast of Portsmouth offshore and between Portsmouth and Lovedean substation onshore.	2021 - 2023	c.5 km
Portsmouth City Council	Granted	Flood and coastal erosion management scheme comprising a combination of encasing sections of the existing sea wall with enhanced stepped revetment, construction of a new vertical sea wall with stepped revetment, improvements to 2no. existing slipways, removal of 1no. existing slipway, reconstruction and raising of the existing coastal footpath, provision of additional seating and viewing areas, creation of an offshore bird island, and all associated works, compounds, removal of trees and landscaping.	2020 - 2026	c.5 km
HTR	Granted	Construction of a new reservoir and associated pipeline to [redacted] pumping station.	HTR	Granted

It is important to note that the evidence is to show, on the basis of objective information, that there will be no LSE; if the SRO may cause LSE on any Habitats sites or Ramsar sites, or it is not known whether the SRO may cause such LSE, that would trigger the need for an Appropriate Assessment.

Section 2.5.2.4 provides a summary of the HRA screening process. For further details on the two-stage screening process, please refer to the technical report.

Stage 2: High-level Information to support Appropriate Assessment

Appropriate Assessment is the consideration of the potential AEoI on the Habitat sites and Ramsar sites screened in during Stage 1, either alone or in-combination with other projects or plans. As noted above, there is no statutory requirement to undertake a HRA at Gate 2, and RAPID will not be making a formal ‘appropriate assessment’ under the Habitats Regulations. This section therefore summarises the high-level Information, reflective of the stage of scheme development of the SROs and relevant for the purposes of Appropriate Assessment based on available information for each SRO. The purpose of this is to determine whether there is objective evidence that AEoI of relevant Habitats sites or Ramsar sites to the SROs can be robustly ruled out at this stage, with respect to the site’s conservation objectives and its structure and function. This stage also includes the identification of potential mitigation measures to avoid or reduce any possible effects.

The Preferred Option will then be subject to a full project level HRA in accordance with Advice Note Ten to support the DCO application. As further scheme development and consultation will be required in relation to the Preferred Option after Gate 2, will be carried out on the high level Options it is recognised that further effects may be identified in the project level HRA of the Preferred Option. However, it is considered that this assessment is appropriate for the stage of scheme development and to inform Gate 2. The DCO application will be supported by a Report to Inform Appropriate Assessment (RIAA), as well as screening and integrity Matrices, in accordance with the requirements of the PINS.

The HRA is informed by the following:

- HRA Stage 1 screening undertaken at Gate 1 (Appendix 10.3 Environmental Assessment, Alternative Appendices: Appendix C to the Gate 1 submission)
- Technical Report 5: Air Quality Assessment to inform Site Selection and Mitigation ([redacted])
- WFD Compliance Assessment
- INNS Risk Assessment
- Technical Report 1: Review of Pipeline Watercourse Crossings ([redacted])

In combination Effects

All key developments currently within the planning system have been screened to determine whether they are likely to result in in-combination effects. This included:

- Developments consented and built but not yet operating
- Developments consented but not yet constructed (or completed)
- Developments in the consenting process but no decision made

Only projects which are reasonably well described and sufficiently advanced to provide information on which to base a meaningful and robust assessment have been included in the in-combination assessment. The in-combination effects assessment takes a highly precautionary approach in order to provide conservative conclusions to inform a robust Options appraisal for Gate 2. In accordance with the principles required of HRA, where there is uncertainty at this stage it is stated that an AEoI cannot be ruled out.

HRA Screening Summary

The following potential effects on Habitats and Ramsar sites as a result of D.2 have been identified based on the available information for the required SRO infrastructure and assumptions on the construction methodology as discussed in the technical report:

Table 23 - Potential effects

Effect Category	Construction Effects	Operational Effects
Terrestrial ecology / Ornithology	• Direct habitat loss if located within a Habitats site • Indirect effects – Temporary disturbance due to noise, vibration, human activity and light – Temporary changes to air quality – Introduction of INNS – Barrier to species migration	• Direct long-term habitat loss if located within a habitats site • Indirect effects – Disturbance due to noise, vibration, human activity and light – Changes to air quality
Freshwater	• Direct habitat loss if located within a Habitats site • Indirect effects – Temporary disturbance due to noise, vibration and human activity – Changes in water quality – Introduction of INNS – Barrier to species migration	• Connectivity with subtidal effects for migratory species • Changes to water quality

Table 24 details a summary of the HRA Screening conclusions for D.2.

Table 24 - Habitat sites screened in / out for D.2

Sites	Qualifying Features	Closest distance to SRO	Screening conclusion	Summary
Butser Hill SAC	• *Taxus baccata* woods of the British Isles. (Yew-dominated woodland) (priority habitat) • Semi-natural dry grasslands and scrubland facies: on calcareous substrates (*Festuco Brometalia*). (Dry grasslands and scrublands on chalk or limestone)	8.22 km	Screened-in	The SRO is sufficiently distant with the urban areas of Waterlooville and Horndean in between and does not support groundwater features. As such, no pathway for effect is identified from the SRO infrastructure. However, air quality effects are screened in due to the SACs proximity to the A3, which could be used for some construction traffic. The potential effects on each feature of the SAC are considered in Section 2.5.2.4.1.4.
Woolmer Forest SAC	• Depressions on peat substrates of the Rhynchosporion • European dry heaths • Natural dystrophic lakes and ponds. (Acid peat-stained lakes and ponds) • Northern Atlantic wet heaths with *Erica tetralix*. (Wet heathland with cross-leaved heath) • Transition mires and quaking bogs. (Very wet mires often identified by an unstable 'quaking' surface)	23.02 km	Screened-in	The SRO is sufficiently distant with the urban areas of Waterlooville and Horndean in between and does not support groundwater features. As such, no pathway for effect is identified from the SRO infrastructure. However, air quality effects are screened in due to the SACs proximity to the A3, which could be used for some construction traffic. The potential effects on each feature of the SAC are considered in Section 2.5.2.4.1.4.
Kingley Vale SAC	• *Taxus baccata* woods of the British Isles. (Yew-dominated woodland) (priority habitat) Semi-natural dry grasslands and scrubland facies: on calcareous substrates (*Festuco Brometalia*).	9.36 km	Screened out (no pathway)	The site is situated c.9 km to the north east of the proposed pipeline route. As such, no pathway for effect is identified from the SRO infrastructure and the SAC is not located within 200 m of any roads likely to be affected by construction traffic..
East Hampshire Hangars SAC	• *Asperulo-Fagetum* beech forests • *Tilio-Acerion* forests of slopes, screes and ravines * Priority feature • Semi-natural dry grasslands and scrubland facies on calcareous	15.65 km	Screened out (no pathway)	The SAC is c.16 km to the west of the SRO, sufficiently distant that there will be no pathway for effect from the SRO infrastructure. The site is c.1.5 km from the A3, which could be used for some construction traffic accessing the construction site south of Havant. However, at this distance there is no potential pathway for effect as defined by NE (2018).

Sites	Qualifying Features	Closest distance to SRO	Screening conclusion	Summary
	substrates (*Festuco-Brometalia*) (* important orchid sites) • Taxus baccata woods of the British Isles * Priority feature			
Emer Bog SAC	• Transition mires and quaking bogs	6.55 km	Screened out (no pathway)	Emer Bog SAC is located approximately 6.5 km to the west of Otterbourne WTW, and to the west of the River Itchen and Eastleigh and Chandlers Ford urban areas. At this distance, no impacts from construction will occur. The proposed pipeline will be sufficiently distant and separated by significant areas of urban development, from the designated site and its associated groundwater and surface water buffer zones (shown in Emer Bog and Baddesley Common Hydrological Desk Study 2017; accessed via the Test Valley Borough Council website) such that there is no pathway for effect. The SAC is not situated within 200m of any roads likely to be utilised by construction traffic for the works.
Mottisfont Bats SAC	• Barbastelle *Barbastella barbastellus*	15.09 km	Screened out (no pathway)	The works at, and in proximity to Otterbourne WSW are c.15 km from the SAC and outside the 7 km buffer zone identified for the SAC based on foraging and commuting distance of the bats. Therefore, there is no pathway for effect.
River Itchen SAC	• Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation. (Rivers with floating vegetation often dominated by water-crowfoot) • Atlantic salmon *Salmo salar* • Brook lamprey *Lampetra planeri* • Bullhead *Cottus gobio* • Otter *Lutra lutra* • Southern damselfly *Coenagrion mercurial* • White-clawed (or Atlantic stream) crayfish *Austropotamobius pallipes*	0 km	Screened-in	Construction of the transfer pipeline from WRP to Otterbourne Routes 3 and 4 have has the potential to impact water quality and habitats as a result of water crossings, construction traffic, mobilisation of sediments from haul roads, open-cut excavations, pumping operations, and potential washout events. The following effects are screened in: • Habitat loss • Temporary disturbance due to noise, vibration and human activity • Changes to river water quality • Barrier to species migration • Introduction of INNS Air quality modelling provided in Technical Report 5 states that Typical NRMM or MCPD plant associated with River Itchen pipeline tunnelling does not cause an exceedance of ecological air quality thresholds. The assessment demonstrates that typical NRMM or MCPD plant is unlikely to cause an exceedance of threshold levels at nearby sensitive ecological receptors and therefore there will be no pathway for effect on this Habitats site.

Sites	Qualifying Features	Closest distance to SRO	Screening conclusion	Summary
River Meon Compensatory SAC Habitat	• Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation. (Rivers with floating vegetation often dominated by water-crowfoot) • Atlantic salmon Salmo salar	0 km	Screened-in	While the River Meon is not a designated site, it is proposed for the development of compensatory measures for adverse effects on the integrity of Atlantic salmon from other schemes (e.g. the Lower Itchen Sources Drought Order). In order to maintain the effectiveness of the River Meon compensatory measures in maintaining the overall coherence of the habitats site network, it is important to assess the effects on Atlantic salmon using the river. The Pipelines are required to cross the river and as such, the following effects are screened in: • Habitat loss • Temporary disturbance due to noise, vibration and human activity • Changes in river water quality • Barrier to species migration • Introduction of INNS
River Test Compensatory Habitat	Restoration measures for the Test between Wherwell and Kimbridge have been identified. The specific measures are likely to include a selection of the following: • Restoration of channel continuity by weir removal or lowering • Rehabilitation of the riparian zone through: – improved vegetation management by reducing the mowing/cutting regime – riparian planting • Rehabilitation of the channel by: – re-profiling the banks to enable berm features to develop – bed level raising (where it has been artificially lowered) – introduction of gravels – restoring connectivity with the floodplain by lowering / removal of embankments	13.6 km	Screened out (no pathway)	The River Test is c.10 km from the onshore works for the SRO, separated by major roads, railway and housing. As a result, there is no pathway for effect on the compensatory habitat of the River Test.

Sites	Qualifying Features	Closest distance to SRO	Screening conclusion	Summary
	– channel narrowing (where it has been artificially widened) by in-channel measures or planting – reduce agricultural sediment inputs			
Singleton and Cocking Tunnels SAC	• Barbastelle *Barbastella barbastellus* • Bechstein's bat *Myotis bechsteinii*	17.01 km	Screened out (no pathway)	The works and pipeline routes are c.17 km from the SAC; however a potential pathway for effect was identified in relation to permanent removal or temporarily remove (pipelines) of foraging habitat, and cause fragmentation whilst vegetation re-establishes. The SACO references the South Downs National Park & NE (2015) Sussex Bat Special Area of Conservation Planning and Landscape Scale Enhancement Protocol which has identified key flight lines and foraging areas for the bat species. The SACO also notes that "The land within the West Weald which encompasses Ebernoe Common SAC; The Mens SAC and Singleton & Cocking Tunnels SAC should be regarded as a single landscape utilised by bats from all three SACs. "In addition to the connected SAC, several other areas support important numbers; Petworth Park - Bechstein's bats use trees within the park as maternity roosts, Slindon - barbastelle bats use this woodland as a maternity roost and woodland north of Chichester -also a maternity roost for barbastelle bats. The following impact zones are recommended around the SAC: • 6.5 km Key conservation area –all impacts assessed. • 12 km Wider conservation area –significant impacts or severance to flight lines to be considered. The proposed works are c.3 km outside the wider conservation area, and the pipelines have been routed to avoid removal of ancient woodland and woodland priority habitat where possible. In addition, the presence of the major A3(M) road network is likely to hinder movement from east to west. A core sustenance zone (CSZ) (BCT, 2020), as applied to bats, refers to the area surrounding a communal bat roost within which habitat availability and quality will have a significant influence on the resilience and conservation status of the colony using the roost. CSZ for Bechstein's bat are 3km and for Barbastelle are 6km, there will be no overlap between the CSZ for either species and the wider conservation area and therefore no indirect impact to either of the qualifying species. As such, no pathway for effect is identified.

High-level Appropriate Assessment

Butser Hill SAC

Temporary changes to air quality

As discussed in Screening, the site is adjacent to the A3, which could be used for some construction traffic accessing the construction site south of Havant, and the some of the construction areas for the pipeline routes. Alternatively, the M27 between Southampton and Portsmouth may be used. However, the final pipeline routes and construction traffic routes have not been determined.

The typically applied threshold for construction vehicle movements is unlikely to be exceeded (threshold of 1000 AADT or 200 HGV movements per day). However, construction vehicle movements will need to be verified in the project level HRA, which will be determined in more detail following the confirmation of the Preferred Options, once construction routes and vehicle movements are known and therefore it is not possible to rule out an adverse effect on integrity at this stage. Further detailed analysis and planning will be undertaken following the identification of the Selection Option, and as part of construction preparation.

Potential mitigation

The following mitigation measures may be required to ensure there will be no adverse effect on integrity of the SAC:

- Construction Traffic Management Plan (CTMP) drafted with measures to limit HGV movements and therefore potential emissions
- Enforcing of a 'no idling' rule for construction traffic, ensuring all vehicles turn off engines when stationary

<u>In-combination</u>

The *following* projects are screened in as having potential to interact with the receptors of relevance to this SAC:

- Aquind Interconnector
- Portsmouth coastal defence
- PW [redacted]
- HTR

None of the HRAs for these projects identify this SAC as being within the study area for the HRA Screening (i.e., there will be no pathway for effect) and therefore there will be no in-combination effect on the SAC between these projects and the D.2 SRO.

Woolmer Forest SAC

Temporary changes to air quality

As discussed in Screening, the site is adjacent to the A3, which could be used for some construction traffic accessing the construction site south of Havant, and the some of the construction areas for the pipeline routes. However, final pipeline routes and construction traffic routes are not yet confirmed, so detailed analysis considering temporary changes in air quality during construction are yet to be assessed at this stage.

The typically applied threshold for construction vehicle movements is unlikely to be exceeded (threshold of 1000 AADT or 200 HGV movements per day). However, construction vehicle movements will need to be verified in the project level HRA for the Preferred Option, once construction routes and vehicle movements are known and therefore it is not possible to rule out an adverse effect on integrity at this stage.

In-combination

The following projects are screened in as having potential to interact with the receptors of relevance to this SAC:

- Aquind Interconnector
- Portsmouth coastal defence
- PW [redacted]
- HTR

None of the HRAs for these projects identify this SAC as being within the study area for the HRA Screening (i.e., there will be no pathway for effect) and therefore there will be no in-combination effect on the SAC between these projects and the D.2 SRO.

Potential mitigation

The following mitigation measures may be required to ensure there will be no adverse effect on integrity of the SAC:

- CTMP drafted with measures to limit HGV movements and therefore potential emissions
- Enforcing of a ‘no idling’ rule for construction traffic, ensuring all vehicles turn off engines when stationary

River Itchen SAC

Habitat loss

To avoid any non-temporary direct impacts from construction, river crossings will be undertaken with directional drilling / trenchless crossings, therefore there will be no AEoI in relation to permanent habitat loss.

Temporary disturbance due to noise, vibration and human activity

Works at Otterbourne pipelines, washwater recovery area and ceramic membrane are located c.150 m to the east of the River Itchen SAC (on the other side of the railway line). Noise, vibration and human activity during construction have the potential to disturb features of the SAC, including otter and southern damselfly.

The potential for adverse effects on the integrity of these features would be subject to the presence of these species and supporting habitat within the potential zone of effect of the construction works and therefore cannot be ruled out at this stage. The project HRA for the Preferred Option will be informed by ecological surveys.

Changes in water quality

There is the potential for construction of the required infrastructure at Otterbourne to impact upon water quality elements of the River Itchen SAC. This could principally occur from the mobilisation of sediment caused by construction traffic, ground clearance and any required excavations. Accidental spillage of contaminants or oils, lubricants and fuels from construction machinery is also a potential risk. In conclusion, an adverse effect on integrity cannot be ruled out at this stage.

Barrier to species migration

Changes to river water quality has the potential to deter upstream migration of Atlantic salmon. This has potential to affect spawning. The salmon in the River Itchen SAC are currently in unfavourable condition and therefore an adverse effect on the integrity of this feature cannot be ruled out at this stage.

Introduction of INNS

The movement of personnel and plant has the potential to spread INNS. This could include the transfer of new INNS into the SAC or increasing the spread of existing INNS within the River Itchen SAC.

The River Itchen SSSI Channel Unit Condition Assessment (UCL, 2014) reports that the extent of invasive plant species along the River Itchen is relatively limited, noting that there has been ongoing management to control known INNS such as Japanese knotweed and Himalayan balsam. However, UCL (2014) states INNS were recorded at most sites, in low abundance. The main riparian plants observed include Orange balsam Impatiens capensis and Monkey flower Mimulus guttatus. Himalayan balsam was observed at the downstream end of the river. An adverse effect on integrity cannot be ruled out at this stage and the project HRA would be informed by an Extended Phase 1 Habitat Survey which would include the identification of INNS.

<u>In-combination</u>

The following projects are screened in as having potential to interact with the receptors of relevance to this SAC:

- Aquind Interconnector
- Portsmouth coastal defence
- PW [redacted]
- HTR

The Aquind interconnector HRA identifies LSE for indirect effects on Atlantic salmon due to changes in water quality due to suspended sediments and potential pollution, concluding no AEoI of the SAC.

As D.2 has potential to cause effects on Atlantic salmon, an in-combination adverse effect with the Aquind interconnector cannot be ruled out at this stage.

The project level HRA for the Preferred Option will assess in-combination effects in full.

The Portsmouth coastal defence, PW [redacted] and HTR HRAs do not identify this SAC as being within the study area for the HRA Screening for these projects (i.e., there will be no pathway for effect) and therefore there will be no in-combination effect with A1 / A2 on this SAC.

Potential mitigation

Table 25 - Potential mitigation in the River Itchen SAC

Effect	Potential mitigation requirements
Habitat loss	• HDD / trenchless crossing
Temporary disturbance	• Application of appropriate buffer zones around protected habitats • Use of noise dampening features such as mufflers and acoustic barriers • Construction lighting only operational when required and positioned and directed to avoid sensitive ecological receptors
Changes to water quality	• HDD / trenchless crossing • Best practice construction methods may comprise of: – Bunding and appropriate storage of sediment – Onsite treatment / polishing of silted water – Use of sediment traps – Regular cleaning of haul roads prevent runoff of construction waste dirt – Appropriate storage and application of both hazardous and non-hazardous waste and chemicals (i.e. diesel) and – Application of onsite mitigation measures such as spill kits and barrier booms
Barrier to movement	• As per water quality
Introduction of INNS	• Best practice biosecurity measures to ensure clothing, boots and machinery are free from propagules to avoid the spread of INNS

River Meon Compensatory SAC Habitat

Habitat loss

To avoid any non-temporary direct impacts from construction, river crossings will be undertaken with directional drilling/trenchless crossings, therefore there will be no AEoI in relation to permanent habitat loss.

Temporary disturbance due to noise, vibration and human activity

The crossing works could result in disturbance (e.g. to damselfly) and limit the effective development of the compensatory habitat. The location of the compensatory habitat is not yet known and therefore an adverse effect on integrity cannot be ruled out at this stage. It is expected that the project HRA for the Preferred Option will be informed by further details on the proposed compensatory measures to enable a detailed assessment and identification of mitigation measures, such as micro siting to avoid any compensatory habitat.

Changes in water quality

There is potential for pipeline construction activities to impact upon the ecological and chemical quality elements of the river. Damage to the river banks and floodplain from construction traffic, fine sediment input into the watercourse from crossing activity, and accidental pollution from onsite chemicals used in construction could lead to a deterioration in the water quality, therefore an adverse effect on the integrity of the compensatory habitat cannot be ruled out at this stage. However, the use of best practice construction techniques and appropriate mitigation measures to prevent the supply of fine sediment and other contaminants into the river will minimise the potential for deterioration in water body status to occur as a result of construction activities.

Barrier to species migration

Changes to river water quality has the potential to deter upstream migration of Atlantic salmon. This has potential to affect spawning and therefore the effective establishment of the River Meon as compensatory habitat, therefore an adverse effect on the integrity cannot be ruled out at this stage. As outlined above, it is the project level HRA for the Preferred Option will be supported by further design of mitigation measures.

Introduction of INNS

The movement of personnel and plant has the potential to spread INNS. This could include the transfer of new INNS into the River Meon or increasing the spread of existing INNS within the River Meon. The spread of INNS would have potential to undermine the objectives of the compensatory habitat and therefore an adverse effect on integrity cannot be ruled out at this stage. The project HRA for the Preferred Option would be informed by an Extended Phase 1 Habitat Survey which would include the identification of INNS, to be completed following the identification of the Preferred Option.

<u>In-combination</u>

The following projects are screened in as having potential to interact with the receptors of relevance to this SAC:

- Aquind Interconnector
- Portsmouth coastal defence
- PW [redacted]
- HTR

The HRAs for these projects do not identify this compensatory SAC habitat, however as this is not a formally designated site at this stage, there is potential that it has not been considered. Therefore, there is insufficient information to assess the in-combination effects on this compensatory habitat at this stage, so an AEOI cannot be ruled out at this stage.

Preferred Option - Potential mitigation

Table 26 - Potential mitigation in the River Meon Compensatory SAC Habitat

Effect	Potential mitigation requirements
Habitat loss	• HDD / trenchless crossing
Temporary disturbance	• Application of appropriate buffer zones around protected habitats • Use of noise dampening features such as mufflers and acoustic barriers • Construction lighting only operational when required and positioned and directed to avoid sensitive ecological receptors
Changes to water quality	• Best practice construction methods may comprise of: – Bunding and appropriate storage of sediment – Onsite treatment / polishing of silted water – Use of sediment traps – Regular cleaning of haul roads prevent runoff of construction waste dirt – Appropriate storage and application of both hazardous and non-hazardous waste and chemicals (i.e. diesel) and – Application of onsite mitigation measures such as spill kits and barrier booms
Barrier to movement	• As per water quality
Introduction of INNS	• Best practice biosecurity measures to ensure clothing, boots and machinery are free from propagules to avoid the spread of INNS

Solent Maritime SAC

Changes to water quality

The pipeline from HT to Otterbourne (route 3) passes within c.500 m of the SAC at its closet point. Potential run-off from the construction of the pipelines requires further assessment to determine the potential for an AEoI.

The Estuaries, Mudflats and Sandflats features of the SAC are currently deemed to be in unfavourable condition, while the coastal lagoons are in favourable condition. MESL (2016) Solent Maritime European Marine Site Sandbank Habitat Mapping Project does not cover the area of the SAC in proximity to the Ashlett Creek site and therefore a site characterisation survey would be required to understand the habitat at this location.

As discussed in Technical Report 3, the Solent Maritime SAC is the only site where smooth cordgrass Spartina alterniflora is found in the UK. It is also one of only two sites where small cordgrass Spartina maritima and Townsend's cordgrass Spartina townsendii are present. If these features are present in proximity to the construction works for the SRO, there is potential for an adverse effect on the integrity of these species. Technical Report 3, HRA Havant Thicket consenting risks shows that Spartina swards is sensitive to changes in suspended solids and smothering. An AEoI therefore cannot be ruled out at this stage.

In-combination

The following projects are screened in as having potential to interact with the receptors of relevance to this SAC:

- Aquind Interconnector
- Portsmouth coastal defence
- PW [redacted]
- HTR

The Aquind interconnector HRA identifies LSE for increased suspended sediment and deposition (smothering), concluding no adverse effect on the integrity of the SAC.

In addition, the HTR HRA identifies LSE on the receptors of the SAC due to run-off, concluding no AEoI. As the SRO has potential to cause run-off into the SAC from the construction of pipelines, an in-combination adverse effect with these projects cannot be ruled out at this stage.

The project level HRA for the Preferred Option will assess in-combination effects in full once the project level effects are understood.

Based upon the Portsmouth coastal management scheme HRA an LSE based on the small scale of potential effects have been assumed to be screened out at this stage, however consideration should be given in the project level HRA as to whether these small effects could interact to provide an adverse effect when combined with the SRO. Therefore, an in-combination adverse effect with this project cannot be ruled out at this stage.

[redacted] HRA does not identify this SAC as being within the study area for the HRA Screening for this project (i.e., there will be no pathway for effect) and therefore there will be no in-combination effect with this project on the Solent Maritime SAC.

Chichester and Langstone Harbours SPA & Ramsar

Temporary disturbance

The presence of people and construction activities associated with installation of the pipeline (Route 3) has the potential to affect the qualifying species, however the effects are likely to be highly localised and temporary and at a distance of c.500 m it is unlikely this would result in an AEoI of the site.

Changes to water quality

The pipeline from HT (Route 3) requires crossing of the Brookside Road Stream that flows into the SPA. Construction could result in potential sedimentation and accidental contamination of the watercourse and ultimately the SPA. There is currently insufficient information to rule out an AEoI at this stage.

<u>In-combination</u>

The following projects are screened in as having potential to interact with the receptors of relevance to this SAC:

- Aquind Interconnector
- Portsmouth coastal defence
- PW [redacted]
- HTR

The Aquind interconnector HRA identifies LSE for disturbance, and changes in water quality and prey resource, concluding no adverse effect on the integrity of the SPA. As the onshore construction of the pipeline (route 3) associated with the direct transfer has potential to cause disturbance effects and run-off into the SPA, an in-combination adverse effect on integrity cannot be ruled out at this stage. The project level HRA for the Preferred Option will assess in-combination effects in full.

The Portsmouth coastal management scheme and HTR HRAs identify LSE on the receptors of the SPA and Ramsar, concluding no AEoI. As the SRO has potential to cause disturbance, an in-combination adverse effect cannot be ruled out at this stage.

The project level HRA for the Preferred Option will assess in-combination effects in full.

The [redacted] HRA screens out potential LSE as a result of disturbance or air quality due to distance from the site. As no air quality effects on this SPA and Ramsar are predicted as a result of D.2, no in-combination effects are predicted between D.2 and [redacted] HRA.

2.5.2.5. Water Framework Directive Compliance Assessment

Introduction

This assessment aims to determine whether the construction, operation and decommissioning of the proposed SRO is compliant with the requirements of the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017, which remain in force following the UK's withdrawal from the European Union under the provisions of the Floods and Water (Amendment etc.) (EU Exit) Regulations 2019.

This report draws on the earlier WFD compliance assessment that was undertaken in support of the Gate 1 submission (September 2021). The findings of the earlier assessment have been updated where appropriate to reflect the latest scheme information, and the updates in the baseline WFD classification data that were published in September 2020.

Approach

The WFD Compliance Assessment undertaken at Gate 1 has been updated to reflect further SRO details and additional assessments and restructured to reflect the stages set out in PINS Advice Note 18: Water Framework Directive, which provides an outline methodology for considering the WFD as part of the Development Control Order (DCO) process. This guidance represents the most comprehensive and up to date guidance for WFD compliance assessments.

Further consideration has also been given to the following guidance:

- 'WFD risk assessment' (EA, 2016a): This provides information on how to assess the risk of a proposed activity, as well as guidance for proposed developments planning to undertake activities that would require a flood risk activity permit
- 'Protecting and improving the water environment' (EA, 2016b): Provides guidance on the WFD compliance of physical works and other activities in river water bodies and
- EUECJ C-461-13. Bund für Umwelt und Naturshutz Deutschland eV v Bundesrepublik Deutschland (ECJ, 2015). This case confirms the detail around determining a deterioration in the status of a water body.

The WFD Compliance Assessment comprises three stages:

- Stage 1 Screening: This stage consists of an initial screening exercise of the key components of the SROs and identifying relevant water bodies which have the potential to be impacted by the construction, operation and decommissioning of each SRO.
- Stage 2 Scoping: This stage identifies whether there is potential for deterioration in water body status or failure to comply with WFD objectives for any of the water bodies identified in Stage 1. Activities are carried forward to Stage 3 if potential impacts on any WFD element are identified in this stage.
- Stage 3 Outline WFD Impact Assessment: This stage assesses whether any project activities that have been carried forward from Stage 2 have the potential to cause deterioration and whether any such deterioration will have a significant effect on the status of one or more WFD quality elements at water body level.

Stage 1: Screening

For the purposes of this assessment, the SRO has been divided into the following key components:

- Initial HLPS at HTR
- Transfer pipeline from HTR to Otterbourne WSW (Routes 3 and 4)
- CeraMac and washwater recovery area
- 2nd stage pumping stations and BPT along transfer pipeline

In accordance with guidance, screening and scoping is only undertaken for water bodies in which activities occur. If a risk is identified in this water body, then adjoining water bodies are considered in the Stage 3 assessment.

The surface and groundwater bodies screened in to the WFD compliance assessment are detailed in Table 27 which also highlights the relevant SRO components that could potentially impact upon each water body.

Table 27 - WFD water bodies screened in to the WFD compliance assessment for Option D.2

SRO component	Water body name	Justification for screening in
Initial HLPS at HTR	• Hermitage Stream ([redacted]	Surface water bodies: Screened in because components are located within the catchment of this water body and therefore, could affect its biology, hydromorphology and physico-chemistry. Groundwater bodies: The component is not underlain by a groundwater body.
Transfer pipeline from HTR to Otterbourne WSW (Route 3)	• Hermitage Stream [redacted] • Potwell Trib [redacted] • Upper Wallington [redacted] • Wallington below Southwick ([redacted] • Meon ([redacted] • Main River Hamble [redacted] • Upper Hamble [redacted] • Horton Heath Stream [redacted] • Bow Lake [redacted]) • Itchen [redacted] • East Hants Chalk [redacted] • South Hants Lambeth Group [redacted] • South East Hants Bracklesham Group [redacted] • East Hants Lambeth Group • [redacted] • Central Hants Lambeth Group [redacted] • River Itchen Chalk [redacted]	Surface water bodies: Screened in because components are located within the catchment of this water body and therefore, could affect its biology, hydromorphology and physico-chemistry. Groundwater bodies: Screened in because the proposed activities are underlain by these water bodies and, therefore, could affect the quality and quantity of groundwater.
Transfer pipeline from HTR to Otterbourne WSW (Route 4)	• Hermitage Stream [redacted] • Potwell Trib [redacted] • Upper Wallington ([redacted] • Upper Hamble [redacted] • Horton Heath Stream [redacted] • Bow Lake [redacted] • Itchen ([redacted]) • East Hants Chalk ([redacted]) • South Hants Lambeth Group [redacted] • South East Hants Bracklesham Group [redacted] • East Hants Lambeth Group • [redacted] • Central Hants Lambeth Group [redacted] • River Itchen Chalk [redacted]	Surface water bodies: Screened in because components are located within the catchment of this water body and therefore, could affect its biology, hydromorphology and physico-chemistry. Groundwater bodies: Screened in because the proposed activities are underlain by these water bodies and, therefore, could affect the quality and quantity of groundwater.
CeraMac and washwater recovery area	• Itchen [redacted] • Itchen Navigation [redacted] • River Itchen Chalk [redacted]	Surface water bodies: Screened in because components are located within the catchment of this water body and therefore, could affect its biology, hydromorphology and physico-chemistry. Groundwater bodies:

SRO component	Water body name	Justification for screening in
		Screened in because the proposed activities are underlain by these water bodies and, therefore, could affect the quality and quantity of groundwater.
2nd Stage Pumping Stations and BPT	• Upper Wallington [redacted] • Hermitage Stream [redacted] • Potwell Trib [redacted] • Moors Stream [redacted] • Upper Hamble [redacted] • East Hants Chalk [redacted] • East Hants Lambeth Group [redacted] • Central Hants Lambeth Group [redacted] • River Itchen Chalk [redacted] • South East Hants Bracklesham Group [redacted] • Langstone Harbour [redacted]	Surface water bodies: Screened in because component is located in the vicinity of this catchment of this water body and therefore, could affect its biology, hydromorphology and physico-chemistry. Groundwater bodies: Screened in because the proposed activities are underlain by these water bodies and, therefore, could affect the quality and quantity of groundwater.

Stage 2: Scoping

This section assesses whether there is potential for the construction, operation and decommissioning of the SRO components associated with Option D.2 to impact on the surface (Table 28) and groundwater bodies (Table 29) that have been screened in to the assessment.

Table 28 - Scoping assessment for screened in surface water bodies for Option D.2

SRO component	Water body name	Ecological quality elements	Chemical quality elements	Protected areas	RBMP mitigation measures
Initial HLPS at HTR	Hermitage Stream [redacted]	Although construction and decommissioning activities could result in the accidental release of fine sediment and contaminants into the water body, the application of best practice pollution prevention and control measures would minimise impacts and ensure that they are unlikely to be sufficient to affect biology, hydromorphology or physico-chemistry at water body scale. Similarly, although there is potential for the accidental release of pollutants into the water body during operation, the application of best practice pollution prevention and control measures would minimise impacts and ensure that they are unlikely to be sufficient to affect biology, hydromorphology or physico-chemistry at water body scale.	Construction and decommissioning activities could potentially result in the accidental release of priority substances into the water body, for example through the accidental spillage of contraction materials or fuel and lubricants from construction equipment. However, the application of best practice pollution prevention and control measures would minimise impacts, there remains some potential for impacts on the chemistry of the water body. Although there is potential for the accidental release of priority substances into surface watercourses during operation, the application of best practice pollution prevention and control measures would minimise impacts and is therefore likely to ensure that they are not sufficient to affect chemistry at water body scale.	No mechanism for impacts on Drinking Water Safeguard Zones or areas protected under the Habitats and Species, Conservation of Wild Birds have been identified.	No mechanisms for the activity to reduce the effectiveness or prevent the future implementation of mitigation measures associated with this water body have been identified.

SRO component	Water body name	Ecological quality elements	Chemical quality elements	Protected areas	RBMP mitigation measures
Transfer pipeline from HTR to Otterbourne WSW (Route 3)	Hermitage Stream [redacted] Potwell Trib [redacted] Upper Wallington [redacted] Wallington below Southwick [redacted] Meon [redacted] Main River Hamble [redacted] Upper Hamble [redacted] Horton Heath Stream [redacted] Bow Lake [redacted] Itchen [redacted]	Construction and decommissioning activities could directly affect the hydromorphology and biology of the water bodies as a result of watercourse crossings. Furthermore, construction and decommissioning activities could result in the accidental release of fine sediment and contaminants into the water bodies. Although the application of best practice pollution prevention and control measures would minimise impacts, there remains some potential for impacts on biology, hydromorphology or physico-chemistry at water body scale. Although there is potential for the accidental release of pollutants into the water bodies during operation, the application of best practice pollution prevention and control measures would minimise impacts and ensure that they are unlikely to be sufficient to affect biology, hydromorphology or physico-chemistry at water body scale.	Construction and decommissioning activities could potentially result in the accidental release of priority substances into the water body, for example through the accidental spillage of contraction materials or fuel and lubricants from construction equipment. Although the application of best practice pollution prevention and control measures would minimise impacts, there remains some potential for impacts on the chemistry of the water body. Although there is potential for the accidental release of priority substances into surface watercourses during operation, the application of best practice pollution prevention and control measures would minimise impacts and is therefore likely to ensure that they are not sufficient to affect chemistry at water body scale.	There is potential for construction, operation and decommissioning to impact on areas protected under the Habitats and Species Directive.	No mechanisms for the activity to reduce the effectiveness or prevent the future implementation of mitigation measures associated with each water body have been identified.

SRO component	Water body name	Ecological quality elements	Chemical quality elements	Protected areas	RBMP mitigation measures
Transfer pipeline from HTR to Otterbourne WSW (Route 4)	Hermitage Stream [redacted] Potwell Trib [redacted] Upper Wallington [redacted] Upper Hamble [redacted] Horton Heath Stream [redacted] Bow Lake [redacted] Itchen [redacted]	Construction and decommissioning activities could directly affect the hydromorphology and biology of the water bodies as a result of watercourse crossings. Furthermore, although construction and decommissioning activities could result in the accidental release of fine sediment and contaminants into the water bodies, the application of best practice pollution prevention and control measures would minimise impacts and ensure that they are not sufficient to affect biology, hydromorphology or physico-chemistry at water body scale. The operation of the transfer pipeline would not affect the biology, hydromorphology or physico-chemistry of the water body, because any active disturbance would be limited to the construction and decommissioning phases.	Construction and decommissioning activities could potentially result in the accidental release of priority substances into the water body, for example through the accidental spillage of contraction materials or fuel and lubricants from construction equipment. Although the application of best practice pollution prevention and control measures would minimise impacts, there remains some potential for impacts on the chemistry of the water body. Although there is potential for the accidental release of priority substances into surface watercourses during operation, the application of best practice pollution prevention and control measures would minimise impacts and is therefore likely to ensure that they are not sufficient to affect chemistry at water body scale.	There is potential for construction, operation and decommissioning to impact on areas protected under the Habitats and Species Directive.	No mechanisms for the activity to reduce the effectiveness or prevent the future implementation of mitigation measures associated with each water body have been identified.

SRO component	Water body name	Ecological quality elements	Chemical quality elements	Protected areas	RBMP mitigation measures
CeraMac and washwater recovery area	Itchen [redacted] Itchen Navigation [redacted]	Construction and decommissioning activities could result in the accidental release of fine sediment and contaminants into the water body. Although the application of best practice pollution prevention and control measures would minimise impacts, there remains some potential for impacts on the biology, hydromorphology and physico-chemistry of the water body. Similarly, there is also potential for the accidental release of pollutants into the water body during operation, which could affect the biology, hydromorphology and physico-chemistry of the water body	Construction and decommissioning activities could potentially result in the accidental release of priority substances into the water body, for example through the accidental spillage of contraction materials or fuel and lubricants from construction equipment. Although the application of best practice pollution prevention and control measures would minimise impacts, there remains some potential for impacts on the chemistry of the water body. Similarly, there is also potential for the accidental release of pollutants into the water body during operation, which could affect the biology, hydromorphology and physico-chemistry of the water body.	There is potential for construction, operation and decommissioning to impact on areas protected under the Habitats and Species Directive.	The RBMP does not identify mitigation measures for the Itchen water body.

SRO component	Water body name	Ecological quality elements	Chemical quality elements	Protected areas	RBMP mitigation measures
2nd Stage Pumping Stations and BPT	Upper Wallington [redacted] Hermitage Stream [redacted] Potwell Trib [redacted] Moors Stream [redacted] Upper Hamble [redacted] Langstone Harbour [redacted]	Construction and decommissioning activities could result in the accidental release of fine sediment and contaminants into the water body, the application of best practice pollution prevention and control measures would minimise impacts and ensure that they are unlikely to be sufficient to affect biology, hydromorphology or physico-chemistry at water body scale. Similarly, although there is potential for the accidental release of pollutants into the water body during operation, the application of best practice pollution prevention and control measures would minimise impacts and ensure that they are unlikely to be sufficient to affect biology, hydromorphology or physico-chemistry at water body scale.	Construction and decommissioning activities could potentially result in the accidental release of priority substances into the water body, for example through the accidental spillage of contraction materials or fuel and lubricants from construction equipment. Although the application of best practice pollution prevention and control measures would minimise impacts, there remains some potential for impacts on the chemistry of the water body. Although there is potential for the accidental release of priority substances into surface watercourses into the water body during operation, the application of best practice pollution prevention and control measures would minimise impacts and is therefore likely to ensure that they are not sufficient to affect chemistry at water body scale.	No mechanism for impacts on Drinking Water Safeguard Zones or areas protected under the Habitats and Species, Conservation of Wild Birds have been identified.	The RBMP does not identify mitigation measures for these water bodies.

Table 29 - Scoping assessment for screened in groundwater bodies for D.2

SRO component	Water body name	Quantitative quality elements	Chemical quality elements	Protected areas
Transfer pipeline from HTR to Otterbourne WSW (Route 3)	East Hants Chalk [redacted] South Hants Lambeth Group [redacted]	Construction and decommissioning activities could potentially affect groundwater levels through dewatering and changes to the rate of groundwater recharge. Any changes in groundwater levels could potentially impact upon the surface drainage network and associated GWDTEs. However, and changes are likely to be highly localised and	Construction and decommissioning activities could potentially introduce new sources of contamination and remobilise existing sources of contamination. This could introduce a new pathway for the contamination of GWDTEs and other dependent surface water features. However, the application of best practice pollution prevention and control measures would minimise impacts and ensure that	No mechanisms for this activity to impact upon Drinking Water Protected Areas were identified.

SRO component	Water body name	Quantitative quality elements	Chemical quality elements	Protected areas
	South East Hants Bracklesham Group [redacted] East Hants Lambeth Group [redacted] Central Hants Lambeth Group [redacted] River Itchen Chalk [redacted]	unlikely to be sufficient to result in deterioration in water body status. Any minor changes to groundwater flows or recharge during the operational phase of the activity are likely to be highly localised and unlikely to be sufficient to affect groundwater quantity.	they are unlikely to be sufficient to affect groundwater quality at water body scale. Similarly, although there is potential for the accidental release of pollutants into the groundwater body during operation, the scheme will be designed to minimise impacts and ensure that they are unlikely to be sufficient to affect groundwater quality at water body scale.	
Transfer pipeline from HTR to Otterbourne WSW (Route 4)	East Hants Chalk [redacted] South Hants Lambeth Group [redacted] South East Hants Bracklesham Group [redacted] East Hants Lambeth Group [redacted]) Central Hants Lambeth Group [redacted] River Itchen Chalk [redacted]	Construction and decommissioning activities could potentially affect groundwater levels through dewatering and changes to the rate of groundwater recharge. Any changes in groundwater levels could potentially impact upon the surface drainage network and associated GWDTEs. However, and changes are likely to be highly localised and not sufficient to result in deterioration in water body status. Any minor changes to groundwater flows or recharge during the operational phase of the activity would be highly localised and insufficient to affect groundwater quantity.	Construction and decommissioning activities could potentially introduce new sources of contamination and remobilise existing sources of contamination. This could introduce a new pathway for the contamination of GWDTEs and other dependent surface water features. However, the application of best practice pollution prevention and control measures would minimise impacts and ensure that they are not sufficient to affect groundwater quality at water body scale. Similarly, although there is potential for the accidental release of pollutants into the groundwater body during operation, the scheme will be designed to minimise impacts and ensure that they are not sufficient to affect groundwater quality at water body scale.	No mechanisms for this activity to impact upon Drinking Water Protected Areas were identified.
CeraMac and washwater recovery area	River Itchen Chalk [redacted]	Construction and decommissioning activities could potentially affect groundwater levels through dewatering and changes to the rate of groundwater recharge. Any changes in groundwater levels could potentially impact upon the surface drainage network and associated GWDTEs. However, and changes are likely to be highly localised and are unlikely to be sufficient to result in deterioration in water body status.	Construction and decommissioning activities could potentially introduce new sources of contamination and remobilise existing sources of contamination. This could introduce a new pathway for the contamination of GWDTEs and other dependent surface water features. However, the application of best practice pollution prevention and control measures would minimise impacts and ensure that they are unlikely to be sufficient to affect groundwater quality at water body scale.	No mechanisms for this activity to impact upon Drinking Water Protected Areas were identified.

SRO component	Water body name	Quantitative quality elements	Chemical quality elements	Protected areas
		Any minor changes to groundwater flows or recharge during the operational phase of the activity are likely to be highly localised and unlikely to be sufficient to affect groundwater quantity.	Similarly, although there is potential for the accidental release of pollutants into the groundwater body during operation, the scheme will be designed to minimise impacts and ensure that they are unlikely to be sufficient to affect groundwater quality at water body scale.	
2nd Stage Pumping Stations and BPT	East Hants Chalk [redacted] East Hants Lambeth Group [redacted] Central Hants Lambeth Group [redacted] River Itchen Chalk [redacted] South East Hants Bracklesham Group [redacted]	Construction and decommissioning activities could potentially affect groundwater levels through dewatering and changes to the rate of groundwater recharge. Any changes in groundwater levels could potentially impact upon the surface drainage network and associated GWDTEs. However, and changes are likely to be highly localised and are unlikely to be sufficient to result in deterioration in water body status. Any minor changes to groundwater flows or recharge during the operational phase of the activity are likely to be highly localised and unlikely to be sufficient to affect groundwater quantity.	Construction and decommissioning activities could potentially introduce new sources of contamination and remobilise existing sources of contamination. This could introduce a new pathway for the contamination of GWDTEs and other dependent surface water features. However, the application of best practice pollution prevention and control measures would minimise impacts and ensure that they are unlikely to be sufficient to affect groundwater quality at water body scale. Similarly, although there is potential for the accidental release of pollutants into the groundwater body during operation, the scheme will be designed to minimise impacts ensure that they are unlikely to be sufficient to affect groundwater quality at water body scale.	

The parameters scoped in for further assessment are summarised in Table 30. Note that further information regarding potential impacts on the River Itchen SAC is provided in 2.5.2.4.

Table 30 - Summary of scoping assessment for Option D.2

SRO component	Surface water bodies				Groundwater bodies		
	Ecological status	Chemical status	Protected Areas	RBMP Mitigation measures	Quantity	Quality	Protected Areas
Initial HLPS at HTR	×	×	×	×	×	×	×
Transfer pipeline from HTR to Otterbourne WSW (Route 3)	✓	✓	✓	×	×	×	×
Transfer pipeline from HTR to Otterbourne WSW (Route 4)	✓	✓	✓	×	×	×	×
CeraMac and washwater recovery area	✓	✓	✓	×	×	×	×
2nd Stage Pumping Stations and BPT	×	×	×	×	×	×	×

2.5.2.6. Outline WFD compliance assessment

Transfer pipeline from Havant Thicket Reservoir to Otterbourne WSW

This component has been identified as having the potential to impact upon the biology, hydromorphology, physico-chemistry and chemistry of the River Itchen, Hermitage Stream, Potwell Trib, Upper Wallington, Wallington below Southwick, Meon, Main River Hamble, Upper Hamble, Horton Heath Stream and Bow Lake river water bodies as a result of the construction (and decommissioning if retained in situ) of watercourse crossings.

To avoid any non-temporary direct impacts on larger or particularly sensitive watercourses (e.g. WFD water bodies, sensitive main rivers and ordinary watercourses, and any watercourses that may be too wide or deep to cross using conventional alternatives), river crossings will be undertaken with directional drilling/trenchless crossings where possible. These will prevent the direct disturbance of the bed and banks of the watercourse and prevent impacts to in-channel habitats. Furthermore, site-specific ground investigations will be undertaken prior to implementation of any trenchless watercourse crossings to identify the appropriate locations of entry and exit pits, the optimal depth of pipe burial, and ensure that the breakout of inert drilling fluid does not occur. This will minimise adverse impacts on the hydromorphology, physico-chemistry and biology of the watercourses.

The proposed pipeline will be installed using standard open cut excavation methods conventionally used for a cross-country pipeline. Open cut excavation will be used for most of the route, including watercourse crossings (notwithstanding the exclusions outlined above). A maximum working corridor of 25 m between perimeter fences has been assumed for the pipeline installation. This will allow sufficient room for open excavation, storage of excavated material, construction plant transit and handing of pipelines. The depth of the trench will vary dependent on the ground conditions but will be a minimum of 0.9 m in open fields. The installation or removal of the pipeline using open trench crossings would result in the direct disturbance of the bed and banks of the affected watercourse and the habitats that they support. However, the working corridor will be reduced where construction allows and to minimise impact (e.g. when crossing watercourses).

Although construction methodologies have not yet been finalised, trenching is likely to be undertaken within a dewatered area of channel (e.g. within a coffer dam, with flow over-pumped, piped or flumed). Where possible, the use of these barriers could potentially be confined to the amount of time required to install and reinstate the trench, thereby minimising impacts on the movement of flow, sediment and biota within each watercourse. In addition, the valuable gravel substrates which are found in many of the watercourses could potentially be stripped and stored separately from surrounding soils and sediments so that they can be successfully reinstated. Finally, the banks would be reinstated prior to the restoration of natural flows.

During construction or decommissioning in areas in proximity to watercourses, a minimum 8 m or 16 m buffer has been assumed from non-tidal riverbanks and tidal riverbanks, respectively (in line with the requirements of the Land Drainage Act 1991 and Environmental Permitting (England and Wales) Regulations 2016). This will minimise direct impacts on the watercourses. However, indirect impacts on river water bodies could occur from mobilisation of sediments from haul roads, open-cut excavations, pumping operations and potential washout events. Greater areas of impermeable surfaces and disturbed ground could alter surface water drainage pathways throughout each catchment, resulting in changes to volume, energy or distribution of flows. Increased fine sediment input to the water body could smother bed habitats, reducing light penetration and dissolved oxygen. Changes to physico-chemistry could also lead to loss or modification of in-channel habitats. The accidental spillage of oils and lubricants from construction equipment and subsequent runoff into watercourses could potentially impact upon the physico-chemistry and chemistry of the water bodies.

However, best practice measures to minimise the runoff of sediment and contaminants from construction components will be implemented to prevent deterioration in water body status. These are likely to include:

- Bunding and appropriate storage of sediment
- Onsite treatment / polishing of silted water
- Use of sediment traps
- Regular cleaning of haul roads prevent runoff of construction waste
- Appropriate storage and application of both hazardous and non-hazardous waste and chemicals (i.e. diesel)
- Application of onsite mitigation measures such as spill kits and barrier booms

These measures will minimise adverse impacts on biology, hydromorphology, physico-chemistry and chemistry of the River Itchen, Hermitage Stream, Potwell Trib, Upper Wallington, Wallington below Southwick, Meon, Main River Hamble, Upper Hamble, Horton Heath Stream and Bow Lake by minimising the supply of fine sediment and other contaminants into the surface drainage network that makes up each water body.

This demonstrates that, although the component could result in temporary and / or highly localised effects on hydromorphology and biology, the changes are not predicted to be sufficient to result in deterioration of the status of any quality elements in the water bodies (within or between status classes). This means that this component would not result in deterioration in the status of this river water body or prevent WFD objectives being achieved in these water bodies in the future.

Component: Ceramic membrane plant and washwater recovery area

The construction and decommissioning of the CeraMac could potentially impact upon the hydromorphology, physico-chemistry and biology of the River Itchen water body as a result of disturbance to the bed and banks of its tributaries, and the input of fine sediment and contaminants into the watercourse from construction works. However, best practice construction mitigation measures to control the supply of fine sediment, water and contaminants (e.g. the EA's Guidance for Pollution Prevention (GPP) notes, including GPP1 'Understanding your environmental responsibilities', GPP5 'Works and maintenance in or near water', GPP21 'Pollution incident response planning' and GPP22 'Dealing with spills', which remain best practice despite no longer being statutory guidance, and CIRIA's 'Control of water pollution from construction sites: Guidance for consultants and contractors'), will be applied to minimise impacts on the hydromorphology, physico-chemistry and biology of the River Itchen water body. Given the sensitivity of the water body to the supply of fine sediment and contaminants, it is acknowledged that the construction stage drainage strategy and associated pollution prevention and control measures will need to be carefully designed on the basis of the available best practice guidance. Particular attention will be paid to ensuring that particulate and liquid contaminants are captured and retained, and not therefore discharged into the surface drainage network. This will minimise the supply of fine sediment, runoff and contaminants into the drainage network during construction and decommissioning will ensure that there are no significant adverse effects. Temporary construction and decommissioning effects are therefore unlikely to cause deterioration in water body status or affect the condition of the River Itchen and its tributaries.

This demonstrates that, although the component could result in temporary and / or highly localised effects on hydromorphology and biology, the changes are not predicted to be sufficient to result in deterioration of the status of any quality elements in the water body (within or between status classes). Furthermore, any effects would not prevent the implementation or counteract the effects of the mitigation measures identified in the RBMP. This means that this component would not result in deterioration in the status of this river water body or prevent WFD objectives being achieved in this water body in the future.

Summary of WFD compliance

The outline WFD compliance assessment concludes that the proposed activities will not result in changes to the hydromorphology, biology, physico-chemistry and chemistry of surface waters or the quantity and quality of groundwaters that are sufficient to result in deterioration in the status of any quality elements. Furthermore, the proposals would not prevent the implementation or counteract the effects of these measures identified in the RBMP. This means that these activities would not result in deterioration in the status of water body status or prevent WFD objectives being achieved in relevant water body in the future.

2.5.2.7. INNS Risk Assessment

Significance of Invasive Non-Native Species

Raw water is considered to be water in its natural state (e.g., a river or groundwater body). Water is abstracted and transferred from sources such as groundwater, rivers and reservoirs, via SW's raw water network, to WSW for treatment and subsequent distribution for potable water supply. The transfer of raw water has been identified as a key potential pathway of concern for the introduction, transfer and spread of INNS by Defra and the Great British Non-Native Species Secretariat (GBNNSS).

Invasive, non-native, alien or exotic species are species that have been released into an environment beyond their native bio-geographic range or habitat, either accidentally or intentionally. On arrival in a new environment, a non-native species may or may not become established, depending on its tolerances to the prevailing conditions, or other influencing factors such as predation. A species is classed as 'invasive' when it adapts too well to the new environment and out-competes native species. This has a detrimental impact on native habitats and native species, i.e. decimation of a native species population.

The transfer of raw water between two points may increase the risk of spreading INNS. The introduction of INNS to a waterbody can have a significant effect such as:

- Detrimental impact on ecosystem structure and function
- Jeopardise compliance with environmental legislation
- Failure to achieve WFD objectives

- Compromise the quality of drinking water
- Compromise the safe return of treated wastewater to the environment, preventing effective treatment

Legislation and Policy

The transfer of INNS is subject to national legislation such as the Wildlife and Countryside Act 1981 (as amended), Invasive Non-native Species (Amendment etc.) (EU Exit) Regulations 2019, Invasive Alien Species (Enforcement & Permitting) Order 2019 and the Water Environment (Water Framework Directive) (England and Wales) Directive 2017.

Objectives of this Assessment

An INNS Risk Assessment for each SRO has been completed for Gate 2. The overall objective of the Risk Assessment is to understand the physical and operational infrastructure of the proposed water transfer network and identify the risk of spread of INNS within the SW raw water transfer network. The Risk Assessment is both descriptive and quantitative. In accordance with the EA (2017) position statement Managing the Risk of Spread of Invasive Non-Native Species Through Raw Water Transfers, the assessment is focused on the pathways by which INNS can spread within the proposed raw water transfer network, rather than on the current distribution of INNS.

Risk Assessment Methodology

The Risk Assessment tool used for this assessment was originally developed by Wessex Water and amended by Northumbrian Water Group to meet the requirements of the EA's PR19 guidance on the assessment of raw water transfers. The tool takes a pathway-based approach and is centred around a comprehensive list of functional groups of INNS. The use of functional groups accounts for all potential INNS at risk of spread, rather than just focusing on the species that are currently present within the source water body.

The assessment is based on a variety of data, which includes, but is not limited to, the following:

- Nature of the connection (e.g. piped, natural)
- Distance of each connection
- Time passage and volume of water
- Frequency of operation
- Details on operational activities
- Details of barriers to passage
- Details of processing / storage

The Risk Assessment uses a scoring matrix which is based on the above data to score the inherent risk for the water transfer. Mitigation measures and actions that might decrease or increase risk are added to the adjusted risk score. A final weighted risk score accounts for known INNS in source waters and protected sites and species near the receptor.

The following data sources (Table 31) detailed have been used to gather the data used to populate the Risk Assessment Matrices.

Table 31 - INNS Raw Water Transfer Risk Assessment Data Sources

Data Source	Description of data utilised
SW	Raw water transfers in Geographical Information Systems (GIS) INNS management plans Biological records

Data Source	Description of data utilised
Biological Records Centre	Biodiversity records centre data and incidental records received by SW Ecologists Protected species and INNS data for Kent, Surry, Sussex, and Isle of Wight Local wildlife site data for Kent, Surry, Sussex, and Isle of Wight
NE Open Data	Designated sites
UKWIR	INNS implications on the Water industry (UKWIR, 2016)
EA	UKTAG high impact list of INNS EA Water Body Risk Assessments (EA, 2014)
MAGIC	UK Government's Multi Agency Geographic Information for the Countryside (MAGIC) website (www.magic.gov.uk)

A list of known non-native species present at the various stages of the raw water transfer were obtained from the sources detailed in Table 31 above. The resulting non-native species records were then cross-referenced against the WFD UK Technical Advisory Group high impact list of INNS, UKWIR on INNS implications on the Water industry (UKWIR, 2016) and INNS list used by Northumbrian Water for conducting raw water Risk Assessments. The lists are not fully comprehensive when compared to the 2,000 INNS species identified by GBNNSS. However, it was considered that the source-pathway-receptor risk assessment approach based on these key species is sufficient to manage the risks of introduction and spread of INNS within the proposed transfers.

Data on the known location of protected species and INNS was collated using the local biodiversity records centre data and incidental records received from SW ecologists. No comprehensive surveys for INNS have been carried out for this Risk Assessment, therefore if no records exist, the absence of INNS cannot be assumed.

The proposed water transfer components of the SRO have been assessed by defining a start and end point (e.g. HTR to Otterbourne) in line with approach set in EA (2017) position statement (Managing the Risk of Spread of Invasive Non-Native Species Through Raw Water Transfers. Position 1321_16). Conservative, worst-case scenarios have been assumed for this assessment. The full transfer of 75 Ml/d will only be required to supply potable water in a 1-in-200-year drought event and is therefore expected to be periodic.

The initial unweighted or 'inherent risk' calculation is calculated by multiplying the pathway occurrence by the pathway INNS score. This takes account of the frequency, volume and distance of the transfer. The 'adjusted risk' uses the inherent pathway INNS scores are adjusts to account for factors that may mitigate or increase the risk posed by the transfer. For example, screening or navigation, respectively. The final 'weighted risk' adds a weighting to the adjusted risk scores to allow for known INNS in source waters and protected species and designated sites near the receptor.

Option D.2

D.2 requires the creation of new raw water transfers that will operate continuously all year round. Water will be transferred from HTR Direct to Otterbourne WSW. The transfer will only be required to operate at 75 Ml/d to supply potable water during a 1-in-200-year drought event. However, this assessment has undertaken a conservative, worst-case approach and a transfer of 75 Ml/d was assumed.

D.2 consists of the following raw water transfer Options:

Table 32 - D.2 Raw Water transfer Options

SRO Route Options	Raw Water Transfers
HT to Otterbourne WSW	Transfer of water following storage in HT to Otterbourne WSW (via pipeline Routes 3 and 4)

Havant Thicket to Otterbourne WSW

The proposed routes would provide a continuous transfer of water between HT and Otterbourne WSW. The transfer would be between WFD operational catchments for Pipeline Routes 3 and 4. Both the pipeline routes have the same level of INNS transfer risk. The transfer through underground pipelines represent little risk to INNS transfer during its transport. Japanese Knotweed Fallopia japonica is known to be present at HTR, the source and is classified as high risk. The water will be stored in an open reservoir at the source. This increases the likelihood of INNS spreading by creating a potential pathway. Furthermore, the reservoir may be used for bankside fishing / Angling and other water sports for casual users (PW, 2008) which further increases the risk. However, the Transfer will be direct to Otterbourne WSW and will not be stored in a bankside reservoir. This results in an overall risk score of zero for INNS spreading.

D.2 INNS Risk Scores

The total risk of transfer for D.2 is detailed in Table 33. The transfer between HT and Otterbourne WSW has no risk of INNS transfer.

Table 33 - INNS Risk of spreading

Risk type	D.2
Inherent	624
Adjusted	0
Weighted	0

2.5.2.8. Biodiversity Net Gain and Natural Capital Assessment

A high level Natural Capital Assessment, underpinned by a Biodiversity Net Gain Assessment, has been undertaken for Gate 2 to determine the potential for each SRO to deliver environmental net gain.. In this case, Environmental Net Gain has been utilised as wider term, which includes Biodiversity Net Gain. The latest methodologies for BNG and NC as set out by All Company Working Group's (ACWG) current guidance to SRO Environmental Assessment have been applied. The requirements and outputs of the assessment are consistent with those in the WRSE Regional Plan Environmental Assessment Methodology Guidance, as well as the Water Resource Planning Guidance for WRMP24 and its supplementary guidance 'Environmental and Society in Decision Making' and UKWIR Environmental Assessment Guidance. Outputs are related to that required for Gate 2 activities in the context of Biodiversity and Natural capital accounting related to more detailed feasibility than at Gate 1 of the conceptual design of a range of scheme configurations / components. In addition, it should be noted that for the accelerated Gate 1 BNG and NC assessment no formal guidance was available and as such this assessment has had to account for current guidance in the context of the Gate 2 conceptual design updates. It should also be noted that in the context of the BNG assessment this has been based on the application of Defra's Biodiversity tool 'The Biodiversity Metric 2.0' (Defra BNG Metric) as a means of scoring the biodiversity gain or loss of each component. The updated Metric 3.0 was released in early July 2021 and will need to be used at Gate 3 at which point additional field data collection will be included noting that key current limitations with the current tool is that it primarily focuses on terrestrial habitats, with limited ability to calculate loss and mitigation for river and intertidal habitats. Furthermore, marine habitats not currently included. Consequently, the outputs are likely to both underestimate both losses and potential gain opportunities. As part of the BNG assessment a strategic assessment of offsite opportunity areas has been undertaken to identity suitable parcels of land where the best biodiversity gain and hence overall environmental net gain, such as certain priority habitats: furthermore marine habitats loss will require further assessment at Gate 3 together with gaining more evidence in terms of habitat quality as well as quantity for ground truthing.

The outputs of the BNG (losses and potential net gain opportunities) currently provide habitat type data upon which the Natural Capital Assessment (NCA) is compiled and account for the NC biodiversity metric. The NCA has been carried out to identify the potential environmental benefits of the SRO components with consideration of the socio-economic aspects of impacted features. Key ecosystem services have been assessed and monetised in accordance with the ACWG guidance (i.e., climate and natural hazard regulation) in terms of both NC loss (temporary and permanent) and on- and off-site creation related to the BNG calculations. In the context of recreation and amenity value this, at Gate 2, can only be assessed as a loss given uncertainty regarding where habitat creation may be sited and local ambitions, whilst agriculture is also shown as temporary and permanent loss, noting that agricultural loss is accounted for a grassland within the BNG tool and hence valued as part of climate regulation and biodiversity net gain. Water purification has been provided in quantitative high-level assessment terms due to limited local data for this gate as ORVAL data for example is too coarse for comparison: more data collection will be required at Gate 3. At this stage water regulation has not been include give that overall aim of each of these schemes is related to water regulation so limited differential: this is especially so given that the assessment has focused on terrestrial habitats, due to the limitations of aquatic data at this stage. This will need to be revisited at Gate 3. Overall, the aim of the NCA assessment has been to include an assessment of baseline natural capital assets and their ability to provide ecosystem services, and how these are likely to change as a result of the SROs (see Technical Report 2: Biodiversity Net Gain and Natural Capital Assessments report for more details and associated NC and BNG Appendices).

For both the BNG and NC the assessment initially provided outputs per scheme component and subsequent to the completion of the site selection work, assessments of the key SRO configurations were completed to inform both the MCDA assessment and provide the outputs for the key BNG and NC documented outputs. These tables include key NC elements as outline in the ACWG plus an assessment of both temporary and where known permanent habitat losses and total off-site habitat creation requirements for 10% net gain overall in hectares).

No cumulative assessment with other schemes or plans has not been undertaken, as the assessment assumes that for any biodiversity loss not fully mitigated, compensation (offsetting) will be undertaken with an additional provision of 10% net gain. Cumulative assessment would only be necessary / feasible when specific land parcels are identified and if these have been identified and providing mitigation or net gain opportunity for another scheme. Once land parcels have been identified a cumulative assessment of opportunity net gain potential would be necessary to ensure no double counting of habitat uplift.

The key findings of the assessment are detailed in Table 34. The assessment detailed in Table 34 represents the configuration that was used in the MCDA as BNG and NC assessments need to assess a single configuration (i.e. not multiple permutations of routes and intake / outfall locations).

Table 34 - Water Recycling Components Assessed for MCDA

	Scenarios*
	B.4 **BF to HTR**
Marine intake and outfall	
Site	Parcel 72
Pipeline route	Route 3 HTR to Otterbourne) *Route 4*
Other Infrastructure / Components (included in the configurations)	WRP – HT Route 1 *WRP – HT Route 2* Eastney LSO (No new infra but would be change to discharge) Pipeline BF – WRP (only 1 Option)

Table 35 - Summary of BNG and Natural Capital Assessment for D.2 (configuration assessed in MCDA)

Configuration	Metric	Assessment	Units
D.2 Route 3 Configuration	Biodiversity		[redacted]
		Total temporary habitat lost during construction	
		Total permanent habitat loss	
		Total on-site re-instatement / creation	
		Total off-site habitat creation / BNG uplift	
	Climate regulation		
		Change in non-traded carbon sequestration value for temporary habitat loss during construction	
		Change in non-traded carbon sequestration value for permanent habitat loss	
		Non-traded carbon sequestration value for on-site re-instatement / creation	
		Non-traded carbon sequestration value for off-site habitat succession	
	Natural hazard regulation		
		Change in natural hazard regulation value for temporary habitat loss during construction	
		Change in natural hazard regulation value for permanent habitat loss	
		Natural hazard regulation value for on-site re-instatement / creation	
		Natural hazard regulation value for off-site habitat succession	
	Recreation & tourism		
		Estimated Welfare Value	
		Estimated visits	
	Agriculture		
		Temporary loss estimated agriculture value	
		Permanent loss estimated agriculture value	
	Water purification	***Current provision:*** greenfield and woodland habitats. *Impact related to land change = potential decline:* Hermitage Stream flows adjacent to the WRP land parcel and the WFD waterbody is currently achieving Moderate status. Park Lane Stream has no WFD classification but flows into Hermitage Stream WFD waterbody. A pumping station will be constructed. Resulting in land cover change and impact on water purification.	

Configuration	Metric	Assessment	Units
		Water transfer (WRP to Havant Thicket) = no change: The water will be transferred to Otterbourne WSW. Therefore, no change to water purification to River Itchen which flows nearby and the WFD waterbody is achieving a Moderate status. *Impact related to land change =potential decline:* A pre-disinfection ceramic membrane plant will be constructed in close proximity to River Itchen resulting land cover change and negative water purification with potential impact on the River Hamble (Upper Hamble) nearby where the WFD waterbody is currently achieving Moderate status. Where a WBS and BPT will be constructed, there are no waterbodies within close proximity however, the change in land cover still has a potential to decline water purification services.	

Table 35 below details the BNG and NC assessments for the components remaining at the end of Stage 4 of Site Selection.

Table 35 - Summary of BNG and Natural Capital Assessment for D.2 (configuration assessed in MCDA)

Configuration	Metric	Assessment	Units
D.2 Route 3 Configuration	Biodiversity		[redacted]
		Total temporary habitat lost during construction	
		Total permanent habitat loss	
		Total on-site re-instatement / creation	
		Total off-site habitat creation / BNG uplift	
	Climate regulation		
		Change in non-traded carbon sequestration value for temporary habitat loss during construction	
		Change in non-traded carbon sequestration value for permanent habitat loss	
		Non-traded carbon sequestration value for on-site re-instatement / creation	
		Non-traded carbon sequestration value for off-site habitat succession	
	Natural hazard regulation		
		Change in natural hazard regulation value for temporary habitat loss during construction	
		Change in natural hazard regulation value for permanent habitat loss	
		Natural hazard regulation value for on-site re-instatement / creation	
		Natural hazard regulation value for off-site habitat succession	
	Recreation & tourism		
		Estimated Welfare Value	
		Estimated visits	
	Agriculture		

Configuration	Metric	Assessment	Units
		Temporary loss estimated agriculture value	[redacted]
		Permanent loss estimated agriculture value	
	Water purification	***Current provision:*** greenfield and woodland habitats. *Impact related to land change = potential decline:* Hermitage Stream flows adjacent to the WRP land parcel and the WFD waterbody is currently achieving Moderate status. Park Lane Stream has no WFD classification but flows into Hermitage Stream WFD waterbody. A pumping station will be constructed. Resulting in land cover change and impact on water purification. *Water transfer (WRP to Havant Thicket) = no change:* The water will be transferred to Otterbourne WSW. Therefore, no change to water purification to River Itchen which flows nearby and the WFD waterbody is achieving a Moderate status. *Impact related to land change =potential decline:* A pre-disinfection ceramic membrane plant will be constructed in close proximity to River Itchen resulting land cover change and negative water purification with potential impact on the River Hamble (Upper Hamble) nearby where the WFD waterbody is currently achieving Moderate status. Where a WBS and BPT will be constructed, there are no waterbodies within close proximity however, the change in land cover still has a potential to decline water purification services.	

Table 36 - Summary of BNG and Natural Capital Assessment for D.2 (remaining components from State 4 Site Selection)

Components	Metric	Assessment	Units
B.4/D.2 HT to Otterbourne WSW Route 4 component	Biodiversity		[redacted]
		Total temporary habitat lost during construction	
		Total permanent habitat loss	
		Total on-site re-instatement / creation	
		Total off-site habitat creation / BNG uplift	
	Climate regulation		
		Change in non-traded carbon sequestration value for temporary habitat loss during construction	
		Change in non-traded carbon sequestration value for permanent habitat loss	
		Non-traded carbon sequestration value for on-site re-instatement / creation	
		Non-traded carbon sequestration value for off-site habitat succession	
	Natural hazard regulation		
		Change in natural hazard regulation value for temporary habitat loss during construction	
		Change in natural hazard regulation value for permanent habitat loss	
		Natural hazard regulation value for on-site re-instatement / creation	

Components	Metric	Assessment	Units
		Natural hazard regulation value for off-site habitat succession	[redacted]
	Recreation & tourism		
		Estimated Welfare Value	
		Estimated visits	
	Agriculture		
		Temporary loss estimated agriculture value	
		Permanent loss estimated agriculture value	
	Water purification	***Current provision***: greenspace and urban habitats. *Impact related to land change = potential decline:* Hermitage Stream WFD waterbody is currently achieving Moderate status so land change may result in potential impacts (however no deterioration at water body scale anticipated).	

2.5.2.9. Environmental Mitigation

The purpose of this section is to summarise potential environmental mitigation measures requiring further consideration for this SRO. The EIA Regulations, and a number of supporting assessments (e.g. HRA, WFD), require a description of the measures envisaged to avoid, prevent, reduce or (where possible) offset any significant adverse effects on the environment. Mitigation measures are also required to address some of the risks outlined in Section 2.7 of this CDR.

This summary is not exhaustive, example mitigation measures have been identified based on emerging concept designs and current understanding of potential impacts. Mitigation measures have been summarised from the individual environmental assessments (e.g. HRA, WFD) reported above.

Details of the approach to decommissioning have not been confirmed at this stage, however any mitigation measures associated to decommissioning would be developed in line with industry best practice. A full suite of mitigation (and potentially compensatory) measures will be further developed and assessed during the scheme development, EIA and detailed design processes, and where appropriate agreed with relevant regulatory bodies prior to submission of the DCO. SW proposes to submit a Mitigation Route Map with the DCO application to confirm how mitigation measures will be delivered / secured.

For the purposes of this preliminary assessment, two types of mitigation are discussed, as defined within the Institute of Environmental Management and Assessment (IEMA) Guide to Shaping Quality Development (IEMA, 2015):

- Primary (inherent) mitigation – an intrinsic part of the project design - For example, reducing the height of a development to reduce visual impact
- Secondary mitigation – requires further activity in order to achieve the anticipated outcome – For example, description of certain lighting limits that will be subject to submission of a detailed lighting layout as a condition of approval

Tertiary (i.e. inexorable) mitigation is not considered specifically here, however will be identified through the EIA process where appropriate.

To align with the EIA assessment process, mitigation measures for this SRO are detailed in Table 37 in relation to anticipated EIA Topics (see leftmost column). Some EIA topics, such as Health, typically draw from impacts and mitigation measures identified in other chapters (in this example noise, air quality etc) so have not be identified separately.

Table 37 - Environmental Mitigation for D.2

EIA Topic	Example potential impact occurring during construction, operation and decommissioning	Example potential embedded mitigation measures to be explored during scheme development and EIA	Example potential secondary mitigation measures to be explored during EIA
Air Quality	• Impacts of dust and particulate matter on dust soiling, human health and nature conservation designations • Impacts of emissions from construction phase plant on human and ecological receptors • Impacts of emissions from increased traffic movements on human and ecological receptors (construction and operation)	• Routing of infrastructure, pipelines and construction routes to avoid sensitive sites where possible (see mitigation for traffic and transport, biodiversity etc) • Emissions during operation (e.g. back-up generators) designed / located to reduce air quality impacts	• HGV movements and construction vehicles could be routed and potentially timed to avoid peak traffic periods and sensitive receptors • Development and implementation of Construction Environmental Management Plans • Dust suppression measures could be utilised during construction • Air quality monitoring could be undertaken if required / where appropriate (with an adaptive plan in place to manage unacceptable effects arising) • Low emissions plant and vehicles could be used
Archaeology and Cultural Heritage	• Direct (physical) impacts • Indirect (physical) impacts • Indirect (non-physical) changes to the setting of heritage assets	• Pipeline route to seek to avoid direct impact to sites and buildings of cultural and heritage importance • Design / layout of above ground infrastructure to consider setting of listed building / scheduled monument • Archaeological assessment of pre-construction survey data, including high resolution geophysical data to inform scheme development	• Recording and removing / relocating archaeological material (preservation by record) • Archaeological Exclusion Zones could be established around sensitive interest features • Develop protocol for archaeological discoveries to account for unexpected finds • Written Scheme of Investigation (WSI) to set out measures for ground clearance appropriate to the categorisation of the area • Heritage awareness initiatives with local interest groups / schools

EIA Topic	Example potential impact occurring during construction, operation and decommissioning	Example potential embedded mitigation measures to be explored during scheme development and EIA	Example potential secondary mitigation measures to be explored during EIA
Biodiversity	• Degradation or loss of habitats • Killing or injuring of fauna through the removal of resting or breeding sites • Loss of foraging or breeding areas • Loss of ecological connectivity • Introduction of INNS	• Pipeline routes to seek to avoid nationally or internationally important terrestrial and marine habitats where possible, or areas identified as functionally linked or supporting protected/notable species. • Sensitive selection of pipeline river crossings to minimise impacts to groundwater flows and water dependent habitats. Use of trenchless techniques where appropriate. • Design measures to reduce risk of INNS (e.g. screens). • Sensitive design around Root Protection Areas.	• Clearance of vegetation to be undertaken prior to the breeding season where possible. • Restoration or compensation of terrestrial, coastal or marine habitat where possible on completion of construction. • Translocation of species prior to construction. • Appropriate isolation, removal and post-construction control measures implemented to minimise spread of INNS. • Avoid significant dust dispersion, sedimentation runoff, nitrogen deposition (from construction traffic and lane closures holding traffic in queues). Consideration will also need to be given to the location of construction compounds to avoid designated areas. Traffic may need to be routed away from any sensitive habitats to avoid increases in nitrogen loading.
Land Quality and Ground Conditions	• Exposure of workforce and the public to contaminated soils and groundwater and associated health impacts • Impacts on ground water quality and groundwater resources • Impacts on surface water quality • Sterilisation of future mineral resources	• Avoidance of known areas of contaminated land through design of the SRO using good design principles • Avoidance of mineral sterilisation through design of the SRO using good design principles	• Reinstatement of land following construction where possible • Remediation if required • In-situ ground improvement techniques or excavation and replacement of poor material
Land Use and Agriculture	• Loss of agricultural production on agricultural land and disruption of farming practices	• Routing of the pipeline to avoid agricultural land where possible	• Topsoil retained and replaced once construction is complete

EIA Topic	Example potential impact occurring during construction, operation and decommissioning	Example potential embedded mitigation measures to be explored during scheme development and EIA	Example potential secondary mitigation measures to be explored during EIA
	• Loss or disruption to recreational assets • Loss or diversion of Public Rights of Way (PRoW) and / or cycle paths	• Routing of the pipeline to avoid recreational land and PRoW where possible • Take appropriate mitigation measures to address adverse effects on National Trails, other PRoW and open access land and, where appropriate, to consider what opportunities there may be to improve the network and other areas of open space and improve access	• Where green infrastructure is affected, the functionality and connectivity of the green infrastructure network should aim to be maintained
Landscape and Visual Impact	• Effects to landscape fabric and features • Effects to landscape / townscape / seascape character • Effects to visual amenity within landscape designations (including consideration of wildlife and natural beauty) • Effects to visual amenity	• Appropriate siting of above ground infrastructure to consider viewpoints / tranquillity / landscape designations • Sensitive lighting design in accordance with best practice • Landscaping schemes to screen infrastructure • Materials and finishes of infrastructure to be given careful consideration	• Preparation and implementation of Landscape Management Plan
Noise and Vibration	• Noise impacts to humans from construction plant, vehicles or vessels • Noise impacts to ecology from construction plant, vehicles or vessels (above ground and underwater) • Vibration impacts to humans (construction) • Vibration impacts to buildings (construction)	• Construction methods selected to reduce noise • Adequate distance between source and noise-sensitive receptors • Layout of structures or buildings to screen noise	• Reduction of noise at point of generation and containment of noise generated • Restriction of activities allowed – specifying noise limits or times of use • Potential use of acoustic barriers
Traffic and Transport	• Driver delay to road users including pedestrians, cyclists and equestrians	• Selection of route Options which avoid heavily congested areas / roads	• HGV movements and construction vehicles could be routed and timed to

EIA Topic	Example potential impact occurring during construction, operation and decommissioning	Example potential embedded mitigation measures to be explored during scheme development and EIA	Example potential secondary mitigation measures to be explored during EIA
	• Severance or loss or pedestrian / cycle amenity • Reduction in road safety	• Consideration could be given to the utilisation of waterborne and rail transport to deliver large quantities of construction materials	avoid peak traffic periods and sensitive receptors • Use of best practice methods including the development and implementation of CTMPs • Siting and construction activities could be undertaken so as to minimise any short-term adverse effects on public rights of way • Control numbers of HGV movements to and from the site in a specified period during construction and operation where possible and consider the impacts of alternative transport routes
Water Resources and Flood Risk	• Changes to flood risk and the hydrology of surface watercourses • Changes to the geomorphology of surface watercourses • Changes to the geomorphology and quality of surface waters • Temporary or permanent changes to surface and groundwater quality • Changes to groundwater recharge and groundwater levels resulting from changes to surface and sub-surface hydrology	• Sustainable drainage approaches and other measures such as planting could be adopted to ensure no net change in fluvial, estuarine or surface water flood risk, arising from site run-off • Where required flood storage measures could be included in the design of development	• Adherence to pollution control practice and pollution prevention guidance • Best practice used to prevent silt, concrete or fuel oil polluting water courses or ground water
Ornithology	• Disturbance and displacement (e.g. noise, light and human activity) • Direct habitat loss and fragmentation • Indirect impacts through effects on habitats and prey species	• Informed by surveys, sensitive location of infrastructure and construction compounds to avoid impacts to sensitive features (e.g. nests, breeding/feeding areas)	• Timing of construction works to minimise potential impacts to breeding birds where possible

EIA Topic	Example potential impact occurring during construction, operation and decommissioning	Example potential embedded mitigation measures to be explored during scheme development and EIA	Example potential secondary mitigation measures to be explored during EIA
Carbon and GHG	• Embodied GHGs within construction materials • GHG emissions from construction and operation vehicle and vessel movements • GHG emissions from construction and operation site activities	• New infrastructure could be designed to incorporate the use of energy efficient materials, building techniques and energy efficient pumping and water treatment equipment • Opportunities could be sought for the use of, or generation of, renewable energy to help offset additional operational carbon emissions	• The use of low emission plant during construction could be considered • Maximising the use of on-site materials could reduce HGV movements • Use of pre-fabricated construction materials and off-line build to minimise materials used
Major accidents	• Flooding • Storm surges, other extreme weather • Cyber attacks • Disease • Industrial action	• The design of the proposed SRO will be informed by the appropriate health and safety regulations, design codes and other legal requirements. Adhering to these requirements will minimise the risk of major accidents and disasters.	• Management plans developed, in line with best practice guidance and relevant legislation, to minimise operational risks associated to major accidents and disasters.

2.5.2.10. Carbon

Carbon, both Capital, Operational and WLC for each SRO, has been estimated and included with in the MCDA and Planning Appraisal work.

Capital carbon emissions were based on scoping information in CIT costing sheets developed by SW. Where costs were developed using a bottom-up approach or based on quotes from suppliers rather than cost models, a general approach to account for additional capital carbon was applied based on the relative proportion of the total cost. For example, if 90% of the total cost was based on cost models and 10% was bottom up, the total capital carbon was scaled up accordingly to account for the additional assets.

Operational carbon emissions were calculated based on quantities for power use, chemical use, transport and operational maintenance requirements.

The whole life carbon estimates comprise the capital carbon emissions, annual operational emissions and additional emissions associated with capital maintenance. The estimated annual carbon emissions profile was based on the whole life cost profile, as summarised below:

- Years 1-4: planning
- Years 5-8: construction
- Year 5: Proportional to 25% of planning costs and 20% remaining CAPEX costs
- Year 6: Proportional to 25% of planning costs and 35% remaining CAPEX costs
- Year 7: Proportional to 25% of planning costs and 35% remaining CAPEX costs
- Year 8: Proportional to 25% of planning costs and 10% remaining CAPEX costs
- Years 9-108: operation & capital maintenance

The monetised cost of carbon was also calculated using the traded and non-traded carbon price forecasts from the Green Book Supplementary Guidance: Valuation of energy use and greenhouse gas emissions for appraisal (Table 118, Carbon prices and sensitivities 2010-2100 for appraisal, 2018 £/tCO2, central price). The traded carbon price was applied to power related emissions only, with the non-traded carbon price applied to all other emissions.

The current estimate of emissions provides a view of how much the Options would add to SW's existing emissions once commissioned. Under SW's net zero operational emissions by 2030 commitment these operational emissions will need to be reduced and potentially offset by 2030. The potential costs of offsets have not been included, at this stage, as this would be considered as part of SW's overall net zero and offsetting strategy.

Table 38 summarises the capital carbon, operational carbon (associated with chemical use, power and transport), whole life carbon (includes capital maintenance in addition to operational carbon over 100 years) and the non-discounted monetised cost of carbon for D.2.

Table 38 - Summary of Carbon Calculations

Operating regime	Flow (Ml/d)	Capital carbon (tco2e)	Operational carbon (tco2e)	Whole life carbon (tco2e)	Monetised whole life carbon (£m)
D.2					
MAX (DO)	75	42,000	1,500	98,000	18
MIN	6	42,000	100	55,000	7
AVERAGE	6.69	42,000	100	55,000	7

The water sector has not yet defined how the sector's net zero ambition will apply at programme, project, or company level whilst also accounting for its duty to maintain efficient and affordable services for customers. Once industry wide net zero plans are finalised, it will be easier to understand which programmes of work will be most cost-effectively meet net zero targets.

2.5.3. Strategic Resource Option B.4

This section summarises the environmental assessments for Option B.4. To avoid repetition, methods and approaches are not repeated in this section that are consistent with Option D.2, where only additional information relevant to either the methodology applied or the results from assessments undertaken, are included.

2.5.3.1. Strategic Environmental Assessment

As noted in the SEA section for Option D.2 as with the approach taken at Gate 1, and in line with the requirements of the RAPID Accelerated Gate 2 Submission Template, environmental assessments that provide information consistent with SEA have been undertaken at option level for each SRO. A statutory SEA is not required for Gate 2.

The first step of Stage B was to undertake a screening exercise, to assess the potential effects of each option against the baseline environment, and to determine whether they are affected by the proposals (in this context 'screening' is used to describe an option level source-pathway-receptor approach taken to identify where impacts may occur, not SEA screening in the sense of deciding whether a whole plan requires an SEA).

SEA Screening

For Option B.4 there is the potential for major adverse effects to biodiversity in relation to the operation of the Waste Stream via Eastney LSO from [redacted] component, due to the potential for adverse effects to the National Site Network Sites. The construction of the ceramic membrane plant at Otterbourne WSW (including the washwater recovery area), required for all SROs, has the potential to have a major adverse impact on the qualifying species of the River Itchen SAC (and SSSI which underpins this designation). Ancient Woodland also borders the Otterbourne WSW site and therefore there is the potential for adverse effects during construction.

B.4 has the potential for major adverse impacts to biodiversity, cultural heritage, landscape and visual and other SEA topics. There are a significant number of Scheduled Monuments and Listed Buildings, and a high potential for undiscovered archaeological remains, within the vicinity of the WRP to HTR pipeline (Route 2) and pipeline transfer from HTR to Otterbourne WSW (Routes 3 & 4). Therefore, there is the potential for major adverse effects to occur on cultural heritage in relation to the construction of these components. However, during operation the potential for adverse effects on heritage assets to occur is very low as these components will be buried. The pipeline transfers from HT to Otterbourne WSW (Route 3 and 4) cross the South Downs National Park, therefore there is the potential of major adverse impacts during construction. The WRP to HT pipeline (Route 2) crosses the Leigh Park / Staunton Country Park and extends around its boundary. The interactions with these designations have the potential to cause major adverse impacts during construction in respect of landscape and visual amenity, although operational impacts are likely to be negligible as the infrastructure is buried. There is the potential for the pipeline transfer from HTR to Otterbourne WSW (Routes 3 & 4) to have major adverse effects on other SEA topics during construction, including impacts to high grade agricultural land to the west of Purbrook, and within 3 km of the Eastleigh No.1 and 2 Air Quality Management Areas (AQMA). The HTR to Otterbourne WSW (Route 3) also has the potential to have a major adverse impact on National Site Network Sites (Chichester and Langstone Harbours SPA and Ramsar, the Solent Maritime SAC and River Itchen SAC) and SSSIs.

[redacted] to new WRP: Route 1

Summary of component adverse effects

One major adverse effect has been identified, relating to biodiversity flora and fauna (potential Likely Significant Effects (LSEs) for several National Site Network designations). Three moderate adverse effects have been identified, relating to population and human health (impacts towards recreational activities including access to Public Rights of Way (PRoWs) and a national trail), material assets and resource use (small quantities of material for construction waste generated for landfill, in addition to major long term energy and chemicals requirements during operation), archaeology and cultural heritage (potential impacts towards heritage assets (Listed Buildings)).

Summary of component beneficial effects

Five major beneficial effects are anticipated, relating to the provision of a large supply of recycled water which would enable improvements in water use efficiency and lessen the pressure on other sources during severe drought conditions, the minimisation of the risks associated with unsustainable abstraction of groundwater and fresh surface waters, and reducing the vulnerability to risks (drought) associated with climate change effects.

Water recycling plant

Summary of component adverse effects

Two major adverse effects have been identified, relating to biodiversity flora and fauna (potential LSEs for several National Site Network Sites, impacts to national designations due to construction traffic) and air and climate (major long-term energy requirement). Four moderate adverse effects have been identified, in relation to material assets and resource use (small quantities of material for construction and waste generated for landfill, in addition to major long term energy and chemicals requirements during operation), water (localised water quality impacts towards coastal waterbodies and transitional waterbodies in proximity to the Water Reuse Plant), archaeology and cultural heritage (potential impacts towards unknown archaeology), and landscape and visual amenity (impacts towards visual amenity of an AONB during construction).

Summary of component beneficial effects

Five minor beneficial effects have been identified for this component, relating to population and human heath (more sustainable provision of water during drought conditions), material assets and resources (lessening the pressure on other sources that abstract water from more limited water resources during drought conditions), water (presents an opportunity to reduce impacts to groundwater through water recycling) and air and climate (reduction in vulnerability to climate change), through its contribution to water delivery resourced as part of the overall Water Recycling SRO. The component contributes to a benefit by ensuring water provided by the other components reaches the right customers, communities and businesses. Additionally, the component contributes to reducing the vulnerability to risks (i.e. drought) associated with climate change effects and improves resilience to the likely effects of climate change.

Waste Stream via Eastney LSO from [redacted]

Summary of component adverse effects

One major adverse effect has been identified, relating to biodiversity flora and fauna (potential LSEs for several National Site Network Sites and national designations due to construction changes in waste stream concentration). Five minor adverse effects have been identified, relating to water (localised water quality impacts towards coastal waterbodies and transitional waterbodies in proximity to the Water Reuse Plant), and archaeology and cultural heritage (potential impacts towards protected wreck sites).

Summary of component beneficial effects

Five minor beneficial effects have been identified for this component, relating to biodiversity (small improvement in the waste stream), population and human heath (more sustainable provision of water during drought conditions), material assets and resources (lessening the pressure on other sources that abstract water from more limited water resources during drought conditions), water (presents an opportunity to reduce impacts to groundwater through water recycling) and air and climate (reduction in vulnerability to climate change), through its contribution to water delivery resourced as part of the overall Water Recycling SRO. The component contributes to a benefit by ensuring water provided by the other components reaches the right customers, communities and businesses. Additionally, the component contributes to reducing the vulnerability to risks (i.e. drought) associated with climate change effects and improves resilience to the likely effects of climate change.

B.4 WRP to Havant Thicket Reservoir: Route 1

Summary of component adverse effects

Three major adverse effects have been identified, relating to biodiversity, flora and fauna (potential dust and air quality impacts of construction works towards National Site Network Sites and national designations), archaeology and cultural heritage (the high potential for undiscovered archaeological remains during construction and proximity to national designations) and landscape and visual amenity (impacts on the visual amenity of the landscape of a national park during construction).

Summary of component beneficial effects

Five minor beneficial effects have been identified for this component, relating to population and human heath (more sustainable provision of water during drought conditions), material assets and resources (lessening the pressure on other sources that abstract water from more limited water resources during drought conditions), water (presents an opportunity to reduce impacts to groundwater through water recycling) and air and climate (reduction in vulnerability to climate change), through its contribution to water delivery resourced as part of the overall Water Recycling SRO. The component contributes to a benefit by ensuring water provided by the other components reaches the right customers, communities and businesses. Additionally, the component contributes to reducing the vulnerability to risks (i.e. drought) associated with climate change effects and improves resilience to the likely effects of climate change.

B.4 WRP to Havant Thicket Reservoir: Route 2

Summary of component adverse effects

Three major adverse effects have been identified, relating to biodiversity, flora and fauna (potential dust and air quality impacts of construction works towards National Site Network Sites and national designations), archaeology and cultural heritage (the high potential for undiscovered archaeological remains during construction and proximity to national designations) and landscape and visual amenity (impacts on the visual amenity of the landscape of a national park during construction).

Summary of component beneficial effects

Five minor beneficial effects have been identified for this component, relating to population and human heath (more sustainable provision of water during drought conditions), material assets and resources (lessening the pressure on other sources that abstract water from more limited water resources during drought conditions), water (presents an opportunity to reduce impacts to groundwater through water recycling) and air and climate (reduction in vulnerability to climate change), through its contribution to water delivery resourced as part of the overall Water Recycling SRO. The component contributes to a benefit by ensuring water provided by the other components reaches the right customers, communities and businesses. Additionally, the component contributes to reducing the vulnerability to risks (i.e. drought) associated with climate change effects and improves resilience to the likely effects of climate change.

2.5.3.2. Marine Conservation Zone Assessment

A MCZA has been completed for Gate 2. The only potential component related to B.4 that could impact on the marine environment is the alteration to the discharge from the Eastney LSO associated with the reduction in wastewater and inclusion of reject water from the recycling process in the Eastney LSO discharge. MCZs included in the assessment include the Yarmouth to Cowes MCZ, The Needles MCZ and Bembridge MCZ. MCZs outside of the Solent are considered to be sufficiently distant so as not to be within the zone of impact for the SROs, this is supported by the modelling work completed to date.

Modelling work undertaken to inform SRO Option appraisal modelled the 15 Ml/d, which is anticipated to be maximum flow for this SRO, but modelling was not undertaken on the BAU flow for this SRO which is 5 Ml/d. The current situation using existing data was also modelled to allow a comparison between the model outputs and therefore it is considered that the likely output for the BAU flow would be comparable to the existing situation given the flows are so low.

Modelling for the 15 Ml/d flows indicates that the TN concentrations could potentially decrease over the existing situation, but this is limited to the northern area of the Solent and the harbours Portsmouth and Langstone. Very little change is noted in the MCZs for which the plume extent overlaps for the 15 Ml/d. The plume extent for both the 15 Ml/d and the existing situation does not overlap with the Bembridge MCZ boundaries. The modelled changes to salinity concentrations are relatively minor and limited to close proximity to the outfall so were not considered further in the assessment.

Based on the results of the modelling and specifically the extent of the plume, the inclusion of the MCZs mentioned above are considered sufficient for the MCZA. No pathway for impact exists for other MCZs that are not in the Solent. Where available, NE’s conservation advice has been considered throughout the assessment.

Screening for the Yarmouth to Cowes Marine Conservation Zone

The screening phase of the MCZ assessment of Yarmouth to Cowes MCZ for B.4 is detailed in Table 39.

As the MCZs conservation objectives are not required to be considered at this stage, in line with accepted industry approach and MMO (2013) Guidance – Marine Conservation Zones and Marine licencing), a precautionary approach has been adopted for the screening, where information is not certain sites and features have been screened in for further assessment. This applies to all future screening assessments for The Needles and Bembridge MCZ. This approach is in line with recommendations made by NE in response to the Gate 2 MCZA Method Statement.

Table 39 - MCZ assessment screening for the Yarmouth to Cowes MCZ for B.4

MMO screening criteria	Yarmouth to Cowes MCZ
Is the plan or project taking place within or near an area being put forward for, or already designated as, an MCZ?	The Eastney LSO for B.4 is located 17.5 km from the MCZ at its closest point. This is not considered to be near the MCZ.
Is the plan or project capable of affecting (other than insignificantly) either: • The protected features of an MCZ; or • Any ecological or geomorphological process on which the conservation of any protected feature of an MCZ is (wholly or in part) dependant?	Construction and decommissioning – there are no components of construction and decommissioning phases that would occur in the marine environment. Operational phase – there would be alterations to current wastewater flows from [redacted] and a discharge of reject water from the water recycling process required to support this water recycling SRO via the Eastney LSO. Therefore, there is the potential for water quality effects on the MCZ. Furthermore, NE's consultation response identifies that the water recycling Options have some limited potential for beneficial effects, if potential impacts elsewhere can be mitigated, to reduce some of the existing water quality impacts within the Solent Habitat sites and therefore contribute to the "better managing" target. Based on the above, this MCZ is screened into a Stage 1 assessment for B.4 for operational effects only.

Stage 1 Assessment for the Yarmouth to Cowes MCZ

This stage of the MCZA considers the potential impacts of B.4 on Yarmouth to Cowes MCZ, which was screened in Table 40 details the features of interest, their current conservation objectives and any potential impacts that may arise due to B.4.

Table 40 - Stage 1 Assessment for Yarmouth to Cowes MCZ for B.4

Feature	Conservation objective	Description of the impact of B.2 on the conservation objectives	Adverse impact as a result of the proposed project
Subtidal coarse sediment	Maintain in favourable condition	Modelling output is available for the maximum flow of 15 Ml/d applicable to this SRO but not for 5 Ml/d which represents the BAU flow for this SRO. The modelling output for the 15 Ml/d indicates a reduction in TN concentrations from the existing situation but this reduction is concentrated to the North of the Solent and in the harbours. However, for the BAU flow (operating for 320 days in an average year) whilst modelling output is not available, the output is considered likely to reflect the existing situation, given that wastewater flows taken from BF for recycling would be relatively low. This indicates that the current overlap of the zone of extent would not alter from the existing overlap and therefore there would be no change in water quality. As such, impacts on the conservation objectives are not predicted.	No adverse impact on conservation objective predicted
Native oyster (Ostrea edulis)	Recover to favourable condition		
Sheltered muddy gravels			
Subtidal chalk			
Subtidal mixed sediments			
Subtidal mud			

Screening for The Needles MCZ

The screening phase of the MCZA of The Needles MCZ for B.4 for is detailed in Table 41.

Table 41 - Screening for The Needles MCZ for B.4

MMO screening criteria	The Needles MCZ
Is the plan or project taking place within or near an area being put forward for, or already designated as, an MCZ?	The Eastney LSO for B.4 is located 35.5 km5km from the MCZ at its closest point. This is not considered to be near to the MCZ.
Is the plan or project capable of affecting (other than insignificantly) either: • The protected features of an MCZ; or • Any ecological or geomorphological process on which the conservation of any protected feature of an MCZ is (wholly or in part) dependant?	Construction and decommissioning – there are no components of construction and decommissioning phases that would occur in the marine environment. Operational phase – there would be alterations to current wastewater flows from BF and a discharge of reject water from the water recycling process required to support this water recycling SRO. Therefore, there is the potential for water quality effects on the MCZ. NE's consultation response identifies that the water recycling Options have some limited potential of beneficial effects, if potential impacts elsewhere can be mitigated, to reduce some of the existing water quality impacts within the Solent Habitat sites and therefore contribute to the "better managing" target of Defra's 25 Year Environment Plan (NE, 2021). Based on the above, this MCZ is screened into a Stage 1 assessment for B.4 for operational effects only.

Stage 1 Assessment for The Needles MCZ

This stage of the MCZA considers the potential impacts of B.4 on The Needles MCZ, which was screened in Table 42, details the features of interest, their current conservation objectives and any potential impacts that may arise due to B.4.

Table 42 - Stage 1 Assessment for The Needles MCZ for B.4

Feature	Conservation objective	Description of the impact of SRO B.4 on the conservation objectives	Adverse impact as a result of the proposed project
Moderate energy infralittoral rock	Maintain in favourable condition	NE's Supplementary Advice on Conservation Objectives states that some habitat features have 'recover' objectives because of the direct anthropogenic pressure they are subject to (i.e. direct habitat disturbance). Similarly, some species have 'recover' objectives because of anthropogenic pressures. NE's Advice on Operations for this MCZ have been reviewed and the pressures relevant to discharges are nutrient enrichment, organic enrichment, salinity decrease and salinity increase, of which most of the features are sensitive to. Modelling output is available for the maximum flow of 15 Ml/d applicable to this SRO but not for 5 Ml/d which represents the BAU flow for this SRO. The modelling output for the 15 Ml/d indicates a reduction in TN concentrations from the existing situation but this reduction is concentrated to the North of the Solent and in the harbours. However, for the BAU flow (operating for 320 days in an average year) whilst modelling output is not available, the output is considered likely to reflect the existing situation, given that wastewater flows taken from BF for recycling would be relatively low. The modelled extent of the plume for the existing situation indicates a small overlap of low TN concentrations from the discharge and this would not be altered by SRO B.4 therefore no change in water quality in this MCZ is predicted. As such, impacts on the conservation objectives are not predicted.	No adverse impact on conservation objective predicted
High energy infralittoral rock			
Moderate energy circalittoral rock			
Stalked jellyfish (Lucernariopsis campanulata)			
Subtidal chalk	Recover to favourable condition		
Subtidal coarse sediment			
Subtidal mixed sediments			
Subtidal sand			
Subtidal mud			
Sheltered muddy gravels			
Seagrass beds			
Peacock's tail (Padina pavonica)			
Native oyster (Ostrea edulis)			

Screening for Bembridge MCZ

The screening phase of the MCZA of Bembridge MCZ for B.4 is detailed in **Error! Reference source not found.**.

Table 43 - Screening for Bembridge MCZ for SRO B.4

MMO screening criteria	Bembridge MCZ
Is the plan or project taking place within or near an area being put forward for, or already designated as, an MCZ?	The Eastney LSO for SRO B.4 is located near the MCZ, approximately 2.5 km from the MCZ at its closest point.
Is the plan or project capable of affecting (other than insignificantly) either: • The protected features of an MCZ; or • Any ecological or geomorphological process on which the conservation of any protected feature of an MCZ is (wholly or in part) dependant?	Construction and decommissioning – there are no components of construction and decommissioning phases that would occur in the marine environment. Operational phase – there would be alterations to current wastewater flows from BF and a discharge of reject water from the water recycling process required to support this water recycling SRO. Therefore, there is the potential for water quality effects on the MCZ. NE's consultation response identifies that the water recycling Options have some limited potential of effect, if potential impacts elsewhere can be

MMO screening criteria	Bembridge MCZ
	mitigated, to reduce some of the existing water quality impacts within the Solent Habitat sites and therefore contribute to the "better managing" target. Based on the above, this MCZ is screened into a Stage 1 assessment for B.4 for operational effects only.

Stage 1 Assessment for Bembridge MCZ

This stage of the MCZA considers the potential impacts of B.4 on Bembridge MCZ, which was screened in Table 44 details the features of interest, their current conservation objectives and any potential impacts that may arise due to B.4.

Table 44 - Stage 1 Assessment for Bembridge MCZ for SRO B.4

Feature	Conservation objective	Description of the impact of SRO B.4 on the conservation objectives	Adverse impact as a result of the proposed project
Sheltered muddy gravels	Maintain in favourable condition	Modelling output is available for the maximum flow of 15 Ml/d applicable to this SRO but not for 5 Ml/d which represents the BAU flow for this SRO. The modelling output for the 15 Ml/d indicates a reduction in TN concentrations from the existing situation but this reduction is concentrated to the north of the Solent and in the harbours. However, for the BAU flow (operating for 320 days in an average year) whilst modelling output is not available, the output is considered likely to reflect the existing situation, given that wastewater flows taken from [redacted] for recycling would be relatively low. The model output for the existing situation does not, however, extend into the boundary of the MCZ. There would therefore be no change to water quality in this MCZ. As such, impacts on the conservation objectives are not predicted.	No adverse impact on conservation objective predicted
Short-snouted seahorse (Hippocampus hippocampus)			No adverse impact on conservation objective predicted
Stalked jellyfish (Calvadosia campanulata)			No adverse impact on conservation objective predicted
Stalked jellyfish (Haliclystus species)			No adverse impact on conservation objective predicted
Subtidal coarse sediment			No adverse impact on conservation objective predicted
Subtidal sand			No adverse impact on conservation objective predicted
Maerl beds	Recover to favourable condition		No adverse impact on conservation objective predicted
Peacock's tail (Padina pavonica)			No adverse impact on conservation objective predicted
Native oyster (Ostrea edulis)			No adverse impact on conservation objective predicted
Sea-pens and burrowing megafauna			No adverse impact on conservation objective predicted
Seagrass beds			No adverse impact on conservation objective predicted
Subtidal mixed sediments			No adverse impact on conservation objective predicted
Subtidal mud			No adverse impact on conservation objective predicted

Conclusions

Yarmouth to Cowes MCZ, The Needles MCZ and Bembridge MCZ were included in this MCZA for SRO B.4, all of which were screened into a Stage 1 assessment due to there being a potential for effect as a result of changes to the wastewater discharge from the Eastney LSO.

The Stage 1 assessment for each site incorporated the modelling results, which concluded that there is no overlap of the plume extent into the Bembridge MCZ. For Yarmouth and Cowes MCZ and The Needles MCZ, the extent and concentrations of the existing plume are not predicted to be altered significantly by the changes in flows to the discharges associated with B.4. For this reason, it is concluded that the effects associated with B.4 will not result in an adverse impact on the conservation objectives of any of the three MCZs considered.

2.5.3.3. Habitats Regulations Assessment

The high level HRA for Option D.2 (Section 2.5.2.4) also applies for Option B.4, with the following additions.

Stage 1 Screening

For Habitats sites and Ramsar sites with a potential pathway for effect, Stage 1b considers the condition and sensitivity of the designated features, conservation objectives and any management measures for each Habitats / Ramsar site to determine the potential for a Likely Significant Effect (LSE).

At this stage, consideration is also given to whether in-combination effects could occur and whether they contribute to or result in any additional or greater magnitude of LSE on any Habitats sites or Ramsar sites. Where there is no pathway for effect for the SROs there will be no in-combination effects with other plans and projects.

Table 45 - Plans and Projects Screened-in to in-combination assessment

Project Name	Status	Description
AQUIND Interconnector	Awaiting decision	Development of AQUIND Interconnector with a nominal net capacity of 2000 MW between Great Britain and France located off the coast of Portsmouth offshore and between Portsmouth and Lovedean substation onshore.
Portsmouth City Council	Granted	Flood and coastal erosion management scheme comprising a combination of encasing sections of the existing sea wall with enhanced stepped revetment, construction of a new vertical sea wall with stepped revetment, improvements to 2no. existing slipways, removal of 1no. existing slipway, reconstruction and raising of the existing coastal footpath, provision of additional seating and viewing areas, creation of an offshore bird island, and all associated works, compounds, removal of trees and landscaping.
Portsmouth Water [redacted]	Granted	Construction of new water treatment building (to accommodate DAF plant).
HTR	Granted	Construction of a new reservoir and associated pipeline to [redacted] pumping station.

It is important to note that the evidence is required to show, on the basis of objective information, that there will be no LSE on any Habitats sites or Ramsar sites; if the SRO may cause LSE on any Habitats sites or Ramsar sites, or it is not known whether the SRO may cause such LSE, that would trigger the need for an Appropriate Assessment.

In combination Effects

Screening of in-combination effects completed to date related to Option B.4 includes considerations of:

- Developments consented and built but not yet operating
- Developments consented but not yet constructed (or completed)
- Developments in the consenting process but no decision made

Only projects which are reasonably well described and sufficiently advanced to provide information on which to base a meaningful and robust assessment have been included in the in-combination assessment. The in-combination effects assessment takes a precautionary approach in order to provide conservative conclusions to inform a robust Options appraisal for Gate 2. In accordance with the principles required of HRA, where there is uncertainty at this stage it is stated that an AEoI cannot be ruled out.

HRA Screening Summary WR SROs

The following potential effects on Habitats and Ramsar sites as a result of each of the Water Recycling SROs have been identified based on the available information for the required SRO infrastructure and assumptions on the construction methodology as set out in the technical report:

Table 46 - Potential effects

Effect Category	Construction Effects	Operational Effects
Subtidal	• N/A	• Indirect effects – Changes to water quality
Terrestrial	• Direct habitat loss if located within a Habitats site • Indirect effects – Temporary disturbance due to noise, vibration, human activity and light – Temporary changes to air quality – Changes to ground water and surface water – Introduction of INNS – Barrier to species migration	• Direct long-term habitat loss if located within a Habitats site • Indirect effects – Disturbance due to noise, vibration, human activity and light – Changes to air quality
Ornithology	• Direct habitat loss if located within a Habitats site • Indirect effects – Temporary disturbance due to noise, vibration, human activity and light – Change in supporting habitat quality due to release in sediment during river crossing construction – Barrier to species migration/movement – Changes to prey resource – Changes to air quality	• Direct habitat loss if located within a Habitats site • Indirect effects – Disturbance due to noise, vibration, human activity and light – Barrier to species migration / movement
Freshwater	• Direct habitat loss if located within a Habitats site • Indirect effects	• Connectivity with subtidal effects for migratory species

Effect Category	Construction Effects	Operational Effects
	– Temporary disturbance due to noise, vibration and human activity – Changes in water quality – Introduction of INNS – Barrier to species migration	• Changes to water quality due to potential emergency environmental buffer lake overflow

The potential effects outlined above apply to each Water Recycling SRO, however the screening of these effects is considered separately for each SRO. This section, along with Sections 2.5.2.4 and 2.5.3.3 details the HRA Screening process for Option B.4. Table 47 details a summary of the HRA Screening conclusions for B.4.

Table 47 - Habitat sites and Ramsar sites screened in / out for B.4

Sites	Qualifying Features	Closest distance to SRO	Screening conclusion	Summary
Briddlesford Copse SAC	• Bechstein's bat *Myotis bechsteinii*	18.26 km	No pathway	Briddlesford Copse SAC is located on the Isle of Wight at Wootton Bridge. There are no pathways for an impact to occur based on the supporting habitat buffers for the SAC which indicate that the Bechstein's bat feature of the SAC do not forage this far afield (SW, 2020a) and therefore there is no pathway for LSE upon the bat population or any other supporting habitats associated with the SAC.
Butser Hill SAC	• *Taxus baccata* woods of the British Isles. (Yew-dominated woodland) (priority habitat) • Semi-natural dry grasslands and scrubland facies: on calcareous substrates (*Festuco Brometalia*). (Dry grasslands and scrublands on chalk or limestone)	10.21 km	Screened-in	The SRO is sufficiently distant with the urban areas of Waterlooville and Horndean in between, and the SAC does not support groundwater features. As such, no pathway for effect is identified from the SRO infrastructure, other than. However, air quality effects, which are screened in due to the SAC being adjacent to the A3, which could be used for some construction traffic.
Woolmer Forest SAC	• Depressions on peat substrates of the Rhynchosporion • European dry heaths • Natural dystrophic lakes and ponds. (Acid peat-stained lakes and ponds) • Northern Atlantic wet heaths with *Erica tetralix*. (Wet heathland with cross-leaved heath) • Transition mires and quaking bogs. (Very wet mires often identified by an unstable 'quaking' surface)	25.21 km	Screened-in	The SRO is sufficiently distant with the urban areas of Waterlooville and Horndean in between and does not support groundwater features. As such, no pathway for effect is identified from the SRO infrastructure, other than However, air quality effects, which are screened in due to the SAC being adjacent to the A3, which could be used for some construction traffic.
Kingley Vale SAC	• *Taxus baccata* woods of the British Isles. (Yew-dominated woodland) (priority habitat) Semi-natural dry grasslands and scrubland facies: on calcareous substrates (*Festuco Brometalia*).	10.93 km	No pathway	The site is situated 10.93 km to the North East of the proposed pipeline routes. As such, no pathway for effect is identified from the SRO infrastructure and the SAC is not likely to be affected by construction traffic.
Emer Bog SAC	• Transition mires and quaking bogs	6.42 km	No pathway	Emer Bog SAC is located approximately 6.42 km to the west of Otterbourne WTW, and to the west of the River Itchen and Eastleigh and Chandlers Ford urban areas. At this distance, no impacts from construction will are expected to occur. The proposed pipelines will be sufficiently distant and separated by significant areas of urban development, from the designated site and its associated groundwater and surface water buffer zones (shown in Emer Bog and Baddesley Common Hydrological Desk Study 2017; accessed via the Test Valley Borough Council website) such that there is no pathway for LSE effect. The SAC is not situated within 200 m of any roads likely to be utilised by construction traffic for the works.
Mottisfont Bats SAC	• Barbastelle *Barbastella barbastellus*	14.97 km	No pathway	The works at, and in proximity to Otterbourne WSW are c.15 km from the SAC and outside the 6 km buffer zone identified for the SAC based

Sites	Qualifying Features	Closest distance to SRO	Screening conclusion	Summary
				on foraging and commuting distance of the bats (BCT, 2020). Therefore, there is no pathway for effect.
River Itchen SAC	• Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation. (Rivers with floating vegetation often dominated by water-crowfoot) • Atlantic salmon *Salmo salar* • Brook lamprey *Lampetra planeri* • Bullhead *Cottus gobio* • Otter *Lutra lutra* • Southern damselfly *Coenagrion mercurial* • White-clawed (or Atlantic stream) crayfish *Austropotamobius pallipes*	0 km	Screened-in	The following effects are screened in: • Habitat loss • Temporary disturbance due to noise, vibration and human activity • Changes to river water quality • Fish entrainment and impingement • Barrier to species migration • Introduction of INNS Air quality modelling provided in Technical Report 5, states that typical NRMM or MCPD plant associated with River Itchen pipeline tunnelling does not cause an exceedance of ecological air quality thresholds. The assessment demonstrates that typical NRMM or MCPD plant is unlikely to cause an exceedance of threshold levels at nearby sensitive ecological receptors and therefore there will be no effect on this Habitats site from the use of such plant.
River Meon Compensatory SAC Habitat	• Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation. (Rivers with floating vegetation often dominated by water-crowfoot) • Atlantic salmon *Salmo salar*	0 km	Screened-in	While the River Meon is not a designated site, it is proposed for the development of compensatory measures for adverse effects on the integrity of Atlantic salmon from other schemes (e.g. the Lower Itchen Sources Drought Order). In order to maintain the effectiveness of the River Meon compensatory measures in maintaining the overall coherence of the habitats site network, it is important to assess the effects on Atlantic salmon using the river. The pipeline routes are required to cross the river and as such, the following effects are screened in: • Habitat loss • Temporary disturbance due to noise, vibration and human activity • Changes in river water quality • Barrier to species migration • Introduction of INNS The discharge for water recycling is c.16 km from the mouth of the compensatory SAC habitat and therefore there is no pathway for the localised effect of discharge on subtidal water quality to interact with the River Meon.

Sites	Qualifying Features	Closest distance to SRO	Screening conclusion	Summary
River Test Compensatory SAC Habitat	• Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation. (Rivers with floating vegetation often dominated by water-crowfoot) • Southern damselfly *Coenagrion mercurial*	13.5 km	No pathway	The River Test is c.13.5 km from the onshore works for the SRO, separated by major roads, railway and housing. As a result, there is no pathway for effect on the compensatory habitat for damselfly and Type III chalk river within the River Test.
Singleton and Cocking Tunnels SAC	• Barbastelle *Barbastella barbastellus* • Bechstein's bat *Myotis bechsteinii*	18.75 km	No pathway	The works and pipeline routes are 18.75 km from the SAC; however a potential pathway for effect was identified in relation to permanent removal (WRP) or temporarily removal (pipelines) of foraging habitat, and cause fragmentation whilst vegetation re-establishes. The SACO references the South Downs National Park & NE (2015) Sussex Bat Special Area of Conservation Planning and Landscape Scale Enhancement Protocol which has identified key flight lines and foraging areas for the bat species. The SACO also notes that "The land within the West Weald which encompasses Ebernoe Common SAC; The Mens SAC and Singleton & Cocking Tunnels SAC should be regarded as a single landscape utilised by bats from all three SACs." In addition to the connected SAC, several other areas support important numbers; Petworth Park -Bechstein's bats use trees within the park as maternity roosts, Slindon -barbastelle bats use this woodland as a maternity roost and woodland north of Chichester -also a maternity roost for barbastelle bats. The following impact zones are recommended around the SAC: • 6.5 km Key conservation area –all impacts assessed • 12 km Wider conservation area –significant impacts or severance to flight lines to be considered The proposed works are c.3 km outside the wider conservation area, and the pipelines have been routed to avoid removal of ancient woodland and woodland priority habitat where possible. In addition, the presence of the major A3(M) road network is likely to hinder movement from East to West. A Core Sustenance Zone (CSZ) (BCT, 2020), as applied to bats, refers to the area surrounding a communal bat roost within which habitat availability and quality will have a significant influence on the resilience and conservation status of the colony using the roost. CSZ for Bechstein's bat are 3 km and for Barbastelle are 6 km, there will be no overlap between the CSZ for either species and the wider conservation area and therefore no indirect impact to either of the qualifying species.

Sites	Qualifying Features	Closest distance to SRO	Screening conclusion	Summary
Solent and Isle of Wight Lagoons SAC	• Coastal lagoons (Priority feature)	2.21 km	Screened-in	The WRP is located 2.21 km from the SAC therefore a potential pathway is identified. The following effects on the coastal lagoon habitat are screened in: • Changes to water quality • In-combination effects
Solent Maritime SAC	• Annual vegetation of drift lines • Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) • Coastal lagoons* • Spartina swards (*Spartinion maritimae*). (Cord-grass swards) • Estuaries • Mudflats and sandflats not covered by seawater at low tide. (Intertidal mudflats and sandflats) • Perennial vegetation of stony banks. (Coastal shingle vegetation outside the reach of waves) • *Salicornia* and other annuals colonising mud and sand. (Glasswort and other annuals colonising mud and sand) • Sandbanks which are slightly covered by sea water all the time. (Subtidal sandbanks) • Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes). (Shifting dunes with marram) • Desmoulin's whorl snail *Vertigo moulinsiana*	5 km	Screened-in	The WRP is located 5 km from the SAC and the pipeline would be required to cross the River Hamble which runs into the SAC therefore a potential pathway is identified. The following effects are screened in: • Temporary changes to water quality • Introduction of INNS • In-combination effects
Solent and Dorset Coast SPA	• Mediterranean gull Larus melanocephalus • Sandwich tern Sterna sandvicensis • Common tern Sterna hirundo • Little tern Sternula albifrons • Roseate tern Sterna dougalli • Dark-bellied brent geese Branta bernicla bernicla • Teal Anas crecca • Ringed plover Charadrius hiaticula • Black-tailed godwit Limosa	2 km	Screened-in	The SRO is located c.2 km from the SPA; therefore a potential effect is identified. The following effects are screened in: • Temporary disturbance due to noise, vibration, human activity and light • Barrier effects • Changes to air quality • Changes to water quality • Changes to prey availability • In-combination effects The LSO extends into the SPA; however no LSE is identified as a result of connectivity with subtidal water quality changes. The WFD Compliance Assessment shows that a relatively minor beneficial effect is predicted as a result of the water recycling and wastewater

Sites	Qualifying Features	Closest distance to SRO	Screening conclusion	Summary
				discharged, reducing the extent of impact in relation to subtidal water quality overall, compared with the existing discharges.
Chichester and Langstone Harbours SPA & Ramsar	• Bar-tailed godwit Limosa lapponica • Common tern Sterna hirundo • Curlew Numenius arquata • Dark-bellied brent goose Branta bernicla • Dunlin Calidris alpina alpina • Grey plover Pluvialis squatarola • Little tern Sternula albifrons • Pintail Anas acuta • Red-breasted merganser Mergus serrator • Redshank Tringa totanus • Ringed plover Charadrius hiaticula • Sanderling Calidris alba • Sandwich tern Thalasseus sandvicensis • Shelduck Tadorna • Shoveler Spatula clypeata • Teal Anas crecca • Turnstone Arenaria interpres • Waterbird assemblage • Wigeon Mareca Penelope The site is designated as a Ramsar site under: • Criterion 1 – Estuarine habitats • Criterion 5 – Assemblages of international importance • Criterion 6 – species / populations occurring at levels of international importance including those listed above and black-tailed godwit Limosa lapponica (1.1% of the European / Northwest Africa population)	0.5 km	Screened-in	The SRO is located close to the SPA / Ramsar; therefore a potential effect is identified. The following effects are screened in: • Temporary disturbance due to noise, vibration, human activity and light • Barrier effects • Temporary changes to water quality • Changes to prey resource • In-combination No LSE is identified as a result of connectivity with subtidal water quality changes. The WFD Compliance Assessment shows that a relative minor beneficial effect is predicted as a result of the water recycling and wastewater discharged, reducing the extent of impact in relation to subtidal water quality overall, compared with the existing discharges.
Portsmouth Harbour SPA and Ramsar	• Black-tailed godwit, Limosa limosa islandica • Dark-bellied Brent goose, Branta bernicla bernicla • Dunlin, Calidris alpina alpina • Red-breasted merganser, Mergus serrator The site qualifies as a Ramsar under the following Criteria:	2.2 km	No pathway	No pathway is identified as a result of effects on these features or their supporting habitat due to the distance between the SRO and SPA / Ramsar. There is unlikely to be disturbance from noise or visual impact at over 2 km. Whilst the behavioural responses of waterbirds to both visual and aural stimuli during to the construction of flood defences on the Humber Estuary and in Cardiff Bay differ depending on the type and nature of construction activity, species, season, site topography, weather, tidal state and degree of habituation studies (Burton et al.,

Sites	Qualifying Features	Closest distance to SRO	Screening conclusion	Summary
	• Criterion 3. Presence of intertidal mudflat, saltmarsh and saline lagoons hosting nationally important species. • Criterion 6 – species / populations occurring at levels of international importance. Qualifying Species / populations (as identified at designation): Species with peak counts in winter: Dark-bellied brent goose, Branta bernicla bernicla, 2105 individuals, representing an average of 2.1% of the GB population (5-year peak mean 1998/9-2002/3)			(2002), indicate that in general effects are confined to areas within 250m of the sources of disturbance during construction. No pathway for effect is identified as a result of connectivity with subtidal water quality changes. The discharge for water recycling is c.6 km from the SPA and Ramsar and therefore there is no pathway for the localised effect of discharge on subtidal water quality to interact with the SPA and Ramsar.
Solent and Southampton Water SPA and Ramsar	• Black-tailed godwit (Limosa limosa islandica) • Common tern (Sterna hirundo) • Dark-bellied brent goose (Branta bernicla bernicla) • Little tern (Sternula albifrons) • Mediterranean gull (Ichthyaetus melanocephalus) • Ringed plover (Charadrius hiaticula) • Roseate tern (Sterna dougallii) • Sandwich tern (Thalasseus sandvicensis) • Teal (Anas crecca) • Waterbird assemblage The site qualifies as a Ramsar under the following Criteria: • Criterion 1 – wetland habitats: saline lagoons, saltmarshes, estuaries, intertidal flats, shallow coastal waters, grazing marshes, reedbeds, coastal woodland and rocky boulder reefs. • Criterion 2 – The site supports an important assemblage of rare plants and invertebrates. • Criterion 5 – Assemblages of international importance: Species with peak counts in winter: 51343 waterfowl (5-year peak mean 1998/99-2002/2003) • Criterion 6 – species / populations occurring at levels of international importance (same species as listed under the SPA).	3 km	No pathway	No pathway is identified as a result of effects on these features or their supporting habitat due to the distance between the SRO and SPA / Ramsar. There is unlikely to be disturbance from noise or visual impact at over 2 km. Whilst the behavioural responses of waterbirds to both visual and aural stimuli during to the construction of flood defences on the Humber Estuary and in Cardiff Bay differ depending on the type and nature of construction activity, species, season, site topography, weather, tidal state and degree of habituation studies (Burton et al., (2002), indicate that in general effects are confined to areas within 250 m of the sources of disturbance during construction. No pathway for effect is identified as a result of connectivity with subtidal water quality changes. The discharge for water recycling is c.4 km from the SPA and Ramsar and therefore there is no pathway for the localised effect of discharge on subtidal water quality to interact with the SPA and Ramsar.

Stage 2 High Level Appropriate Assessment

The results detailed for Option D.2 related to the Butser Hill SAC, Woolmer Forest SAC and River Itchen SAC are applicable for Option B, plus the following.

River Meon Compensatory SAC Habitat

Habitat loss

To avoid any non-temporary direct impacts from construction, river crossings will be undertaken with directional drilling / trenchless crossings, therefore there are not expected to be any AEoI in relation to permanent habitat loss.

Temporary disturbance due to noise, vibration and human activity

The crossing works could result in disturbance to Atlantic salmon and changes to water quality which could limit the effective development of the compensatory habitat and therefore an AEoI cannot be ruled out at this stage.

Changes in water quality

There is potential for pipeline construction activities to impact upon the ecological and chemical quality elements of the river. Damage to the river banks and floodplain from construction traffic, fine sediment input into the watercourse from crossing activity, and accidental pollution from onsite chemicals used in construction could lead to a deterioration in the water quality, therefore an AEoI of the compensatory habitat cannot be ruled out at this stage.

Barrier to species migration

Changes to river water quality has the potential to deter upstream migration of Atlantic salmon. This has potential to affect spawning and therefore the effective establishment of the River Meon as compensatory habitat, therefore an AEoI cannot be ruled out at this stage.

The levels of subtidal water quality changes are not predicted to represent a barrier to migration of Atlantic salmon at the LSO location. As discussed above, the WFD Compliance Assessment shows the effect of the future scenario where water is recycled and wastewater discharged is to reduce the extent of impact in relation to subtidal water quality changes overall, compared with the existing discharges.

Introduction of INNS

The movement of personnel and plant has the potential to spread INNS. This could include the transfer of new INNS into the River Meon or increasing the spread of existing INNS within the River Meon. The spread of INNS would have potential to undermine the objectives of the compensatory habitat and therefore an adverse effect on integrity cannot be ruled out at this stage. The project HRA for the Preferred Option would be informed by an Extended Phase 1 Habitat Survey which would include the identification of INNS.

In-combination

The following projects are screened in as having potential to interact with the receptors of relevance to this compensatory habitat:

- Aquind Interconnector
- Portsmouth coastal defence

- PW [redacted]
- HTR
- Fawley Waterside

The HRAs for these projects do not identify this compensatory SAC habitat, however as this is not a formally designated site at this stage, there is potential that it has not been considered. Therefore, there is insufficient information to assess the in-combination effects on this compensatory habitat at this stage.

The project level HRA for the Preferred Option will consider and assess this, should sufficient information become available for these projects in relation to the compensatory habitat and potential for in-combination effects for Option B.4.

Potential mitigation

Table 48 - Potential mitigation in the River Meon Compensatory Habitat

Effect	Potential mitigation requirements
Habitat loss	• HDD / trenchless crossing
Temporary disturbance	• Application of appropriate buffer zones around protected habitats • Use of noise dampening features such as mufflers and acoustic barriers • Construction lighting only operational when required and positioned and directed to avoid sensitive ecological receptors
Changes to water quality	• Best practice construction methods may comprise of: – Bunding and appropriate storage of sediment; – Onsite treatment / polishing of silted water; – Use of sediment traps; – Regular cleaning of haul roads prevent runoff of construction waste dirt; – Appropriate storage and application of both hazardous and non-hazardous waste and chemicals (i.e. diesel); and, – Application of onsite mitigation measures such as spill kits and barrier booms
Barrier to movement	• As per water quality
Introduction of INNS	• Best practice biosecurity measures to ensure clothing, boots and machinery are free from propagules to avoid the spread of INNS

Solent and Isle of Wight Lagoons SAC

Changes in water quality

Construction of the pipeline from BF crosses a tributary in proximity to the lagoon at Farlington Marshes. Farlington Marshes is part of the Solent and Isle of Wight Lagoons SAC and comprises the Shut Lake waterbody. Potential run-off of sediment and contaminants has potential to cause changes to water quality within the SAC. There is currently insufficient information to rule out an AEoI at this stage.

In-combination

The Aquind Interconnector HRA (available on the PINS website) concludes that there is no connectivity between the zone of influence of the interconnector and the Solent and Isle of Wight Lagoons SAC and therefore there will be no in-combination effect with this project on this SAC.

The Portsmouth coastal management scheme, HTR, [redacted] and Fawley Waterside HRAs do not identify this SAC as being within the study area for the HRA Screening for these projects (i.e., there will be no pathway for effect) and therefore there will be no in-combination effect with these projects on this SAC.

Potential mitigation

Table 49 - Potential mitigation in the Solent and Isle of Wight Lagoons SAC

Effect	Potential mitigation requirements
Changes to water quality	• Best practice construction methods may comprise of: – Bunding and appropriate storage of sediment; – Onsite treatment / polishing of silted water; – Use of sediment traps; – Regular cleaning of haul roads prevent runoff of construction waste dirt; – Appropriate storage and application of both hazardous and non-hazardous waste and chemicals (i.e. diesel); and, – Application of onsite mitigation measures such as spill kits and barrier booms

Solent Maritime SAC

Changes to water quality

The pipeline requires crossing of the watercourses (Brockhampton and River Hamble) that flows into the SAC. Construction could result in potential sedimentation and accidental pollution into the watercourses and ultimately the SAC. There is currently insufficient information to rule out an AEoI at this stage.

Introduction of INNS

The movement of personnel and plant and potential run-off into the SAC has the potential to transfer of new INNS into the Solent SAC. Best practice mitigation is expected to avoid any AEoI of the SAC as a result of INNS.

In-combination

The Aquind interconnector HRA identifies LSE for increased suspended sediment and deposition (smothering), concluding no AEoI of the SAC. In addition, the HTR identifies LSE on the receptors of the SAC due to run-off, concluding no AEoI. As the onshore construction of the pipelines associated with the WRP have potential to cause run-off into the SAC, an in-combination AEoI with these projects cannot be ruled out at this stage.

The Fawley Waterside HRA identifies LSE for disturbance to migratory fish, changes to coastal habitat, intertidal habitat and water quality. As the construction of B.4 has potential to cause changes to water quality through run-off into watercourses flowing into the SAC, an in-combination AEoI cannot be ruled out at this stage.

The Portsmouth coastal management scheme HRA screened out this SAC due to no pathway for effect, therefore there will be no in-combination AEoI with this project on the Solent Maritime SAC.

[redacted] and HTR HRAs do not identify this SAC as being within the study area for the HRA Screening for this project (i.e., there will be no pathway for effect) and therefore there will be no in-combination AEoI with these projects on the Solent Maritime SAC.

Potential mitigation

Table 50 - Potential mitigation in the Solent Maritime SAC

Effect	Potential mitigation requirements
Changes to water quality	• Best practice construction methods may comprise of: – Bunding and appropriate storage of sediment; – Onsite treatment / polishing of silted water; – Use of sediment traps; – Regular cleaning of haul roads prevent runoff of construction waste dirt; – Appropriate storage and application of both hazardous and non-hazardous waste and chemicals (i.e. diesel); and, – Application of onsite mitigation measures such as spill kits and barrier booms
Introduction of INNS	• Best practice biosecurity measures to ensure clothing, boots and machinery are free from propagules to avoid the spread of INNS

Solent and Dorset Coast SPA

Disturbance

Common tern, little tern and sandwich tern breed on the RSPB islands within the harbour, the closest to the WRP site being North Binness and Long Island. Further South are Baker's Island, South Binness Island and Round Nap Island. Technical Report 6 (Noise assessment) identifies a 3 dB noise increase to breeding tern during construction activities. This would result in an AEoI of the site.

In the absence of survey data, it has been assumed that tern could be foraging within 500 m of construction. All terns are highly sensitive to visual disturbance with low resistance and resilience to disturbance, therefore the potential for an AEoI of the site from visual disturbance of terns cannot be ruled out at this stage.

Barrier effects

Given the relatively localised effects described above, it is unlikely that this would result in barrier effects and therefore there is not expected to be an AEoI for this effect.

Changes to air quality

Construction plant and traffic around [redacted] has potential to increase emissions in proximity to the SPA and Ramsar. Any changes will be highly localised in the context of the wider SPA, therefore there is not expected to be an AEoI for this effect.

Changes to water quality

The pipeline construction has potential to interact with watercourses that discharge to Langstone Harbour, which is a component of the SPA. Construction could result in potential sedimentation and accidental pollution into streams feeding the SPA. There is currently insufficient information to rule out an AEoI at this stage.

Changes to prey availability

Changes to water quality has the potential to affect prey resource for the features of the SPA. There is currently insufficient information to rule out an AEoI at this stage.

In-combination

The Aquind interconnector HRA identifies LSE for disturbance, and changes in water quality and prey resource, concluding no AEoI of the SPA.

In addition, the HTR identifies LSE on the receptors of the SPA due to run-off, concluding no AEoI.

As the onshore construction of the pipelines associated with the WRP have potential to cause disturbance effects and run-off into the SPA, an in-combination AEoI cannot be ruled out at this stage.

The Portsmouth coastal management scheme HRA screens out an LSE based on the small scale of potential effects; however consideration will be given in the project level HRA for the Preferred Option as to whether these small effects could interact to provide an AEoI when combined with the SRO.

[redacted] and Fawley Waterside HRAs do not identify this SPA as being within the study area for the HRA Screening for these projects (i.e., there will be no pathway for effect) and therefore there will be no in-combination effect with these projects on the Solent and Dorset Coast SPA.

Potential mitigation

Table 51 - Potential mitigation in the Solent and Dorset Coast SPA and Ramsar

Effect	Potential mitigation requirements
Disturbance	• Seasonal restrictions on certain construction activities may be required to ensure disturbance effects do not result in an adverse effect on site integrity
Changes to water quality	• Best practice construction methods may comprise of: – Bunding and appropriate storage of sediment; – Onsite treatment / polishing of silted water; – Use of sediment traps; – Regular cleaning of haul roads prevent runoff of construction waste dirt; – Appropriate storage and application of both hazardous and non-hazardous waste and chemicals (i.e. diesel); and, – Application of onsite mitigation measures such as spill kits and barrier booms
Changes to prey resource	• As per water quality

Chichester and Langstone Harbours SPA & Ramsar

Temporary disturbance due to noise, vibration, human activity and light

A worst-case assessment of noise impact within Chichester and Langstone Harbours SPA & Ramsar have been completed It concludes that, assuming a flight response could occur above 55dB, during piling works at LAmax, an area of approximately 85.5 ha within the North East of Langstone Harbour would be within this contour. The Northern part of Langstone Harbour is characterised by mudflat habitat and therefore, disturbance at low tide could result in an AEoI of the site.

The presence of people and construction activities also have the potential to affect the qualifying species and flight responses could have an AEoI of the site.

Barrier effects

Given the relatively localised effects described above, it is unlikely that this would result in barrier effects and therefore there is not expected to be an AEoI for this effect.

Temporary changes to water quality

The pipeline from BF to the WRP requires crossing of the Brockhampton Mill lake that flows into the SPA. Construction could result in potential sedimentation and accidental pollution into the watercourse and ultimately the SPA. There is currently insufficient information to rule out an AEoI at this stage from onshore works.

The WFD Compliance Assessment shows the effect of the future scenario under the water recycling SRO is to reduce the extent of impact in relation to subtidal water quality changes overall, compared with the existing discharges and therefore no AEoI is predicted as a result of subtidal discharges.

Changes to prey resource

Prey resources could potentially be affected by both:

- Deoxygenation from an increase in area and density of algal blooms smothering the sediment (sandbank qualifying feature) leading to changes in the invertebrate and macrophyte assemblages, and a resulting effect on the prey availability for foraging terns
- Changes in salinity resulting in a change in availability or composition of prey species for birds

Analysis completed concludes that as coastal waters and estuaries have a more variable salinity than the offshore environment due to the greater influence of freshwater input in coastal regions, it would be unlikely that changes in salinity offshore would be persistent or major enough to affect food availability for qualifying bird features. Therefore, there is not expected to be an AEoI for this effect.

In-combination

The Aquind interconnector HRA identifies LSE for disturbance, and changes in water quality and prey resource, concluding no AEoI of the SPA. As the onshore construction of the pipelines associated with the WRP have potential to cause disturbance effects and run-off into the SPA, an in-combination AEoI cannot be ruled out at this stage.

The Portsmouth coastal management scheme and HTR HRAs identify LSE on the receptors of the SPA and Ramsar, concluding no AEoI. As the SRO has potential to cause disturbance, an in-combination AEoI cannot be ruled out at this stage.

[redacted] and Fawley Waterside HRAs do not identify this SPA and Ramsar as being within the study area for the HRA Screening for these projects (i.e., there will be no pathway for effect) and therefore there will be no in-combination effect with these projects on the Chichester and Langstone SPA and Ramsar.

Potential mitigation

Table 52 - Potential mitigation in the Chichester and Langstone Harbour SPA and Ramsar

Effect	Potential mitigation requirements
Disturbance	• Seasonal restrictions on certain construction activities may be required to ensure disturbance effects do not result in an adverse effect on site integrity
Changes to water quality	• Best practice construction methods may comprise of: – Bunding and appropriate storage of sediment; – Onsite treatment / polishing of silted water; – Use of sediment traps; – Regular cleaning of haul roads prevent runoff of construction waste dirt; – Appropriate storage and application of both hazardous and non-hazardous waste and chemicals (i.e. diesel); and, – Application of onsite mitigation measures such as spill kits and barrier booms

2.5.3.4. Water Framework Directive

Introduction

This assessment aims to determine whether the construction, operation and decommissioning of the proposed water recycling SROs are compliant with the requirements of the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (as amended).

This report builds on the WFD compliance assessment that was undertaken in support of the Gate 1 submission (September 2020). The findings of the earlier assessment have been updated where appropriate to reflect the latest scheme information, and the updates in the baseline WFD classification data that were published in September 2020.

Approach

The WFD Compliance Assessment undertaken at Gate 1 has been updated to reflect further SRO details and additional assessments that have been undertaken (e.g. plume modelling) and has been restructured to reflect the stages set out in PINS Advice Note 18: Water Framework Directive, which provides an outline methodology for considering the WFD as part of the DCO process. This guidance represents the most comprehensive and up to date guidance for WFD compliance assessments.

Further consideration has also been given to the following guidance and case law:

- 'Clearing the waters for all' (EA, 2017): Outlines a detailed methodology for assessing impacts on transitional and coastal water bodies
- 'WFD risk assessment' (EA, 2016a): This provides information on how to assess the risk of a proposed activity, as well as guidance for proposed developments planning to undertake activities that would require a flood risk activity permit
- 'Protecting and improving the water environment' (EA, 2016b): Provides guidance on the WFD compliance of physical works and other activities in river water bodies
- EUECJ C-461-13. Bund für Umwelt und Naturshutz Deutschland eV v Bundesrepublik Deutschland (ECJ, 2015). This case confirms the detail around determining a deterioration in the status of a water body.

The WFD Compliance Assessment comprises three stages:

- Stage 1 Screening: This stage consists of an initial screening exercise of the key components of the SROs and identifying relevant water bodies which have the potential to be impacted by the construction, operation and decommissioning of each SRO
- Stage 2 Scoping: This stage identifies whether there is potential for deterioration in water body status or failure to comply with WFD objectives for any of the water bodies identified in Stage 1. Activities are carried forward to Stage 3 if potential impacts on any WFD element are identified in this stage.
- Stage 3 Outline WFD Impact Assessment: This stage assesses whether any project activities that have been carried forward from Stage 2 have the potential to cause deterioration and whether any such deterioration will have a significant effect on the status of one or more WFD quality elements at water body level

Stage 1: Screening

For the purposes of this assessment, B.4 has been divided into the following key components:

- New WRP near BF (WRP)
- Effluent transfer from [redacted] to WRP, underground pipeline
- Transfer pipeline from WRP to HTR Transfer pipeline from HTR to Otterbourne WSW (Routes 3 and 4)
- HLPS near to HTR
- 2nd Stage Pumping Stations and BPT along transfer pipeline from HTR to Otterbourne
- Ceramic membrane plant and washwater recovery area
- Reject water to BF and discharged through Eastney LSO

In accordance with guidance set out in Section 2.5.2.3, screening and scoping is only undertaken for water bodies in which activities occur. If a risk is identified in this water body, then adjoining water bodies are considered in the Stage 3 assessment.

The surface and groundwater bodies screened in to the WFD compliance assessment are detailed in Table 53 which also highlights the relevant SRO components that could potentially impact upon each water body.

Table 53 - Water bodies screened in for B.4

SRO component	Water body name	Justification for screening in
WRP	• Langstone Harbour ([redacted]) • East Hants Chalk ([redacted])	Surface water bodies: Screened in because components are located within the catchment of this water body and therefore, could affect its biology, hydromorphology and physico-chemistry. Groundwater bodies: Screened in because the proposed activities are underlain by these water bodies and, therefore, could affect the quality and quantity of groundwater.
Effluent transfer from [redacted] to WRP	• Langstone Harbour [redacted] • East Hants Chalk ([redacted]	Surface water bodies: Screened in because components are located within the catchment of this water body and therefore, could affect its biology, hydromorphology. Groundwater bodies: Screened in because the proposed activities are underlain by these water bodies and, therefore, could affect the quality and quantity of groundwater.
Transfer pipelines from WRP to HTR	• Hermitage Stream [redacted]) • East Hants Chalk [redacted] • South Hants Lambeth Group [redacted]	Surface water bodies: Screened in because components are located within the catchment of this water body and therefore, could affect its biology, hydromorphology. Groundwater bodies: Screened in because the proposed activities are underlain by these water bodies and, therefore, could affect the quality and quantity of groundwater.
Transfer pipeline from HTR to Otterbourne WSW (Route 3)	• Hermitage Stream • ([redacted] • Potwell Trib ([redacted] • Upper Wallington ([redacted] • Wallington below Southwick ([redacted] • Meon [redacted] • Main River Hamble [redacted] • Upper Hamble [redacted] • Horton Heath Stream [redacted] • Bow Lake [redacted] • Itchen [redacted] • East Hants Chalk [redacted] • South Hants Lambeth Group [redacted]	Surface water bodies: Screened in because components are located within the catchment of these water bodies and therefore, could affect its biology, hydromorphology and physico-chemistry. Groundwater bodies: Screened in because the proposed activities are underlain by these water bodies and, therefore, could affect the quality and quantity of groundwater.

SRO component	Water body name	Justification for screening in
	• South East Hants Bracklesham Group [redacted] • East Hants Lambeth Group • [redacted] • Central Hants Lambeth Group [redacted] • River Itchen Chalk [redacted]	
Transfer pipeline from HTR to Otterbourne WSW (Route 4)	• Hermitage Stream • [redacted] • Potwell Trib [redacted] • Upper Wallington [redacted] • Upper Hamble ([redacted]) • Horton Heath Stream [redacted]) • Bow Lake ([redacted]) • Itchen [redacted] • East Hants Chalk ([redacted] • South Hants Lambeth Group ([redacted] • South East Hants Bracklesham Group [redacted]) • East Hants Lambeth Group • [redacted] • Central Hants Lambeth Group [redacted] • River Itchen Chalk [redacted]	Surface water bodies: Screened in because components are located within the catchment of this water body and therefore, could affect its biology, hydromorphology and physico-chemistry. Groundwater bodies: Screened in because the proposed activities are underlain by these water bodies and, therefore, could affect the quality and quantity of groundwater.
HLPS at HTR	• Hermitage Stream ([redacted]	Surface water bodies: Screened in because components are located within the catchment of this water body and therefore, could affect its biology, hydromorphology. Groundwater bodies: The component is not underlain by a groundwater body.
2nd Stage Pumping Stations and BPT	• Upper Wallington [redacted] • Wallington below Southwick [redacted] • Hermitage Stream [redacted] • Potwell Trib ([redacted] • Moors Stream [redacted] • Upper Hamble [redacted] • East Hants Chalk [redacted]	Surface water bodies: Screened in because component is located in the vicinity of this catchment of this water body and therefore, could affect its biology, hydromorphology and physico-chemistry. Groundwater bodies: Screened in because the proposed activities are underlain by these water bodies and, therefore, could affect the quality and quantity of groundwater.

SRO component	Water body name	Justification for screening in
	• East Hants Lambeth Group [redacted])	
Ceramic membrane plant and washwater recovery area	• Itchen [redacted] • Itchen Navigation [redacted] • River Itchen Chalk [redacted]	Surface water bodies: Screened in because components are located within the catchment of this water body and therefore, could affect its biology, hydromorphology and physico-chemistry. Groundwater bodies: Screened in because the proposed activities are underlain by these water bodies and, therefore, could affect the quality and quantity of groundwater.
Reject water to BF and discharged through Eastney LSO	• Langstone Harbour [redacted] • Solent [redacted] • Portsmouth Harbour [redacted] • Chichester Harbour ([redacted] • Isle of Wight East [redacted] • Langstone Oyster beds [redacted]	Surface water bodies: Solent water body screened in because direct changes could occur as a result of alterations to current wastewater discharges and addition of the reject water to this water body. With respect to Portsmouth Harbour, Chichester Harbour, Langstone Harbour and Isle of Wight East, these water bodies are screened in because there is a mechanism for potential impacts resulting from changes to current wastewater discharges to the Solent water body. Groundwater bodies: No pathway for effect identified.

Stage 2: Scoping

This section describes whether there is potential for construction, operation and decommissioning impacts from the components associated with B.4 on the status of the surface (**Error! Reference source not found.**) and groundwater bodies (Table 55) scoped into the assessment.

Table 54 - Scoping assessment for screened in surface water bodies for B.4

SRO component	Water body name	Ecological quality elements	Chemical quality elements	Protected areas	RBMP mitigation measures
WRP	Langstone Harbour [redacted]	Although onshore construction and decommissioning activities could result in the accidental release of fine sediment and contaminants into the surface watercourses that drain directly into the water body, the application of best practice pollution prevention and control measures would minimise impacts and ensure that they are unlikely to be sufficient to affect biology, hydromorphology or physico-chemistry at water body scale. Although there is potential for the accidental release of pollutants into the surface watercourses that drain directly into the water body during operation, the application of best practice pollution prevention and control measures would minimise impacts and ensure that they are unlikely to be sufficient to affect biology, hydromorphology or physico-chemistry at water body scale.	Construction and decommissioning activities could potentially result in the accidental release of priority substances into the water body, for example through the accidental spillage of contraction materials or fuel and lubricants from construction equipment. However, the application of best practice pollution prevention and control measures would minimise impacts, there remains some potential for impacts on the chemistry of the water body. Although there is potential for the accidental release of priority substances into the surface watercourses that drain directly into the water body during operation, the application of best practice pollution prevention and control measures would minimise impacts and is therefore likely to ensure that they are not sufficient to affect chemistry at water body scale.	No mechanism for impacts on Drinking Water Safeguard Zones or areas protected under the Habitats , Birds, Bathing Waters, Shellfish Waters and Urban Waste Water Treatment Directives have been identified.	No mechanisms for the activity to reduce the effectiveness or prevent the future implementation of mitigation measures associated with flood and coastal protection have been identified.
Effluent transfer from [redacted] to WRP	Langstone Harbour ([redacted]	Although onshore construction and decommissioning activities could result in the accidental release of fine sediment and contaminants into the surface watercourses that drain directly into the water body, the application of best practice pollution prevention and control measures would minimise impacts and ensure that they are unlikely to be sufficient to affect biology, hydromorphology or physico-chemistry at water body scale. Although there is potential for the accidental release of pollutants into the surface watercourses that drain directly into the water body during operation, the application of best practice pollution	Construction and decommissioning activities could potentially result in the accidental release of priority substances into the water body, for example through the accidental spillage of contraction materials or fuel and lubricants from construction equipment. However, the application of best practice pollution prevention and control measures would minimise impacts, there remains some potential for impacts on the chemistry of the water body. Although there is potential for the accidental release of priority substances into the surface watercourses that drain directly into the water body during operation, the application of best practice	No mechanism for impacts on Drinking Water Safeguard Zones or areas protected under the Habitats and Species, Conservation of Wild Birds, Bathing Waters, Shellfish Waters and Urban Waste Water Treatment Directives have been identified.	No mechanisms for the activity to reduce the effectiveness or prevent the future implementation of mitigation measures associated with flood and coastal protection have been identified.

SRO component	Water body name	Ecological quality elements	Chemical quality elements	Protected areas	RBMP mitigation measures
		prevention and control measures would minimise impacts and ensure that they are unlikely to be sufficient to affect biology, hydromorphology or physico-chemistry at water body scale.	pollution prevention and control measures would minimise impacts and is therefore likely to ensure that they are not sufficient to affect chemistry at water body scale.		
Transfer pipeline from WRP to Havant Thicket Reservoir	Hermitage Stream ([redacted]	Construction and decommissioning activities could directly affect the hydromorphology and biology of the water bodies as a result of watercourse crossings. The construction and decommissioning of the transfer pipeline could also result in changes to the physico-chemistry and chemistry of the water body, for example through the accidental spillage of construction materials or fuel and lubricants from construction equipment. Although there is potential for the accidental release of pollutants into the water bodies during operation, the application of best practice pollution prevention and control measures would minimise impacts and ensure that they are unlikely to be sufficient to affect biology, hydromorphology or physico-chemistry at water body scale.	Construction and decommissioning activities could potentially result in the accidental release of priority substances into the water body, for example through the accidental spillage of contraction materials or fuel and lubricants from construction equipment. However, the application of best practice pollution prevention and control measures would minimise impacts, there remains some potential for impacts on the chemistry of the water body. Although there is potential for the accidental release of priority substances into the surface watercourses that drain directly into the water body during operation, the application of best practice pollution prevention and control measures would minimise impacts and is therefore likely to ensure that they are not sufficient to affect chemistry at water body scale.		No mechanism for any SRO component to prevent the future implementation of measures that are not yet in place in Hermitage Stream to manage the impacts associated with flood protection and urbanisation. The nature of the proposed activities means that there are unlikely to be any opportunities to contribute to the delivery of measures that are not yet in place.
Transfer pipeline from Havant Thicket Reservoir to Otterbourne WSW (Route 3)	Hermitage Stream [redacted] Potwell Trib [redacted] Upper Wallington [redacted] Wallington below Southwick [redacted] Meon [redacted] Main River Hamble [redacted] Upper Hamble [redacted]	Construction and decommissioning activities could directly affect the hydromorphology and biology of the water bodies as a result of watercourse crossings. Furthermore, although construction and decommissioning activities could result in the accidental release of fine sediment and contaminants into the water bodies, the application of best practice pollution prevention and control measures would minimise impacts and ensure that they are unlikely to be sufficient to affect biology, hydromorphology or physico-chemistry at water body scale.	Construction and decommissioning activities could potentially result in the accidental release of priority substances into the water body, for example through the accidental spillage of contraction materials or fuel and lubricants from construction equipment. However, the application of best practice pollution prevention and control measures would minimise impacts, there remains some potential for impacts on the chemistry of the water body. Although there is potential for the accidental release of priority substances	There is potential for construction, operation and decommissioning to impact on areas protected under the Habitats and Species Directive.	No mechanisms for the activity to reduce the effectiveness or prevent the future implementation of mitigation measures associated with each water body have been identified.

SRO component	Water body name	Ecological quality elements	Chemical quality elements	Protected areas	RBMP mitigation measures
	Horton Heath Stream ([redacted]) Bow Lake ([redacted] Itchen ([redacted]	Although there is potential for the accidental release of pollutants into the water bodies during operation, the application of best practice pollution prevention and control measures would minimise impacts and is therefore likely to ensure that they are not sufficient to affect biology, hydromorphology or physico-chemistry at water body scale.	into the surface watercourses that drain directly into the water body during operation, the application of best practice pollution prevention and control measures would minimise impacts and is therefore likely to ensure that they are not sufficient to affect chemistry at water body scale.		
Transfer pipeline from Havant Thicket Reservoir to Otterbourne WSW (Route 4)	Hermitage Stream [redacted] Potwell Trib [redacted] Upper Wallington [redacted] Upper Hamble [redacted] Horton Heath Stream ([redacted] Bow Lake [redacted] Itchen [redacted]	Construction and decommissioning activities could directly affect the hydromorphology and biology of the water bodies as a result of watercourse crossings. Furthermore, although construction and decommissioning activities could result in the accidental release of fine sediment and contaminants into the water bodies, the application of best practice pollution prevention and control measures would minimise impacts and ensure that they are not sufficient to affect biology, hydromorphology or physico-chemistry at water body scale. The operation of the transfer pipeline would not affect the biology, hydromorphology or physico-chemistry of the water body, because any active disturbance would be limited to the construction and decommissioning phases.	The activity will not cause the release of priority substances, priority hazardous substances or other potentially hazardous chemicals into the water bodies. There is therefore no mechanism for impacts on chemical quality elements.	There is potential for construction, operation and decommissioning to impact on areas protected under the Habitats and Species Directive.	No mechanisms for the activity to reduce the effectiveness or prevent the future implementation of mitigation measures associated with each water body have been identified.
Initial high lift pumping station at Havant Thicket Reservoir	Hermitage Stream ([redacted]	Although construction and decommissioning activities could result in the accidental release of fine sediment and contaminants into the water body, the application of best practice pollution prevention and control measures would minimise impacts and ensure that they are unlikely to be sufficient to affect biology, hydromorphology or physico-chemistry at water body scale.	Construction and decommissioning activities could potentially result in the accidental release of priority substances into the water body, for example through the accidental spillage of contraction materials or fuel and lubricants from construction equipment. However, the application of best practice pollution prevention and control measures would minimise impacts, there remains some potential for impacts on the chemistry of the water body.	There is potential for construction, operation and decommissioning to impact on areas protected under the Habitats and Species Directive.	No mechanism for any SRO component to prevent the future implementation of measures that are not yet in place in Hermitage Stream to manage the impacts associated with flood protection and

SRO component	Water body name	Ecological quality elements	Chemical quality elements	Protected areas	RBMP mitigation measures
		Similarly, although there is potential for the accidental release of pollutants into the water body during operation, the application of best practice pollution prevention and control measures would minimise impacts and ensure that they are unlikely to be sufficient to affect biology, hydromorphology or physico-chemistry at water body scale.	Although there is potential for the accidental release of priority substances into the surface watercourses that drain directly into the water body during operation, the application of best practice pollution prevention and control measures would minimise impacts and is therefore likely to ensure that they are not sufficient to affect chemistry at water body scale.		urbanisation. The nature of the proposed activities means that there are unlikely to be any opportunities to contribute to the delivery of measures that are not yet in place.
2nd Stage Pumping Stations and Break Pressure Tank	Upper Wallington [redacted] Hermitage Stream [redacted] Potwell Trib [redacted] Moors Stream [redacted] Upper Hamble [redacted]	Although construction and decommissioning activities could result in the accidental release of fine sediment and contaminants into the water body, the application of best practice pollution prevention and control measures would minimise impacts and ensure that they unlikely to be sufficient to affect biology, hydromorphology or physico-chemistry at water body scale. Similarly, although there is potential for the accidental release of pollutants into the water body during operation, the application of best practice pollution prevention and control measures would minimise impacts and ensure that they are unlikely to be sufficient to affect biology, hydromorphology or physico-chemistry at water body scale.	Construction and decommissioning activities could potentially result in the accidental release of priority substances into the water body, for example through the accidental spillage of contraction materials or fuel and lubricants from construction equipment. However, the application of best practice pollution prevention and control measures (Section 2.2) would minimise impacts, there remains some potential for impacts on the chemistry of the water body. Although there is potential for the accidental release of priority substances into the surface watercourses that drain directly into the water body during operation, the application of best practice pollution prevention and control measures (Section 2.2) would minimise impacts and is therefore likely to ensure that they are not sufficient to affect chemistry at water body scale.	No mechanism for impacts on Drinking Water Safeguard Zones or areas protected under the Habitats and Species, Conservation of Wild Birds, Bathing Waters, Shellfish Waters and Urban Waste Water Treatment Directives have been identified.	The RBMP does not identify mitigation measures for these water bodies.
Ceramic membrane plant and washwater recovery area	Itchen [redacted]	Construction and decommissioning activities could result in the accidental release of fine sediment and contaminants into the water body. Although the application of best practice pollution prevention and control measures would minimise impacts, there remains some potential for impacts on the biology,	Construction and decommissioning activities could potentially result in the accidental release of priority substances into the water body, for example through the accidental spillage of contraction materials or fuel and lubricants from construction equipment. However, the application of best practice pollution prevention and control measures would	There is potential for construction, operation and decommissioning to impact on areas protected under the Habitats and Species Directive.	The RBMP does not identify mitigation measures for the Itchen water body.

SRO component	Water body name	Ecological quality elements	Chemical quality elements	Protected areas	RBMP mitigation measures
		hydromorphology and physico-chemistry of the water body. The operation of the ceramic membrane plant would not affect the biology, hydromorphology or physico-chemistry of the water body, because any active disturbance would be limited to the construction and decommissioning phases. Although there is potential for the accidental release of pollutants into the water bodies during operation, the application of best practice pollution prevention and control measures would minimise impacts and is therefore likely to ensure that they are not sufficient to affect biology, hydromorphology or physico-chemistry at water body scale.	minimise impacts, there remains some potential for impacts on the chemistry of the water body. Although there is potential for the accidental release of priority substances into the surface watercourses that drain directly into the water body during operation, the application of best practice pollution prevention and control measures would minimise impacts and is therefore likely to ensure that they are not sufficient to affect chemistry at water body scale.		
Reject water to [redacted] and discharged through Eastney LSO	Solent [redacted] Isle of Wight East [redacted] Portsmouth Harbour [redacted] Chichester Harbour ([redacted]) Langstone Oyster beds ([redacted]	This activity would not require offshore construction activities, and as such no mechanism for impact during the construction phase has been identified. During operation, the discharge of reject water could alter water quality which could impact on biology and physico-chemistry.	This activity would not require offshore construction activities, and as such no mechanism for impact during the construction phase has been identified. During operation, the discharge of reject water could potentially release priority substances into the water body.	There is potential for construction, operation and decommissioning to impact on areas protected under the Habitats and Species, Conservation of Wild Birds, Urban Waste Water Treatment and Shellfish Waters Directives.	No mechanisms for the activity to reduce the effectiveness or prevent the future implementation of mitigation measures associated with flood and coastal protection have been identified.

Table 55 - Scoping assessment for screened in groundwater bodies for B.4

SRO component	Water body name	Quantitative quality elements	Chemical quality elements	Protected areas
WRP	East Hants Chalk [redacted]	Construction and decommissioning activities could potentially affect groundwater levels through dewatering and changes to the rate of groundwater recharge. Any changes in groundwater levels could potentially impact upon the surface drainage network and associated GWDTEs. However, changes are likely to be highly localised and therefore unlikely to be sufficient to result in deterioration in water body status. Any minor changes to groundwater flows or recharge during the operational phase of the activity are likely to be highly localised and therefore unlikely to be sufficient to affect groundwater quantity.	Construction and decommissioning activities could potentially introduce new sources of contamination and remobilise existing sources of contamination. This could introduce a new pathway for the contamination of GWDTEs and other dependent surface water features. However, the application of best practice pollution prevention and control measures would minimise impacts and ensure that they are unlikely to bet sufficient to affect groundwater quality at water body scale. Similarly, although there is potential for the accidental release of pollutants into the groundwater body during operation, the scheme will be designed to minimise impacts and ensure that they are unlikely to be sufficient to affect groundwater quality at water body scale.	No mechanisms for this activity to impact upon Drinking Water Protected Areas were identified.
Effluent transfer from [redacted] to WRP	East Hants Chalk [redacted] South Hants Lambeth Group [redacted]	Construction and decommissioning activities could potentially affect groundwater levels through dewatering and changes to the rate of groundwater recharge. Any changes in groundwater levels could potentially impact upon the surface drainage network and associated GWDTEs. However, any changes are likely to be highly localised and are therefore unlikely to be sufficient to result in deterioration in water body status. Any minor changes to groundwater flows or recharge during the operational phase of the activity are likely to be highly localised and therefore unlikely to be sufficient to affect groundwater quantity.	Construction and decommissioning activities could potentially introduce new sources of contamination and remobilise existing sources of contamination. This could introduce a new pathway for the contamination of GWDTEs and other dependent surface water features. However, the application of best practice pollution prevention and control measures would minimise impacts and ensure that they are unlikely to be sufficient to affect groundwater quality at water body scale. Similarly, although there is potential for the accidental release of pollutants into the groundwater body during operation, the scheme will be designed to minimise impacts and ensure that they are unlikely to be sufficient to affect groundwater quality at water body scale.	No mechanisms for this activity to impact upon Drinking Water Protected Areas were identified.

SRO component	Water body name	Quantitative quality elements	Chemical quality elements	Protected areas
Transfer pipeline from WRP to HTR	East Hants Chalk [redacted] South Hants Lambeth Group [redacted]	Construction and decommissioning activities could potentially affect groundwater levels through dewatering and changes to the rate of groundwater recharge. Any changes in groundwater levels could potentially impact upon the surface drainage network and associated GWDTEs. However, any changes are likely to be highly localised and therefore unlikely to be sufficient to result in deterioration in water body status. Any minor changes to groundwater flows or recharge during the operational phase of the activity are likely to be highly localised and are therefore unlikely to be sufficient to affect groundwater quantity.	Construction and decommissioning activities could potentially introduce new sources of contamination and remobilise existing sources of contamination. This could introduce a new pathway for the contamination of GWDTEs and other dependent surface water features. However, the application of best practice pollution prevention and control measures would minimise impacts and ensure that they are unlikely to be sufficient to affect groundwater quality at water body scale. Similarly, although there is potential for the accidental release of pollutants into the groundwater body during operation, the scheme will be designed to minimise impacts and ensure that they are unlikely to be sufficient to affect groundwater quality at water body scale.	
Transfer pipeline from HTR to Otterbourne WSW (Route 3)	East Hants Chalk [redacted]) South Hants Lambeth Group ([redacted]) South East Hants Bracklesham Group ([redacted]) East Hants Lambeth Group [redacted] Central Hants Lambeth Group ([redacted] River Itchen Chalk [redacted]	Construction and decommissioning activities could potentially affect groundwater levels through dewatering and changes to the rate of groundwater recharge. Any changes in groundwater levels could potentially impact upon the surface drainage network and associated GWDTEs. However, any changes are likely to be highly localised and are therefore unlikely to be sufficient to result in deterioration in water body status. Any minor changes to groundwater flows or recharge during the operational phase of the activity are likely to be highly localised and therefore unlikely to be sufficient to affect groundwater quantity.	Construction and decommissioning activities could potentially introduce new sources of contamination and remobilise existing sources of contamination. This could introduce a new pathway for the contamination of GWDTEs and other dependent surface water features. However, the application of best practice pollution prevention and control measures would minimise impacts and ensure that they are unlikely to be sufficient to affect groundwater quality at water body scale. Similarly, although there is potential for the accidental release of pollutants into the groundwater body during operation, the scheme will be designed to minimise impacts and ensure that they are unlikely to be sufficient to affect groundwater quality at water body scale.	No mechanisms for this activity to impact upon Drinking Water Protected Areas were identified.

SRO component	Water body name	Quantitative quality elements	Chemical quality elements	Protected areas
Transfer pipeline from HTR to Otterbourne WSW (Route 4)	East Hants Chalk [redacted] South Hants Lambeth Group ([redacted] South East Hants Bracklesham Group ([redacted] East Hants Lambeth Group [redacted] Central Hants Lambeth Group [redacted] River Itchen Chalk [redacted]	Construction and decommissioning activities could potentially affect groundwater levels through dewatering and changes to the rate of groundwater recharge. Any changes in groundwater levels could potentially impact upon the surface drainage network and associated GWDTEs. However, any changes are likely to be highly localised and not sufficient to result in deterioration in water body status. Any minor changes to groundwater flows or recharge during the operational phase of the activity are likely to be highly localised and therefore unlikely to be sufficient to affect groundwater quantity.	Construction and decommissioning activities could potentially introduce new sources of contamination and remobilise existing sources of contamination. This could introduce a new pathway for the contamination of GWDTEs and other dependent surface water features. However, the application of best practice pollution prevention and control measures would minimise impacts and ensure that they are not sufficient to affect groundwater quality at water body scale. Similarly, although there is potential for the accidental release of pollutants into the groundwater body during operation, the scheme will be designed to minimise impacts and ensure that they are unlikely to be sufficient to affect groundwater quality at water body scale.	No mechanisms for this activity to impact upon Drinking Water Protected Areas were identified.
2nd Stage Pumping Stations and BPTs	East Hants Chalk [redacted] East Hants Lambeth Group ([redacted] Central Hants Lambeth Group [redacted] River Itchen Chalk [redacted] South East Hants Bracklesham Group ([redacted]	Construction and decommissioning activities could potentially affect groundwater levels through dewatering and changes to the rate of groundwater recharge. Any changes in groundwater levels could potentially impact upon the surface drainage network and associated GWDTEs. However, any changes are likely to be highly localised and are therefore unlikely to be sufficient to result in deterioration in water body status. Any minor changes to groundwater flows or recharge during the operational phase of the activity are likely to be highly localised and are therefore unlikely to be sufficient to affect groundwater quantity.	Construction and decommissioning activities could potentially introduce new sources of contamination and remobilise existing sources of contamination. This could introduce a new pathway for the contamination of GWDTEs and other dependent surface water features. However, the application of best practice pollution prevention and control measures would minimise impacts and ensure that they are unlikely to be sufficient to affect groundwater quality at water body scale. Similarly, although there is potential for the accidental release of pollutants into the groundwater body during operation, the scheme will be designed to minimise impacts and ensure that they are unlikely to be sufficient to affect groundwater quality at water body scale.	No mechanisms for this activity to impact upon Drinking Water Protected Areas were identified.

SRO component	Water body name	Quantitative quality elements	Chemical quality elements	Protected areas
Ceramic membrane plant and washwater recovery area	River Itchen Chalk ([redacted]	Construction and decommissioning activities could potentially affect groundwater levels through dewatering and changes to the rate of groundwater recharge. Any changes in groundwater levels could potentially impact upon the surface drainage network and associated GWDTEs. However, any changes are likely to be highly localised and therefore unlikely to be sufficient to result in deterioration in water body status. Any minor changes to groundwater flows or recharge during the operational phase of the activity are likely to be highly localised and therefore unlikely to be sufficient to affect groundwater quantity.	Construction and decommissioning activities could potentially introduce new sources of contamination and remobilise existing sources of contamination. This could introduce a new pathway for the contamination of GWDTEs and other dependent surface water features. However, the application of best practice pollution prevention and control measures would minimise impacts and ensure that they are unlikely to be sufficient to affect groundwater quality at water body scale. Similarly, although there is potential for the accidental release of pollutants into the groundwater body during operation, the scheme will be designed to minimise impacts and ensure that they are unlikely to be sufficient to affect groundwater quality at water body scale.	No mechanisms for this activity to impact upon Drinking Water Protected Areas were identified.

Table 56 - Water bodies screened in for B.4

SRO component	Water body name	Justification for screening in
WRP	• Langstone Harbour [redacted] • East Hants Chalk ([redacted])	Surface water bodies: Screened in because components are located within the catchment of this water body and therefore, could affect its biology, hydromorphology and physico-chemistry. Groundwater bodies: Screened in because the proposed activities are underlain by these water bodies and, therefore, could affect the quality and quantity of groundwater.
Effluent transfer from [redacted] to WRP	• Langstone Harbour [redacted] • East Hants Chalk [redacted])	Surface water bodies: Screened in because components are located within the catchment of this water body and therefore, could affect its biology, hydromorphology. Groundwater bodies: Screened in because the proposed activities are underlain by these water bodies and, therefore, could affect the quality and quantity of groundwater.
Transfer pipelines from WRP to Otterbourne (Routes 1 and 2)	• Potwell Trib [redacted] • Upper Wallington ([redacted] • Wallington below Southwick [redacted] • Meon ([redacted] • Main River Hamble [redacted] • Upper Hamble ([redacted]) • Horton Heath Stream ([redacted]) • Moors Stream ([redacted]) • Bow Lake ([redacted] • Itchen ([redacted]) • Itchen Navigation [redacted]) • Langstone Harbour [redacted] • East Hants Chalk [redacted] • Central Hants Lambeth Group [redacted]) • South East Hants Bracklesham Group [redacted] • South Hants Lambeth Group [redacted] • River Itchen Chalk ([redacted] • East Hants Lambeth Group [redacted]	Surface water bodies: Screened in because components are located within the catchment of these water bodies and therefore, could affect its biology, hydromorphology and physico-chemistry. Groundwater bodies: Screened in because the proposed activities are underlain by these water bodies and, therefore, could affect the quality and quantity of groundwater.

SRO component	Water body name	Justification for screening in
2nd Stage Pumping Stations and BPTs	• Upper Wallington [redacted]) • Potwell Trib [redacted] • Upper Hamble [redacted] • East Hants Chalk [redacted] • East Hants Lambeth Group [redacted]	Surface water bodies: Screened in because component is located in the vicinity of this catchment of this water body and therefore, could affect its biology, hydromorphology and physico-chemistry. Groundwater bodies: No pathway for effect identified.
Ceramic membrane plant and washwater recovery area	• Itchen [redacted] • Itchen Navigation [redacted] • River Itchen Chalk ([redacted]	Surface water bodies: Screened in because components are located within the catchment of this water body and therefore, could affect its biology, hydromorphology and physico-chemistry. Groundwater bodies: Screened in because the proposed activities are underlain by these water bodies and, therefore, could affect the quality and quantity of groundwater.
Reject water to BF and discharged through Eastney LSO	• Langstone Harbour [redacted] • Langstone Oysterbeds [redacted] • Solent ([redacted]) • Portsmouth Harbour ([redacted] • Chichester Harbour ([redacted] • Isle of Wight East [redacted]	Surface water bodies: Solent water body screened in because direct changes could occur as a result of alterations to current wastewater discharges and addition of the reject water to this water body. With respect to Portsmouth Harbour, Chichester Harbour, Langstone Harbour, Langston oyster beds and Isle of Wight East, these water bodies are screened in because there is a mechanism for potential impacts resulting from changes to current wastewater discharges to the Solent water body. Groundwater bodies: No pathway for effect identified.

The parameters scoped in for further assessment are summarised in Table 57.

Table 57 - Scoping assessment for screened in groundwater and surface water bodies for B.4

SRO component	Surface Waters				Groundwater bodies		
	Ecological Quality elements	Chemical Quality elements	Protected Areas	RBMP Mitigation measures	Quantitative	Quality	Protected Areas
WRP	×	×	×	×	×	×	×
Effluent transfer from [redacted] to WRP	×	×	×	×	×	×	×
Transfer pipeline from WRP to HTR	✓	✓	×	×	×	×	×
Transfer pipeline from HTR to Otterbourne WSW	✓	✓	×	×	×	×	×
Initial HLPS at HTR	×	×	×	×	×	×	×
2nd Stage Pumping stations and BPTs	×	×	×	×	×	×	×
Ceramic membrane plant and washwater recovery area	✓	✓	✓	×	×	×	×
Reject water to BF and discharged through Eastney LSO	✓	×	✓	×	×	×	×

Outline WFD compliance assessment

Transfer pipeline from WRP to HTR and Transfer pipeline from HTR to Otterbourne WSW

There is potential for the construction and decommissioning of the pipeline components to directly impact upon the biology, hydromorphology and physico-chemical quality elements of the river water bodies that it crosses (i.e. River Itchen, Pontwell Trib, Upper Wallington, Wallington below Southwick, Meon, Upper Hamble, Horton Heath Stream, Moors Stream, Bow Lake, Itchen Navigation and Hermitage Stream).

To avoid any non-temporary direct impacts (i.e. extending beyond the construction or decommissioning period) on larger or particularly sensitive watercourses (e.g. WFD water bodies, sensitive main rivers and ordinary watercourses, and any watercourses that may be too wide or deep to cross using conventional alternatives), river crossings will be undertaken with directional drilling / trenchless crossings where possible. These will prevent the direct disturbance of the bed and banks of the watercourse and prevent impacts to in-channel habitats. Furthermore, site-specific ground investigations will be undertaken prior to implementation of any trenchless watercourse crossings to identify the appropriate locations of entry and exit pits, the optimal depth of pipe burial, and ensure that the breakout of inert drilling fluid does not occur. This will minimise adverse impacts on the hydromorphology, physico-chemistry and biology of the watercourses.

The proposed pipeline will be installed using standard open cut excavation methods conventionally used for a cross-country pipeline. Open cut excavation will be used for most of the route, including watercourse crossings (notwithstanding the exclusions outlined above). A maximum working corridor of 25 m between perimeter fences has been assumed for the pipeline installation. This will allow sufficient room for open excavation, storage of excavated material, construction plant transit and handing of pipelines. The depth of the trench will vary dependent on the ground conditions but will be a minimum of 0.9 m in open fields. The installation or removal of the pipeline using open trench crossings would result in the direct disturbance of the bed and banks of the affected watercourse and the habitats that they support. However, the working corridor would be reduced where construction allows and to minimise impact (e.g. when crossing watercourses).

Although construction methodologies have not yet been finalised, trenching is likely to be undertaken within a dewatered area of channel (e.g. within a coffer dam, with flow over-pumped, piped or flumed). Where possible, the use of these barriers could potentially be confined to the amount of time required to install and reinstate the trench, thereby minimising impacts on the movement of flow, sediment and biota within each watercourse. In addition, the valuable gravel substrates which are found in many of the watercourses could potentially be stripped and stored separately from surrounding soils and sediments so that they can be successfully reinstated. Finally, the banks would be reinstated prior to the restoration of natural flows.

During construction or decommissioning in areas in proximity to watercourses, a minimum 8 m or 16 m buffer has been assumed from non-tidal riverbanks and tidal riverbanks, respectively (in line with the requirements of the Land Drainage Act 1991 and Environmental Permitting Regulations 2016). This will minimise direct impacts on the watercourses. However, indirect impacts on river water bodies could occur from mobilisation of sediments from haul roads, open-cut excavations, pumping operations and potential washout events. Greater areas of impermeable surfaces and disturbed ground could alter surface water drainage pathways throughout each catchment, resulting in changes to volume, energy or distribution of flows. Increased fine sediment input to the water body could smother bed habitats, reducing light penetration and dissolved oxygen. Changes to physico-chemistry could also lead to loss or modification of in-channel habitats. The accidental spillage of oils and lubricants from construction equipment and subsequent runoff into watercourses could potentially impact upon the physico-chemistry and chemistry of the water bodies.

However, best practice measures to minimise the runoff of sediment and contaminants from construction components will be implemented to prevent deterioration in water body status. Mitigation measures are likely to include:

- Bunding and appropriate storage of sediment
- Onsite treatment / polishing of silted water
- Use of sediment traps
- Regular cleaning of haul roads prevent runoff of construction waste
- Appropriate storage and application of both hazardous and non-hazardous waste and chemicals (i.e. diesel)
- Application of onsite mitigation measures such as spill kits and barrier booms

These measures will minimise adverse impacts on biology, hydromorphology, physico-chemistry and chemistry of the River Itchen, Pontwell Trib, Upper Wallington, Wallington below Southwick, Meon, Upper Hamble, Horton Heath Stream, Moors Stream, Bow Lake, Itchen Navigation and Hermitage Stream by minimising the supply of fine sediment and other contaminants into the surface drainage network that makes up each water body.

Ceramic membrane plant and washwater recovery area

The construction and decommissioning of this component could potentially impact upon the hydromorphology, physico-chemistry and biology of the River Itchen water body as a result of disturbance to the bed and banks of its tributaries, and the input of fine sediment and contaminants into the watercourse from construction works.

However, best practice construction mitigation measures to control the supply of fine sediment, water and contaminants (e.g. the EA's GPP notes, including GPP1 'Understanding your environmental responsibilities', GPP5 'Works and maintenance in or near water', GPP21 'Pollution incident response planning' and GPP22 'Dealing with spills', which remain best practice despite no longer being statutory guidance, and CIRIA's 'Control of water pollution from construction sites: Guidance for consultants and contractors'), will be applied to minimise impacts on the hydromorphology, physico-chemistry and biology of the River Itchen water body. Given the sensitivity of the water body to the supply of fine sediment and contaminants, it is acknowledged that the construction stage drainage strategy and associated pollution prevention and control measures will need to be carefully designed on the basis of the available best practice guidance. Particular attention will be paid to ensuring that particulate and liquid contaminants are captured and retained, and not therefore discharged into the surface drainage network. This will minimise the supply of fine sediment, runoff and contaminants into the drainage network during construction and decommissioning will ensure that there are no significant adverse effects Temporary construction and decommissioning effects are therefore unlikely to cause deterioration in water body status or affect the condition of the River Itchen and its tributaries.

Reject water to [redacted] and discharged through Eastney LSO

During operation, there is a requirement to discharge reject water via the Eastney LSO. Modelling using MIKE21 was undertaken on several flows to determine the envelope of effects covering all three SROs. The existing situation using existing wastewater discharge information was also modelled to enable a comparison (i.e. presents a baseline). As summary of the modelled scenarios is provided below in Table 58.

Table 58 - Summary of modelling output for B.4

Modelled flow	Comment on output
15 Ml/d	This represents the maximum flow for B.4.
Existing situation	Enables comparison of effects associated with each flow as outline above – effectively represents the baseline. Likely to represent effects associated with lower BAU of 5 Ml/d.

For the purposes of understanding the potential effects associated with B.4, the modelled output for the 15 Ml/d and the output for the existing situation (assumed to be comparable to the 5 Ml/d BAU flow) are therefore described below.

Model simulations were carried out for the existing and future scenarios for a period in excess of a 30 days (two spring / neap tidal cycles). Only changes in salinity and TN were modelled. Reject water from the water recycling process is positively buoyant and will mix through the water column as it rises towards the surface. The model assumed a simple low velocity discharge into the water column therefore outfall dimensions and potential diffuser arrangements were not built into the model output.

The results show that there is a very small improvement in the Solent and Portsmouth Harbour WFD water bodies in TN concentrations over the existing situation for the 15 Ml/d. This is considered to be because the process removing nitrogen from the wastewater is not 100% effective and therefore not all TN is discharged back into the marine environment. It is likely that the flows associated with the BAU flow of 5 Ml/d would be similar to the existing situation, i.e. no change.

Overall therefore, a deterioration in WFD water bodies on a water body scale is not predicted. There could be a small decrease in the discharge of nitrogen concentrations over the existing situation for maximum flows, but this would decrease depending on weather conditions.

With respect to salinity, very little difference in salinity changes were predicted and therefore a deterioration in salinity within the WFD water bodies is not predicted.

Summary of WFD compliance

The previous sections demonstrate that, although there could be a small improvement in nitrogen concentrations, this is unlikely to be significant on a water body scale. The changes would not result in deterioration of the status of any quality elements in the water body (within or between status classes). This means that this component would not result in deterioration in status or prevent WFD objectives being achieved in this water body in the future.

2.5.3.5. INNS Risk Assessment

B.4 involves the creation of new raw water transfers that will operate continuously all year round. Water will be transferred from BF WTW to Otterbourne WSW via a WRP and HTR. The transfer will only be required to operate at a maximum of 15 Ml/d from the WTW to HTR, for the purpose of supplementing backfill to the Reservoir. The transfer between HTR and Otterbourne will was assumed to operate at 61 Ml/d. B.4 can be divided into the following raw water transfer Options:

Table 59 – B.4 Raw Water transfer Options

SRO Route Options	Raw Water Transfers
BF WTW to WRP	Transfer of water from WTW to Recycling Plant
WRP to HT	Transfer of treated water from WRP to HT (via pipeline Routes 1 and 2)
HT to Otterbourne WSW	Transfer of water following storage in HT to Otterbourne WSW (via pipeline Routes 1 and 2)

[redacted] to Water Recycling Plant

Water will be transferred from the existing BF WTW to a new WRP. The transfer will be upstream within the Langstone Harbour WFD water body ([redacted]). The transfer will require construction of a new pipeline. Laying new pipeline represents a greater risk in terms of potential INNS transfers than utilising existing pipeline as this creates a new, additional pathway. Japanese Knotweed Fallopia japonica is known to be present at BF WTW and the proposed WRP and is classified as high risk. There is no pathway for the transfer of INNS from recreational activities either at the source ([redacted] or along the transfer. It has been assumed that no methods to reduce the risk of INNS spreading (e.g., Screening, chlorination) will be employed for this transfer.

Water Recycling Plant to Havant Thicket

The proposed routes would provide a continuous transfer of water between the WRP and HTR. The transfer would be between WFD operational catchments for an approximate length of 6.2 km and 6.6 km for pipeline route 1 and Route 2, respectively. Both the pipeline routes have the same level of INNS transfer risk. The transfer through underground pipelines represent little risk to INNS transfer during transport. Japanese Knotweed Fallopia japonica is known to be present at the source and is classified as high risk. Water will be stored in a large reservoir upon reaching HTR. This increases the likelihood of INNS spreading due to the open-top design of the reservoir creating a potential pathway.

Havant Thicket to Otterbourne WSW

The proposed routes would provide a continuous transfer of 61 Ml/d of water between HTR and Otterbourne WSW. The transfer would be between WFD operational catchments for an approximate length of 36.0 km and 36.1 km for Pipeline routes 1 and 2, respectively. Both the pipeline routes have the same level of INNS transfer risk. The transfer through underground pipelines represent little risk to INNS transfer during its transport. Japanese Knotweed Fallopia japonica is known to be present at the source, namely HTR. The water will be stored in an open reservoir at the source. This increases the likelihood of INNS spreading by creating a potential pathway. Furthermore, the reservoir may be used for bankside fishing / Angling but other recreational activities such as swimming and water sports will not be permitted (PW, 2020) which further increases the risk. However, the Transfer will be direct to Otterbourne WSW and will not be stored in a bankside reservoir at Otterbourne. This results in an overall risk score of zero for INNS spreading between HTR and Otterbourne WSW.

INNS Risk Scores

The total risk of transfer for B.4 is detailed in Table 60. The greatest INNS transfer risk is associated with the transfer between the [redacted] and the WRP and the WRP to HT. The transfer between HT and Otterbourne WSW has no risk of INNS transfer because it will not be stored in a bankside reservoir at Otterbourne.

Table 60 – B.4 INNS Risk of spreading

Risk type	B.4
Inherent	1,144
Adjusted	1,708
Weighted	3,717

2.5.3.6. Biodiversity Net Gain and Natural Capital Assessment

The key findings of the assessment for B.4 are detailed in Table 61. The assessment detailed in Table 62 represents the configuration that was used in the MCDA as BNG and NC assessments need to assess a single configuration (i.e. not multiple permutations of routes and intake / outfall locations). Table 61 below details the BNG and NC assessments for the components remaining at the end of Stage 4 of Site Selection.

Table 61 – Summary of BNG and Natural Capital Assessment for B.4 configuration assessed in MCDA

Configuration	Metric	Assessment	Units
B.4 [redacted] to HTR Configuration – Route 3 pipeline (HTR to Otterbourne WSW)	Biodiversity		[redacted]
		Total temporary habitat lost during construction	
		Total permanent habitat loss	
		Total on-site re-instatement / creation	
		Total off-site habitat creation / BNG uplift	
	Climate regulation		
		Change in non-traded carbon sequestration value for temporary habitat loss during construction	
		Change in non-traded carbon sequestration value for permanent habitat loss	
		Non-traded carbon sequestration value for on-site re-instatement / creation	
		Non-traded carbon sequestration value for off-site habitat succession	
	Natural hazard regulation		
		Change in natural hazard regulation value for temporary habitat loss during construction	
		Change in natural hazard regulation value for permanent habitat loss	
		Natural hazard regulation value for on-site re-instatement/creation	
		Natural hazard regulation value for off-site habitat succession	
	Recreation & tourism		
		Estimated Welfare Value	
		Estimated visits	
	Agriculture		
		Temporary loss estimated agriculture value	
		Permanent loss estimated agriculture value	
	Water purification	***Current provision***: grassland and woodland habitats	

Configuration	Metric	Assessment	Units
		Impact related to land change = potential decline: Hermitage Stream flows adjacent to the WRP land parcel and the WFD waterbody is currently achieving Moderate status. Park Lane Stream has no WFD classification but flows into Hermitage Stream WFD waterbody. A pumping station will be constructed. Resulting in land cover change and impact on water purification. *Water transfer (WRP to HT) = no change:* The water will be transferred to Otterbourne WSW. Therefore, no change to water purification to River Itchen which flows nearby and the WFD waterbody is achieving a Moderate status. *Impact related to land change = potential decline:* A pre-disinfection ceramic membrane plant will be constructed in close proximity to River Itchen resulting land cover change and negative water purification with potential impact on the River Hamble (Upper Hamble) nearby where the WFD waterbody is currently achieving Moderate status. Where a Water Booster Station (WBS) and BPT will be constructed, there are no waterbodies within close proximity however, the change in land cover still has a potential to decline water purification services.	

Table 62 – Summary of BNG and Natural Capital Assessment for B.4 (remaining components from Stage 4 of Site Selection)

Components	Metric	Assessment	Units
B.4 WRP to HTR Route 2 component	Biodiversity		[redacted]
		Total temporary habitat lost during construction	
		Total permanent habitat loss	
		Total on-site re-instatement / creation	
		Total off-site habitat creation / BNG uplift	
	Climate regulation		
		Change in non-traded carbon sequestration value for temporary habitat loss during construction	
		Change in non-traded carbon sequestration value for permanent habitat loss	
		Non-traded carbon sequestration value for on-site re-instatement / creation	
		Non-traded carbon sequestration value for off-site habitat succession	
	Natural hazard regulation		
		Change in natural hazard regulation value for temporary habitat loss during construction	
		Change in natural hazard regulation value for permanent habitat loss	
		Natural hazard regulation value for on-site re-instatement / creation	
		Natural hazard regulation value for off-site habitat succession	
	Recreation & tourism		
		Estimated Welfare Value	
		Estimated visits	
	Agriculture		
		Temporary loss estimated agriculture value	
		Permanent loss estimated agriculture value	
	Water purification	***Current provision:*** greenspace and urban habitats *No change:* Hermitage Stream WFD waterbody is currently achieving Moderate status. There would be no change in water purification services.	

2.5.3.7. Environmental Mitigation

The purpose of this section is to summarise potential environmental mitigation measures requiring further consideration for this SRO. The EIA Regulations, and a number of supporting assessments (e.g. HRA, WFD), require a description of the measures envisaged to avoid, prevent, reduce or (where possible) offset any significant adverse effects on the environment. Mitigation measures are also required to address some of the risks outlined in Section 2.7 of this CDR.

This summary is not exhaustive. Example mitigation measures have been identified based on emerging concept designs and current understanding of potential impacts. Mitigation measures have been summarised from the individual environmental assessments (e.g. HRA, WFD) reported above.

Details of the approach to decommissioning have not been confirmed at this stage, however any mitigation measures associated with decommissioning would be developed in line with industry best practice. A full suite of mitigation (and potentially compensatory) measures will be further developed and assessed during the scheme development, EIA and detailed design processes, and where appropriate agreed with relevant regulatory bodies prior to submission of the DCO. SW proposes to submit a Mitigation Route Map with the DCO application to confirm how mitigation measures will be delivered / secured.

For the purposes of this preliminary assessment, two types of mitigation are discussed, as defined within the Institute of Environmental Management and Assessment (IEMA) Guide to Shaping Quality Development (IEMA, 2015):

- Primary (inherent) mitigation – an intrinsic part of the project design – For example, reducing the height of a development to reduce visual impact
- Secondary mitigation – requires further activity in order to achieve the anticipated outcome – For example, description of certain lighting limits that will be subject to submission of a detailed lighting layout as a condition of approval

Tertiary (i.e. inexorable) mitigation is not considered specifically here, however will be identified through the EIA process where appropriate.

To align with the EIA assessment process, mitigation measures for this SRO are considered in Table 64 in relation to anticipated EIA Topics (see leftmost column). Some EIA topics, such as Health, typically draw from impacts and mitigation measures identified in other chapters (in this example noise, air quality etc) so have not be identified separately.

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Table 63 – Environmental Mitigation for B.4

EIA Topic	Example potential impact occurring during construction, operation and decommissioning	Example potential embedded mitigation measures to be explored during scheme development and EIA	Example potential secondary mitigation measures to be explored during EIA
Air Quality	• Impacts of dust and particulate matter on dust soiling, human health and nature conservation designations • Impacts of emissions from construction phase plant on human and ecological receptors • Impacts of emissions from increased traffic movements on human and ecological receptors (construction and operation)	• Routing of infrastructure, pipelines and construction routes to avoid sensitive sites where possible (see mitigation for traffic and transport, biodiversity etc) • Emissions during operation (e.g. back-up generators) designed / located to reduce AQ impacts	• HGV movements and construction vehicles could be routed and potentially timed to avoid peak traffic periods and sensitive receptors • Development and implementation of Construction Environmental Management Plans • Dust suppression measures could be utilised during construction • Air quality monitoring could be undertaken if required / where appropriate (with an adaptive plan in place to manage unacceptable effects arising) • Low emissions plant and vehicles could be used
Archaeology and Cultural Heritage	• Direct (physical) impacts • Indirect (physical) impacts • Indirect (non-physical) changes to the setting of heritage assets	• Pipeline route to seek to avoid direct impact to sites and buildings of cultural and heritage importance • Design / layout of above ground infrastructure to consider setting of listed building / scheduled monument • Archaeological assessment of pre-construction survey data, including high resolution geophysical data to inform scheme development	• Recording and removing / relocating archaeological material (preservation by record) • Archaeological Exclusion Zones could be established around sensitive interest features • Develop protocol for archaeological discoveries to account for unexpected finds • Written Scheme of Investigation (WSI) to set out measures for ground clearance appropriate to the categorisation of the area • Heritage awareness initiatives with local interest groups / schools
Biodiversity	• Degradation or loss of habitats • Killing or injuring of fauna through the removal of resting or breeding sites • Loss of foraging or breeding areas • Loss of ecological connectivity • Introduction of INNS	• Pipeline routes to seek to avoid nationally or internationally important terrestrial and marine habitats where possible, or areas identified as functionally linked or supporting protected / notable species. • Sensitive selection of pipeline river crossings to minimise impacts to groundwater flows and water dependent habitats. Use of trenchless techniques where appropriate. • Design measures to reduce risk of INNS (e.g. screens).	• Clearance of vegetation to be undertaken prior to the breeding season where possible. • Restoration or compensation of terrestrial, coastal or marine habitat where possible on completion of construction. • Translocation of species prior to construction. • Appropriate isolation, removal and post-construction control measures implemented to minimise spread of INNS. • Avoid significant dust dispersion, sedimentation runoff, nitrogen deposition (from construction traffic and lane closures holding traffic in queues). Consideration will also need to be given to the location of construction compounds to avoid designated areas. Traffic may

EIA Topic	Example potential impact occurring during construction, operation and decommissioning	Example potential embedded mitigation measures to be explored during scheme development and EIA	Example potential secondary mitigation measures to be explored during EIA
		• Sensitive design around Root Protection Areas.	need to be routed away from any sensitive habitats to avoid increases in nitrogen loading.
Land Quality and Ground Conditions	• Exposure of workforce and the public to contaminated soils and groundwater and associated health impacts • Impacts on ground water quality and groundwater resources • Impacts on surface water quality • Sterilisation of future mineral resources	• Avoidance of known areas of contaminated land through design of the SRO using good design principles • Avoidance of mineral sterilisation through design of the SRO using good design principles	• Reinstatement of land following construction where possible • Remediation if required • In-situ ground improvement techniques or excavation and replacement of poor material
Land Use and Agriculture	• Loss of agricultural production on agricultural land and disruption of farming practices • Loss or disruption to recreational assets • Loss or diversion of ProW and / or cycle paths	• Routing of the pipeline to avoid agricultural land where possible • Routing of the pipeline to avoid recreational land and ProW where possible • Take appropriate mitigation measures to address adverse effects on National Trails, other ProW and open access land and, where appropriate, to consider what opportunities there may be to improve the network and other areas of open space and improve access	• Topsoil retained and replaced once construction is complete • Where green infrastructure is affected, the functionality and connectivity of the green infrastructure network should aim to be maintained
Landscape and Visual Impact	• Effects to landscape fabric and features • Effects to landscape / townscape / seascape character • Effects to visual amenity within landscape designations (including consideration of wildlife and natural beauty) • Effects to visual amenity	• Appropriate siting of above ground infrastructure to consider viewpoints / tranquillity / landscape designations • Sensitive lighting design in accordance with best practice • Landscaping schemes to screen infrastructure. • Materials and finishes of infrastructure to be given careful consideration	• Preparation and implementation of Landscape Management Plan
Noise and Vibration	• Noise impacts to humans from construction plant, vehicles or vessels • Noise impacts to ecology from construction plant, vehicles or vessels (above ground and underwater) • Vibration impacts to humans (construction)	• Construction methods selected to reduce noise • Adequate distance between source and noise-sensitive receptors • Layout of structures or buildings to screen noise	• Reduction of noise at point of generation and containment of noise generated • Restriction of activities allowed – specifying noise limits or times of use • Potential use of acoustic barriers

EIA Topic	Example potential impact occurring during construction, operation and decommissioning	Example potential embedded mitigation measures to be explored during scheme development and EIA	Example potential secondary mitigation measures to be explored during EIA
	• Vibration impacts to buildings (construction)		
Traffic and Transport	• Driver delay to road users including pedestrians, cyclists and equestrians • Severance or loss or pedestrian / cycle amenity • Reduction in road safety	• Selection of route Options which avoid heavily congested areas / roads • Consideration could be given to the utilisation of waterborne and rail transport to deliver large quantities of construction materials	• HGV movements and construction vehicles could be routed and timed to avoid peak traffic periods and sensitive receptors • Use of best practice methods including the development and implementation of CTMP • Siting and construction activities could be undertaken so as to minimise any short-term adverse effects on public rights of way • Control numbers of HGV movements to and from the site in a specified period during construction and operation where possible and consider the impacts of alternative transport routes
Water Resources and Flood Risk	• Changes to flood risk and the hydrology of surface watercourses • Changes to the geomorphology of surface watercourses • Changes to the geomorphology and quality of surface waters • Temporary or permanent changes to surface and groundwater quality • Changes to groundwater recharge and groundwater levels resulting from changes to surface and sub-surface hydrology	• Sustainable drainage approaches and other measures such as planting could be adopted to ensure no net change in fluvial, estuarine or surface water flood risk, arising from site run-off • Where required flood storage measures could be included in the design of development	• Adherence to pollution control practice and pollution prevention guidance • Best practice used to prevent silt, concrete or fuel oil polluting water courses or ground water
Marine Water Quality	• Potential benefits to water quality as a result of water recycling process (benefits in term of total nitrogen and salinity) as indicated by preliminary modelling results	• N/A	• N/A
Ornithology	• Disturbance and displacement (e.g. noise, light and human activity) • Direct habitat loss and fragmentation • Indirect impacts through effects on habitats and prey species	• Informed by surveys, sensitive location of infrastructure and construction compounds to avoid impacts to sensitive features (e.g. nests, breeding / feeding areas)	• Timing of construction works to minimise potential impacts to breeding / overwintering birds where possible
Carbon and GHG	• Embodied Green House Gases (GHGs) within construction materials	• New infrastructure could be designed to incorporate the use of energy	• The use of low emission plant during construction could be considered

EIA Topic	Example potential impact occurring during construction, operation and decommissioning	Example potential embedded mitigation measures to be explored during scheme development and EIA	Example potential secondary mitigation measures to be explored during EIA
	• GHG emissions from construction and operation vehicle and vessel movements • GHG emissions from construction and operation site activities	efficient materials, building techniques and energy efficient pumping and water treatment equipment • Opportunities could be sought for the use of, or generation of, renewable energy to help offset additional operational carbon emissions	• Maximising the use of on-site materials could reduce HGV movements • Use of prefabricated construction materials and off-line build to minimise materials used
Major accidents	• Flooding • Storm surges, other extreme weather • Cyber attacks • Disease • Industrial action	• The design of the proposed SRO will be informed by the appropriate health and safety regulations, design codes and other legal requirements. Adhering to these requirements will minimise the risk of major accidents and disasters.	• Management plans developed, in line with best practice guidance and relevant legislation, to minimise operational risks associated to major accidents and disasters

2.5.3.8. Carbon

Please see 2.5.2.9 for a summary of how carbon costs have been calculated for B.4.

Table 64 summarises the capital carbon, operational carbon (associated with chemical use, power and transport), whole life carbon (includes capital maintenance in addition to operational carbon over 100 years) and the non-discounted monetised cost of carbon for B.4.

Table 64 – Summary of Carbon Calculations for B.4

Operating regime	Flow (Ml/d)	Capital carbon (tco2e)	Operational carbon (tco2e)	Whole life carbon (tco2e)	Monetised whole life carbon (£m)
B.4					
MAX (DO)	75	71,000	4,600	363,000	86
MIN	6	71,000	1,100	193,000	41
AVERAGE	6.69	71,000	1,200	195,000	41

2.6. Planning and Consenting

2.6.1. Executive Summary

This planning strategy builds on the planning strategy submitted as part of SW's Gate 1 submission. It outlines the variety of consenting activities undertaken since Gate 1 to progress the development of the Havant Thicket Reservoir (HTR)-based options, including, the development of a consenting programme for delivery and review of the consenting route for the proposed options.

The consenting programme provides helpful visibility and certainty to the delivery programme, enabling key consenting, engagement, scheme development and environmental assessment activities to be properly defined, planned, integrated and executed.

The consenting route review reaffirms SW's initial view at Gate 1 that a DCO is the preferred route to consent for the HTR-based options based on a number of factors, including the need for the options and benefits of timely delivery, the scale and significance of the options, their complex terrestrial interfaces and various consents required, and likely significant impacts across a 'larger than local' area.

The strategy also confirms that, based on current understanding of characteristics of the Options, access into the DCO consenting regime would not be automatic, i.e. the project does not currently meet the thresholds for being defined as a Nationally Significant Infrastructure Project (NSIP). Projects can however be directed into the DCO regime through a s35 direction by the Secretary of State – SW's consideration of the factors to support a request for such a direction suggest that a comprehensive case can be made.

In addition, the strategy outlines the likely DCO application deliverables, the secondary consents and licences required in conjunction with planning consent and potential land acquisition powers (identifying those which can be included in a DCO as part of a single authorisation), the approach to environmental assessment and potential consenting risks. Key next steps are also set out, which will include ongoing review and refinement of this strategy should any of the HTR-based Options be developed beyond Gate 2. An update of progress on consenting activities will be provided at Gate 3.

2.6.2. Background & Objectives

As part of its Gate 1 submission in September 2020, SW provided an early planning strategy to primarily establish an initial view of likely consenting route for the delivery of the Preferred Option, which was the Desalination Base Case as set out in SW's WRMP 19[1].

That strategy considered the pros and cons of the two principal consenting routes under the Town and Country Planning Act 1990 (TCPA) and the Planning Act 2008 (i.e. the DCO process). Based on the emerging characteristics of the project at that time, it was determined that the DCO consenting route offered the most beneficial pathway to achieving consent.

The planning strategy set out a number of commitments and requirements in respect of the planning activities and outcomes that should be achieved for Gate 2. These were supplemented by additional requirements in subsequent RAPID and Ofwat documentation detailed below.

[1] Water Resources Management Plan 2020–70 (southernwater.co.uk)

The objectives of this strategy are broadly to demonstrate progress against those requirements, update on the preferred consenting route for the HTR-based options and set out key next planning steps and activities for the consenting process, including to Gate 3.

2.6.3. Introduction

2.6.3.1. Overview

The Gate 2 Planning Strategy for the HTR-based options builds upon the initial consideration of the principal consenting route presented in the Gate 1 Submission: Annex 13 Planning Strategy (September 2020).

The Planning Strategy is structured around the following sections:

- **Executive summary, background and objectives**
- **Introduction**: overview of the Planning Strategy and confirmation of how actions agreed at Gate 1 have been addressed
- **Overview of work undertaken since Gate 1:** detailing the work undertaken since Gate 1 to initiate early pre-application work, including that to inform selection of a principal consenting route
- **Development description**: defining the preliminary description of development and development assumptions
- **Preferred consenting route:** confirmation of preferred consenting route, informed by further legal and planning consideration
- **Schedule of main application deliverables and responsibilities:** review and update of principal deliverables and responsibilities
- **Consenting programme for delivery**
- **Summary of consenting risks and countermeasures**
- **Conclusions & next steps**

2.6.3.2. Actions Agreed at Gate 1 & Gate 2 Requirements

Table 65 details the actions agreed for the Planning Strategy as part of SW's Gate 1 submission to RAPID, and the information which has been requested by RAPID to accompany the Gate 2 Planning Strategy. Table 65 confirms where this information is located within the Gate 2 Planning Strategy.

Table 65 confirms that the requirements for the Gate 2 Planning Strategy specified in the Gate 1 submission and subsequent Gate 2 template and guidance have been fulfilled by this document.

Table 65 - Planning Strategy actions agreed at Gate 1 / Gate 2 Planning Strategy requirements

Source	Applicable Option	Requirement for Gate 2 Planning Strategy	Location within the Gate 2 Planning Strategy
Gate 1 Planning Strategy (SW)	All Options	Engagement with Defra, DLUHC (previously MHCLG) and PINS and the local authorities.	2.6.2: Overview of work undertaken since Gate 1.
Gate 1 Planning Strategy (SW)	All Options	Further assessments to confirm the development parameters for each progressed solution and Option type.	2.6.2: Overview of work undertaken since Gate 1. 2.6.3: Development description.

Source	Applicable Option	Requirement for Gate 2 Planning Strategy	Location within the Gate 2 Planning Strategy
Gate 1 Planning Strategy (SW)	All Options	Defining preliminary description of development, application boundary and development assumptions.	2.6.3: Development description.
Gate 1 Planning Strategy (SW)	All Options	Consenting risk workshop.	2.6.4: Summary of consenting risks & countermeasures.
Gate 1 Planning Strategy (SW)	All Options	Preparation of an updated technical note supported by further legal and planning advice on selection and confirmation of preferred consenting route.	2.6.4: Preferred consenting route.
Gate 1 Planning Strategy (SW)	All Options	Approach to EIA and associated assessments (e.g. HRA, WFD).	2.6.6: Approach to EIA & associated assessments.
Gate 1 Planning Strategy (SW)	All Options	Preparation of a Planning Strategy setting out the deliverables and strategy for the preferred principal consenting route.	2.6.4: Preferred consenting route. 2.6.5: Schedule of main application deliverables and responsibilities.
Gate 1 Planning Strategy (SW)	All Options	Review and update the application programme; review inputs / outputs, dependencies and critical path.	2.6.8: Consenting programme for delivery.
Gate 1 Planning Strategy (SW)	All Options	Review and update principal deliverables and responsibilities.	2.6.5: Schedule of main application deliverables and responsibilities.
Gate 1 Planning Strategy (SW)	All Options	Establish application documents and plans (and owners).	2.6.5: Schedule of main application deliverables and responsibilities.
Gate 1 Planning Strategy (SW)	All Options	Develop approach to other consents and licences.	2.6.7: Approach to Other Licences & Consents.
Gate 1 Planning Strategy (SW)	All Options	Monitor the progress of consent applications being prepared by PW (HT) and Bristol Water (Cheddar 2 Reservoir) and consider implications for consenting strategy.	2.6.2: Overview of work undertaken since Gate 1.
Gate 1 Determination (Ofwat)	All Options	Recommendation: Provide further detail on the planning risks and the planned mitigation measures.	2.6.9: Summary of consenting risks and countermeasures.
Gate 2 Submission Template (RAPID)	All Options	Explain the preferred consenting route – DCO or TCPA.	2.6.4: Preferred consenting route.

Source	Applicable Option	Requirement for Gate 2 Planning Strategy	Location within the Gate 2 Planning Strategy
Gate 2 Submission Template (RAPID)	All Options	Pre-planning application activity plan (land referencing, field surveys, environmental permitting plans).	Section 2.5 Environmental. 2.6.2 Overview of work undertaken since Gate 1.
Gate 2 Submission Template (RAPID)	All Options	Highlight key planning steps and risks	2.6.4: Preferred consenting route. 2.6.9: Summary of consenting risks and countermeasures. 2.6.10 Next steps.

2.6.4. Overview of Work Undertaken since Gate 1

Since the Gate 1 submission, SW has progressed a number of key activities to initiate and progress early pre-application work, including that relating to the selection of a principal consenting route for the HTR-based options and to support the site and scheme selection process. These activities include:

- The appointment of a Planning & Consenting Lead for the WfLH programme, supported by a Town Planning team
- Delivery of a programme of consenting route workshops
- The design and implementation of a robust planning-led evaluation exercise as part of site / route and scheme selection for Gate 2 (see Section 2.4)
- Assessment work to confirm development parameters
- Stakeholder engagement – guided by a comprehensive approach to consultation and engagement
- Land referencing and engagement with landowners to secure land access for surveys
- Full consenting schedule reviews for each of the strategic resource options (including HTR-based Options)
- Progression of the procurement process to source the planning, consenting and consultation resource required to deliver consent applications for the selected option
- Collaboration with PW on the consenting and delivery interfaces between the HTR-based options and the new Havant Thicket reservoir
- Identification of consenting risks
- Monitoring of consent applications for other strategic water resources

2.6.4.1. Consenting Route Workshops

A series of internal consenting route workshops for each of the strategic resource options (including HTR-based Options) were undertaken to define and test the development parameters and characteristics for each option and its component parts in order to identify the key pertinent factors that will influence the development of the consenting strategy (e.g. temporary / permanent physical development required; land requirements; protected sites and species; utilities; transport undertakings; local policy; local authority administrative areas; and EIA).

Those attending the consenting route workshops included project managers, engineers, programme managers, land agents, environmental specialists, town planners and legal advisors.

2.6.4.2. Assessments to Confirm Development Parameters

The consenting route workshops enabled an assessment of the proposed development against relevant legislation and guidance to further consider the principal consenting regime the HTR-based options. Southern Water will continue to review the approach to consenting route beyond Gate 2 should the HTR-based options be developed further.

It has also enabled SW to identify the secondary consents and licences required to support each option, confirm consultation requirements and define a consenting programme.

2.6.4.3. Stakeholder Engagement

SW's overall approach to pre-application engagement for each of the strategic resource Options comprises different 'stages' of engagement, including specific public consultation exercises, which SW will undertake for the Preferred Option prior to submission of an application for consent.

In accordance with this approach, a non-statutory consultation exercise was undertaken between February 2021 and April 2021 ('the Stage 1 Consultation'). This focused on the previous Base Case (Desalination at Fawley) and introduced the alternative Water Recycling and Havant Thicket Reservoir-based options, with a broadcast element to raise awareness of the WfLH programme. A Consultation Feedback Report, summarising issues raised in response to the consultation, was published in September 2021 to raise awareness and provide transparency in respect of the feedback received. The feedback received was considered in the work to develop the SROs for Gate 2 and SW will report on how that feedback has been taken into account and influenced its proposals at the next public consultation stage for the project. Section 2.8 Stakeholder & Customer briefly describes the nature of feedback received.

Following completion of the non-statutory consultation, ongoing engagement continued up to the Gate 2 submission. This included engagement with many of the key stakeholders specified under the various planning and regulatory regimes applicable to the delivery of SW's SRO, including Defra, PINS, statutory environmental bodies (EA, NE, MMO) and local authorities. This engagement principally focused on SW's site, route and scheme selection process, including methodology, assessment criteria and outcomes from the various process stages. The feedback helpfully flagged key issues important to those stakeholders in terms of technical inputs and outcomes and enabled SW to progress confidently towards Gate 2. Engagement specifically in respect of site, route and scheme selection is detailed within Chapters 2 and 3 of Annex 5, Options Appraisal Process.

Whilst the Gate 1 Planning Strategy stated that engagement with MHCLG (now Department for Levelling Up, Housing and Communities (DLUHC)) should be undertaken, SW does not consider that this is necessary at this stage in the programme or would be of benefit to the development of the approach to planning and consenting.

Beyond Gate 2, engagement will continue with key stakeholders across a number of technical disciplines (e.g. planning, environmental assessment, scheme development) as SW progresses the pre-application activities for the Preferred Option. This will include up to two additional stages of public consultation (both statutory and non-statutory) if SW progresses along the DCO consenting route. This will enable all interested parties to provide meaningful input into SW's emerging proposals.

2.6.4.4. Section 35 Direction

Southern Water had previously developed a case for obtaining a direction under s 35 of the Planning Act 2008 for the Desalination Base Case and is currently updating that work to reflect its Emerging Preferred Option for Gate 2. Many of the factors that supported a case as to why the previous Base Case solution was considered by SW to be capable of being designated as of ‘national significance’ would apply equally to the HTR-based options should any of these be progressed through the consenting process.

Key factors relate to:

- The need for the development and its significance in maintaining crucial water supplies in a drought (as set out in WRMP19)
- The contribution to meeting UK environmental objectives (WFD and delivering water abstraction reductions)
- The size of the project and the potential impacts over a ‘larger than local’ area (potentially stretches over 6 local authority administrative areas)
- The timely delivery of consents
- The benefits of the single authorisation process under the Planning Act 2008 (noting multiple licenses, consents and powers, including compulsory acquisition, will be needed in addition to planning consent)

These factors would be developed into a coherent ‘case for national significance’ as part of any request for a direction under s35. SW acknowledges that achieving a s 35 direction is not precluded simply because a project does not automatically fall within the NSIP thresholds for the purposes of the Planning Act 2008 – the case for ‘national significance’ is based on a number of factors that need to be taken together. This is considered further later in this chapter.

2.6.4.5. Land Referencing, Access and Surveys

SW has undertaken the following activities prior to Gate 2:

- All potential main sites have been referenced and identified registered owners contacted to obtain information on known land interests and constraints
- Crown land and ‘special’ interests in or categories of land under s 127 to s132 of the Planning Act 2008 have been identified along the pipeline corridors

Activities proposed in the period to Gate 3 will include:

- Referencing of pipeline corridors / routes and identifying and contacting registered owners to obtain information on known land interests and constraints
- Site notices on unregistered land requesting those with an interest in the land to make contact
- Collation of information to inform the development of the proposals and the Book of Reference
- Contacting land interests to secure agreement where access is required for engineering and ecological surveys
- Engaging with persons with an interest in land in accordance with s 42(1)(d) of the Planning Act 2008
- Early negotiations with landowners over potential Option agreements for securing land interests

2.6.4.6. Planning Application Monitoring

The Gate 1 Planning Strategy required SW to monitor the progress of consent applications being prepared by Bristol Water (Cheddar Reservoir 2) and PW (HTR) and consider implications for the consenting strategy. SW has closely monitored the progress of these two schemes, to identify potential learnings and other information that my guide the consenting process.

Bristol Water – Cheddar Reservoir 2

The monitoring of this proposal was initially proposed on the basis that the Cheddar Reservoir 2 scheme could provide a potential source of water supply to SW. An extant (unimplemented) hybrid planning permission exists for the second reservoir at Cheddar but expires in November 2021 and it is understood that this will not be implemented by Bristol Water. At the time of writing, SW is not aware that Bristol Water has progressed either with the implementation of the extant consent or with the preparation or submission of a further planning application for the Cheddar Reservoir 2 project. Moreover, SW's own consideration of this scheme has shown that it would not be a feasible water supply proposition.

It is considered that the current planning status of this scheme does not therefore have implications for the HTR-based options.

Portsmouth Water – Havant Thicket

Hybrid planning applications for the HTR scheme, made under the TCPA, were submitted by PW to East Hampshire District Council and Havant Borough Council in November 2020. An outline planning application for the associated pipeline was submitted to Havant Borough Council at the same time. The hybrid approach to the reservoir planning application sought full planning permission for some components of the scheme and outline planning permission for others.

Following completion of a s 106 Agreement, planning permissions for the reservoir and associated pipeline works were issued by the two Councils on 15 October 2021. Southern Water has engaged with Portsmouth Water on the interface between the proposed reservoir and its HTR-based options to understand how the planning and delivery of the schemes can best be aligned. Should a HTR-based option be selected at Gate 2, ongoing close dialogue will be maintained with Portsmouth Water to ensure the timely delivery of both schemes.

The approval (pending judicial review) of the reservoir scheme provides increased certainty to the deliverability of the HTR-based options. This is because these options are directly reliant on the new reservoir as the source of water supply – i.e. without the reservoir, Southern Water's proposed HTR-based options are not viable.

2.6.5. Development Description

Site selection work has been undertaken prior to Gate 2 to determine the likely locations for key components of the HTR-basedOptions (i.e. sites for plant and corridors for pipelines). This has been necessary to determine the consentability of all SROs in order to confirm SW's preferred solution for delivery.

Although initial site selection work identified a preferred site close to the proposed new reservoir as a suitable location for the HLPS, in addition to planning considerations, the siting of the HLPS will be partly dictated by the hydraulic modelling associated with the actual pipeline routing, as is the case for the secondary pumping station and break pressure tank. Assumptions made regarding early site selection work for the HLPS were nonetheless carried through the scheme evaluation work to inform Gate 2 but have been subject to sensitivity testing to ensure the current uncertainty in site selection is appropriately accounted for.

Post Gate 2, more detailed site and pipeline route planning will take place as part of further scheme development for the Selected Option to determine land requirements and ultimately inform any application boundary. Site selection will closely follow pipeline route studies to determine suitable pumping station locations, and these will be evaluated to ensure judgements and assessments made prior to Gate 2 remain valid.

Construction methods for the HTR-based options are being assessed at a level commensurate with the maturity of the proposals. Further consideration, including the method for laying of the pipelines, will be developed through the engagement, design and contracting processes. As above, close dialogue will continue with PW to ensure alignment of consenting and delivery interfaces with HTR.

It is important to note that any DCO application could, in places, adopt a maximum 'design parameters' approach to design detail for the project rather than a detailed design that might be expected for a traditional full planning application approach.

Work undertaken to date to select likely locations for scheme plant and pipeline components has been based on areas of interest and indicative corridors. Sites and routes would be further defined through any DCO consenting process, including through comprehensive consultation and engagement, to determine appropriate application boundaries (or order limits) for the various aspects of the scheme. At this early stage of the process, it is not therefore possible or appropriate to indicate an application boundary.

2.6.5.1. Proposed Development

The principal elements of the HTR-based Option D.2 that a consent application would be sought for are:

- Transfer Pipeline to transfer at least 75Ml/d of water from a connection point at the HTR to Otterbourne Water Supply Works (WSW); c.40 km (Route 3 at 43 km or Route 4 at 31 km) at 800 mm diameter
- Along the pipeline route at separate points there is expected to be:
  - High lift pumping station
  - Second stage pumping station
  - Break pressure tank

The principal elements of the HTR-based Option B.4 that a consent application would be sought for are largely the same as Option D.2 but additionally comprise:

- Modifications to outlet channels at BF Water Treatment Works (WTW) to transfer c.19 Ml/d waste water during drought conditions via a short (c.0.5 km) gravity pipeline to the Water Recycling Plant (WRP)
- WRP with a capacity to produce at least 15 Ml/d of recycled water during drought conditions;
- WRP waste returns and overflows to Eastney Long Sea Outfall - via a short (c.0.5 km) pipeline. This is downstream of BF WTW and the take-off described in bullet point 1 above.
- High Lift Pumping Station within WRP footprint

These principal elements of the development would be supported by 'associated development'. This could include (but is not limited to):

- Receiving / blending tank infrastructure at Otterbourne WSW;
- Circa 5km pipeline to transfer at least 15Ml/d recycled water during drought conditions form the WRP to the new Havant Thicket Reservoir;
- Temporary works to support construction;
- Permanent works to support operation / maintenance
- Accesses and utility connections for the site including electrical substation, telecoms, water and sewerage facilities; and
- Landscaping and environmental mitigation, enhancement and compensation measures.

2.6.5.2. Site Location

The HTR-based Options would be located within the administrative areas of Havant Borough Council, Winchester City Council, City of Portsmouth Council, Eastleigh Borough Council and South Downs National Park, and Hampshire County Council as county authority (subject to pipeline route selection work that is still ongoing).

Site selection work leading up to Gate 2 has had regard to consultation and engagement feedback to inform initial decisions around the selection of proposed sites for plant and indicative corridors for pipeline infrastructure.

The location of the new HTR is in Havant Borough Council's administrative area.

The broad location of the WRP element would be located in Havant, located approx. 0.5 km North-West of the existing SW [redacted] within Havant District Council's administrative area.

The Otterbourne WSW is located in Otterbourne, north of Eastleigh, situated within Winchester City Council's administrative area.

Some elements of the HTR-based Options (pipeline infrastructure) could be located within the South Downs National Park, which carries a high level of protection under national planning policy to ensure the protection of natural beauty, wildlife and cultural heritage.

2.6.6. Preferred Consenting Route

2.6.6.1. Overview

As set out in SW's Gate 1 Planning Strategy, two principal consenting routes are potentially available for the HTR-based Options: planning permission under the TCPA (accompanied by secondary consents and separate compulsory purchase order) and a DCO under the Planning Act 2008.

The benefits and disbenefits of each principal consenting route were included in the Gate 1 Planning Strategy. This assessment and consideration of consenting route has been reviewed and developed following the further appraisal and consultation work which has been undertaken since September 2020.

2.6.6.2. Assessment

For the HTR-based Options, the opportunities and risks for each principal consenting route are detailed in Table 66 for the TCPA regime and Table 67 for the DCO regime.

Table 66 - TCPA regime – opportunities and risks associated with the consenting regime

Opportunities / Benefits	Disadvantages / Threats
• More common consenting route, familiarity by local authorities. • The mechanisms for material amendments under the TCPA are established and understood, and likely to be considerably quicker to secure than through the DCO process.	• Multiple planning permissions required due to the scale of the project, may present difficulties in terms of coordination of approach / lead authority and inconsistent consents, or risk of one element of the project failing at a late stage and delaying the ability to implement other elements. • Increases the number of separate secondary consent applications required.

Opportunities / Benefits	Disadvantages / Threats
• Likely to be quicker to obtain Planning Permission over a DCO (assuming no lengthy public inquiry which cannot be guaranteed). • A lower level of pre-application consultation and associated evidence required at submission, less 'front loaded'.	• Determined in accordance with the local development plan. • Lower requirements for community / stakeholder pre-application consultation, hence unforeseen risks / issues may arise during determination. • A full planning application is likely to require a much higher level of design detail than a DCO, based upon precedent from other similar projects and planning applications. • Potential for greater risk to challenge on EIA (no requirement for the preparation of a PEIR under TCPA). • No supplementary powers are available through the TCPA process when compared to the wide range of powers and consents that can be 'wrapped up' in a DCO. • No mechanisms of regulating relationships with key stakeholders, particularly in terms of asset protection (in contrast to a DCO, which can include 'protective provisions' for regulating key interfaces). • The ability to secure compulsory acquisition and temporary possession powers in respect of land required fall outside of the TCPA process – therefore a separate on process would be required after the planning permission is granted in the event that land purchase cannot be agreed. This would potentially create significant delay in the programme if required.

Table 67 - DCO regime – opportunities and risks associated with the consenting regime

Opportunities / Benefits	Disadvantages / Threats
• The certainty of timely delivery and the largely single authorisation of consents enabled by the Planning Act 2008 regime would be critical for SW to meet its section 20 Agreement obligations - absent this, a range of different consenting applications would be required, which increases risks in terms of programme and delivery. • The DCO regime would provide for a more flexible consent on an adaptive basis in terms of DO (a TCPA planning permission would be limited to a threshold below 80 Ml/d) enabling greater capacity to be secured if future modelling requires higher water resource requirements. • Provides policy certainty as the dNPS establishes the needs case where schemes are specified in a water company's WRMP. • The DCO regime has now been in place for some time, meaning it is a tried and tested method for	• Secretary of State may refuse a request for a direction to make the project qualify as a NSIP (see section 2.6.10 below). • Likely to take longer to secure than Planning Permission under TCPA regime (if no public inquiry or compulsory purchase order public inquiry and TCPA advisory timescales are met – this is not guaranteed, so in reality the timescales may well be similar). • Requires significant investment upfront - 'front loaded' approach (e.g. surveys, consultation with stakeholders and the community, issue resolution). • Overall cost is likely to be more for DCO compared to TCPA (cost of front-loading, documentation, consultation and examination, expert team, etc). • Retaining flexibility in the design (e.g. the 'envelope' or parameters-based environmental assessment) may result

Opportunities / Benefits	Disadvantages / Threats
achieving consent for large infrastructure projects. Linked to this, good practice has evolved significantly – as such, no need to 're-invent the wheel' in respect of preparatory work. • High success rate, particularly for projects with NPS support. Front loaded nature and PINS acceptance gate before examination helps to reduce successful judicial review challenges. • Land requirements (in terms of both the need for land to be acquired compulsorily and occupied temporarily) - a DCO would avoid the need for separate processes which could otherwise create delays and risk in programme – dealing with issues once means 'making the case' for compulsory acquisition can be more straightforward. • Greater potential to avoid historic issues of lengthy / costly delays during consideration of the application. Inquisitorial DCO examinations are typically more favourable than adversarial TCPA inquiries. • Reduces the number of separate consent / permit applications required. Enables the Applicant to incorporate a range of other critical consents and powers within the one instrument, including the ability to compulsorily acquire land and to agree protective provisions where third party interests may be affected, resulting in a consistent consent in terms of requirements/conditions. • Suited to developments crossing large areas and multiple local authorities (e.g. pipelines). • DCO consents typically build in a greater level of design flexibility through assessments based on 'envelopes' ('Rochdale Envelope' - a parameters-based assessment, for example setting maximum building size/footprint). A DCO typically also includes 'limits of deviation' to allow flexibility during detailed design / construction. • Can incorporate mechanisms to deal with key interfaces (e.g. assets of statutory undertakers and other bodies) through protective provisions and therefore meaning objector management can be more straightforward. • Judicial reviews are less likely to succeed given the rigour of the process	in conservative assessments and greater impacts reported. • Material amendments to DCOs have not been tested (the first is currently going through the process) and the material amendment procedure is similar to that for making a new DCO application but in a shortened form (only non-material amendments have been approved to date and that is a well understood process). Some Applicants revert to TCPA to amend consent as a result (in terms of development that does not constitute the NSIP).

2.6.6.3. Consenting Strategy

The consenting strategy set out in this section represents SW's current preferred approach, which may be subject to change if the HTR-based Options are developed further beyond Gate 2.

Drawing on the benefits and disbenefits of the principal consenting routes for the HTR-based Options, a DCO is the favoured consenting route for each option at this stage due primarily to:

- The certainty of timely delivery and the largely single authorisation of consents enabled by the Planning Act 2008 regime which is critical for SW to meet the need for new water resource infrastructure - absent this, a range of different consenting applications would be required, which increases risks significantly in terms of programme and delivery.
- The ability to include powers to compulsorily acquire and temporarily occupy land, as well as other critical consents, which would otherwise need to be sought separately - a DCO would avoid the need for separate processes which could otherwise create delays and risk in the programme.
- The scale and complexity of the HTR-based Options, which would impact the number and extent of consents ordinarily required. The need to obtain a number of different consents from multiple local authorities (given the linear nature of the pipelines in the scheme) would place a burden on the determining authorities.
- Clarity and support of national policy, in the form of the expected National Policy Statement for Water Resources Infrastructure (NPS), which confirms the 'need' for a particular scheme when it is included in a WRMP.
- High success rate, particularly for projects with NPS support. Front loaded nature and PINS acceptance gate before examination helps to reduce successful judicial review challenges.
- Significant opportunities for public participation.
- The scope of powers and other provisions that can be included, beyond traditional consents (e.g. in relation to operation and for multiple terrestrial licences).

Dialogue with PW has helped to better understand the likely consenting and delivery interfaces between the reservoir and the HTR-based Options.

Whilst a DCO is currently SW's preference, the activities and schedule for a TCPA consenting route have been broadly considered, should further detailed work show that a TCPA route is more preferable or that a s35 direction is not forthcoming. The work in respect of the TCPA route is not included here for brevity, although the high level learning from that work is that whilst a TCPA consenting route may appear to be a quicker route to secure planning permission, it does not offer the certainty of consenting timescales provided by the DCO route including in relation to land acquisition powers and other consents also required for the delivery of the project. It is therefore an inherently more risky consenting route.

It is recognised that the HTR-based Options do not automatically qualify as NSIPs under the Planning Act 2008 since the water transfer elements fall short of the 80 Ml/d qualifying threshold on DO (as defined in Section 28 of the Planning Act 2008). The water recycling technology aspect of Option B.4 is also not currently a category of 'automatic' NSIP. Therefore, it can only proceed under the DCO consenting route where it is the subject of a s35 direction. It is permissible to seek a s35 direction for a technology that is not a category of 'automatic' NSIP, provided it is in the 'field' of 'water'.

The key test in deciding whether to give such a direction is whether the Secretary of State considers a project to be 'nationally significant' under s35 (2)(c) of the Planning Act 2008.This is not based on bare 'DO' figures alone – instead, a range of factors will need be considered 'in the round', as outlined earlier in this chapter. On the basis of the factors identified, SW considers that a comprehensive case can be made that the HTR-based options are of 'national significance'.

2.6.7. Schedule of Main Application Deliverables and Responsibilities

Table 68 details an indicative schedule of the potential main application deliverables and responsibilities for the HTR-based Options, on the basis that the DCO regime is the principal consenting route for these Options.

Regulations 5, 6 and 7 of the Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 ('the Regulations') set out the statutory requirements for what must accompany an application for development consent made under the Planning Act 2008.

In formulating the schedule SW has given regard to the 2009 Regulations as well as guidance issued by the Department for Communities and Local Government (now DLUHC) and relevant Advice Notes published by the PINS[2].

The schedule of main application deliverables is at this time indicative. In due course, SW will engage with PINS to discuss the schedule as part of pre-application discussions. The precise list of application deliverables would be confirmed nearer to the submission of the DCO application.

The 'Responsible workstream' column in Table 68 reflects workstreams of qualified professionals established within SW to develop the DCO application.

Table 68 - Indicative schedule of main application deliverables and responsibilities

Category	Document Type	Responsible Workstream
Application cover documents	Application form	Planning & Consenting
	Introduction to the application	
	s 55 checklist	
	Glossary	
	Electronic index	
	Signposting document	
	Copies of newspaper notices	
Plans / Drawings / Sections	Location plan	Engineering & Design
	Land plans	
	Works plans	
	Access / rights of way plan	
	Site layout plan	
	Elevation drawings	
	Floor plans	

[2] Planning Inspectorate (2021) Advice Note Six: Preparation and submission of application documents. Available at: https://infrastructure.planninginspectorate.gov.uk/legislation-and-advice/advice-notes/advice-note-six-preparation-and-submission-of-application-documents/

Category	Document Type	Responsible Workstream
	Access / parking / landscape	
	Drainage / surface water	
	Other detailed plans	
	Plan of statutory / non-statutory sites or features	
	Plan showing statutory or non-statutory historic or scheduled monument sites	
Draft DCO	Draft proposed DCO	Legal
	Explanatory memorandum to draft DCO	
Compulsory Acquisition Information	Statement of reasons	Land & Property
	Funding statement	
	Book of reference	
Reports / Statements	Consultation report	Planning & Consenting
	Project overview	
	Funding statement	Strategy & Regulation
	Transport assessment	Environmental
	WFD assessment	
	Details of other consents and licences	Planning & Consenting
	BNG report	Environmental
EIA & habitat regulations information	Environmental Statement (ES)	Environmental
	ES technical appendices	
	Non-technical summary	
	Scoping opinion	
	HRA	
	Mitigation route map	
	Publicity requirements	Stakeholder Engagement
Photographs	Photographs and photomontages	Engineering, Design and Environmental

2.6.8. Approach to Environmental Impact Assessment and Associated Assessments

Outlined below is a summary of SW's approach to undertaking an environmental assessment of the HTR-based options, including other associated assessments. Further detail can be found in the Environmental Chapter of this report.

In accordance with the Infrastructure Planning (EIA) Regulations 2017 (the EIA Regulations), and as the project is likely to fall within the remit of the EIA Regulations, a formal EIA will be required as part of the application for a DCO. An ES, the report documenting the EIA process, will be prepared. The ES will describe the likely significant effects predicted to occur as a result of the construction and operation of the Project, whether alone or in combination with other relevant development. It supports, and is submitted as part of, the DCO application.

In summary, the EIA process will consist of the following key stages:

- **EIA Screening**: Screening is normally undertaken to determine, in cases where it is not clear, if a development requires an EIA to be undertaken. It is anticipated that the HT Water Transfer Option would require an EIA and therefore it is unlikely that a screening report would be required.
- **EIA Scoping**: Scoping is the first major milestone of the EIA process and sets out the initial project description, identifies the key topics of potential environmental impact and sets out the proposed methodologies by which these impacts are proposed to be investigated and assessed. The 'Scoping Opinion' published by the PINS in response to a Scoping Request from the project promoter, is a crucial part of the Scoping process, in which it outlines its response to the scope, and level of detail the Applicant is proposing to include in the ES. In accordance with Regulation 14(3)(a) of the EIA Regulations, where a Scoping Opinion has been adopted, the Applicant's ES should "*be based on the most recent scoping opinion adopted (so far as the proposed development remains materially the same as the proposed development which was subject to that opinion)*".
- **Preliminary Environmental Information (PEI)**: PEI is the overarching term that describes a range of information that is provided by the Applicant in advance of the formal submission of the final ES alongside the DCO to assist consultees in understanding the likely environmental effects of the Project, and to inform their consultation responses. The PEI can include an early version of the ES, although it is not a requirement, to allow stakeholder feedback to inform the final submission and aims to reach agreement with key stakeholders on key impacts and mitigation proposals in advance of the DCO examination where possible.
- **ES**: The ES is the final report which sets out the methods, data, assessments, consultation and recommendations of the EIA process to inform the decision-makers during the examination and determination process.

A key role of the EIA process will be to set out measures envisaged to avoid, prevent, reduce or (where possible) offset any significant adverse effects on the environment.

To date, SW has progressed work on the EIA process, namely in relation to the preparation of an EIA Scoping Report. An EIA methodology document has been prepared and is currently being quality assured. The EIA methodology document will provide a framework for the EIA Scoping Report, which will be submitted to PINS (or the Local Planning Authorities in the event of a TCPA consenting route). SW will engage with relevant statutory and non-statutory bodies, including local authorities, on the development of this methodology as a precursor to engage on the subsequent scoping report.

The EIA process will be supported by a number of other assessments, including for example an assessment under the Habits Regulations (HRA) and a WFD compliance assessment.

The HRA will follow the four-stage process defined by PINS (2012), as summarised below:

- **Stage 1** - Screening is the process which initially identifies the likely impacts upon a National Site Network site of a project or plan, either alone or in-combination with other projects or plans and considers whether these impacts may be significant. It is important to note that the burden of evidence is to show, on the basis of objective information, that there will be no significant effect; if the effect may be significant, or is not known, that would trigger the need for an Appropriate Assessment (Stage 2).
- **Stage 2** - Appropriate Assessment is the detailed consideration of the impact on the integrity of the National Site Network site of the project or plan, either alone or in-combination with other projects or plans, with respect to the site's conservation objectives and its structure and function. This is to determine whether there is objective evidence that adverse effects on the integrity of the site can be excluded. This stage also includes the development of mitigation measures to avoid or reduce any possible impacts. Where adverse impacts on the integrity of a site cannot be ruled out, it is necessary to proceed to Stage 3.
- **Stage 3** - Assessment of alternative solutions is the process which examines alternative ways of achieving the objectives of the project or plan that would avoid adverse impacts on the integrity of the National Site Network site, should avoidance or mitigation measures be unable to prevent adverse effects. Where no alternative solution can be identified which would meet the strategic objectives of the project, and adverse effects remain, it is necessary to proceed to Stage 4.
- **Stage 4** - At Stage 4 an assessment is made as to whether the development is necessary for Imperative Reasons of Overriding Public Interest (IROPI) and, if so, of the compensatory measures needed to maintain the overall coherence of the National Site Network.

A WFD compliance assessment will be required to assess compliance of the proposed construction, operation and decommissioning activities with The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017. This assessment will comprise of screening, scoping and detailed assessment stages, in accordance with guidance from the PINS (PINS, 2017) and the EA (EA, 2016). It will outline any appropriate mitigation measures required to ensure compliance with the WFD.

2.6.9. Approach to Other Consents and Licences

Table 69 below is an update of the table presented within SW's Gate 1 Planning Strategy and sets out the secondary licences and consents that may be required for the HTR-based options. As set out previously, the list, which is not exhaustive at this stage of design development, presents the licences and consents that may be required as part of the solution design, scheme construction and operational phases of the project.

To reiterate, under a DCO consenting route, some secondary consents will be automatically disapplied by the Planning Act 2008 (Category A), some will only be included (or 'deemed') with the agreement of the consenting body (Category B), and the need for others can be overridden by powers in the DCO itself (Category C). This enables the DCO to act, as far as possible, as a single overarching consent.

Table 69 - Secondary licences and consents

Activity	Licence / Consent / Permit or Permission	Regulating or Consenting body	Timescale to prepare application documents (approx.)	Timescale for determination	Surveys and assessments Required	Category	Notes	Option D.2	Option B.4
Land based developments (EB, booster stations, pipelines)									
Works within, or with the ability to effect, a SSSI.	SSSI Assent	NE	4 weeks	28 Days	Phase 1 Ecology Survey	C	The consent is personal to the owner / occupier of the land included in the SSSI (s 28E WCA 1981). Where consent is required for operations on an SSSI, this must be sought from NE by the owner / occupier so that those operations may lawfully be carried out.	Yes All pipeline routes have the potential to impact SSSIs (e.g. River Itchen SSSI).	Yes All pipeline routes have the potential to impact SSSIs (e.g. River Itchen SSSI)
Works that could disturb European protected species (e.g. badger, bats, great crested newt, listed birds).	European Protected Species Licence	NE	Species-dependent	30 Days	Protected species surveys	B	Some species may require translocation under licence.	Yes Desk-based assessment has indicated presence of protected species within study area.	Yes Desk-based assessment has indicated presence of protected species within study area
Works affecting an important hedgerow, if the hedge is: • A rural hedge, more than 20 m long (or any part of such a length) • Less than 20 m long but meets another hedge at each end Located on or next to: • Land used for agriculture or forestry • Land used for keeping horses, ponies or donkeys • Common land • A SSSI • A local nature reserve • A PRoW	Hedgerow Removal Notice	Local Planning Authority (LPA)	4 weeks	6 weeks	Phase 1 Habitat Survey High Resolution Aerial Photography Hedgerow condition assessment	C	The hedgerow removal notice must be served by either the owner of the hedgerow or a 'relevant utility operator' (as defined by the Hedgerow Regs 1997, if to be removed by or on behalf of that operator) who is not the owner, following which the LPA will either serve on that person written notice that the hedgerow may be removed, or the 42-day period has expired without the LPA serving a hedgerow retention notice (Regulation 5, HR 1997). Reg 6(1)(e) of the Hedgerow Regs permits hedgerow removal if it is required for development authorised by a planning permission or deemed planning permission - hence may perhaps be disapplied by grant of a DCO.	Yes Aerial photography has indicated the presence of hedgerows along pipeline routes which are likely to be deemed important through survey.	Yes Aerial photography has indicated the presence of hedgerows along pipeline routes which are likely to be deemed important through survey
Works to trees with Tree Preservation Orders	Tree Preservation Order Consent	LPA	6 weeks	8 weeks	Arboriculture Impact Assessment and Method Statement	C	Regulation 13 Tree Preservation Regs 2012 states that subject to the exceptions in regulation 14, no person shall—(a) cut down;(b) top;(c) lop;(d) uproot;(e) wilfully damage; or(f) wilfully destroy, any tree to which an order relates, or shall cause or permit the carrying out of any of the activities in sub-paragraphs (a) to (f) to such a tree, except with the written consent of the authority and, where such consent is given subject to conditions, in accordance with those conditions.	Potentially applies To be confirmed through desk study, maps to be obtained from relevant LPAs.	Potentially applies To be confirmed through desk study, maps to be obtained from relevant LPAs
Works to trees located within a Conservation Area	Notification of works	LPA	6 weeks	6 weeks	Arboriculture Impact Assessment and Method Statement	A	The outcomes are either: the local authority makes a Tree Preservation Order (TPO) to protect the tree; or not make a TPO and allow the work to go ahead.	Potentially applies Conservation Areas to be mapped as part of planning policy review.	Potentially applies Conservation Areas to be mapped as part of planning policy review
Tree Felling Licence required where more than 5 m^3 per quarter for non-statutory functions, i.e. habitat restoration / management.	Tree Felling Licence	Forestry Commission	4 weeks	12 weeks	Arboricultural survey Arboriculture Impact Assessment and Method Statement	B	An application for a felling licence may be made by 'a person having such an estate or interest in the land on which the trees are growing as enables him, with or without the consent of any other person, to fell the trees' (s.10 FA 1967).	Yes Whilst impacts to trees to be avoided, some trees may require felling (e.g. HLPS).	Yes Whilst impacts to trees to be avoided, some trees may require felling (e.g. WRP)
Requirement to temporarily close a PRoW.	Temporary Closure Order	LPA	2 weeks	8 weeks	PRoW condition assessment	A	The DCO would include a schedule of roads and PRoW to be closed. However, there would still be a requirement to serve notice of the closure. Closures and diversions are likely to be required at multiple stages.	Yes A number of pipeline routes are constructed in / along / near to PRoW.	Yes A number of pipeline routes are constructed in /along / near to PRoW
Requirement to permanently close or divert a PRoW.	Stopping up or extinguishment of a public right of way	LPA	2 weeks	16 weeks	PRoW condition assessment	A	As above	Yes Some established access across WRP sites.	Yes Some established access across WRP sites
Works of demolition, alteration or extension to a listed building that affect its character as a building of special architectural or historic interest. The requirement applies to all types of works and to all parts of those buildings covered by the listing protection (possibly including attached and curtilage buildings or other	Listed Building Consent	LPA	2 weeks	8 weeks	Historic Environment Records Search Heritage statement	A		Potentially applies A number of Listed Buildings located along route, potential impacts associated to HGV movement, setting etc.	Potentially applies A number of Listed Buildings located along route, potential impacts associated to HGV movement, setting etc

Activity	Licence / Consent / Permit or Permission	Regulating or Consenting body	Timescale to prepare application documents (approx.)	Timescale for determination	Surveys and assessments Required	Category	Notes	Option D.2	Option B.4
structures), provided the works affect the character of the building as a building of special interest.									
Works and other activities that physically affect a scheduled monument.	Scheduled Monument Consent	Historic England	8 weeks	8 weeks	Historic Environment Records Search Heritage statement	A		Potentially applies Whilst no direct impacts anticipated, potential impacts to setting to be confirmed through assessment.	Potentially applies Whilst no direct impacts anticipated, potential impacts to setting to be confirmed through assessment
Works in, over, under or affecting the flow of an ordinary watercourse	Ordinary Watercourse Consent	LPA or Internal Drainage Board	4 weeks	8 weeks	Flood Risk Assessment	B	S 120(3) of the Planning Act 2008 states that an order granting development consent may make provision relating to, or to matters ancillary to, the development for which consent is granted. s 120(4) and Schedule 5 states that this may include in particular the diversion of navigable or non-navigable watercourses. s 23(1) of the LDA 1991 provides that no person shall erect any mill dam, weir or other like obstruction to the flow of any ordinary watercourse or raise or otherwise alter any such obstruction or erect a culvert in an ordinary water course, or alter a culvert in a manner that would be likely to affect the flow of an ordinary watercourse, without the consent of the drainage board concerned. s 23(6) states that nothing in this section shall apply to any works carried out or maintained under or in pursuance of any Act or any order having the force of an Act. The DCO is an order having the force of an act so land drainage consent is not required.	Yes A number of pipeline routes are constructed in, or near to, Ordinary Watercourses.	Yes A number of pipeline routes are constructed in, or near to, Ordinary Watercourses
Works on or near a main river, on or near a flood defence structure, in a flood plain or, on or near a sea defence	Standard or Bespoke Flood Risk Activity Permit EA	12 weeks Flood Risk Assessment	4 weeks		Topographic Survey Flood Risk Assessment WFD Compliance Assessment Phase 1 Ecology Survey	B	Environmental Permits are granted to the 'operator' of a regulated facility ((Reg 13, EPR 2016). The 'operator' is the person who has control of the facility (Reg 7, EPR 2016). The regulator (the EA in England) may transfer an Environmental Permit to a proposed transferee on the joint application of the operator and proposed transferee (Reg 21, EPR 2016).	Yes All pipeline routes cross Main Rivers (e.g. Itchen).	Yes All pipeline routes cross Main Rivers (e.g. Itchen)
	Flood Risk Activity Exemption	EA	4 weeks	7 days	-				
Discharging liquid or wastewater into surface water that does not comply with the 'Temporary dewatering from excavations to surface water'.	Standard or Bespoke Environmental Permit for dewatering	EA	4 weeks	12 weeks	Flood Risk Assessment Protected Species Surveys	B		Potentially applies Requires ECI	Potentially applies Requires ECI
New water discharge activity	Standard or Bespoke Environmental Permit	EA	8 weeks	12 weeks	Flood Risk Assessment	B		No	Yes
Operation of a Part A1 Low Impact Installation	Standard or Bespoke Environmental Permit	EA	8 weeks	16 weeks	Protected Species Surveys HRA EIA WFD Assessment	B			
Operation of Part B Activities related to Local Air Pollution Prevention and Control (this includes the processing of used concrete with a mechanical crusher (for use onsite or at another designated site).	Environmental Permit	LPA	12 weeks	Four weeks' notice of deployment	EIA	B		Yes	Yes
New requirement to abstract over 20 cubic metres a day and / or impound water by creating a new sluice, weir or dam.	Abstraction / Impoundment Licence	EA	12 weeks	16 weeks	Protected Species Surveys HRA WFD Assessment	B		No	No
Temporary abstraction of more than 20 cubic metres of water a day over a period of less than 28 days.	Temporary abstraction licence	EA	12 weeks	28 days	-	B		Potentially applies, to be confirmed by ECI	Potentially applies, to be confirmed by ECI

Activity	Licence / Consent / Permit or Permission	Regulating or Consenting body	Timescale to prepare application documents (approx.)	Timescale for determination	Surveys and assessments Required	Category	Notes	Option D.2	Option B.4
Connection to a mains sewer		Local Water Authority	8 weeks	Varies	-	C		Yes	
New potable mains water connection		Local Water Authority	8 weeks	Varies	-	C		Yes	
For connection of a business to the main sewer supply	Trade Effluent Consent	Local Water Authority	8 weeks	Up to 2 months	-	C		Yes	Yes
Activities involving use, treatment, disposal or storage of waste (e.g. screening and blending of waste, aerosol crushing, composting, etc.).	Standard or Bespoke Environmental Permit for using, treating, storing and disposing of waste.	EA	8 weeks	Up to 4 months	-	B		Yes	Yes
	Exemption for using, treating, storing and disposing of waste.	EA	8 weeks	5 working days	-	B		Yes	Yes
Treatment of waste bricks, tiles and concrete by crushing, grinding or reducing in size.	T7 waste treatment exemption	LPA	4 weeks	5 working days	Ground investigation	C		Potentially applies To be confirmed through ground investigation.	Potentially applies To be confirmed through ground investigation
Approval for noise generating activities during construction.	Section 61 consent (noise and / or vibration)	LPA	4 weeks	4 weeks	Noise Impact Assessment	C		Yes Proximity of development to residential / sensitive receptors.	Yes Proximity of development to residential / sensitive receptors
The operation of a mobile plant for the treatment of soils and contaminated material, substances or products.	Standard rules mobile plant permit.	EA	8 weeks	Up to 4 months	Ground Investigation	B		Potentially applies	Potentially applies
Permanent alterations or improvements to a public highway.	Section 278 highways agreement	LPA	8 weeks	Up to 6 months	Topographical Survey Traffic Count Data Visibility Splays	C		Potentially applies May be required for HLPS, or to enable construction activities.	Potentially applies May be required for WRP, or to enable construction activities
Transport of an Abnormal Load	Notification	Police, Highways Authorities and bridge and structure owners like Network Rail	8 weeks	1 week	-	C	An 'abnormal load' is a vehicle that has any of the following: • a weight of more than 44,000 kg • an axle load of more than 10,000 kg for a single non-driving axle and 11,500 kg for a single driving axle • a width of more than 2.9 metres • a rigid length of more than 18.65 metres	Potentially applies, requires ECI involvement.	Potentially applies, requires ECI involvement
Transport of a Special Load	Notification	Police, Highways Authorities and bridge and structure owners like Network Rail	8 weeks	Up to 10 weeks	-	C		As above	As above
Applications for road closures and other restrictions which require a Temporary Traffic Regulation Order (TTRO). This includes restrictions on county roads, footpaths and bridleways.	TTRO	LPA	4 weeks	12 weeks	-	C		Yes	Yes
Works affecting Network Rail Land (Within 15 m)	Asset Protection Agreement	Network Rail	12 weeks	8 weeks		C		Yes Pipeline route passes beneath Havant Main Line.	Yes Pipeline route passes beneath Havant Main Line
Hold certain quantities of hazardous substances at or above defined limits.	Hazardous Substance Consent	LPA	9 weeks	8 weeks	-	C		Potentially applies	Potentially applies
Works within Common Land and / or village greens.	Section 38 Consent	PINS	8 weeks	6 months	EIA	C	Land referencing in progress	Potentially applies	Potentially applies

2.6.10. Consenting Programme for Delivery

The indicative programme below (illustrated in Figure 51) provides an optimised schedule for DCO delivery. It identifies the key consenting related activities that drive the consenting critical path, including s35 direction, scoping, PEIR, public consultation, EIA and DCO application and examination.

The programme provides important visibility of the key consenting stages and timelines for the planning process and enables more detailed activities to be defined and planned moving forward. SW's P6 schedule for each of the SROs contains the detailed deliverables and activities required against the timelines within the indicative consenting programme below.

Key assumptions behind this programme include:

- Only one SRO being progressed post Gate 2 submission into the planning process
- Any WRMP19 review or WRMP24 consultation does not delay this programme
- Sufficient resourcing is in place to deliver this programme on time
- External assurance, dependencies and approvals are in place as and when required
- Deliverables for subsequent RAPID gates largely represent progress updates aligned to the consenting schedule
- Two further public consultations are required
- The level of design detail for any DCO application will be at a 'maximum design parameters' level of design rather than 'detailed'

A contingency programme for a Town & Country Planning Application consenting route has also been prepared should the DCO consenting regime not be available.

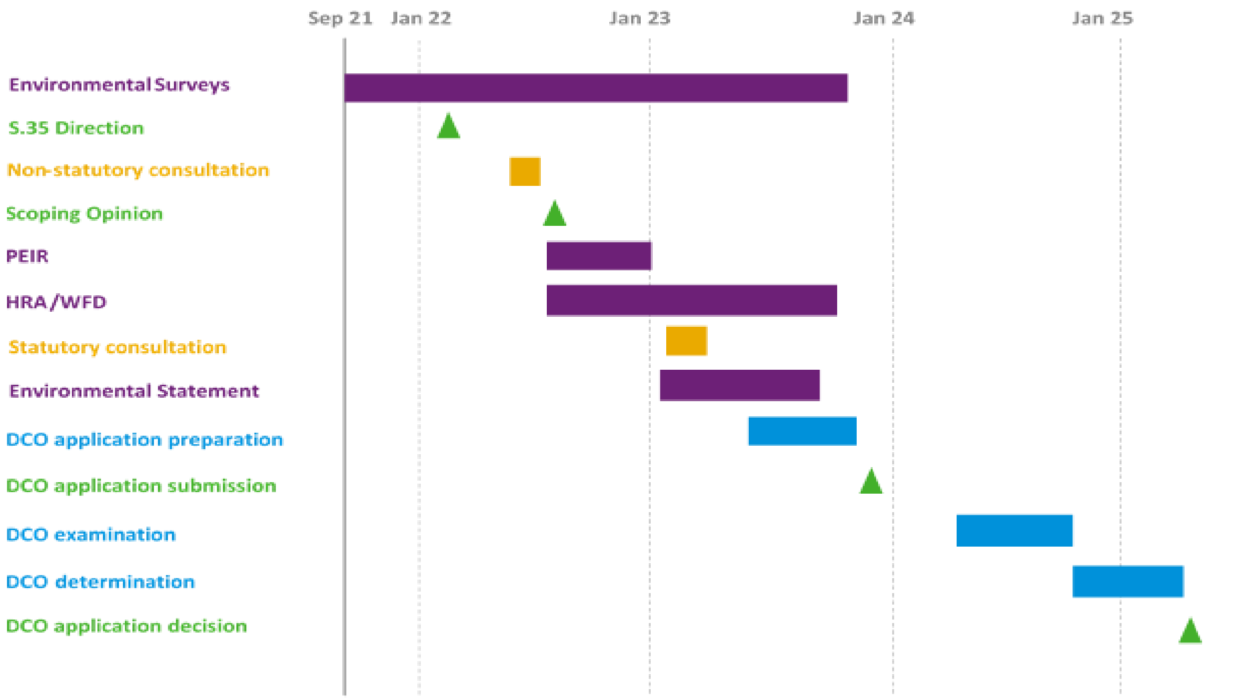


Figure 51 – Havant Thicket - Indicative DCO consenting programme

2.6.11. Summary of Consenting Risks and Countermeasures

The main consenting risks associated with the proposed HTR-based Options are detailed in Table 70 below. All of these risks sit within either the WfLH Programme level Risk Register or the relevant Project Level Risk Registers where they are actively managed in accordance with the WfLH Risk Management Strategy and Process. In addition, in the event that these risks are considered 'key' (see Section 2.7 Risk Management for definition), they are included in more detail in Section 2.7.3 and the risk ID is included below for reference.

Table 70 - Main consenting risks and countermeasures

Risk	Risk Description	Risk Mitigation
s35 Direction (aligned to risk ID Prog-R22. See Section 2.7.3)	SW's preference to utilise the DCO consenting regime cannot be realised because the SRO is below the NSIP thresholds and a s35 direction is not given to bring the SRO into the DCO regime.	Continue close engagement with Defra, RAPID, legal and consenting advisors to understand if level of risk requires contingency planning for a TCPA consenting process.
s35 Delay (aligned to risk ID Prog-R22. See Section 2.7.3)	Progress of the SRO through the DCO consenting route is frustrated because there is delay in obtaining a timely s35 Direction.	As above. Ensure stakeholder awareness of consenting activities that affect critical path.
TCPA route (aligned to risk ID Prog-R22. See Section 2.7.3)	Using the TCPA consenting route (if required) unacceptably extends the consenting period compared to a DCO route, particularly if a planning appeal and compulsory purchase of land are required, as well as the multiple other consents required in addition to planning.	Ongoing review of consenting route and risks, including contingency planning for a TCPA consenting process. Ensure stakeholder awareness of consenting timescales.
DCO non-acceptance	Any DCO application for the SRO is not accepted by PINS due to inadequate consultation & engagement.	Adopt robust consultation and engagement strategies to meet DCO requirements & expectations.
DCO refused	The DCO application is refused because the site and scheme selection process is not sufficiently robust.	Undertake rigorous planning evaluation to determine consentability of base case and alternatives taking into account key legislative and policy requirements.
TCPA refused	The TCPA application is refused because one of the local authorities or a statutory body objects to the potential impacts of the proposal.	Undertake comprehensive stakeholder engagement and consultation to ensure project impacts are understood and mitigated as far as possible, and that stakeholder engagement helps shape SW's preferred solution.
Resourcing (aligned to risk ID Prog-83. See Section 2.7.3)	SRO delivery is delayed because the consenting schedule cannot be achieved due to an unrealistic programme and / or resourcing constraints (e.g. external bodies delay handling of consenting requirements or assurances).	Ongoing review of consenting schedule and resourcing requirements to achieve schedule.

Risk	Risk Description	Risk Mitigation
Alternatives	HT proves unconsentable if other less environmentally damaging alternative solutions are available to meet the WRMP19 need.	Apply a rigorous planning evaluation as part of site / scheme selection to test the consentability of both base case and alternatives.
Water Resources NPS	National Policy Cover for the SRO is weakened because the draft NPS is not progressed to adoption.	Engage with Defra to understand timescales for NPS adoption.
WRMP alignment (aligned to risk ID Prog-R98 & Prog-R99. See Section 2.7.3)	The need case for an alternative solution is not beyond challenge because it does not explicitly feature in WRMP19 as being the preferred solution to meeting the agreed supply deficit.	Reflect the Selected Option in WRMP19 Annual Review; ensure alignment with the emerging Regional Plan; and include the Selected Option in emerging WRMP24
HTR consent (See Section 2.7.3)	Planning consents for the reservoir are quashed following legal challenge	Monitor progress of application closely and support PW as necessary to address any legal challenge that may be made.

2.6.12. Conclusions and Next Steps

The consenting route review within this planning strategy reaffirms SW's initial view at Gate 1 that a DCO is the preferred route for the HTR-based options.. This is based on a number of factors, including the need for the schemes and benefit of timely delivery, the scale and significance of the schemes, their complex terrestrial interfaces interfaces and various consents required, and likely significant impacts across a 'larger than local' area.

The strategy also confirms that, based on current understanding of the schemes' characteristics, access into the DCO consenting regime would not be automatic, i.e. the options do not currently meet the thresholds for being defined as NSIPs. Projects can however be directed into the DCO regime through a s35 direction by the Secretary of State – SW's consideration of the factors to support such a direction suggest that a comprehensive case can be made.

In addition, the strategy identifies likely DCO application deliverables, the secondary consents and licences required in conjunction with planning consent and potential land acquisition powers, the approach to environmental assessment and potential consenting risks. Overall, it demonstrates that sufficient progress has been made in undertaking various planning and consenting activities in line with Gate 1 commitments and Gate 2 requirements.

Listed below are the key next steps in progressing consenting activities should either of the HTR-based Options proceed post Gate 2, informed largely by the draft consenting schedule in section 2.6.10 above:

- Ongoing refinement of high-level consenting schedule, aligned with other regulatory and procurement processes, and incorporation of detailed activities to achieve key consenting activities into P6 schedule
- Further consideration of the consenting and delivery interfaces between the HTR and the HTR-based options and how these can be managed through the planning and delivery processes

- Submission of s 35 Request to Defra
- Submission of a Scoping Request to PINS
- Commencement of early environmental and other impact assessment activities to inform the next stage of public consultation
- Refinement of the approach, planning for and preparation of the deliverables required for next stage of public consultation
- Ongoing resource planning and procurement of resource necessary to progress successfully through the planning process
- Increased levels of stakeholder, community and landowner engagement in accordance with SW's approach to stakeholder engagement

2.7. Risk Management

2.7.1. Risk Management Methodology

2.7.1.1. Risk Management Strategy Summary

Throughout this document, unless expressly stated, the term ‘risk’ incorporates both threats and opportunities. This is explained in more detail in Section 2.7.1.2 Risk Terminology.

The key assumption, risk and issue information contained in the tables within Section 2.7.3 has been captured, assessed and managed in accordance with the WfLH Programme Risk Management Strategy that was detailed within Section 1 of Annex 14 Risk Report WfLH Strategic Programme of the SW, WfLH Gate 1 submission. This document formed part of the formal assurance process undertaken at Gate 1, with approval obtained internally by the Project and Programme team, as well as externally by 3 independent assurers.

Assumption, risk and issue information has been populated in collaboration with PW.

The WfLH Programme Risk Management Strategy has been created specifically for the WfLH Programme through utilisation of the defined WfLH Programme Structure (Programme, Workstream and Project), and alignment to the Risk Management Process within the SW Risk Management Handbook, as well as the wider SW Engineering & Construction (E&C) Risk Management Strategy, where appropriate as illustrated in Figure 52. Alignment to the SW E&C Risk Management Strategy was deemed acceptable as the Project types within the WfLH Programme, whilst complex, are sufficiently similar to those delivered by the wider SW organisation. However, for the purposes of Section 2.7, only the elements of the WfLH Programme Risk Management Strategy relating to the SROs are discussed.

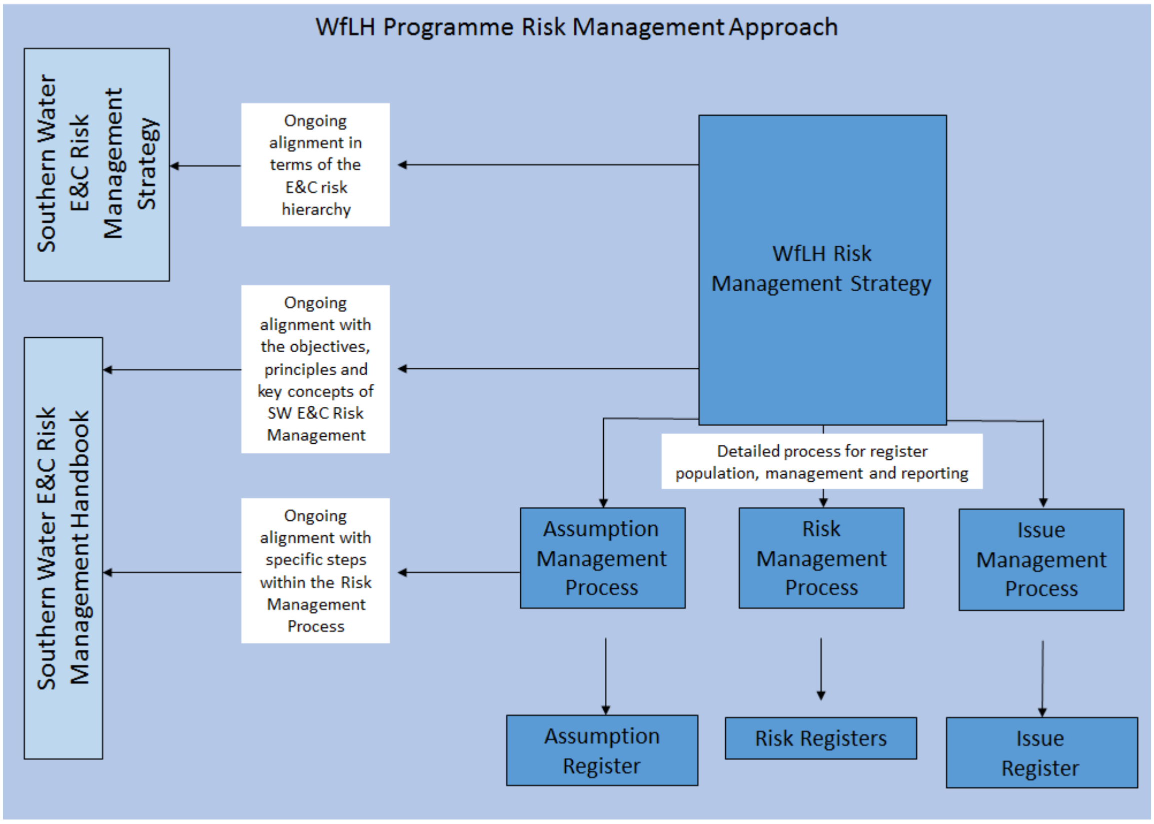


Figure 52 - WfLH Programme Risk Management Strategy

The WfLH Programme Risk Management Strategy has been designed to incorporate all aspects of risk management, and demonstrates a commitment to managing assumptions, risks and issues proactively and comprehensively throughout the lifecycle of the WfLH Programme. It defines and communicates the approach relating to the management of assumptions, risks and issues that could impact on the achievement and satisfactory delivery of all objectives associated with the WfLH Programme. The WfLH Programme Risk Management Strategy is then supported by the relevant Process, which explains in detail how relevant assumptions, risks and issues will be identified, assessed, mitigated, reviewed, escalated and communicated. Therefore, in relation to the SROs within the wider WfLH Programme, this ensures coverage across all aspects of their lifecycle from concept to operation, as illustrated in Figure 53, and through the full extent of the WfLH Programme Structure from Programme, Workstream to Project._An example of this hierarchy, and an indication of the levels within the hierarchy where risk information is captured, is illustrated in the summary diagram within Figure 54. As illustrated in Figure 54, risk information is not captured at the Workstream level which again, is aligned to the wider SW E&C Risk Management Strategy.

Further detail in relation to the specific dates of the future RAPID Gates as well as the tendering, construction and handover phases is described in Section 2.9, Schedule.

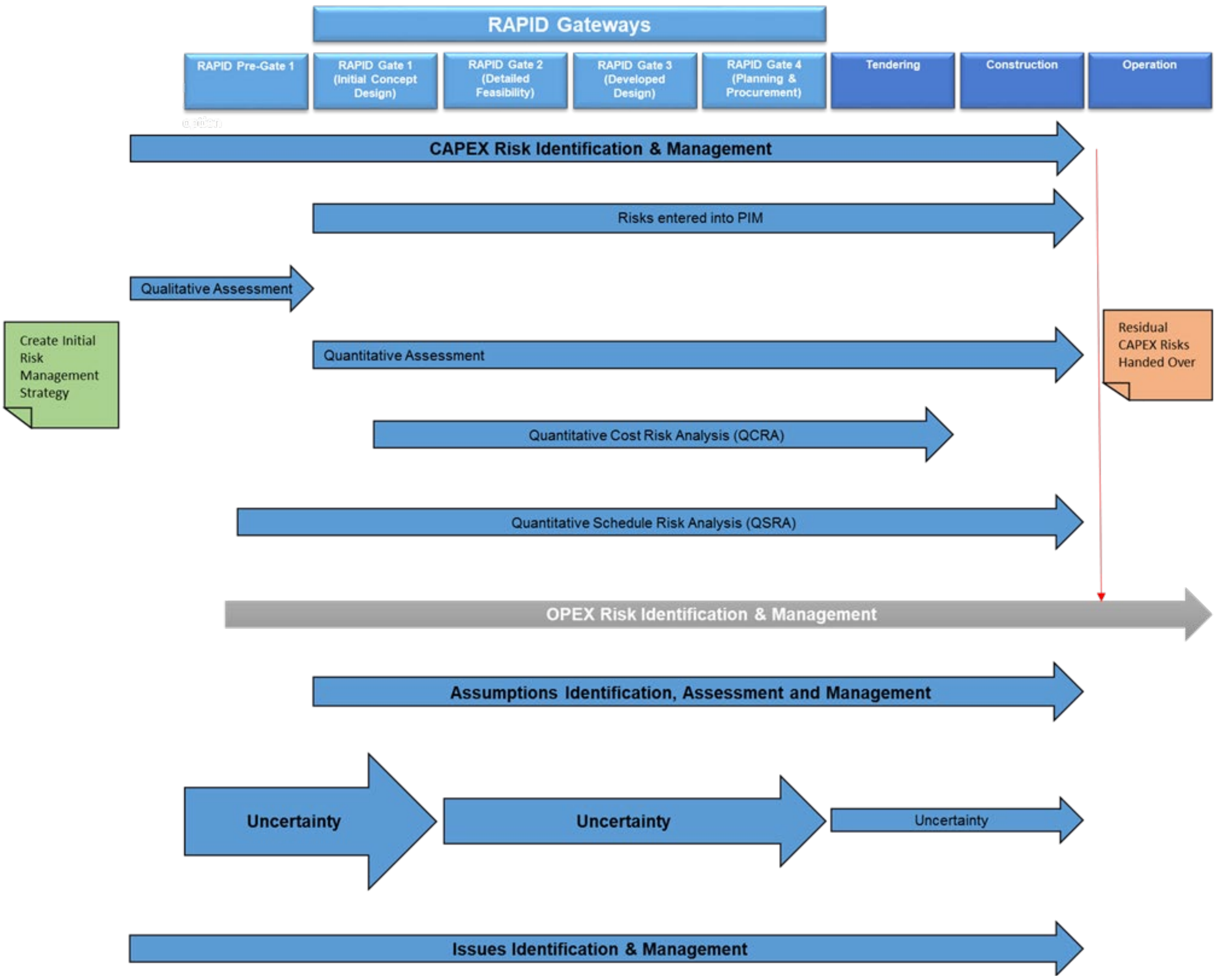


Figure 53 - WfLH Programme Risk Management Timeline

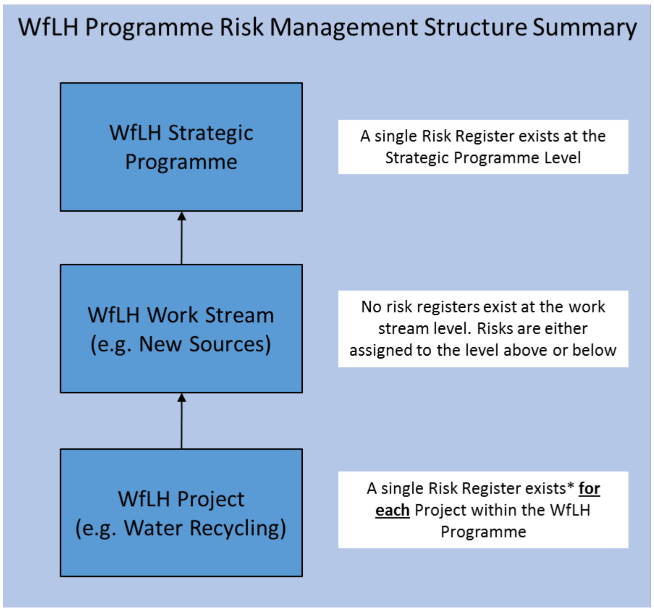


Figure 54 - WfLH Programme Risk Management Structure Summary

Administering this WfLH Programme Risk Management Strategy effectively in relation to the SROs within the WfLH Programme involves undertaking a number of key activities. These activities have included the development of the WfLH Programme Risk Management Strategy utilising the defined WfLH Programme Structure (Programme, Workstream and Project), following the steps within the Assumptions Management, Risk Management and Issues Management Processes, and undertaking any specific, specialist risk management techniques, as indicated within the relevant sections of the WfLH Programme Risk Management Strategy.

Following the completion of Gate 1, the following risk management activities have been completed:

- The entering of risk information into the mandated SW E&C Risk Management System, Programme Insight Manager (PIM) in accordance with SW governance requirements
- Quantification of new and existing risk information incorporating evolving sources of information and the changing Programme lifecycle stage
- Reporting of key risk information at the agreed WfLH Programme governance forums including Project Boards, Monthly Performance Reviews, WfLH Programme Steering Group and the WfLH Executive Programme Board as part of the automated monthly reporting cycle
- Development of the Base Case and Strategic Alternative cost estimates using quantitative cost modelling techniques
- Strategic Risk Modelling utilising the latest information in relation to the realisation of the benefits of the schemes contained within the WRMP19 Preferred Strategy to determine the Supply Demand Deficit (SDD) value
- A Schedule Risk Profile has been applied to each of the P6 development schedules to express the risk and uncertainty contained within the schedule assumptions

Currently, the following risk management activities in motion are:

- The ongoing management and communication of the quantified risks contained within those previously created registers utilising the Risk Management Process as detailed in the Risk Management Strategy

- The ongoing management and communication of the assumptions contained within the previously created register utilising the process as detailed in the Risk Management Strategy
- The ongoing management and communication of the issues contained within the previously created register utilising the process as detailed within the Risk Management Strategy

Following Gate 2, in addition to the current activities, the following risk management activities will take place:

- An updated review of the risk and uncertainty associated with the WRMP19 Preferred Strategy benefits, with further modelling undertaken as required
- Refinement of the Base Case cost estimate, again utilising quantitative cost modelling techniques that integrate base cost, uncertainty and risk
- Ongoing review of the P6 schedule to refine the risk profile as schedule detail increase, utilising risk modelling techniques as appropriate

2.7.1.2. Risk Terminology

Throughout this Risk section, unless expressly stated, the term ‘risk’ incorporates both threats and opportunities. This is in accordance with Section 1.3 of the SW Risk Management Handbook, the wording of which is illustrated in Figure 55.

Risk

A risk is an uncertain event or set of circumstances that, should it occur, will affect (in either a positive or negative way) the achievement of one or more objectives. A positive risk event that will have a beneficial effect on one or more of the objectives or facilitate other benefits is referred to as an Opportunity. A negative risk event that will have an undesirable effect on one or more of the objectives is referred to as a Threat.

For the remainder of the Handbook, the term Risk refers to both Threats and Opportunities, unless it is explicitly stated otherwise.

Figure 55 - Threat and Opportunity Terminology

2.7.2. Risk Management Analysis

2.7.2.1. Gate 2 Key Information Selection Approach

Section 2.7.3 communicates the key assumptions, key risks and key issues that have the potential to impact on the successful delivery of the HT Solution, which incorporates two specific Options (B.4 and D.2) as detailed in Table 71. These specific Options are being jointly developed with PW and as such, all assumptions, risks and issues have been identified collaboratively. For more information in relation to the HT Solution, see Section 2.1, Overview.

Table 71 - Havant Thicket Options

Solution	Option No.	Option Name
HT	B.4 (Strategic Alternative)	61 Ml/d (up to 75 Ml/d) abstraction from HTR to Otterbourne WSW with 15 Ml/d WRP adjacent to BF
	D.2 (Strategic Alternative)	61 Ml/d (up to 75 Ml/d) abstraction from HTR to Otterbourne WSW

It should be noted that Option A.1, a 75 Ml/d Desalination Plant at Fawley, is included within the Preferred Strategy in WRMP19, and is referred to as the Base Case. B.4 and D.2 are also included in the gated process and are assessed as Strategic Alternatives in case the Base Case is determined not to be consentable. In addition, these Strategic Alternatives are assessed to support the planning requirements associated with the delivery of new water resource infrastructure.

For efficiency, the key assumptions, key risks and key issues are listed first for the HT Solution in its entirety, with separate tables only being used for specific Options (B.4 and D.2) in the event that specific key risks are relevant. All key assumptions and key issues will be shown at the level of the HT Solution. A summary of the tables and their contents can be found in Table 72 below.

Table 72 - Summary of Section 2.7.3 Tables

Content	Key Assumptions	Key Threats	Key Opportunities	Key Issues
HT	Table 4	Table 5	Table 6	Table 7
Option B.4	Table 4	Table 8	Table 9	Table 7
Option D.2	Table 4	Table 10	Table 11	Table 7

Key Assumption Criteria

For the purposes of Section 2.7.2, key assumptions have been selected for inclusion based on a combination of their stability (confidence in the assumption) and sensitivity rating (impact of an incorrect assumption), as per Gate 1 and Figure 56 below. Both stability and sensitivity are scored on a scale of A to D. Similar to risks and issues, assessment is undertaken as the assumption is identified but reassessment takes place through the life of the assumption as further information is obtained. For those assumptions that, when assessed, return a score of CC, CD, DC or DD, they are transferred to the appropriate risk register, and managed as part of the Risk Management Process.

Stability:	Sensitivity:
A – Very Confident B – Fairly Confident C – Uncomfortable D – Very Uncomfortable	A – Minor Impact B – Manageable Impact C – Significant Impact D - Critical Impact
Confidence that the assumption will turn out to be correct?	Impact in the event that the assumption turns out to be incorrect.

Figure 56 - Assumptions Analysis Assessment Criteria

The focus of the key assumptions in Section 2.7.3 is therefore not on those assumptions that have already been transferred to the Risk Management Process, but instead on those that are close to being considered as risks. Therefore, in order to be selected as a key assumption for inclusion within Section 2.7.3, the assumption must score as either BC, CB, BD or DB against stability and sensitivity respectively.

Whilst not a selection criterion for the purposes of this document, in addition to stability and sensitivity, each assumption is also assigned a Red, Amber, Green (RAG) status to indicate the current state of the assumption in terms of management intervention. The RAG status definitions are illustrated in Figure 57.

Basic RAG Definitions	
Red	Escalated. Item requires urgent management action to mitigate or remedy
Amber	Problem(s) identified and/or building up. Expectation is that this can be handled within the Programme Team. However, flagged amber to notify management of potential future escalation
Green	Satisfactorily managed/tolerated. No management action required at this point in time.

Figure 57 - Assumptions RAG status

Key Risk Criteria

The term key risk translates within Section 2.7 as key Project risk. This is to ensure it is distinguished from key technical risks (e.g. key engineering risks) that are referenced in other Sections within this document. In relation to the key risks, the key threats shown throughout Section 2.7.3. have been selected for inclusion based on their Current Risk Score. Key threats are defined as those threats with a Current Risk Score of 19 or greater. This ensures that all threats scored as high (Current Risk Score of 19 or greater) when plotted on the WfLH Programme Probability Impact Diagram (PID) are included, as illustrated in Figure 58.

		Probability Impact Diagram									
		Threat					Opportunity				
Probability	VH (5)	11	16	20	23	25	11	16	20	23	25
	H (4)	7	12	17	21	24	7	12	17	21	24
	M (3)	4	8	13	19	22	4	8	13	19	22
	L (2)	2	5	9	14	18	2	5	9	14	18
	VL (1)	1	3	6	10	15	1	3	6	10	15
		VL (1)	L (2)	M (3)	H (4)	VH (5)	VL(1)	L(2)	M (3)	H(4)	VH(5)
		Impact					Impact				

Figure 58 - WfLH Programme Probability Impact Diagram

All opportunities, regardless of Current Risk Score, are included within the key opportunity tables.

Key Issue Criteria

In relation to the key issues selected, these have been included within Section 2.3.7.3 based on their impact on the successful delivery of the Solution in the event that mitigations were not undertaken. Issue impact is rated on a scale of negligible, minor, major and critical. For the purposes of the key issues contained within Section 2.3.7.3, only those issues assessed as having a major or critical impact on the successful delivery of the Solution are included.

2.7.2.2. Gate 2 RAPID Requirements

The following narrative has been prepared to specifically respond to the comments received by RAPID within the Gate 1 Determination.

Actions and Residual Risk Relationship

In order that consideration is given to the effect of each action on the Residual Risk Score (the score associated with the risk following the assumed completion of the listed actions), the following approach is undertaken. Following the identification of each action, discussion takes place between the Programme Risk Manager, Risk Owner and Action Owner to understand whether the identified action:

- Influences the current probability of the risk (proactive action)
- Influences one or more of the current risk impacts (reactive action)
- Influences both the current probability and one or more of the current risk impacts (combined action)
- Is a necessary step in developing an action aimed at tackling one of the above

Once the outcome of this discussion has been determined, the extent of the influence on either the probability or impact is agreed and this extent is applied to the appropriate Residual Risk Score input(s), thus updating the Residual Risk Score. This approach is applied to all actions upon their identification in order to ensure an ongoing link between the identified actions and the Residual Risk Score.

Despite the above, it is still important to note that the approach does not guarantee that the proposed implementation of mitigation actions will result in a change to the Residual Risk Score, when compared to the Current Risk Score. However, it does guarantee that consideration of the mitigation actions will be given when assessing the Residual Risk Score. In addition, it is important to note that the mitigation actions identified at this stage primarily relate to the near-term realistic approach that can be taken (rather than a long-term aspirational approach) in order to commence and develop mitigation of the risk. This reinforces the reason why, in some cases, there is currently no difference between the Current and Residual Risk Score recorded.

Scoring Criteria

Since Gate 1, the information contained within the key risk tables shown in Section 2.3.7.3 has been updated to provide greater clarity and transparency in relation to the Current and Residual Risk Scores. This has resulted in the key risk tables now including the input score assigned to the probability and each individual impact, in order that the Current and Residual Risk Score calculations are visible.

For each risk, the probability is assessed in a quantitative manner on a scale of 1% to 99%. This quantitative value is then assigned a qualitative score based on the parameters illustrated in Figure 59 (opportunities) and Figure 60 (threats) below. This approach is in accordance with the wider Risk Management Process as contained within the SW Risk Management Handbook.

PROBABILITY				
VL	L	M	H	VH
Less than 11%	11 to 30%	31 to 50%	51 to 70%	Over 70%

Figure 59 - Qualitative Probabilities for Opportunities

PROBABILITY				
VL	L	M	H	VH
Less than 11%	11 to 30%	31 to 50%	51 to 70%	Over 70%

Figure 60 - Qualitative Probabilities for Threats

In addition to the probability, each risk is assessed against 5 potential impacts. These impacts are detailed in Table 73 and can either be positive (opportunities) or negative (threats).

Table 73 - Risk Impact Descriptions

Impact	Impact Description
Cost	The risk results in a financial change to the relevant cost objectives.
Time	The risk results in change to the delivery date of one or more key milestones within the schedule.
Reputation	The risk results in company exposure to either a regulator, industry press, or the wider media.
Quality	The risk results in a change to the suitability of the end product being delivered.
Operational Service	The risk results in a change to the service normally received by SW customers.

Similar to the probability assessment, each impact is qualitatively assessed on a scale of 1 (Very Low) to 5 (Very High), as illustrated in Figure 61 (opportunities) and Figure 62 (threats). These Qualitative Impact tables, similar to the Qualitative Probability tables, are utilised as the approach is in accordance with the Risk Management Process within the SW Risk Management Handbook. However, if following assessment of an impact, it is deemed that the impact does not apply to a particular risk, the impact may be scored with a 0 (Negligible). In the event that an impact is scored as 0, this is not included within the key risk tables within Section 2.7.3. It should also be noted the cost impact is now assessed in the first instance as a quantitative impact using a 1 point (Most Likely cost), 2 point (Minimum and Maximum cost) or 3 point (Minimum, Most

Likely and Maximum cost) estimate, which is then translated to a qualitative impact for the purpose of calculating the risk score. This is a significant step forward in the risk assessment process since Gate 1 and shows in practice the evolving nature of the Risk Management Strategy designed for the WfLH Programme.

Impact Score		Very Low (1)	Low (2)	Medium (3)	High (4)	Very High (5)
Cost	RISK – OPPORTUNITY CLASSIFICATION	<=1.25% saving of Project Forecast outturn (excl. risk). 1.25% is VL.	>1.25% - 2.5% saving of Project Forecast outturn (excl. risk); 2.5% is L.	>2.5% - 5% saving of Project Forecast outturn (excl. risk); 5% is M.	>5% - 10% saving of Project Forecast outturn (excl. risk); 10% is H.	>10% saving of Project Forecast outturn (excl. risk); More than 10% is VH.
Time		Time saving on key milestone by 7 days (1 week).	Time saving on key milestone of 8 - 14 days (1 - 2 weeks).	Time saving on key milestone of 15 - 28 days (2 – 4 weeks).	Time saving on key milestone of 29 - 56 days (1 - 2 months).	Greater than 57 days (2 months) time saving on key milestone, and / or any time saving to regulation date or project completion date.
Reputation		Insignificant reputational enhancement.	Local reputational enhancement and increased stakeholder satisfaction.	Local reputational enhancement and increased stakeholder confidence.	Beneficial regional reputational enhancement and increased stakeholder confidence.	Extremely beneficial reputational enhancements, association with high profile national interests.
Quality		Minor enhancement to functionality of solution.	Some enhancement to functionality of solution.	Significant enhancement to functionality of solution.	Major enhancement to functionality of solution.	Major enhancement to functionality of solution, and / or programme outputs.
Operational Service		Service supply benefits would be negligible to public.	Small numbers of customers would benefit better supply.	Moderate numbers of customers would benefit from better supply.	Large numbers of customers would benefit from better supply.	Large numbers of customers benefit. Significant geographical area improvement.

Figure 61 - Qualitative Impacts for Opportunities

Impact Score		Very Low (1)	Low (2)	Medium (3)	High (4)	Very High (5)
Cost	RISK – OPPORTUNITY CLASSIFICATION	>0 - <=1.25% of Project Forecast outturn (excl. risk); 1.25% is VL.	>1.25% - 2.5% of Project Forecast outturn (excl. risk); 2.5% is L.	>2.5% - 5% of Project Forecast outturn (excl. risk); 5% is M.	>5% - 10% of Project Forecast outturn (excl. risk); 10% is H.	>10% of Project Forecast outturn (excl. risk); More than 10% is VH.
Time		Up to 7 days (1 week) added to key milestone date.	8 - 14 days (1 - 2 weeks) added to key milestone date.	15 - 28 days (3 - 4 weeks) added to key milestone date.	29 - 56 days (1 - 2 months) added to key milestone date.	Greater than 57 days or more (2 months) added to key milestone date and / or any impact to regulation date or project completion date.
Reputation		Insignificant reputational impact.	Local press article low running order. E.g. Operations action criticised from partner forums, local pressure groups, alleged "expert", etc.	Criticism in industry press or local press front page. E.g. Southern Water Operations proposals / outcomes receive negative reaction in the national water forums, and / or from Regulator(s).	Local TV / tabloid press low running order. E.g. Southern Water reputation impacted (e.g. incident, business performance, HR issue, etc.) and publicised negatively by Regulator(s) and water pressure groups.	National media coverage in TV and newspapers. Failure to adequately address known problem or to anticipate or prepare for unpredictable occurrence. Southern Water Group bondholder's confidence severely impacted.
Quality		Negligible requirements impact; functionality of solution / deliverable not impacted.	Some requirements impacted; functionality of solution / deliverable will be fit for purpose.	Key requirements impacted; functionality of solution / deliverable will be fit for purpose.	Key requirements will not be achieved; functionality of solution / deliverable severely impacted and / or anticipated programme outputs will not be achieved.	Solution / deliverable will not be fit for intended purpose and / or programme outputs will not be achieved.
Operational Service		Effects would be "invisible" to customers.	Small numbers of customers would be affected. Minimal degradation of Standard of Service.	Moderate numbers of customers affected. Moderate degradation of service delivery.	Large numbers of customers affected. Widespread degradation of service delivery.	Large numbers of customers affected. Widespread failure.

Figure 62 - Qualitative Impacts for Threats

Once the probability and impact is assessed for each risk, these input scores, ranging from 1 (Very Low) to 5 (Very High) for probability and 0 (Negligible) to 5 (Very High) for each impact, are automatically plotted on a PID, which then determines the overall risk score. Separate assessments are conducted for the current and residual positions. The PID was previously illustrated in Figure 58 with separate PIDs existing for threats and opportunities.

The key risk tables in Section 2.7.3 have therefore been updated to show the both the current and residual qualitative probability score and current and residual qualitative impact scores in order to provide this enhanced clarity of the Current and Residual Risk Scores. In addition, the key impact or impacts that are driving the risk score are highlighted in bold in order to provide further clarity.

Risk Categorisation

As stated in the narrative above, the information within Section 2.7 relates only to key items impacting on the SRO Solution (and specific Options), as per the assessment criteria detailed. As explained at Gate 1, the risk identification process has been designed to be suitably robust to support the agreed scope of risk management as defined in the WfLH Programme Risk Management Strategy. This scope is defined as “those items that have the potential to impact on the successful delivery of their respective benefits and objectives, across all SRO relevant aspects of the WfLH Programme lifecycle from concept to operation, and throughout the SRO relevant extent of the defined WfLH Programme Structure”.

In order to constantly review the robustness of this identification process to ensure full coverage of the information captured, assessed and managed, each assumption or risk is assigned an appropriate SW category depending on whether the risk sits at the Programme level (Table 74) or Project level (Table 75). In addition, these SW categories have been mapped to the RAPID categories used in the Quarterly Dashboards to ensure alignment and consistency for both reporting internally and externally.

Table 74 - Programme Assumption & Risk Categories

WfLH Programme Category	RAPID Category
Programme Scope, Requirements & Benefits	Other
People & Resourcing	Stakeholder
Engineering & Technical	Water Quality
Reputation & Public Perception	Stakeholders
Regulatory	Stakeholders
Budgetary & Financial	Budget
Planning & Consents	Planning
Legal	Planning
Operational	Stakeholder
Schedule	Timetable
Commercial & Supply Chain	Stakeholders

Table 75 - Project Assumption & Risk Categories

WfLH Project Category	RAPID Category
Access	Land
Asset Condition	Stakeholders
Contractor Performance	Stakeholders
Design Development	Other

WfLH Project Category	RAPID Category
Estimating	Budget
Ground & Environmental Conditions	Environment
Handover to Operations	Stakeholder
Procurement	Stakeholders
Scope & Requirements	Other
Stakeholders & Approvals	Stakeholders
Testing & Commissioning	Other

Ongoing analysis of these categories is then undertaken to provide confidence that all types of assumptions and risk have been considered, and that specific types of assumptions and risks are not being overlooked. This has helped to ensure that items relating to cost, benefits, project activities (e.g. environmental, engineering, process design, etc.), dependencies, regulatory barriers, and the long-term operation of the asset have, as a minimum, all been considered, and will continue to be considered, throughout the identification process.

In addition, these SW categories have been mapped to the RAPID categories used in the Quarterly Dashboard process to ensure alignment and consistency.

Therefore assumptions, risks and issues may well be referenced throughout other sections of this CDR. However, given the explanation of the criteria used for enabling the inclusion of any key assumptions, key risks and key issues within Section 2.3.7.3, these items listed elsewhere in this CDR may not be repeated in Section 2.3.7.3 and therefore may not appear to show appropriate alignment. However, alignment checks have been undertaken and assessment of each of those items has been undertaken. Where those items have been assessed and meet the criteria detailed in the narrative above, alignment will exist with Section 2.3.7.3. Where those items do not meet the selection criteria, those items will only be listed in their respective technical section.

Sections where assumptions, risk and issues information can be found elsewhere within this Conceptual Design Report include:

Section 2.2 Engineering Design: Section 2.2.3.11 & Section 2.2.3.12

Section 2.3 Network Infrastructure: Section 2.3.23

Section 2.6 Planning and Consenting: Section 2.6.9

Section 2.9 Schedule: Section 2.1.1

RAPID Quarterly Dashboard Alignment

The key risk and issues contained within Section 2.7.3 are fully aligned to those contained within the latest RAPID Quarterly Dashboard.

2.7.3. Key Assumptions, Key Risks and Key Issues

Table 76 - Havant Thicket Key Assumptions

Assumption ID	Assumption Description	Stability	Sensitivity	Validation / Mitigation Strategy	RAG Status
WfLH-A0054	It is assumed that the quality of the FE at BF will not deteriorate between now and the construction of the WRP in order that our treatment assumptions remain valid.	C	B	Validation: BF is, at all times, required to meet the discharge permit quality. Failure to do this will result in a £3.5 m fine. SW has therefore based its design on the permit quality. Ensure that this has factored in the concerns over trade effluent increases. Further information has now come to light that there are issues with the turbidity at BF and [redacted] These will lead to issues with FE quality. Mitigation: Continued measurement of the FE under the current sampling programme to confirm that any variations are still within the assumed levels. Additional design has now been undertaken to increase the NFU for turbidity spikes. However, further assets ([redacted] may be required to mitigate.	G

Assumption ID	Assumption Description	Stability	Sensitivity	Validation / Mitigation Strategy	RAG Status
WfLH-A0024	It has been assumed that there is sufficient market appetite for the DPC process to be utilised whilst still delivering on the Section 20 agreement obligations, including timescales.	B	D	Validation: Current concerns over the varying complexity of Options being taken through the early Gate stages, and the impact this will have on the market. In addition, there are concerns over the current tight timescales for delivery, and the impact this will have on appetite to respond. The procurement process is currently one of the key drivers to successfully delivering the strategic solution in accordance with the Section 20 agreement obligations, including timescales. [redacted] has taken place to obtain information on the current market appetite and to capture key concerns in order that these can be resolved in advance of the formal tender process. Mitigation: Ensure that evaluation criteria are suitably selected to not discourage potential bidders. Look at benchmarking / lessons learned of other major national projects in order to understand the level of information that will be expected to be available for potential bidders to be interested in the Project. [redacted] in order that interest is maintained and SW is aware of concerns. Set clear expectations with potential bidders around the management of bid costs.	G
WfLH-A0015	It is assumed that there will be sufficient space for all the raw water connections required at Otterbourne in order to deliver the Preferred Strategy. Connections include Water Recycling, Andover to Otterbourne, HT transfer, etc.	B	C	Validation: [redacted] to understand the scope they have been tasked to deliver, and the dates by which it is required. In addition, dates by which any impacts from WfLH Programme are known in order that timely decisions are made. Mitigation: [redacted] to understand progress and discuss the impacts of any further WfLH Programme requirements as they are confirmed.	A

Assumption ID	Assumption Description	Stability	Sensitivity	Validation / Mitigation Strategy	RAG Status
WfLH-A0084	It is assumed that a 2nd main is not required to be included within the design at critical crossings for resilience purposes.	B	C	Validation: The SW standard is to install a 2nd main at critical crossings. However, [redacted] and owing to precedent on other works, plus that fact that all assets will be sleeved at critical crossings, it has been agreed that this is not required. Installation of a 2nd main at critical crossings would result in a significant cost increase owing to additional materials. Mitigation: [redacted]	G

Table 77 - Havant Thicket Solution Key Threats

Risk ID	Description	SW RBS	RAPID Category	Start Date & Activity ID	Expiry Date & Activity ID	Probability	Impact	Score	Mitigation Strategy	Probability	Impact	Score
Prog-R56	Owing to a number of currently identified risk events, there is a risk that delivery of the chosen SRO is not achieved in accordance with the obligations under the Section 20 agreement, including timescales,, leading to potential legal enforcement and significant reputational damage. Drivers include environmental survey timescales, durations associated with the DCO application preparation and determination, stakeholder consultation timescales, and timescales around the DPC procurement strategy.	Schedule	Timetable	31/3/27 RYWR.KEY.00010	9/1/30 RYWR.KEY.00040	5	**Reputation: 5** Op. Service: 4	25	Utilising the recently developed schedules, continue to provide progress updates to understand the current position against the baseline, and focus opportunity exploration and schedule mitigation on the critical path activities. Continue to keep the regulator informed through formal governance routes of any updates to the latest forecast dates of the SRO and seek to vary S20 as required. Develop and obtain all necessary approval for the implementation of mitigation schemes as part of the Programme Level Mitigation Project to enable provision of water for the period of time between 2027 and the SRO becoming operational.	4	**Reputation: 5** Op. Service: 4	24

Risk ID	Description	SW RBS	RAPID Category	Start Date & Activity ID	Expiry Date & Activity ID	Probability	Impact	Score	Mitigation Strategy	Probability	Impact	Score
710064-030	Owing to the number of pipe route Options currently still being pursued and the legal / planning implications of removing these route Options without correct process, there is a risk that the Project is required to continue to pursue these Options for a greater duration than assumed with the current level of resource, resulting in a lack of suitable resource to undertake the necessary activities, a subsequent impact on the quality of required deliverables, and the potential for delay.	Contractor Performance	Timetable	1/4/21	10/8/23 RYWR.CON.06090	3	**Time: 4 Reputation: 4 Quality: 4 Op. Service: 4**	19	Confirm with the legal team and DCO team that the down selection methodology will be suitable to achieve 1 route corridor with Options. Utilise the schedule to track the progress of the down selection process to ensure resource requirements do not change.	2	**Time: 4 Reputation: 4 Quality: 4 Op. Service: 4**	14
710064-048	Owing to a number of global factors including shipping costs, import tariffs, the coronavirus pandemic, and other supply / demand volatility, projections are indicating significant increases in costs associated with Steel and Timber. Therefore, there is a risk that the costs associated with these items are significantly higher than assumed within the cost estimate rates, leading to an increase in the cost of the Non-Infrastructure element of the cost estimate (cost increases around pipe materials previously accounted for).	Estimating	Budget	29/3/23 RYWR.DGN.00830	9/9/25 RYWR.PRO.00190	5	**Cost: 5**	25	Continue to monitor material volatility as the estimate is revised throughout the lifecycle. Adjust the base estimate and risk profile accordingly as further information is received. Ensure that contractors, as part of the design process, have started to look at scalability testing and raw water / treated water profiles to determine the most appropriate pipe to use, as this may be informed by cost Explore alternative procurement approaches to procure materials in advance of contract award and free issue to mitigate against rising costs.	4	**Cost: 5**	24

Risk ID	Description	SW RBS	RAPID Category	Start Date & Activity ID	Expiry Date & Activity ID	Probability	Impact	Score	Mitigation Strategy	Probability	Impact	Score
Prog-R96	Owing to B.4 involving agreement and collaboration with an external party (PW), there is a risk that a Collaborative Strategy and Agreement on the delivery approach is not secured, leading to B.4 not being able to be delivered.	Programme Scope, Requirements & Benefits	Other	8/3/22 RYWR. KEY.00 120	20/2/23 RYWR. KEY.00 140	4	**Time: 5** Reputation: 4 Quality: 4 Op. Service: 4	24	Continue to develop B.4 at pace and work towards an agreed approach regarding collaboration. Regulator assistance will possibly be required to manage the relationship and process. Utilise RAPID engagement to assist in developing a mutually agreeable solution for both PW and SW.	3	**Time: 5** Reputation :4 Quality: 4 Op. Service: 4	22
710064-140	There is a risk that the funding required to undertake construction of the SW recycled water assets that interface with the HT reservoir is not in order to allow early alignment of the SW and PW construction schedules, leading to significant delay, increased cost and reputational damage in the event of retrofitting the assets into the operational reservoir.	Estimating	Budget	31/3/22 RYWR. KEY.01 050	30/9/26 RYWR. KEY.01 100	4	Cost: 4 **Time: 5** Reputation: 4 Op. Service: 4	24	Complete the alignment review in order to better define the scope which needs to be accelerated in order to mitigate against the risk. Undertake cost estimating to understand the magnitude and range of funding required in order to deliver any selected works outside of the currently proposed procurement route. Utilise RAPID engagement to assist in developing a mutually agreeable solution for both PW and SW.	3	Cost: 4 **Time: 5** Reputation: 4 Op. Service: 4	22

Risk ID	Description	SW RBS	RAPID Category	Start Date & Activity ID	Expiry Date & Activity ID	Probability	Impact	Score	Mitigation Strategy	Probability	Impact	Score
710064-141	At present, the assumption within the SW delivery schedule is that SW will undertake construction within the HT reservoir whilst the filling programme is ongoing. There is a risk that this parallel working is not achievable leading to a significant delay to the HT filling programme (if acceptable) leading to a delay to the operation of the reservoir to provide SW with water to Otterbourne.	Stakeholders & Approvals	Stakeholders	30/9/26 RYWR.KEY.01100	2/7/29 RYWR.KEY.01110	4	**Time: 5:** Reputation: 4 Op. Service: 4	24	Complete the alignment review in order to better define the scope which needs to be accelerated in order to mitigate against the risk. Utilise the early fill deliverables in order to reduce the filling period timescales and therefore mitigate any delay to the fill completion date. Utilise RAPID engagement to assist in developing a mutually agreeable solution for both PW and SW.	3	**Reputation: 4**	19
710064-146	Owing to the commercial agreements that are required in order for the Havant Thicket SRO to successfully interface with the HTR, there is a risk that the decision making and approval process negatively impacts on the delivery schedules of both organisations, leading to delays in the delivery and therefore operation of the reservoir and SRO Option.	Stakeholders & Approvals	Stakeholders	6/12/21 RYWR.KEY.00110	30/9/26 RYWR.KEY.01100	4	**Time: 5:** Reputation: 4	24	Develop a list of all key agreements that are required to enable the Option to work. Utilise the delivery schedules to understand the dates by when approvals are required in order to prevent delay. Develop a suitable governance process to ensure that decisions and approvals can be made in timely manner and feed into the schedule to track progress.	2	**Time: 5** Reputation: 4	18

Risk ID	Description	SW RBS	RAPID Category	Start Date & Activity ID	Expiry Date & Activity ID	Probability	Impact	Score	Mitigation Strategy	Probability	Impact	Score
710064-051	Risk that the lengths and techniques assumed in the base design in relation to the A3(M) crossing are incorrect, resulting in a change in methodology and increased costs.	Design Development	Other	6/12/21 RYWR.KEY.00110	29/3/23 HTRW.DGN.00830	3	**Cost: 5**	22	Undertake a feasibility study on this route and the alternative Options, including examination of further utility information and discussions with local highways teams. In conjunction with the Planning & Consents team, prepare an appropriate methodology to enable the route to be correctly defined. This must ensure that all relevant topics are reviewed. Use [redacted] to gather more information along route. Look at topics such as traffic, air quality, etc. to help determine the most appropriate route. Focus discussions with the key stakeholders (local authority) impacted by the route to enable input into the design to potentially refine the technique that SW is proposing.	3	**Cost: 5**	22

Risk ID	Description	SW RBS	RAPID Category	Start Date & Activity ID	Expiry Date & Activity ID	Probability	Impact	Score	Mitigation Strategy	Probability	Impact	Score
710064-136	There is a risk that key stakeholders closely related to Havant Thicket classic (public, regulators, local authorities, etc.) may be negatively influenced by their perception of Option B.4, causing delays or negative impacts to the delivery of the Havant thicket Reservoir and / or associated supporting infrastructure components an negative reputational impact to SW and PW.	Stakeholders & Approvals	Stakeholders	6/12/21 RYWR.KEY.00110	30/9/26 RYWR.KEY.01100	3	**Time: 5:** Reputation: 4 Op. Service: 4	22	Ensure that a close relationship is maintained between PW and SW communications teams so that we have dynamic feedback loop around messaging received at relevant stakeholder groups (ongoing). Take a proactive stance with key stakeholder groups to ensure that they are formally informed around any developments (ongoing). Ensure that there is a collaborative strategy to the release of key information into the public domain to prevent mixed messaging.	2	**Time: 5:** Reputation: 4 Op. Service: 4	18
Prog-R92	Owing to the complexities involved in the design, planning approval and construction of the HTR, there is a risk that the HTR transfer is not operationally accessible to SW to a suitable level in accordance with the currently assumed PW timescales, leading to a delay to the operation of this scheme or the 21Ml/d Havant Thicket transfer (outside of the SRO projects).	Stakeholders & Approvals	Timetable	31/3/27 RYWR.KEY.00010	9/1/30 RYWR.KEY.00040	3	**Time: 5:** Reputation: 4 Op. Service: 4	22	Ensure that the Step in Rights are ready to be enacted in the event that they are required (correct conditions are met) to prevent delay in decision making. Monitor feedback from the Joint Planning & Assurance group to influence risk profile (ongoing). Prepare range of fall-back plans in the event that the Strategic Solution is not operational by the Section 20 date. Conclude the PW / SW Project alignment process in order to reduce the interface risk profile.	2	**Time: 5:** Reputation: 4 Op. Service: 4	18

Risk ID	Description	SW RBS	RAPID Category	Start Date & Activity ID	Expiry Date & Activity ID	Probability	Impact	Score	Mitigation Strategy	Probability	Impact	Score
710064-046	Owing to the significant number of unknowns in relation to the any mitigated habitat requirements, there is a risk that the level of the mitigations assumed to be required from the HRA / SEA is not sufficient, resulting in increased costs and potential delays depending on the habitat required.	Stakeholders & Approvals	Environment	30/1/21	6/1/25 RYWR.CON.06230	4	**Cost: 4** Time: 3 Reputation: 3 Quality: 3	21	Continue to develop HRA Assessments with a specialist consultant to understand the extent to which habitat mitigation will be required and factor into cost estimate.	3	**Cost: 4** Time: 3 Reputation: 3 Quality: 3	19

Risk ID	Description	SW RBS	RAPID Category	Start Date & Activity ID	Expiry Date & Activity ID	Probability	Impact	Score	Mitigation Strategy	Probability	Impact	Score
710064-050	Owing to environmental and spatial constraints adjacent to environmental crossings, there is a risk that significant amendments are required to the location and extent of the reception and launch pits, leading to additional requirements and increased costs.	Ground & Environmental Conditions	Environment	8/3/22 RYWR.KEY.00120	10/8/23 RYWR.CON.06090	5	**Cost: 3**	20	Continue the feasibility analysis and other considerations of the potential pipeline routes, as detailed in the Site Selection section of this report, including examination of further utility information and discussions with local highways teams. In conjunction with the Planning & Consents team, prepare an appropriate methodology to enable the route to be correctly defined. This must ensure that all relevant topics are reviewed. Use [redacted] to gather more information along route. Look at topics such as traffic, air quality, etc. to help determine the most appropriate route. Focus discussions with the key stakeholders (local authority) impacted by the route to enable input into the design to potentially refine the technique that we are proposing. Utilise the environmental crossing report that [redacted] have completed for Gate 2 (technical document) to inform design.	5	**Cost: 3**	20

Risk ID	Description	SW RBS	RAPID Category	Start Date & Activity ID	Expiry Date & Activity ID	Probability	Impact	Score	Mitigation Strategy	Probability	Impact	Score
710064-145	Owing to the WRSE outputs being released in January 2022 and WRMP drafts in August 2022, there is a risk that the B4 Option proposed at Gate 2 requires significant amendment at Gate 3,, leading to impact on the cost estimate, the delivery schedule as well as reputational damage following further change.	Scope & Requirements	Other	6/12/21 RYWR. KEY.00 110	18/11/22 RYWR. KEY00 130	3	**Cost: 5** Time: 4 Reputation: 3	19	Utilise the WRSE draft outputs to feed into the Future Needs and Options Evolution works to pre-empt WRSE final results. Continue to develop the design of the Preferred Option, as per the Activity Plan to Gate 3, which includes considerations regarding the Ensure that Future Needs and Option Evolution works, completed prior to Gate 3 are completed for Gate 2 to communicate potential future changes in design	2	**Cost: 5** Time: 4 Reputation : 3	14

Risk ID	Description	SW RBS	RAPID Category	Start Date & Activity ID	Expiry Date & Activity ID	Probability	Impact	Score	Mitigation Strategy	Probability	Impact	Score
Prog-R98	Owing to the Selected Option at Gate 2 being shift away from the 'Base Case' included within WRMP19 (desalination at Fawley), in order to support our future planning application, this needs to be reflected in an update of WRMP19 and consultation on our Selected Option is also required. It has been agreed with Defra and the EA that WRMP19 will be updated to reflect our Selected Option through the annual review process, and consultation on the Selected Option will take place via WRMP24. However, Defra has informed SW that it will issue a direction shortly (Dec '21/Jan '22) that will require SW to produce its WRMP24 submission to an expedited timeline (June '22, as compared with standard submission of August '22). Owing to this expedited WRMP24 timeline, there is a risk that the quality of the information provided in WRMP24 will be unsatisfactory, leading to the potential for public inquiry into our plan, and delay to scheduling and delivery of our scheme.	Regulatory	Stakeholders	1/6/22	7/9/23 RYWR.CON.06140	4	Cost: 1 **Schedule: 5** Reputation: 4 Op. Service: 3	24	Communicate with the EA expressing SW concerns over the expedited WRMP24 timeline and the impact that this may have on submission quality. Seek support from the EA in the form of additional resource in order to assist in the preparation of WRMP24.	3	Cost: 1 **Schedule:** 5 Reputation: 3 Op. Service: 3	22

Risk ID	Description	SW RBS	RAPID Category	Start Date & Activity ID	Expiry Date & Activity ID	Probability	Impact	Score	Mitigation Strategy	Probability	Impact	Score
Prog-R99	Owing to the Selected Option at Gate 2 being shift away from the 'Base Case' included within WRMP19 (desalination at Fawley), in order to support our future planning application, this needs to be reflected in an update of WRMP19 and consultation on our Selected Option is also required. It has been agreed with Defra and the EA that WRMP19 will be updated to reflect our Selected Option through the annual review process, and consultation on the Selected Option will take place via WRMP24. However, Defra has informed SW that it will issue a direction shortly (Dec '21/Jan '22) that will require SW to produce its WRMP24 submission to an expedited timeline (June '22, as compared with standard submission of August '22). Owing to this expedited WRMP24 timeline, there is a risk that the information provided in the WRMP24 consultation will be misaligned with that being produced as part of the WRSE modelling and regional planning process, leading to delays to the regional plan which could undermine our application for planning consent, the potential for public inquiry into our plan, and delay to scheduling and delivery of our scheme.	Regulatory	Stakeholders	1/6/22	7/9/23 RYWR.CON.06140	4	Cost: 1 Schedule: 5 Reputation: 4 Op. Service: 3	24	Communicate with the EA expressing SW concerns over the expedited WRMP24 timeline and the impact that this may have on SW ability to align WRMP24 with the final outputs of the WRSE modelling and regional planning process. SW to work with WRSE in order to find opportunities to reduce the risk of misalignment (e.g. WRMP24 to utilise draft outputs from the WRSE).	3	Cost: 1 Schedule: 5 Reputation: 3 Op. Service: 3	22

Table 78 - Havant Thicket Key Opportunities

Risk ID	Description	SW RBS	RAPID Category	Start Date	Expiry Date	Probability	Impact	Score	Realisation Strategy	Probability	Impact	Score
710064-041	The HLPS location to the West of the reservoir currently requires a 30 m shaft to be constructed owing to the topography. However, there is an opportunity to move this HLPS to PW land at [redacted] removing the need for the 30 m shaft at this new location, resulting in construction cost savings, efficiency in the construction programme and a reduced risk profile in terms of ecological permissions.	Scope & Requirements	Other	6/12/21 RYWR.KEY.00110	29/3/23 HTRW.DGN.00830	3	**Cost: 5 Time: 5** Reputation: 4	22	Understand the timescales by which a resolution of this item is required through review of collaborative schedule with PW and project alignment review. Regular updates of design to be shared with PW with specific deep dives arranged as needed.	3	**Cost: 5 Time: 5** Reputation: 4	22
710064-144	Owing to the filling of the HTR being weather dependent, there is an opportunity that the timescales associated with the current filling programme (3 years) are shorter than assumed, leading to Havant Thicket Reservoir being filled and wet commissioned ahead of schedule, allowing an earlier operation of the reservoir, and therefore the SRO.	Testing & Commissioning	Other	30/9/26 RYWR.KEY.01100	2/7/29 RYWR.KEY.01110	2	**Time: 5**	18	Explore all Options to maximise flow rate to ensure filling period is reduced compared to current schedule. Develop the SRO delivery schedule to maximise opportunities in order that the schedule can be improved suitably to take advantage of reductions in the filling timescales.	2	**Time: 5**	18
710064-052	Owing to ongoing refinement to the design as more hydraulic information is known, there is an opportunity that the BPTs can be removed from the design, leading to cost saving compared to that assumed in the base estimate.	Scope & Requirements	Other	6/12/21 RYWR.KEY.00110	29/3/23 RYWR.DGN.00830	2	**Cost: 1**	2	Undertake further hydraulic analysis on the routes as part of the advancing design maturity.	2	**Cost: 1**	2

Risk ID	Description	SW RBS	RAPID Category	Start Date	Expiry Date	Probability	Impact	Score	Realisation Strategy	Probability	Impact	Score
710064-053	There is an opportunity to utilise the existing underpass structure under the South West Mainline, thus removing the need to undertake micro tunnelling and therefore leading to a cost saving compared to that assumed in the base estimate.	Design Development	Other	6/12/21 RYWR.KEY.00110	29/3/23 RYWR.DGN.00830	2	**Cost: 1**	2	Undertake a feasibility study on this route and the alternative Options, including examination of further utility information and discussions with local highways teams. In conjunction with the Planning & Consents team, prepare an appropriate methodology to enable the route to be correctly defined. This must ensure that all relevant topics are reviewed. Use [redacted] to gather more information along route. Look at topics such as traffic, air quality, etc. to help determine the most appropriate route. Focus discussions with the key stakeholders (local authority) impacted by the route to enable input into the design to potentially refine the technique that SW is proposing.	2	**Cost: 1**	2

Table 79 - Havant Thicket Key Issues

Issue ID	Issue Description	RAPID Category	Issue Priority	Issue Impact	Mitigation Strategy
WfLH-Iss-016	The HTR is required to be completed and operational in order to act as a source of water for the HT Raw Water scheme. However, the current timescales in relation to the delivery and operation of the HTR mean that this scheme, whilst meeting the WRMP need in relation to the Strategic Solution deficit, will not be able to meet the need in relation to SW's legal obligation in relation to the Section 20 milestone date in 2027.	Timetable	Medium	Critical	Work with PW on an early filling programme. Present to RAPID the timescales in relation to delivery of this scheme and the implications this may have on sustainability reductions beyond 2027 prior to the HT Raw Water scheme being operational.

Option B.4

Key assumptions to Option B.4 are as those listed above, common across both Havant Thicket-based Options, plus the following.

Table 80 - Option B.4 Key Assumptions

Assumption ID	Assumption Description	Stability	Sensitivity	Validation / Mitigation Strategy	RAG Status
WfLH-A0054	It is assumed that the quality of the FE at BF will not deteriorate between now and the construction of the WRP in order that our treatment assumptions remain valid.	C	B	Validation: BF is, at all times, required to meet the discharge permit quality. Failure to do this will result in a £3.5 m fine. SW has based the design on ensuring that the permit conditions can be met. Ensure that design has factored in the concerns related to anticipated trade effluent increases over time. Further information has now come to light that there are issues with the turbidity at BF and [redacted] These will lead to issues with FE quality, which needs to be considered in future stages of the design process. Mitigation: Continued measurement of the FE under the current sampling programme to confirm that any variations are still within the assumed levels. Additional design has now been undertaken to increase the number of filtration units for turbidity spikes. However, further assets [redacted] may be required to mitigate.	G

Key threats to Option B.4 are as those listed above, common across both Havant Thicket-based Options, plus the following.

Table 81 - Option B.4 Key Threats

Risk ID	Description	SW RBS	RAPID Category	Start Date	Expiry Date	Probability	Impact	Score	Mitigation Strategy	Probability	Impact	Score
Prog-R96	Owing to B.4 involving agreement and collaboration with an external party (PW), there is a risk that a Collaborative Strategy and Agreement on the delivery approach is not secured, leading to the B.4 not being able to be delivered.	Programme Scope, Requirements & Benefits	Other	8/3/22 RYWR.KEY.00120	20/2/23 RYWR.KEY.00140	4	**Time: 5** Reputation: 4 Quality: 4 Op. Service: 4	24	Continue to develop B.4 at pace and work towards an agreed approach regarding collaboration. Regulator assistance will possibly be required to manage the relationship and process. Utilise RAPID engagement to assist in developing a mutually agreeable solution for both PW and SW.	3	**Time: 5** Reputation: 4 Quality: 4 Op. Service: 4	22
710064-140	There is a risk that the funding required to undertake construction of the SW recycled water assets that interface with the HT reservoir is not in order to allow early alignment of the SW and PW construction schedules, leading to significant delay, increased cost and reputational damage in the event of retrofitting the assets into the operational reservoir.	Estimating	Budget	31/3/22 RYWR.KEY.01050	30/9/26 RYWR.KEY.01100	4	Cost: 4 **Time: 5** Reputation: 4 Op. Service: 4	24	Complete the alignment review in order to better define the scope which needs to be accelerated in order to mitigate against the risk. Undertake cost estimating to understand the magnitude and range of funding required in order to deliver any selected works outside of the currently proposed procurement route. Utilise RAPID engagement to assist in developing a mutually agreeable solution for both PW and SW.	3	Cost: 4 **Time: 5** Reputation: 4 Op. Service: 4	22

Risk ID	Description	SW RBS	RAPID Category	Start Date	Expiry Date	Probability	Impact	Score	Mitigation Strategy	Probability	Impact	Score
710064-136	There is a risk that key stakeholders closely related to Havant Thicket classic (public, regulators, local authorities, etc.) may be negatively influenced by their perception of Option B4, causing delays or negative impacts to the delivery of the Havant thicket Reservoir and / or associated supporting infrastructure components, causing an negative reputational impact to SW and PW.	Stakeholders & Approvals	Stakeholders	6/12/21 RYWR.KEY.00110	30/9/26 RYWR.KEY.01100	3	**Time: 5:** Reputation: 4 Op. Service: 4	22	Ensure that a close relationship is maintained between PW and SW communications teams so that we have dynamic feedback loop around messaging received at relevant stakeholder groups (ongoing). Take a proactive stance with key stakeholder groups to ensure that they are formally informed around any developments (ongoing). Ensure that there is a collaborative strategy to the release of key information into the public domain to prevent mixed messaging.			
710060-001	Owing to the Pilot being a complex and time critical process, and in light of the extraordinary circumstances around COVID-19, there is a risk that there is insufficient data generated to support further assessments in relation to water recycling, which could lead to delays in finalising a suitable design.	Contractor Performance	Water Quality	30/1/20	29/3/23 RYWR.DGN.00830	5	Reputation: 3 **Quality: 4**	24	Obtain agreement with [redacted] over NDA and the ability to examine their data for comparison with our own. Ongoing monitoring of the [redacted] operation to understand any data gaps that may occur. Ensure that investigation is undertaken into reasons for [redacted] being offline in order that any corrective measures can be incorporated as part of the [redacted] trial. Communicate with the DWI to discuss the current data gaps and SW proposals for utilising the [redacted] to develop future mitigations.	4	Reputation: 3 **Quality: 4**	22

Risk ID	Description	SW RBS	RAPID Category	Start Date	Expiry Date	Probability	Impact	Score	Mitigation Strategy	Probability	Impact	Score
710064-058	Owing to the relatively novel technique of Water Recycling and the fact that this water will be placed in a reservoir previously fed by a natural source, there is a risk that public perception is negatively skewed against Water Recycling, leading to delays to during the planning process as the DWI expects public concerns are addressed, as well as reputational impact on PW and SW. (Perception driven by source, odour, hygiene, etc.).	Stakeholders & Approvals	Water Quality	6/12/21 RYWR.KEY.00110	8/7/24 RYWR.CON.06180	5	**Time: 4 Reputation: 4 Quality: 4** Op. Service: 3	24	Create joint [redacted] and continue to undertake purposeful customer consultation to build an informed picture of current perception, including focus on wastewater treatment Details to include CAG, YPM, Surveys, Analysis, etc. Complete the [redacted] to assist in changing perception as required. Undertake necessary activities and obtain necessary approvals / funding in order to relocate the [redacted] from [redacted] in order to provide an end to end stakeholder experience for recycled water. Utilise the regulators to assist in promoting a consistent, collaborative message around the use of recycled water.	4	**Time: 4 Reputation: 4 Quality: 4** Op. Service: 3	22

Table 82 - Option B.4 Key Opportunities

Risk ID	Description	SW RBS	RAPID Category	Start Date	Expiry Date	Probability	Impact	Score	Realisation Strategy	Probability	Impact	Score
710064-021	Owing to the fact that both PW and SW are required to run pipe routes to the HTR and these are currently separate, there is the opportunity to combine these into a single tunnelled route, resulting in SW reducing their planning requirements, their costs and therefore improving the delivery programme through an overall reduction in the risk profile (PW would also see a cost reduction related to the pipe route).	Scope & Requirements	Other	6/12/21 RYWR.KEY.00110	29/3/23 RYWR.DGN.00830	2	**Cost: 5** Time: Reputation: 3 Op. Service: 3	19	Utilise the joint working group sessions to keep PW informed of progress. SW to complete the down selection process for Options as efficiently as possible. Regular updates of design to be shared with PW with specific deep dives arranged as needed. Complete the joint alignment review to understand those elements of interfacing scope that should be pursued.	3	**Cost: 5** Time: 4 Reputation: 3 Op. Service: 3	22
710064-024	Previously SW was informed that it could not use the existing inlet owing to concerns of mixing spring and reservoir water. There is now an opportunity that a case can now be presented in order to utilise this previous Option, leading to efficiency in design of the inlet structure, and a reduction in construction costs.	Scope & Requirements	Other	6/12/21 RYWR.KEY.00110	29/3/23 HTRW.DGN.00830	3	Cost: 1 **Time: 3** **Reputation: 3** **Quality: 3**	13	Utilise the joint working group sessions to keep PW informed of progress. SW to complete the down selection process for Options as efficiently as possible. Regular updates of design to be shared with PW with specific deep dives arranged as needed. Complete the joint alignment review to understand those elements of interfacing scope that should be pursued.	4	Cost: 1 **Time: 3** **Reputation: 3** **Quality: 3**	17

Option D.2

There are currently no specific threats identified for Option D.2 that have not already been included within Table 77 (HT Solution) and Table 81 (Option B.4).

There are currently no specific opportunities identified for Option D.2 that have not already been included within Table 78 (HT Solution) and Table 82 (Option B.4).

2.8. Stakeholder and Customer

2.8.1. Engagement Overview

This section outlines SW's engagement activities between Gate 1 and Gate 2 in relation to the Havant Thicket options and sets out SW's plans for future engagement. As Option A.1 was the Base Case set out in WRMP19, engagement during this period has been more heavily focused towards that Option; however, SW has continued to engage with stakeholders and customers on all the solutions taken forward past Gate 1: desalination, water recycling and water transfer.

<table>
<tr><th>Customers</th><th>Stakeholders</th><th>Regulators</th><th>Planning Consultees</th></tr>
<tr><td colspan="4">Non-statutory consultation</td></tr>
<tr><td>Customer Action Group</td><td>WfLH Stakeholder Group meetings</td><td>1-1 briefings and discussions</td><td>Briefing and engagement with Local planning authorities</td></tr>
<tr><td>Ongoing Customer Insight</td><td rowspan="2">1-1 briefings and discussions</td><td>Senior Stakeholder Group meetings</td><td>Briefing and engagement with statutory bodies</td></tr>
<tr><td>Industry-wide engagement</td><td>Practitioner Workshops</td><td>Communications with communities for the Base Case</td></tr>
</table>

SW's engagement plan predominantly focuses on the investigations into the water resources infrastructure solutions that are being considered as part of RAPID's gated process. These are the desalination, water recycling, Havant Thicket solutions.

In respect of the Havant Thicket solutions (Options D.2 and B.4), SW is working with PW to develop joint communications and engagement on certain parts of developing the options. Due to the early stage of development that these options are at, this has focused on explaining the partnership between the two companies and on the need for, and the benefits of, a joined-up approach to developing strategic regional water resources.

Care has been taken to incorporate the other areas of water resource management work in Hampshire into SW's approach to engagement, such as tackling leakage and promoting water efficiency. Incorporating this overarching narrative into SW's messaging enables it to communicate its holistic approach to the water resources challenge in the county and its commitment to improving the resilience of water supplies and protecting the environment. It also reduces the likelihood of duplication of engagement.

Tailored and proactive engagement is key to overcoming stakeholder concerns and challenges. SW's customer and stakeholder insight for WfLH first focused on immersing SW with what it already knew from WRMP19, PR19 and global experts. It then built a deliberative programme that was designed through the use of its Participation Principles (Figure 1 of Annex 9, Customer and Stakeholder methodology) and aligned to best practice guidance by CCW [1].

Customer insight engagement has been undertaken across a range of different forums with targeted customer representation groups, enabling SW to understand preferences and views in relation to the Havant Thicket solutions as it develops the different options.

SW has held a non-statutory public consultation on the Base Case and to introduce the concept of back up alternatives to consultees and members of the public, including the Water Recycling Options.

Feedback from regulators, stakeholders, customers and general members of the public has been analysed and a feedback report has been published reporting on the key themes emerging from the consultation.

Engagement with regulatory stakeholders and other statutory body has been managed at both WfLH Programme level and at SRO project level. This reflects the dual basis in which some of these organisations are engaged in relation to the WfLH Programme and each SRO. Annex 9 Customer and Stakeholder Methodology contains a summary of engagement carried out with Customer groups and Stakeholders.

SW has engaged with stakeholders, including local groups, environmental groups and groups active in the water sector, on an ongoing basis between Gate 1 and Gate 2 (as detailed in section 3.3 of Annex 9, Customer and Stakeholder methodology).

2.8.2. Stakeholder Engagement – Summary of Activity for Havant Thicket Options (B.4 and D.2)

2.8.2.1. Joint Working with Portsmouth Water

SW has worked closely with PW to develop the joint submission for the proposed enhanced uses of the HTR (Option B.4 and Option D.2). Joint messaging has been developed to explain the interface between these options and Havant Thicket Reservoir, which is being developed separately to the SROs. Both SW and PW have joined each other's established stakeholder meetings to present on Options B.4 and Option D.2 and to join in discussions with stakeholders. PW colleagues also helped develop engagement materials for SW's non-statutory consultation and appeared in a short film uploaded to SW's consultation room which talked through the HT "classic" (the Havant Thicket Reservoir) and HT "enhanced" proposals (Options B.4 and D.2), as SW has taken to calling them internally.

SW is also engaging with PW on the likely consenting, delivery and operational interfaces between the Havant Thicket Reservoir and SW's Option B.4 and Option B.2. Should either of these Options be confirmed at Gate 2 as SW's Preferred Option, further engagement will be required with key stakeholders and consultees to ensure that these interfaces are effectively communicated and managed to facilitate the timely delivery of both schemes.

2.8.2.2. Regulatory Engagement

As explained in Section 3.3.1 of Annex 9, Customer and Stakeholder Methodology, SW has continued to engage regularly with regulators and other statutory bodies. Due to the early stage of the Programme and the fact that a wide range of Options were still being considered in between Gate 1 and Gate 2, there has been a focus on engaging with the statutory stakeholders at this stage.

SW's ongoing engagement with RAPID and regulators (Ofwat, Defra, EA, DWI, CCW) has continued since Gate 1 at various levels within the respective organisations. SW has met with RAPID more than 20 times since Gate 1, including at the monthly 'checkpoint' meetings, and held numerous workshops and individual meetings with the regulators and other statutory bodies. These sessions were used to share concepts, discuss ideas and to demonstrate and discuss the processes behind key decisions, such as Option Appraisal Process. The RAPID Checkpoint meetings were used to provide a regular update on progress, expenditure, key milestones and demonstrate alignment with PW and external bodies such as WRSE.

Ongoing and regular engagement has taken place with the EA, NE and the MMO, in their dual roles as both key statutory environmental bodies and regulators. The EA and NE in particular have been engaged on the scope and outputs of the various environmental reports that have been produced to assess the performance of the Options, as well as on the detail of the assessments.

Feedback from this engagement has informed the scope of environmental reports and judgements on the nature of the likely impacts of the Options, as well as providing confidence in the OAP methodology.

Southern Water has also briefed Historic England and all of the local authorities likely to be affected by the various Options on the methodology and results of the OAP.

Throughout Gate 2 there has been solution specific engagement with regulators and other statutory bodies who have a statutory role in the option development process. This has been undertaken on an ongoing basis and focuses on sharing and discussing key elements of the Gate 2 (and beyond) deliverables so that these stakeholders can be taken along on the journey with us. The details of this feedback can be found in the relevant technical sections of this annex.

1. Environmental – Section 2.5.2.2
2. Engineering and design – Section 2.2.11.1
3. Costs and efficiency of expenditure – Annex 6, Efficiency of Expenditure
4. Consultation – Section 2.4.2

An overview of engagement topics and outputs with our regular stakeholder groups is set out below:

Table 83 - Overview of engagement topics and discussion points with regular stakeholder groups

<table>
<tr><th>Name of stakeholder group

(attendees set out in Annex 9)</th><th>Frequency of meetings</th><th>Purpose</th><th>Scope of discussions</th></tr>
<tr><td>Senior Stakeholder Group</td><td>Regularly since March 2021</td><td>Monthly senior-level meeting to discuss progress on Programme.</td><td rowspan="3">Topics discussed include:
• Option Appraisal Process and methodology
• Programme milestones
• Regulatory milestone updates
• Scheme development
• Water Industry insights
• Customer insights

Non statutory consultation feedback</td></tr>
<tr><td>Practitioner Workshop</td><td>Monthly since May 2021</td><td>A monthly practitioner-level meeting to discuss progress on programme and key issues arising.</td></tr>
<tr><td>Water for Life – Hampshire Stakeholder Group</td><td>Twice a year since January 2019</td><td>Regular meeting to update on Section 20 progress and delivery of the wider programme.</td></tr>
</table>

2.8.2.3. Non-statutory Consultation Engagement and Outputs

largest stakeholder and consultee engagement event was the non-statutory consultation, which was as run as a virtual consultation from February 8 to April 16, 2021. More information on the process for the non-statutory consultation is set out at Section 3.4 of Annex 9, Customer and Stakeholder Methodology to the Gate 2 submission.

2.8.2.4. Information shared on Havant Thicket Options

Whilst the consultation was primarily on the Base Case, including the pipeline routes and inlet / outfall locations, it also introduced and provided a high level explanation of the back-up alternatives options. This included Option B.4, which was presented as a water recycling alternative, and Option D.2, which was presented as a water transfer alternative, as the Options that interface with Havant Thicket Reservoir.

For Option D.2, the consultation brochure explained that this option comprises an additional abstraction of water from the proposed Havant Thicket Reservoir, but that the reservoir would not be supplemented with recycled water. An underground pipeline of about 35km would transfer the water to Otterbourne Water Supply Works for treatment.

For Option B.4, the consultation brochure explained that the proposed water recycling plant would supplement the spring-fed water in the Havant Thicket Reservoir to maintain the water level to increase the amount available for supply. It also explained that an approximate 5km pipeline would be required to transfer recycled water into the reservoir and the need for a pipeline to transfer water from the reservoir to Otterbourne Water Supply Works, which is common to Option D.2. At the time of the non-statutory consultation, Option B.4 was being considered as a water recycling plant up to 61Ml/d transferred to Havant Thicket Reservoir; however, which has since been amended to a 15Ml/d water recycling plant.

It was explained that for both options the potential future use of Havant Thicket in connection to Options B.4 and D.2 is separate to PW's planning application, which had already been submitted at the time of the consultation, and that if these Options became the Preferred Option, it would be part of a separate scheme which changes the way that the reservoir is used so would undergo additional consultation, planning consent and environmental permits.

2.8.2.5. Response to the consultation Feedback Form on Havant Thicket options

A summary of the response to consultation is set out in the Consultation Feedback Report published on SW's website: https://www.southernwater.co.uk/our-story/water-for-life-hampshire/consultations. It is important to note that when considering the responses to the consultation, a total of 67% of respondents stated that they lived within the local area of the Programme, whilst 38% stated that they lived close to the proposed Base Case Option. As a result, we can expect the issues and preferences of those local to the Base Case to be better represented in the consultation feedback.

At the non-statutory consultation, Option B.4 was presented as a water recycling alternative and Option D.2 was presented as a water transfer alternative. The Feedback Form that was used at the consultation asked consultees questions on the water recycling and on the water transfer alternatives and so neither the questions nor the responses to the questions differentiate between the different options within those solution types. As a result, the responses to the consultation that were received relating to the water recycling element of Option B.4 have been summarised in Section 2.4.3 of Annex 2, Water Recycling technical. The responses to the consultation relating to Option D.2 and the water transfer element of Option B.4 are summarised below.

2.8.2.6. Individual responses to the consultation via the Feedback Form

A large proportion of respondents agreed that water transfer alternatives would be an acceptable alternative solution to the Base Case to address potential future water resource challenges in Hampshire, should it not be delivered, with a similar proportion responding, 'don't know' or 'neither agree nor disagree'. Of those who agreed, 64% are located in Fawley and the surrounding area to the Base Case location.

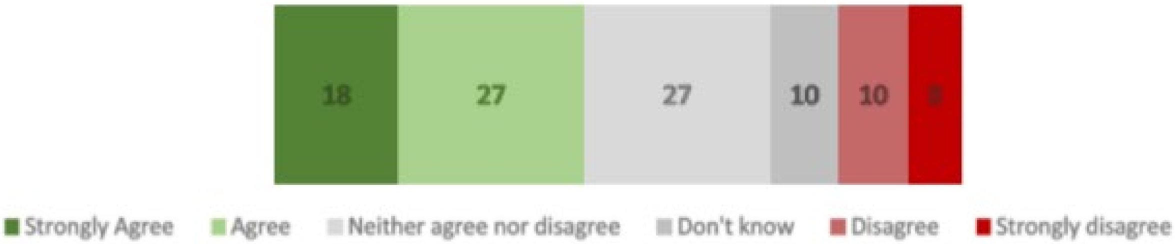


Figure 63 - Consultee response to “to what extent do you feel the water transfer alternatives would be an acceptable alternative solution should the Base Case not be delivered, to address potential future water resource challenges in Hampshire?”

The response to the question asking consultees to what extent they felt water recycling is an acceptable alternative solution should the Base Case note be delivered is summarised in Section 2.8.2.2 of Annex 2, Water Recycling technical report.

When asked to provide any comments to support their view on the acceptability of water transfer alternatives, the key issues raised in response related to the environment, including with regards to disruption to the environment, the local road network and the local community. Some respondents perceived that water transfer alternatives would have a lower environmental impact and presumed that they would be less costly than the Base Case however concerns were raised about whether they offered a long-term solution. However, it is important to note that the consultation materials did not include any assessment work to confirm that the water transfer alternatives have lower environmental impacts than the Base Case.

When asked to provide any comments in relation to the potential impacts of any of the water transfer alternatives, the key issues raised in response related to the environment, including with regards to disruption to the environment, the local road network and the local community. Some respondents perceived that water transfer alternatives would have a lower environmental impact and be less costly than the Base Case. However, it is important to note that the consultation materials did not include any assessment work to confirm that this is the case. Concerns were raised about whether water transfer alternatives offer a long-term solution.

2.8.2.7. Direct responses to consultation

As well as the responses to the consultation via the Feedback Form, some consultees (individuals and stakeholder organisations) responded with feedback via direct communication (letter and email). Due to the nature of the consultation, most responses primarily related to the Base Case; however, in some direct responses from individuals, concerns were raised around the scheme selection process undertaken to identify the Base Case as the Preferred Option. SW will share details of its recent OAP to select the new Preferred Option at its next consultation so that consultees can be informed on the process.

Responses were received from Local Planning Authorities in the Hampshire area. This included authorities close to the Base Case and the water recycling and Havant Thicket options. Consultation responses received from local planning authorities included both supportive comments and objections in principle to the Base Case. In general, the Local Planning Authorities requested that Southern Water work closely with them as the Water for Life - Hampshire programme progresses. Since the consultation, SW has been engaging with the Local Planning Authorities, including those relevant to the Havant Thicket Options, on an ongoing basis and will continue to do so as it enters the consenting process.

Some Local Planning Authority consultation responses stated a preference for the alternative solutions due to the likely negative environmental impacts created by the Base Case. This included concerns about the anticipated negative impact on biodiversity, climate change, landscape and water environments, along with the high energy usage required. Reference was made to the climate emergency and national and local targets for net zero. Alternative solutions included water recycling schemes and alternative locations for the desalination plant.

Consultation responses were also received from regulators and other statutory bodies who are engaged on the WfLH Programme, including the EA, Historic England and Natural England. This feedback primarily related to the Base Case, but the following feedback was provided in relation to water transfer and water recycling alternatives:

1. The EA in principle support SW in its investigations into all water recycling options (including Option B.4), other than Option B1 which was removed at Gate 1, and it emphasised the need to progress options assessment at pace so that the company can reduce reliance on drought orders. The EA would welcome more information on the alternative uses of the proposed Havant Thicket reservoir (Options D.2 and B.4), and to engage with SW in advance of Gate 2. The EA also welcomed the fact that both SW and PW were represented in the consultation as it demonstrated that some of the alternatives require close working between water companies.
2. Natural England requested more information on the comparison of impacts between the Base Case and the alternatives and the difference in the scale and likelihood of achieving mitigation of impacts between the Options. NE also commented that the difference in cost to customers of the different options is not fully clear.
3. Historic England raised a concern that some of the pipeline routes had not yet been fully assessed to understand the impacts on heritage assets

We have analysed and are having regard to consultation feedback and consider that it largely reflects the limited information that was shared on the water transfer and Water Recycling Options at the non-statutory consultation (February 2021) due to it being at the early stage of development. Since then, SW has completed its MCDA economic appraisal comparing the options, and it has also undertaken its site selection process and Consenting Evaluation, where the likely consenting and environmental impacts of each Option were considered against each other. Both the MCDA and Consenting Evaluation directly fed into the overall OAP and decision-making process to identify the Preferred Option. SW will continue to progress the pipeline route scheme development process after Gate 2, where impacts, such as those on heritage assets, will be further considered as part of the scheme development process for the Preferred Option.

As SW's progresses its Preferred Option past Gate 2 into the consenting process, there will be further consultations on the emerging proposals where consultees (including stakeholders, customers, regulators and landowners) will be invited to feedback on the scheme and route development process and eventually on the final proposal for the Preferred Option. This includes SW's engagement with PW in relation to the interface with the HTR where joint engagement plans are underway to inform the ongoing scheme development work for Gate 3 activities. Section 4 of Annex 9, Customer and Stakeholder Methodology provides further detail on Gate 3 engagement plans. SW will deliver the engagement that is relevant to the final option.

2.8.3. Customer Insight Engagement Findings

Following CCW best practice and SW Customer Participation Strategy SW's focus has been on high quality and meaningful engagement – with the objective to ensure it had the insight it needed for any of the potential resource options to succeed. For Gate 2 it engaged with more than 240 informed customers through deliberative approaches and more than 1,950 in quantitative surveys. This built on the insight from Gate 1 with more than 250 informed customers, 2,300 Households and 350 Businesses through joint work with WRSE and the thousands of interviews from WRMP19 (more than 5,000) and PR19 (more than 42,000).

Conducting targeted customer insight engagement and understanding the key issues and concerns that these customers identify is critical for helping us tailor our proactive engagement with the wider customer and consultee base on the Preferred Option (and the Back-up Option to the extent it is necessary) following

Gate 2. This section provides a summary of feedback from SW's insight projects run as part of Gate 2 for the WfLH and has been assured by the independent research team who led SW's Customer Action Group (CAG). For more detailed information on the methods, approaches and sample used to gather the insight, please see Annex 9, Stakeholder and Customer Engagement Methodology.

2.8.3.1. Initial Reactions to Water Transfers

SW's insight has shown that although initially appealing and intuitive, on reflection customers have a lot of questions about the mechanics of water transfers. Prior to engagement, customers from the insight engagement forums have low awareness of water transfers being a common source in the UK. They accept and expect it as part of the overall solution for Hampshire, although the mode of transfer dictates the level of support. There are concerns that transfers can shift the problem around the country, rather than addressing the root cause of a water deficit issue.

Customers who were engaged with expressed that transfers from HT hold strong appeal, feeling like a natural and sustainable option but also boosting local wildlife habitats, and recreation for residents. Options where key asset components are within closer proximity to each other gave reassurances over the expected degree of construction disruption and volume of pipework needed - a shorter distance means less cost and less disruption. Transfers and the dilution the reservoir offers, i.e. greater storage volume compared to other options which include impounding storage can offer can start to 'balance out' some of customer concerns with the desalination and recycling options.

However, customers told SW through CAG that the term 'raw water' can create confusion when used to describe the transfer, as this is an unfamiliar term and raises concerns (e.g. would this water be 'dirtier' than in other reservoirs? And if so, would it contaminate our supply?).

Customers said that the use of a reservoir for storage is seen as a familiar and natural process. It is perceived to be a well-established, tried and tested process, which builds confidence in the solution. Collecting and storing rain and ground water feels natural and less engineered. The HT plans feel future focused, sustainable and logical to store water for when it is needed - making better use of what SW already has. This feels like a more sustainable approach as it has the potential to minimise environmental damage in the long term (refer to section 2.5 of this document).

2.8.3.2. Customer Benefits and Concerns of Water Transfers[3]

During Gate 1 WRSE ran a joint project which analysed all previous and existing insights on water transfers. They then ran a new qualitative and quantitative approach across the ensure WRSE region, the outputs of which are summarised below.

Primary Customer Benefits:

- ✓ Water quality: safe after treated
- ✓ Sensible to take a surplus
- ✓ Greater collaboration

Primary Customer Concerns:

- X Water quality –Taste / hardness / short term impact
- X Environmental and cost impacts
- X Over reliance on other areas
- X Shifting problem elsewhere
- X Using rivers / canals and the environmental impact this could have

[3] **From Gate 1 Submission,** (Annex 15 – Stakeholder and Customer Report, sections 4.1, 4.2 and 4.3 WRSE_Supply-side solutions workshop note_190820

Figure 64 - primary customer benefits and concerns (general themes)

2.8.3.3. Key Questions to Find Out More - from CAG Members[4]

After reviewing the information available and doing their own research, there are areas where customers wish to know more about the solution. CAG Members raised the following questions where future engagement would need to ensure SW is able to provide the relevant answers:

- *What will be the method of transfer and need for additional or new infrastructure?*
- *How will charges from other water companies be passed on and calculated?*
- *What reassurances and controls will you have over managing water profiles and marine life?*

2.8.3.4. Comparison of Water Transfers vs Alternative Solutions

SW's customers (represented on the CAG and Water Futures 2050 groups) insight demonstrates that customers understand that the WfLH programme is not about one overall solution, but a combination that work together, with everyone playing a part. Customers feedback that they expect that transfers will be part of that overall solution – but not the answer on its own. When looking at the options of transfers, desalination and water recycling – bulk transfers polarises opinions. Whilst I it feels sensible to use a surplus of high-quality water compared to the potential cost and environmental impacts of desalination and recycling, it is also seen as the less effective as customers fear it puts a strain on other areas and therefore isn't as reliable for when it is required, which means there is a risk that it will not resolve the supply demand deficit issues during drought periods.

For Option B.4, which is both water transfer (as above) and water recycling, please also read Section 2.8 of Annex 2, Water Recycling Technical for customers views on the technologies.

Below demonstrates summary charts taken from SW's CAG, young person's research [5] (Water Futures 2050) and household quantitative preference survey[6] for Gate 2.

[4] **Annex 9: Customer and Stakeholder Methodology**, Figure 3 – Overview of Customer Insight Projects for Gate 2, Burst Reports: *Water for Life Hampshire Burst 11 Oct '20 up to Burst 18 Jun '21*

[5] **Annex 9: Customer and Stakeholder Methodology**, Figure 3 – Overview of Customer Insight Projects for Gate 2, Ref 8: Water Futures 2050 – Wave 2, Apr '21

[6] **Annex 9: Customer and Stakeholder Methodology,** Figure 3 – Overview of Customer Insight Projects for Gate 2, Ref 7 Quantitative Option Preferences – Debrief March 2021

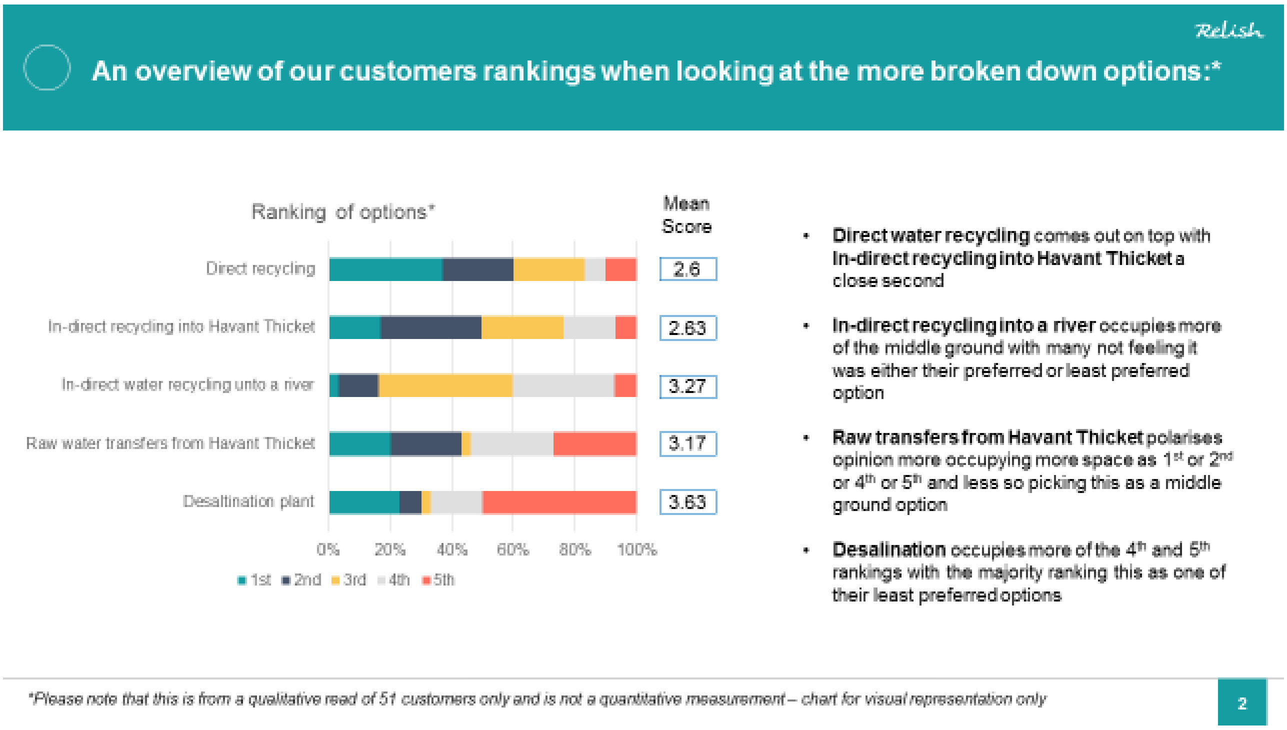
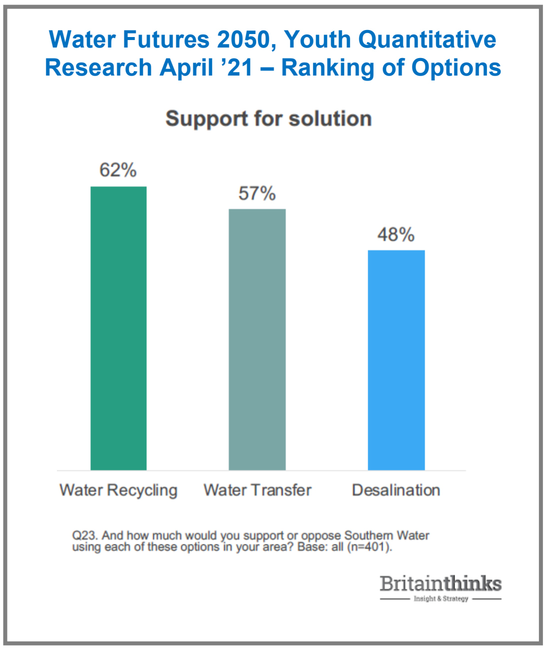


Figure 65 - CAG members voted on their preferred solutions[7]



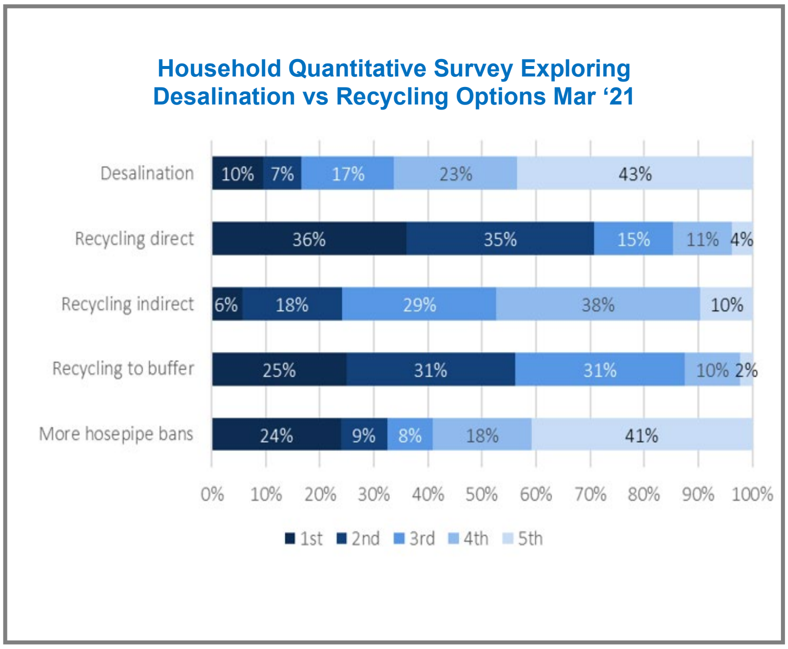


Figure 67 - Water Futures 2050, Youth Quantitative Research April '21 – Ranking of Options

Figure 66 - Household Quantitative Survey Exploring Desalination vs Recycling Options Mar '21

[7] **Annex 9: Customer and Stakeholder Methodology**, Figure 3 – Overview of Customer Insight Projects for Gate 2 Ref 1: Water for Life Hampshire Burst 18 Jun '21

2.8.3.5. Differing Views of Transfers across Customer Groups

Of the Solutions discussed with customers (water transfers, desalination and water recycling), water transfers had the most consistent views across different customer groups. Transfers were the least understood relative to other options consulted upon by customers.

- **Future customers**[8] through SW's young persons' panel told they had very little prior knowledge of water transfers. On reviewing transfer options, the greatest emphasis was placed on environmental impacts and there was concern over potential displacement of ecology through the movement of water.
- **Customers with affordability concerns** [9]expressed in SW's insight that they were worried about the reliability of transfers and saw the option as the least effective as they were particularly concerned over a consistent and reliable supply. However, after seeing potential cost impacts their preference was strongly in favour or the transfer option – as their primary motivator was minimising impacts to bills.
- **Customers from more diverse cultures**[10] through SW's bespoke insight shared the wider customer narrative with limited differences to the feedback already shared above.
- **Businesses**[11] told SW they were concerned that the water transfer option was the most misunderstood. They felt that the natural reservoir as part of the HT option could cloud judgement due to other benefits it brings. Whilst they did view this as a more natural solution, there were some concerns that the availability from the original source could be limited.

2.8.4. Primary Actions to Mitigate Customer Concerns

From SW's insight there are 9 primary actions identified by customers that would be mitigated from or developed for SW's engagement planning should this solution be selected at Gate 2. If either Option B.4 or Option D.2 are chosen as the Preferred Option these would then be developed into SW's engagement plans. These include:

Table 84 - Primary actions to mitigate customer concerns

#	**Water Transfers: Primary Actions to Mitigate Concerns - as *identified by customers through SW's insight programme***	**Key Actions Planned following Gate 2 to Mitigate Each Concern**	**Ownership**
1	Developing a much stronger understanding of the rationale for bulk transfers through engagement on water scarcity, and in particular the protection of chalk streams and the environment.	SW's engagement for WfLH has already begun by explaining the need to protect chalk streams. SW's water efficiency programme (Target 100) has already started for AMP7, with communication through a range of channels and using outputs from insight work to develop messaging.	WfLH Communications Team
2	Ensure customers are aware that transfers are already common across the UK.	This insight will be used in engagement planning should transfers be part of the Preferred Option. Engagement will ensure to explain the role transfers plays across supply boundaries and will reference to local networks.	WfLH Communications Team and working with Water UK

[8] **Annex 9: Customer and Stakeholder Methodology**, Figure 3 – Overview of Customer Insight Projects for Gate 2 Ref 8, *Water Futures 2050 – Wave 1 Report, Dec '20 and Water Futures 2050 – Wave 2, Apr '21*
[9] **Annex 9: Customer and Stakeholder Methodology**, Figure 3 – Overview of Customer Insight Projects for Gate 2 Ref 4, Affordability Concerns and Diverse Cultures - April 2021
[10] **Annex 9: Customer and Stakeholder Methodology**, Figure 3 – Overview of Customer Insight Projects for Gate 2 Ref 5, Affordability Concerns and Diverse Cultures - April 2021
[11] **Annex 9: Customer and Stakeholder Methodology**, Figure 3 – Overview of Customer Insight Projects for Gate 2 Ref 6, Hampshire Water Resource Business Challenge Report 21.04.2021

#	Water Transfers: Primary Actions to Mitigate Concerns - as *identified by customers through SW's insight programme*	Key Actions Planned following Gate 2 to Mitigate Each Concern	Ownership
3	Provide justification around the impacts to customer bills. Intergenerational fairness helps provide a reason for new solutions and protecting for future generations.	SW's MCDA assessment as part of the Options Appraisal process considered a number of scenarios, including focusing on bill affordability. SW is committed to develop a solution that balances the long-term bill impact and keeps customer's bills as consistent as possible. SW's engagement materials for WfLH ensure to focus on explaining the need and benefit of the Preferred Option as part of protecting future generations' supply.	WfLH Communications Team
4	In advance of any change in water source to the home, proactive engagement would be needed to help customers to understand any differences.	Proactive engagement through a range of channels is planned for the WfLH. Channels would include advertorials through the press, social media, website and direct communications - however, the exact scope is dependent on the Preferred Option, timing and outputs from pilots / trials which will provide data as to the exact difference on water quality depending on the source.	Water Resource Planning Team, WfLH Strategic Leadership and Communication Teams
5	Review the use of the term 'raw water' – as the phrase is unfamiliar and has negative associations. SW needs to consider more customer friendly.	This insight will be used in engagement planning should transfers be part of the Preferred Option.	WfLH Communications Team and working with Water UK
6	Climate change and a growing population are front of mind, reassurances are needed to demonstrate that the reservoir is being built with these issues in mind and will be prepared for future generations.	The materials created by PW currently address these issues and SW will work with them for future engagement planning to demonstrate these.	WfLH Communications Team and partnership working with PW
7	Highlight the partnership and collaboration that sits behind transfer agreements.	The HTR is a key to demonstrating collaboration across water companies and is also locally relevant to customers as part of WfLH. This can be used to illustrate to customers the benefits of water companies working together to transfer water between water undertakers' areas.	WfLH Communications Team and partnership working with PW and WRSE
8	For HT, ensure to visualise the specifics around the community and leisure facilities.	The materials created by PW currently highlight these benefits. SW is undertaking scheme development work for Options D.2 and B.4 and will consider community and leisure facilities as part of this process.	WfLH Communications Team and partnership working with Portsmouth Water and WRSE
9	Ensure to focus on how the source would capture water that usually flows out to sea, so is minimising wastage.	This insight will be used in engagement planning should transfers be part of the Preferred Option.	Water Resource Planning Team, WfLH Strategic Leadership and Communication Teams

2.9. Schedule

2.9.1. Introduction

2.9.1.1. Background

Since the Interim Update, further development and refinement of the schedule has been limited to the Emerging Preferred Option from the Interim Update – and now the Preferred Option, Option B.4. As a result the schedules presented for the other options were developed prior to the Interim Update. This is reflected through the following section.

SW has an obligation under a Section 20 Agreement[12] to implement, 'using ABE, a 75 Ml/d desalination plant, in the Fawley area, in accordance with the preferred strategy in WRMP19.

In addition, Ofwat has requested that, as part of the RAPID gated process, SW also considers a number of alternatives to the Base Case which is explored further in this section. The assessment of alternatives in this way also represents prudent risk management and business planning, to ensure that, should it be required, there is an alternative available to meet SW's supply obligation, in the event that for any reason it is not possible to implement the Base Case, despite SW using ABE to do so. Essentially, the alternative solutions act as 'back up' Options, in case the Base Case cannot be implemented. In addition, the consideration of alternatives is required in order to support important assessments such as SEA, HRA and WFD Assessment as part of the gated process, and EIA, HRA and WFD Assessment in the context of the subsequent planning and consenting process for the Base Case.

At RAPID Gate 2, SW has developed and is evaluating multiple Options. The Options discussed within this section are:

- Option B.4 - 75 Ml/d supply into Otterbourne WSW from HTR with supplementary top-up from a 15 Ml/d recycled water plant
- Option D.2 - 61 Ml/d supply into Otterbourne WSW from HTR

Each Option, outlined above, supply raw water to be treated at an existing SW WSW, before entering its potable water supply network. These Options are required by SW on an intermittent basis and are coincidental with a 1-in-200-year drought event.

2.9.1.2. Purpose

This is supporting document to the delivery schedules for delivering the Options which utilise the HTR.

The developed delivery schedules are comprehensive schedules that detail the full suite of activities, dependencies and interfaces required to deliver this highly complex project. This document is to be read in parallel as it details the supporting narrative, highlights key features and aspects of the schedule and documents key assumptions and dependencies.

2.9.1.3. Section 20 Agreement

SW has an obligation under a s20 Agreement to implement, 'using ABE, a 75 Ml/d desalination plant, in the Fawley area, in accordance with the Preferred Strategy in WRMP19.

A key assumption is that in accordance with the dNPS for Water Resources Infrastructure, the WRMP provides the robust 'need' case for the DCO application and that the Option taken to planning should align

[12] Section 20 Agreement of the Water Resources Act with the Environment Agency (EA) and the Secretary of State for the Department of Food & Rural Affairs (DEFRA), which references the Strategy A in the SW Water Resources Management Plan for 2019 (WRMP19)

with what is in the current WRMP. If the Option in the DCO application is materially different from the WRMP, it would be preferable to have the WRMP revised before the DCO application is submitted, which could be assumed a ‘reasonable endeavours’ delivery approach. However, if the WRMP revision is in preparation only, it will still be capable of being an important and relevant matter, and SW will need to provide the project need and justification material at the application level and not be able to rely on this in the WRMP document alone. This would add material risk to the planning process and likely require additional time within the pre-application stage of the project.

If, during the ‘ABE delivery of the Option, it is found that the Option has insurmountable obstacles to delivery or is significantly different from the Option listed in Strategy A of WRMP19, a material change to the Option within the WRMP may need to be sought.

For the non-desalination Options, a material change would be required to WRMP19. Accordingly, SW has included activities associated with the management of a material change to WRMP19, including likely consultation and engagement activities. The schedules developed have been developed with the ‘ABE’ level of effort, as this references the approved WRMP, rather than specific solutions. The schedules developed for the project are accordingly designed to expedite the project in the fastest overall sequencing possible. As a result, there are significant parallel running activities that must be managed and interfaced to facilitate the effective delivery of the project. Key dependencies and assumptions are detailed later within this document.

2.9.2. Delivery Schedule Development

2.9.2.1. Methodology

During the period between Gate 1 and Gate 2 the schedule has been further developed and refined in parallel with the wider project development. The project has evolved significantly since Gate 1 as SW has further developed the design, undertaken significant investigatory activities, formulated likely construction techniques, integrated specialist suppliers and engaged with key stakeholders.

SW’s schedules are owned by SW’s Project Leadership team and present a fully integrated plan for the delivery of a highly complex project. SW maintains and updates project schedules in real time throughout the month and has formal reviews every two weeks to maintain focus on quality and progress.

As part of the schedule development process, a series of deep dive workshops were held on key interface areas such as:

- environmental and planning consent
- procurement and commercial
- engineering and process design

Where activities were common to the Base Case and strategic alternatives, workshops were combined for all the projects, with separate sessions held to develop project specific detail.

To inform the workshops, several project delivery assumptions were developed in advance, as is discussed later in this chapter. Specialist suppliers were engaged to provide key information, aligned with industry benchmarks, for the activities proposed. In particular, these were associated with ecological surveys, tunnelling and pipeline construction. The objective of the workshops was to develop the detail of activities further from Gate 1, to test the logic between the activities identified and ensure that a robust plan was developed through to completion, incorporating all development and learning from of Gate 1 activities.

Following the initial deep-dive workshops, the draft output schedules were then tested through a high-level risk analysis to ensure a realistic output. The schedule was then passed through another phase to scrutinise the logic and timeframes; this was done through identification of activities longer than nine months, without a fixed start date and introducing parallel workstreams where possible (rather than sequential).

Throughout the process, a number of scenarios were identified which will be further explored in Gate 3 with the objective to continue to optimise the schedule and explore opportunities as the project scope and design further develops. To fully develop and exploit these opportunities, SW generally needs to engage extensively with the market, stakeholders and suppliers. The opportunity to explore these opportunities is significantly improved as Options are rationalised and it moves into the next phase of the DPC delivery process.

For further information on the Gate 2 assurance process please see Annex 7, Assurance Process.

2.9.2.2. Schedule Work Breakdown Structure

The schedule has been developed to 7 Levels at present, with Level 1 to 4 of the WBS being identical all across all SROs.

The below Table 85 has detailed SW's high-level WBS and the contents within lower levels within each section.

Table 85 - WBS Summary - D.2 and B.4

WBS Level	Item	Details of Level 3 and beyond
L2	Key Milestones	High level milestones to include: DPC milestones RAPID gateway dates OFWAT Control Points DCO process milestones Construction start, complete, commissioning complete, plant / facility operational Key interfaces with HTR Development, include PW Board meetings
L2	Senior Stakeholder Meetings	Key milestones for the WRMP19 revisions and Section 20 process
L2	Gates (RAPID)	Project level capturing the governance and assurance of tasks associated with the RAPID process
L2	Ofwat	Activities associated with DPC Control Points and any interface points that require information from other functional teams within the project
L2	WRMP19 Amendment	Process for WRMP19 amendment (as these Options were not included in the original WRMP19)
L2	Consent & Permit & Licencing	Required activities and processes informing DCO supported by statutory permitting, statutory and non-statutory consultation, DCO documentation application and submission
L2	Procurement & Commercial	Service routes for DCO sourcing teams, contract and equipment package awards including land acquisition and appointment of consultants, early contractor involvement and the procurement of CAP
L2	Surveys	Execution of surveys pertaining to land access, environment and engineering design works
L2	Design Phase	Conceptual design, feasibility designs informing non-statutory and statutory consultations for non-infrastructure and infrastructure scope

WBS Level	Item	Details of Level 3 and beyond
L2	Post Contract Award (DPC)	Site establishment, clearance and remediation and ground works Detailed designs, site investigation, procurement and site works undertaken by the CAP
L2	Early Delivery Review	Stages to review opportunities for schedule further schedule optimisation
L2	Otterbourne Pre-disinfection plant	Key activities for the delivery of Otterbourne pre-disinfection permanent works
L2	Otterbourne ceramic pilot plant	Key activities for the delivery of Otterbourne pre-disinfection pilot plant

2.9.2.3. Schedule Gantt Charts

SW has developed a comprehensive series of P6 schedules for each of the solutions being progressed to RAPID Gate 2.

The full schedule for Option B.4 and D.2 can be found in Appendix A. The schedule submitted for D.2 at the time of Gate 2 is progressed up to July 2021, as this was the cut-off date for the development of the Interim Update submission.

Since the Interim Update, further development and refinement of the schedule has been limited to the Emerging Preferred Option from the Interim Update – and now the Preferred Option, Option B.4. As a result, the schedule presented for B.4 is based on an October 2021 cut-off date and incorporates 3 further months of schedule evolution. This is reflected through the following Sections.

The key milestones and delivery routes are the same for both B.4 and D.2, however, given the differences in infrastructure scope the design and construction periods naturally vary. Due to the introduction of recycled water into HTR, there are likely also to be additional regulatory and stakeholder engagements, however, this is currently captured as part of the risk management chapter. The below describes the differences in infrastructure scope for the two projects:

The infrastructure scope for D.2 comprises of:

- an abstraction from HTR
- pipeline (with associated pumping stations) into Otterbourne WSW

The infrastructure scope for B.4 comprises of:

- connection from BF sewage treatment works and pipeline into the WRP
- 15 ML/d WRP and pipeline into HTR (with associated pumping station)
- abstraction from HTR
- pipeline (with associated pumping stations) into Otterbourne WSW

B.4 includes a WRP which provides recycled water into the HTR to 'top-up' the [redacted] supply, the raw water is then transferred to B.4 through the same scope as describes for D.2.

The level of schedule detail is sufficient to enable the agreed execution plan to be modelled and analysed. Activities are measurable, quantifiable and (where practical) linked to deliverables. Activities are not less than one month in duration unless absolutely necessary. Attention has been paid to incorporate a realistic logic chain for DCO submission and Ofwat control points enabling timely appointment of a CAP.

Engineering activity durations take into account expediting requirements, review and approval cycles and regulatory requirements. Developed logic for the key activities identify where interfaces between SW, PW and consultants / contractors are required. Permits are interfaced to relevant design and construction type activities where applicable.

Given the length of the pipeline in Option D.2 and B.4, surveys represent a lengthy activity and have been timed to coincide with the relevant survey calendar for specific species or habitats, such as overwintering birds.

For both D.2 and B.4 the longest construction activity is the pipeline between HTR and Otterbourne pre-disinfection works. The period required for the WRP is also close to that of the conveyance pipework and both should be considered as critical path activities. The construction schedule has been packaged into sections of the pipeline, with construction gangs planned to work on multiple fronts in parallel to promote time efficiencies. Wet commissioning of the pipeline and assets along the pipeline (such as the HLPS) will start following the HTR Outcome Delivery Incentive (ODI) target date for filling completion.

2.9.2.4. Risk Alignment

SW has a comprehensive risk management process that is complementary to its schedule development processes. This process, and the outcomes of it is detailed within Section 2.7.

Overall, SW has followed a similar process to that at Gate 1, in line with the development of the Strategic Outline Case. From a schedule perspective, SW has articulated a delivery date range that is cognisant of the project's key opportunities and threats. This is detailed within Section 2.9.4. It should be noted that the 'ABE' obligation means that most schedule opportunities, particularly those associated with client led activities, are embedded within the schedule. SW has a limited number of opportunities that still require further engagement with external parties to understand the full costs and benefits. These will be explored with key stakeholders, partners, and the market within the next phase of activity.

The threat range is articulated through the use of the Green Book methodology to establish ranges of out-turn delivery dates. This aligns with UK best practice in complex project development and dovetails with the approach that SW has taken for cost estimating for consistency.

2.9.3. RAPID Gate 2 Delivery Schedules

The full delivery schedule can be found in Appendix A. These detail all relevant milestones, activities, durations, dependencies and governance gates. Each SRO project is highly complex in nature and must follow clearly identified development and governance paths for procurement, consenting, environmental and engineering development and funding.

These are fully articulated in the master schedules. SW has however created a simplified version of this plan to articulate the key features of the overarching project delivery schedule.

2.9.3.1. Plan on a Page

The Plan on a Page gives a simplified, visual overview of the key governance points, overarching consenting and procurement activities and key design, construction and commissioning durations. It does not detail the full suite of interfaces and dependencies. Further detail of these can be found within this document and the full delivery schedules located within Appendix A.

[redacted]

Figure 68 - D.2 Plan on a page

[redacted]

Figure 69 - B.4 Plan on a page

The Plan on a Page details the proposed RAPID Gates and Ofwat Control Points as well as the current overlap with the HTR development led by PW.

The key block of activity required to develop a DCO submission and undertake examination are detailed including the timing of these critical activities.

SW's procurement process and timeframes are based upon executing the project under the DPC delivery model. A two-stage tender process is currently proposed to be utilised to facilitate the CAP competition.

Design activities are detailed, including those activities that are undertaken internally and those that will be undertaken by the successful CAP. Construction and commissioning durations are also detailed. These have been significantly updated in line with the project evolution between Gate 1 and Gate 2 and are now based on bottom-up estimates and comparative durations.

2.9.3.2. Key Interdependencies and Critical Path

When combined with the development of the HTR milestones, the critical path for both D.2 and B.4 operation is the completion of the reservoir filling completion date. For the purposes of interrogating the critical path for the development of the HT alternatives projects, this section discussed the project's critical path to the point of readiness for wet commissioning.

Given the number of parallel processes that are being undertaken simultaneously, there a number of critical path and sub-critical path activities that are incredibly sensitive to being critical should there be relatively small movements within the overall delivery schedule. The below narrative highlights areas on the primary critical path along with key areas that are very close to the primary critical path.

A full copy of the critical path schedules for D.2 and B.4 are appended in Appendix B.

The Key Critical Path starts from Gate 2 as that currently that drives the submission of the s35 request. Following submission of the draft S35, SW was informed that Defra were not willing to pass comment on the draft s35 while optionality was still present within the process. As Gate 2 is the end of this optionality, it has been utilised as the commencement of this process, although delays to the schedule have been mitigated by the undertaking of substantial preparatory work associated with the s35 request.

The Key Critical Path then flows through the surveys and then through into the main DCO pre-application process.

Concurrently the DPC procurement process is also on the Key Critical Path. Virtually all procurement activities form part of the Critical Path. This includes the development of Control Point C, D and E materials and the progress and development Project Business Case. The CAP competition also forms the critical path.

Due to the above, and the fact that they are critical governance milestones, Control Point E and F are currently critical path activities. SW is working closely with Ofwat to ensure that it is closely engaging through the pre-activities to ensure that the Control Point materials are understood and that there are unlikely to be major surprises which should assist with minimising timeframes to pass the hard governance gates.

Control Point F is positioned to allow Contract Award post DCO consent being granted, and judicial review being completed. This is a key dependency to ensure that key risk items are addressed ahead of the award of the DPC delivery contract.

Elements of design activities and investigatory activities form part of the critical path. It is crucial that these activities are delivered on time as these will inform both procurement and consenting workstreams.

The consenting activities are currently sub-critical, however are very close to the critical path. Delays in the progression of the consenting activities will quickly move the process on to the critical path. Scoping activities, ecological surveys, public consultations and the development of the key pre-application data and information are all very close to being on the critical path. The DCO application and examination activities do form part of the primary critical path, indicating just how closely linked and sensitive the parallel progression of procurement and consenting activities are.

Post contract award the key critical path flows through the design and construction of the conveyance pipework between HTR and Otterbourne (D.2 and B.4). However, as the design and construction of the WRP is estimated to be completed one month prior to the conveyance pipework, SW intends to treat both activities as on the critical path, although they will be delivered in parallel.

Once the conveyance pipework, WRP (B.4 only) and associated infrastructure such as pumping stations are in place and dry commissioning completed, completion is then solely dependent on the filling of the HTR.

2.9.3.3. Key Milestones

The below Table 86 details the key milestones and those milestones and the current forecasted dates associated with the milestones.

Table 86 – Key milestones for Gate 2

Key Milestone	Gate 2 Forecast Date D.2	Gate 2 Forecast Date B.4
RAPID Gate 2	Q3 2021	Q4 2021
DCO: s35 Request	Q4 2021	Q1 2022
DCO: s35 Direction given by SoS	Q4 2021	Q1 2022
DCO: Redline for Preferred Route Announcement (PRA) confirmed	Q2 2022	Q3 2022
DCO: Masterplan published	N/A	N/A
DPC: Ofwat Control Point E	Q3 2023	Q3 2023
DPC: Contract Notice to be issued	Q3 2023	Q3 2023
DCO: Submission of the DCO application	Q4 2023	Q4 2023
DPC: Ofwat Control Point F	Q3 2025	Q2 2025
DCO: DCO decision (end of DCO Stage 5)	Q2 2025	Q2 2025
Construction: end of DCO requirements discharged allowing plant construction to commence	Q4 2025	Q1 2026
Construction: Commissioned asset in use	Q1 2030	Q1 2030

DCO Masterplan published has been removed from the P6 schedule as further accuracy has been provided on the submission documents.

2.9.3.4. Key Assumptions and Dependencies

Given the stage of development of the schedule, there are a number of assumptions that have been made in order to develop the schedule. There are also significant dependencies within the schedule where activities have a knock-on impact upon subsequent activities. SW details some of the key assumptions and dependencies in the following tables.

Table 87 – Consenting

Assumption / Dependency	Assumption	Rationale and impacts of change
Assumption	Planning approval is sought and obtained at the first attempt via DCO consenting route rather than Town and Country Planning. The critical path mostly comprises activities required for the DCO submission.	Should S35 direction not be given then the impact of following the TCPA consenting route likely include delay due to the more fragmented approach that need to be followed for a project of this complexity.
Assumption / Dependency	DCO follows a post Gate 2 2-stage consultation process with additional non-statutory and statutory consultations and is currently assumed to be dependent on the submission of the s35 which is therefore on the critical path.	Two additional stages of consultation will enable SW to adequately address the rigorous consultation requirements associated with the DCO consenting process, ensuring that interested and affected stakeholders are given meaningful opportunities to influence its proposals as they are developed. This mitigates the risk of non-acceptance of the DCO application due to the inadequacy of consultation.
Dependency	DCO consent is required before DPC Contract Award.	DCO consent drives OFWAT Control Point F which allows contract award to the final preferred CAP bidder.
Assumption	All stakeholders and regulators, can resource adequately to meet the schedule.	Stakeholder Engagement strategy is being developed to support the establishment of resourcing levels for key stakeholders to ensure the schedule can be met.
Dependency	ECI is a key predecessor for multiple activities.	Delay to the mobilisation of the ECI could impact DCO application submission

Table 88 – Procurement and Commercial

Assumption / Dependency	Assumption	Rationale and impacts of change
Assumption	One DPC contract is being issued containing all of the elements of the SRO activities up to the Otterbourne boundary.	Multiple contracts may result in potential for delay via resource and interfaces required to award. Further packaging assessment will be undertaken in the next phase of activity.
Dependency	Otterbourne upgrades will be delivered outside the scope of the CAP agreement.	The Otterbourne upgrade is related to existing scope agreed with regulators and is on an earlier timeline to the SRO delivery.
Assumption / Dependency	Procurement of DCO sourcing team in support of the Planning & Consents Manager concludes end 2021 / Jan 2022.	Specialist resources will be required to support these activities and ensure that the DCO consenting process is delivered successfully.
Dependency	Judicial Review completion drives the financial closure period leading to the DCO application submission.	Market engagement has informed SW that potential bidders may struggle to the contract until such time that DCO consent has been achieved and any conditions reviewed, and risks associated with those conditions have been quantified and apportioned. This linkage between DCO Consent and the procurement process is highly critical and will be a key area of focus for the next stage of market engagement.
Assumption	CAP award initiates CAP site investigations, designs (procurement) and construction sequentially.	These may require confirmatory investigations by the CAP to finalise construction and tunnelling methodologies at crossings (as required).

Table 89 – Surveys

Assumption / Dependency	Assumption	Rationale and impacts of change
Assumption	SW agrees negotiated access with the majority of landowners ahead of undertaking surveys.	Use of statutory powers for access may result in negative opinion of affected stakeholders.
Dependency	Perform all relevant surveys within feasibility design periods.	Feasibility design not sufficiently developed for DCO and DPC processes and survey data not available.

Table 90 – Design Phase

Assumption / Dependency	Assumption	Rationale and impacts of change
Assumption	Feasibility design for statutory consultation is sufficient quality to enable meaningful stakeholder engagement.	Delay to statutory consultation, or currently assumed 2 month post statutory consultation design period is insufficient for design to be updated.
Assumption	Feasibility design continues after Statutory consultation period for a period of 2 months.	Failure of feasibility design continuing post Statutory Consultation would result in feasibility design not being developed in line with feedback received from interested and affected stakeholders resulting in risk to DCO Consent.

Table 91 – Post Contract Award (DPC)

Assumption / Dependency	Assumption	Rationale and impacts of change
Assumption / Dependency	Sequencing and durations of construction is reflective of design maturity at the time of this submission and which has been used for all other aspects of this submission. It will require further development as the design matures to validate	Changes and evolution to the design will inevitably impact on the construction durations. This could be in a positive or negative direction.
Assumption	Pipeline construction is based on 50 m per week per gang and 7 gangs working.	This is based on three teams working concurrently extended hours 7 days a week as required but Hampshire County Council for all pipelaying works.
Assumption	Commissioning apportioned as fixed period of 6 Months.	This is based on information provided from SW's key Water Recycling consultant and other examples that have been implemented worldwide.

2.9.3.5. Schedule Evolution since Gate 1

Some of the key changes in the Gate 2 schedules to those presented at Gate 1 are:

- It was assumed at Gate 1 that SW could progress more quickly into the DCO development process. Engagement with key stakeholders meant that SW has agreed to delay the Request for S35 Direction until a single solution was confirmed. This has held back elements of activity that were planned in the current phase.
- At Gate 1, the assumption was that there would need to be 2 consultations associated with the consenting aspect of the project. These would be in the form of a non-statutory consultation ahead of Gate 2 and a Statutory consultation ahead of DCO submission. Following feedback from the non-

statutory consultation, SW believes that a further non-statutory consultation will be required in order to generate necessary stakeholder support for the project.

- At Gate 1, the design element of work had little impact on the overall critical path. Following SW's project evolution, the design and development activities are far more intwined with each aspect of the project. Design, Consenting, Procurement and Stakeholder Management interfaces are now much more clearly defined, understood and documented.
- Following SW's post Gate 1 market engagement activities, it became clear that it needs to make an allowance for a Financial Close period for the successful DPC CAP. This had not been accounted for at Gate 1.
- Ofwat Control Point C includes key activities such as market engagement and testing appetite of DPC procurement route from potential suppliers. It is a critical Control Point as it is the first point that Ofwat can 'carve out' scope for a potential DPC project. Following SW's Gate 1 activities, engagement with Ofwat and wider lessons learnt, SW has a stronger understanding around the level of activity and coordination with the market and stakeholders that this will entail. SW has allowed more time as a result within Gate 3 / DPC Stage 3 activities.

Significant work has taken place between Gate 1 to Gate 2 to evolve designs, construction techniques, related-site investigations and main construction site works durations. This involved activity from SW team members and specialist suppliers where applicable. This has resulted in much greater granularity in bottom-up plans whilst improving confidence in delivery plans.

The tables, shown in section 2.9.3.3 Key Solution Specific Milestones give a detailed narrative of movements between the Gate 1 schedule milestones and the Gate 2 schedule milestones.

Further schedule development work will take place between Gate 2 to Gate 3, as SW moves into the development of the Outline Business Case. SW will be further developing design, consenting and procurement activities to strengthen the underlying data.

SW will also be engaging extensively with stakeholders and the market as it moves into the next phase of activity. This will also shape its delivery plans and schedules as the project evolves. These activities will be delivered jointly with PW. This is explained further at the end of this chapter.

2.9.3.6. Solution Required Date

Q1 2027 is the target delivery date for the project. Following SW's extensive schedule development, engagement and Gate 2 optimisation activities, this date is forecast now as Q1 2030 for both D.2 and B.4. Please see the previous sections for information on the movement of key milestones.

SW has been working very closely with regulators and stakeholders to communicate and understand the impacts associated with late delivery against the target dates. SW proposes to deploy an agreed and extensive mitigation strategy to ensure that the gap between the target date and the current forecast completion date can be effectively managed from a Supply / Demand balance perspective.

2.9.3.7. Timeframes for Future RAPID Gated Process

The schedule details indicative schedule dates for subsequent RAPID Gates (see Section 2.9.3.1).

These are milestones are fully detailed in Section 2.9.5. It should be noted that the proposed dates for RAPID Gate 4 and 5 are indicative only at this stage and will flex as the project continues to evolve and continue through the project delivery lifecycle.

RAPID Gate 3 is now positioned at a point where SW can demonstrate technical and commercial feasibility for the solution, ensure that it is embedded within its approved WRMP and carries stakeholder and customer support. To meet these objectives, the gate is now positioned following Control Point C, SW's non-statutory consultation and following any update to WRMP19. The forecast date for Gate 3 is November 2022.

RAPID Gate 4 is broadly positioned to align with the start of the DPC procurement process and the DPC application. SW will continue to work closely with RAPID to determine the precise timings of this gate, and where in the project lifecycle best fits to align with the procurement and consenting process. It is currently forecast to be Q4 2023.

RAPID Gate 5 is positioned to align with the completion of the DCO consenting process, the determination of Control Point F and the award of the DPC delivery contract. It is currently forecast to be Q2 2025.

2.9.3.8. Missing Information

At this stage SW does not believe that there is significant outstanding information that would be expected at the Strategic Outline Case stage of major project development.

SW will continue to develop further granularity, engage specialist suppliers and secure further detail input as it moves into the next phase of activity. ECI will be secured to test and challenge construction and commissioning schedules to ensure that these are robust and optimised.

The Gate 3 activities will include significant engagement with the market, stakeholders and regulators which will continually feed into and update the delivery plans.

2.9.4. Delivery Range of Earliest Deployable Output

2.9.4.1. Future Opportunities

There are a number of areas of opportunity that are not currently incorporated into SW's base delivery schedule. These areas relate to the post-DPC Contract timeframe and are mainly related to construction activities. At this stage SW has not included them within the base schedule because they either:

- Conflict with one of regulatory obligations (such as delivering Value for Money (VfM) for Customers); or
- SW needs additional information from the market to make an objective assessment

Full details of the opportunities are in Appendix C.

In summary, SW believes that there may be up to 6 months of time opportunity associate with the most viable opportunities that have been identified. This 6-month period will be fully validated and examined in the next phase of activity, including through ECI engagement and market engagement activities associated with the Control Point C submission.

2.9.4.2. Optimism Bias

To calculate the threat range, SW has utilised the same OB approach that it utilised at Gate 1. This is consistent with the development of the Strategic Outline Case.

There are a series of statements that have been developed to substantiate the OB assessment. Please see Section 2.7 for details. These statements apply to both cost and schedule and are consistent for both areas.

Table 92 below summarises the current Original and Adjusted OB percentage of the works duration.

Table 92 - Current Original and Adjusted OB percentage of the works duration for D.2 and B.4

Option	Non-Standard Split	Standard Split	Original OB Percentage (%)	Adjusted OB Percentage (%)
B.4	100	0	25%	15.00%
D.2	100	0	25%	13.20%

Option D.2 and B.4 have the same works duration of 60 months. The Table below details the Original OB Works durations.

Table 93 – Original OB Works durations for D.2 and B.4

Option	Works Duration (months)	Original OB Percentage (%)	Original OB Threat allowance (months)	Total Works Duration inc. Original OB (months)
D.2	51	25	13	64
B.4	51	25	13	64

The Table below details the Adjusted OB Works Durations.

Table 94 - Adjusted OB Works Durations for D.2 and B.4

Option	Works Duration (months)	Adjusted OB Percentage (%)	Adjusted OB Threat allowance (months)	Total Works Duration inc. Adjusted OB (months)
D.2	51	13.2	7	58
B.4	51	15	8	59

2.9.4.3. Overall Delivery Range

Incorporating the above factors, the delivery range for the B.4 and D.2 is detailed below.

Table 95 - Delivery range for the D.2 and B.4

Option	Earliest Opportunity Date	ABE Delivery Date	Adjusted OB Delivery Date	Original OB Delivery Date
D.2	Q1 2030	**Q1 2030**	Q3 2030	Q1 2031
B.4	Q1 2030	**Q1 2030**	Q3 2030	Q1 2031

2.9.4.4. Extended Milestone Dates with Comparison to Gate 1 Dates

Since the Interim Update, further development and refinement of the schedule has been limited to the Emerging Preferred Option from the Interim Update – and now the Preferred Option, Option B.4. As a result, the schedules presented for the other Options were developed prior to the Interim Update. This is reflected through the following Section.

There are eight sets of milestones, they are categorized based on the WBS from the previous section of this report.

The below Tables detail the extended series of milestones, movements since Gate 1, the narrative around those movements and any relevant assumptions for B.2 and B.4.

There are eight sets of milestones, they are categorized based on the WBS from the previous section of this report.

The below Tables detail the extended series of milestones, movements since Gate 1, the narrative around those movements and any relevant assumptions.

Table 96 - Gate Dates D.2

Activity ID	Description	Date at Gate 1 (D.2)	Option D.2	Narrative	Assumptions
HTRW.KEY.00110	Gate 2 Submission	Q3 2021	Q3 2021	Gate 3 has been moved back following the development of key areas of the schedule such as non-statutory consultations and the OFWAT Control process. This ensures that the Outcomes proposed for Gate 3 can be met. Gates 4 and 5 have been aligned with appropriate points on the delivery schedule.	
HTRW.KEY.00120	Gate 2 Decision	Q1 2022	Q1 2022		
HTRW.KEY.00130	Gate 3 Submission	Q2 2022	Q4 2022		
HTRW.KEY.00140	Gate 3 Decision	Q3 2022	Q1 2023		
HTRW.KEY.00150	Gate 4 Submission	Q1 2023	Q4 2023		
HTRW.KEY.00160	Gate 4 Decision	Q3 2023	Q1 2024		
HTRW.KEY.00170	Gate 5 Submission	Q3 2024	Q3 2025		
HTRW.KEY.00180	Gate 5 Decision	Q4 2024	Q4 2025		

Table 97 - OFWAT D.2

Activity ID	Description	Date at Gate 1	Option D.2	Narrative	Assumptions
HTRW.KEY.00210	OFWAT Control Point A Submission	Q4 2020	Agreed with OFWAT to combine with B	SW has held a series of informal, exploratory meetings with Ofwat to discuss how best to schedule the control points. RAPID has joined some of the meetings. These discussions are ongoing and will include the examination of any assumptions being made by SW, as well as the format and content of each report.	At Gate 1, SW's initial thinking was that each Control Point had to be submitted separately. However, following further consideration and discussion with Ofwat, we have combined Control Point A and B. This is because most of the content for Control Point A would also be produced for Control Point B. By combining the two, we would thus increase efficiency whilst also achieving Control Point B Determination much sooner in new schedule.
HTRW.KEY.00220	OFWAT Control Point A Decision	Q1 2021	Agreed with OFWAT to combine with B		
HTRW.KEY.00230	OFWAT Control Point B Submission	Q2 2021	Q4 2021		
HTRW.KEY.00240	OFWAT Control Point B Decision (Strategic Outline	Q3 2021	Q1 2022		

Activity ID	Description	Date at Gate 1	Option D.2	Narrative	Assumptions
	Case (SCO) Approved				
HTRW.KEY.00250	OFWAT Control Point C Submission	Q4 2021	Q3 2022		It is currently felt that the optimum submission time is ahead RAPID G3.
HTRW.KEY.00260	OFWAT Control Point C Decision	Q4 2021	Q3 2022		
HTRW.KEY.00270	OFWAT Control Point D Submission	Q1 2022	Q1 2023		Combining Control Point D with Control Point C was considered, given the apparent closeness in submission dates. However, this is currently deemed to be impractical given the amount of information required for Control Point D. Control Point D's submission scheduling will thus need to take into account the need to await Control Point C determination and feedback. It will now be more closely aligned with Control Point E.
HTRW.KEY.00280	OFWAT Control Point D Decision	Q2 2022	Q1 2023		
HTRW.KEY.00290	OFWAT Control Point E Submission	Q2 2022	Q3 2023		As part of Control Point E, SW intends to undertake a further VfM analysis, in addition to gathering all relevant information required for an Outline Business Case.
HTRW.KEY.00300	OFWAT Control Point E Decision (Commence Procurement)	Q3 2022	Q3 2023		
HTRW.KEY.00310	OFWAT Control Point F Submission	Q2 2024	Q3 2025		Control Point F is dependent on the point at which SW internally identifies a Preferred Bidder. The Preferred Bidder's proposal will in turn enable the Full Business Case to be completed as well as enabling SW to undertake all relevant governance prior to submission of Control Point F to Ofwat.
HTRW.KEY.00320	OFWAT Control Point F Decision (Contract Award Enabler)	Q3 2024	Q3 2025		

Table 98 - Key Dates D.2

Activity ID	Description	Date at Gate 1	Option D.2	Narrative	Assumptions
HTRW.KEY.00010	[redacted]	Q1 2027	Q1 2027	Section 20 Agreement date is a constrained date within the schedule and as such has not been affected by the schedule development.	This target date will be highly challenging to delivery for both B.4 and D.2 due to the dependency of both of on the construction and filling of the HTRs, which will occur after the S20 date. Critical path challenges as well as opportunities to recover time are explored in the narrative of this chapter.
HTRW.KEY.00510		Q1 2022	Q3 2022	Changes due to a comprehensive review of timings and alignment with concurrent RAPID and WRSE processes.	This is captured in the separate assumptions table.
HTRW.KEY.00910		N/A	Q3 2021	No change to Gate 1	
HTRW.KEY.01000		Q3 2022	Q1 2022	Amended following updates in the WRSE process.	
HTRW.KEY.00050		Q1 2027	Q2 2029	Delayed due to developed understanding of the critical path (including design and construction activities) and the key activities such as DCO process.	
HTRW.KEY.00040		N/A	Q1 2030	New activity to demonstrate linkage to HTR.	This assumes that there are no delays to the delivery of the HTR.

Table 99 - Portsmouth Water Interfaces D.2

Activity ID	Description	Date at Gate 1	Option D.2	Narrative	Assumptions
HTRW.KEY.01010	[redacted]	N/A	Q3 2021	Key milestones from the HTR added to support the schedule	It is assumed that the HTR will be delivered as per the dates provided here. PW / SW meet regularly to manage delays (as
HTRW.KEY.01030		N/A	Q4 2021		

Activity ID	Description	Date at Gate 1	Option D.2	Narrative	Assumptions
HTRW.KEY.01020	[redacted]	N/A	Q4 2021	development of the dependent activities under D.2.	required) to minimise impact on D.2.
HTRW.KEY.01040		N/A	Q1 2022		
HTRW.KEY.01050		N/A	Q1 2022		
HTRW.KEY.01060		N/A	Q4 2022		
HTRW.KEY.01070		N/A	Q1 2023		
HTRW.KEY.01080		N/A	Q1 2025		
HTRW.KEY.01090		N/A	Q1 2026		
HTRW.KEY.01100		N/A	Q3 2026		
HTRW.KEY.01110		N/A	Q3 2029		

Table 100 - DCO Process D.2

Activity ID	Description	Date at Gate 1	Option D.2	Narrative	Assumptions
HTRW.CON.08080	REQUEST for a SCOPING OPINION - SUBMITTED to PINS	Q3 2021	Q4 2021	The movement in the Scoping Opinion being submitted to PINS is directly related to the movement in the S35 date.	The Scoping Opinion cannot be submitted to PINS until the S35 direction has been given. The schedule logic has been amended so that the submission of the Scoping Opinion is driven by the S35 Direction. Significant preparatory work on the Scoping documentation being undertaken at risk prior to S35 direction to mitigate the movement as much as possible.
HTRW.CON.08120	SCOPING OPINION - ADOPTED by PINS	Q4 2021	Q1 2022	The movement in the Scoping Opinion being submitted to PINS is directly related to the movement in the S35 date.	

Activity ID	Description	Date at Gate 1	Option D.2	Narrative	Assumptions
HTRW.CON.06090	DCO APPLICATION SUBMITTED	Q2 2023	Q4 2023	DCO Application submitted date movement is a result of earlier delays to the S35 Direction and the key decision to undertake a two-stage consultation process post Gate 2.	SW's approach to public consultation is proposing two further stages of consultation, including both a non-statutory and statutory consultation. Two additional stages of consultation will enable it to adequately address the rigorous consultation requirements associated with the DCO consenting process, ensuring that interested and affected stakeholders are given meaningful opportunities to influence its proposals as they are developed. This mitigates the risk of non-acceptance of the DCO application due to the inadequacy of consultation.
HTRW.CON.06140	DCO ACCEPTED	Q2 2023	Q4 2023	The movement in all of these activity dates are aligned with the above reasoning.	The statutory process, logic and stated durations have remained. The internal durations for development of design maturity post consultation phases and internal governance periods have undergone rigorous challenge both internally during deep dive session with Subject Matter Experts (SMEs) and externally via legal review.
HTRW.CON.06160	EXAMINATION STARTED	Q2 2023	Q2 2024		
HTRW.CON.06180	EXAMINATION ENDED	Q4 2023	Q4 2024		
HTRW.CON.06230	DECISION ISSUED	Q2 2024	Q2 2025		
HTRW.CON.06270	JUDICIAL REVIEW PERIOD COMPLETED	Q3 2024	Q2 2025		
HTRW.CON.00640	Non-Statutory Consultation Complete	Q1 2021	Q3 2022	Non-Statutory Consultation was undertaken in Q1 2021 as per the Gate 1 schedule. The date now presented in the Gate 2 schedule represents the key decision to undertake a two-stage consultation process post Gate 2. The date presented here is the additional non-statutory consultation.	This assumes any challenges raised are managed in available time.
HTRW.CON.00540	Statutory Consultation Complete	Q3 2022	Q2 2023	The movement in all of these activity dates are due to the key decision to undertake a two-stage consultation process post Gate 2.	

Table 101 – Procurement Milestones D.2

Activity ID	Description	Date at Gate 1	Option D.2	Narrative	Assumptions
HTRW.PRO.02150	ECI CONSULTANT START DATE	N/A	Q4 2021	These new additional	SW has identified key areas where the

Activity ID	Description	Date at Gate 1	Option D.2	Narrative	Assumptions
HTRW.PRO.02570	DCO CONSENT CONSULTANT START DATE	N/A	Q4 2021	activities are representative of the increased granularity within the schedule presented at Gate 2. This is a key skilled resource required to deliver to the DCO process. Key to start this as per the dates due to seasonality. This is a key skilled resource required to deliver to the DCO process. Land access process have been split out due to the difference access required.	programme would benefit from commissioning external parties to apply their expertise. This is the proposed timeline for the procurement of specialist support expertise. Resource is available and mobilised on time.
HTRW.PRO.05090	DCO CONSULTATION CONSULTANT START DATE	N/A	Q4 2021		
HTRW.PRO.04080	INFRA SURVEYS & DESIGNS SUPPLIERS START DATE	N/A	Q1 2022		Expertise available and can be on-boarded on time.
HTRW.SVY.01030	Ecological Surveys - THE START DATE	N/A	Q1 2022		Assumes no challenges with securing land access.
HTRW.SVY.06140	Infra Surveys & Designs Contractor START ON SITE FOR SURVEY	N/A	Q2 2022		Resource is available and mobilised on time.
HTRW.SVY.07400	Land Access 'Handshake' for Phase 1 Ecological Surveys	N/A	Q1 2022		Assumes no challenges throughout the land owner engagement process.
HTRW.SVY.05110	Land Access 'Handshake' for Phase 2 Ecological Surveys	N/A	Q2 2022		
HTRW.SVY.07410	Land Entry 'Handshake' for Engineering Surveys	N/A	Q1 2022		
HTRW.PRO.00100	DPC - ISSUE CONTRACT NOTICE (OFWAT E dependent)	N/A	Q3 2023	Due to the changes in the DCO consultation strategy and the Control Points detailed above, there is a subsequent impact on the dates associated with these activities. This assumes 1 DPC project.	
HTRW.PRO.00120	DPC - TENDER COMMENCED	N/A	Q1 2024		Assumes sufficient market interest and capacity.
HTRW.PRO.00140	DPC - Inform Bidders of Tender Shortlist	N/A	Q2 2024		
HTRW.PRO.00160	DPC - PREFERRED BIDDER NEGOTIATIONS	N/A	Q1 2025		
HTRW.PRO.00190	DPC - Contract Award (KEY)	N/A	Q3 2025		Following market engagement with potential CAP participants a logic link has had to be incorporated into the schedule resulting in a SW and CAP financial close period of 60 days post

Activity ID	Description	Date at Gate 1	Option D.2	Narrative	Assumptions
					DCO Judicial Review. This also ensures that any final consent conditions are known, can be assessed and the risk associated quantified and apportioned.
HTRW.PRO.00220	DPC - CONSTRUCTION DESIGN COMMENCE (KEY)	N/A	Q4 2025		

Table 102 - Design D.2

Activity ID	Description	Date at Gate 1	Option D.2	Narrative	Assumptions
HTRW.DGN.01010	EQUIPMENT SELECTED	N/A	Q2 2022	New line added	
HTRW.DGN.01040	(GIVE) - REDLINE for PRA CONFIRMED	Q2 2021	Q2 2022	Due to the addition of a secondary non-statutory process, SW is required to maintain optionality in the route selection for longer. This and further work completed to detail the route development process has resulted in a revised date.	This is dependent on issues identified which delay the process to identifying a preferred route and any necessary survey work can be completed as required (i.e. no issues with seasonality).
HTRW.DGN.01020	(GIVE) - SUFFICIENT DESIGN COMPLETE for PRE-APPLICATION CONSULTATION (KEY)	N/A	Q2 2023	SW has worked through the interfaces in detail and is now allowing additional design effort to support throughout the consenting and procurement phases of activity. Following the key decision to undertake a two-stage consultation process post Gate 2 there has been further movement within this date.	
HTRW.DGN.01030	(GIVE) - ENGINEERING INFORMATION COMPLETE for PROCUREMENT TENDER DOCUMENT	N/A	Q2 2023	This is a new key activity that has been included during the development of the schedule.	This activity has been linked to the Statutory Consultation process to mitigate the risks associated with having SRO information in the public domain that is not

Activity ID	Description	Date at Gate 1	Option D.2	Narrative	Assumptions
					representative of what is being presented at Statutory Consultation and to limit the potential for change to the documentation during the tender process due to the incorporation of commentary from interested and affected stakeholders.

Table 103 - Post- DPC Award Construction D.2

Activity ID	Description	Date at Gate 1	Option D.2	Narrative	Assumptions
624	Conveyance Pipework HTR to HLPS - Construction Commence	N/A	Q4 2026	Additional information provided as per design development.	Historical project experience has been used where comparable projects could not be identified in the algorithm raw data. Expert supply chain has been used for discrete schedule area development such as the conveyance pipework and tunnelling
138	HLPS HT to Otterbourne Construction Commence	N/A	Q1 2026		
609	Conveyance Pipework HTR to Otterbourne - Construction Commence	N/A	Q4 2026		
629	BPT - Construction Commence	N/A	Q1 2026		Historical project experience has been used where comparable projects could not be identified in the algorithm raw data.
HTRW.MCW.14000	Otterbourne Pre-Disinfection Plan - Construction Commence	N/A	Q4 2024		
HTRW.MCW.14050	Otterbourne Pre-Disinfection Plan - Wet Commissioning Commence	N/A	Q4 2026		
653	HT RAW WATER TRANSFER - OPERATIONAL	N/A	Q1 2030		There are no delivery delays to the HTR.

Table 104 - Gate Dates B.4

Activity ID	Description	Date at Gate 1	Option B.4	Narrative	Assumptions
RYWR.KEY.00110	Gate 2 Submission	Q3 2021	Q4 2021	Gate 3 has been moved back following the development of	

Activity ID	Description	Date at Gate 1	Option B.4	Narrative	Assumptions
RYWR.KEY.00120	Gate 2 Decision	Q1 2022	Q1 2022	key areas of the schedule such as non-statutory consultations and the OFWAT Control process. This ensures that the Outcomes proposed for Gate 3 can be met. Gates 4 and 5 have been aligned with appropriate points on the delivery schedule.	
RYWR.KEY.00130	Gate 3 Submission	Q2 2022	Q4 2022		
RYWR.KEY.00140	Gate 3 Decision	Q3 2022	Q1 2023		
RYWR.KEY.00150	Gate 4 Submission	Q1 2023	Q4 2023		
RYWR.KEY.00160	Gate 4 Decision	Q3 2023	Q1 2024		
RYWR.KEY.00170	Gate 5 Submission	Q3 2024	Q2 2025		
RYWR.KEY.00180	Gate 5 Decision	Q4 2024	Q3 2025		

Table 105 - OFWAT B.4

Activity ID	Description	Date at Gate 1	Option B.4	Narrative	Assumptions
RYWR.KEY.00210	OFWAT Control Point A Submission	Agreed with OFWAT to combine with B	Agreed with OFWAT to combine with B	SW has held a series of informal, exploratory meetings with Ofwat to discuss how best to schedule the control points. RAPID has joined some of the meetings. These discussions are ongoing and will include the examination of any assumptions being made by SW, as well as the format and content of each report.	At Gate 1, SW's initial thinking was that each Control Point had to be submitted separately. However, following further consideration and discussion with Ofwat, we have combined Control Point A and B. This is because most of the content for Control Point A would also be produced for Control Point B. By combining the two, we would thus increase efficiency whilst also achieving Control Point B Determination much sooner in new schedule.

Activity ID	Description	Date at Gate 1	Option B.4	Narrative	Assumptions
RYWR.KEY.00220	OFWAT Control Point A Decision	Agreed with OFWAT to combine with B	Agreed with OFWAT to combine with B		
RYWR.KEY.00230	OFWAT Control Point B Submission	Q2 2021	Q1 2022		
RYWR.KEY.00240	OFWAT Control Point B Decision (Strategic Outline Case (SCO) Approved	Q3 2021	Q1 2022		
RYWR.KEY.00250	OFWAT Control Point C Submission	Q4 2021	Q4 2022		It is currently felt that the optimum submission time is ahead of RAPID G3.
RYWR.KEY.00260	OFWAT Control Point C Decision	Q4 2021	Q4 2022		
RYWR.KEY.00270	OFWAT Control Point D Submission	Q1 2022	Q1 2023		Combining Control Point D with Control Point C was considered, given the apparent closeness in submission dates. However, this is currently deemed to be impractical given the amount of information required for Control Point D. Control Point D's submission scheduling will thus need to take into account the need to await Control Point C determination and feedback. It will now be more closely aligned with Control Point E.
RYWR.KEY.00280	OFWAT Control Point D Decision	Q2 2022	Q1 2023		
RYWR.KEY.00290	OFWAT Control Point E Submission	Q2 2022	Q3 2023		As part of Control Point E, SW intend to undertake a further VfM analysis, in addition to gathering all relevant information

Activity ID	Description	Date at Gate 1	Option B.4	Narrative	Assumptions
					required for an Outline Business Case.
RYWR.KEY.00300	OFWAT Control Point E Decision (Commence Procurement)	Q3 2022	Q3 2023		
RYWR.KEY.00310	OFWAT Control Point F Submission	Q2 2024	Q2 2025		Control Point F is dependent on the point at which SW internally identifies a Preferred Bidder. The Preferred Bidder's proposal will in turn enable the Full Business Case to be completed as well as enabling SW to undertake all relevant governance prior to submission of Control Point F to Ofwat.
RYWR.KEY.00320	OFWAT Control Point F Decision (Contract Award Enabler)	Q3 2024	Q3 2025		

Table 106 - Key Dates B.4

Activity ID	Description	Date at Gate 1	Option B.4	Narrative	Assumptions
RYWR.KEY.00010	SECTION 20 AGREEMENT - SRO Operational (75Ml/d DE-SAL @ FAWLEY OPERATIONAL)	Q1 2027	Q1 2027	Section 20 Agreement date is a constrained date within the schedule and as such has not been affected by the schedule development.	This target date will be highly challenging to delivery for both B.4 and D.2 due to the dependency of both of on the construction and filling of the HTRs, which will occur after the S20 date. Critical path challenges as well as opportunities to recover time are explored in the narrative of this chapter.
RYWR.KEY.00510	FINAL WRMP 19 PUBLISHED	Q1 2022	Q4 2022	Changes due to a comprehensive review of timings and alignment with concurrent RAPID and WRSE processes.	See separate assumptions tables.

Activity ID	Description	Date at Gate 1	Option B.4	Narrative	Assumptions
RYWR.KEY.00910	SRO Consolidation (MCDA-3no SROs become 1) (c.Oct 2021)	N/A	Q1 2022	No change to Gate 1.	
RYWR.KEY.01000	WRSE Outcome (Final Result Early 2022. Assume Mar 2022)	Q3 2022	Q2 2022	Amended following updates in the WRSE process.	
RYWR.KEY.00060	Pilot PC Commissioning Complete	N/A	Q4 2025	New activity line added for completeness.	
RYWR.KEY.00050	15 Ml/d WRP to HT. 61 Ml/d to OTTERBOURNE - READY FOR WET COMMISSIONING	Q1 2027	Q2 2029	Delayed due to developed understanding of the critical path (including design and construction activities) and the key activities such as DCO process.	
RYWR.KEY.00040	15 Ml/d WRP to HT. 61 Ml/d to OTTERBOURNE - OPERATIONAL	N/A	Q1 2030	New activity to demonstrate linkage to HTR.	

Table 107 - Portsmouth Water Interfaces B.4

Activity ID	Description	Date at Gate 1	Option B.4	Narrative	Assumptions
HTRW.KEY.01010	[redacted]	N/A	Q4 2021	Key milestones from the HTR added to support the schedule development of the dependent activities under D.2.	It is assumed that the HTR will be delivered as per the dates provided here. PW / SW meet regularly to manage delays (as required) to minimise impact on D.2.
HTRW.KEY.01030		N/A	Q1 2022		
HTRW.KEY.01020		N/A	Q4 2021		
HTRW.KEY.01040		N/A	Q1 2022		
HTRW.KEY.01050		N/A	Q1 2022		
HTRW.KEY.01060		N/A	Q1 2023		
HTRW.KEY.01070		N/A	Q2 2023		
HTRW.KEY.01080		N/A	Q1 2025		

Activity ID	Description	Date at Gate 1	Option B.4	Narrative	Assumptions
HTRW.KEY.01090	[redacted]	N/A	Q1 2026		
HTRW.KEY.01100		N/A	Q3 2026		
HTRW.KEY.01110		N/A	Q3 2029		

Table 108 - DCO Process B.4

Activity ID	Description	Date at Gate 1	Option B.4	Narrative	Assumptions
RYWR.CON.08080	REQUEST for a SCOPING OPINION - SUBMITTED to PINS	Q3 2021	Q3 2022	The movement in the Scoping Opinion being submitted to PINS is directly related to the movement in the S35 date.	The Scoping Opinion cannot be submitted to PINS until the S35 direction has been given. The schedule logic has been amended so that the submission of the Scoping Opinion is driven by the S35 Direction. Significant preparatory work on the Scoping documentation being undertaken at risk prior to S35 direction to mitigate the movement as much as possible.
RYWR.CON.08120	SCOPING OPINION - ADOPTED by PINS	Q4 2021	Q3 2022	The movement in the Scoping Opinion being submitted to PINS is directly related to the movement in the S35 date.	
RYWR.CON.06090	DCO APPLICATION SUBMITTED	Q2 2023	Q4 2023	DCO Application submitted date movement is a result of earlier delays to the S35 Direction and the key decision to undertake a two-stage consultation process post Gate 2.	SW's approach to public consultation is proposing two further stages of consultation, including both a non-statutory and statutory consultation. Two additional stages of consultation will enable SW to adequately address the rigorous consultation requirements associated with

Activity ID	Description	Date at Gate 1	Option B.4	Narrative	Assumptions
					the DCO consenting process, ensuring that interested and affected stakeholders are given meaningful opportunities to influence SW's proposals as they are developed. This mitigates the risk of non-acceptance of the DCO application due to the inadequacy of consultation.
RYWR.CON.06140	DCO ACCEPTED	Q1 2023	Q4 2023	The movement in all of these activity dates are aligned with the above reasoning.	The statutory process, logic and stated durations have remained. The internal durations for development of design maturity post consultation phases and internal governance periods have undergone rigorous challenge both internally during deep dive session with SMEs and externally via legal review.
RYWR.CON.06160	EXAMINATION STARTED	Q2 2023	Q2 2024		
RYWR.CON.06180	EXAMINATION ENDED	Q4 2023	Q4 2024		
RYWR.CON.06230	DECISION ISSUED	Q2 2024	Q2 2025		
RYWR.CON.06270	JUDICIAL REVIEW PERIOD COMPLETED	Q3 2024	Q2 2025		
RYWR.CON.00640	Non-Statutory Consultation Complete	Q1 2021	Q3 2022	Non-Statutory Consultation was undertaken in Q1 2021 as per the Gate 1 schedule. The date now presented in the Gate 2 schedule represents the key decision to undertake a two-stage consultation process post Gate 2. The date presented here is	

Activity ID	Description	Date at Gate 1	Option B.4	Narrative	Assumptions
				the additional non-statutory consultation.	
RYWR.CON.00540	Statutory Consultation Complete	Q3 2022	Q2 2023	The movement in all of these activity dates are due to the key decision to undertake a two-stage consultation process post Gate 2	

Table 109 - Procurement B.4

Activity ID	Description	Date at Gate 1	Option B.4	Narrative	Assumptions
RYWR.PRO.02150	ECE CONSULTANT START DATE	N/A	Q2 2022	These new additional activities are representative of the increased granularity within the schedule presented at Gate 2.	SW has identified key areas where the programme would benefit from commissioning external parties to apply their expertise. This is the proposed timeline for the procurement of specialist support expertise.
RYWR.PRO.02570	DCO CONSENT CONSULTANT START DATE	N/A	Q1 2022	This is a key skilled resource required to deliver to the DCO process.	Resource is available and mobilised on time.
RYWR.PRO.02570	DCO CONSULTATION CONSULTANT START DATE	N/A	Q4 2021		
RYWR.SVY.01030	Ecological Surveys - THE START DATE	N/A	Q1 2022	Key to start this as per the dates due to seasonality.	Assumes no challenges with securing land access.
RYWR.SVY.00100	Infra Surveys & Designs Contractor START ON SITE FOR SURVEY	N/A	Q3 2022	This is a key skilled resource required to deliver to the DCO process.	Resource is available and mobilised on time.
RYWR.SVY.04090	Land Access 'Handshake' for Phase 1 Ecological Surveys	N/A	Q1 2022	Land access process have been split out due to the difference access required.	Assumes no challenges throughout the land owner engagement process.
RYWR.SVY.05110	Land Access 'Handshake' for Phase 2 Ecological Surveys	N/A	Q3 2022		
RYWR.SVY.05290	Land Entry 'Handshake' for Engineering Surveys	N/A	Q1 2022		

Activity ID	Description	Date at Gate 1	Option B.4	Narrative	Assumptions
RYWR.PRO.00100	DPC - ISSUE CONTRACT NOTICE (OFWAT E dependent)	N/A	Q3 2023	Due to the changes in the DCO consultation strategy and the Control Points detailed above, there is a subsequent impact on the dates associated with these activities.	
RYWR.PRO.00120	DPC - TENDER COMMENCED	N/A	Q1 2024	This assumes 1 DPC project.	Assumes sufficient market interest and capacity.
RYWR.PRO.00140	DPC - Inform Bidders of Tender Shortlist	N/A	Q2 2024		
RYWR.PRO.00160	DPC - PREFERRED BIDDER NEGOTIATIONS	N/A	Q1 2025		
RYWR.PRO.00190	DPC - Contract Award (KEY)	N/A	Q3 2025		Following market engagement with potential CAP participants a logic link has had to be incorporated into the schedule resulting in a SW and CAP financial close period of 60 days post DCO Judicial Review. This also ensures that any final consent conditions are known, can be assessed and the risk associated quantified and apportioned.
RYWR.PRO.00220	DPC - CONSTRUCTION DESIGN COMMENCE (KEY)	N/A	Q4 2025		

Table 110 - Design B.4

Activity ID	Description	Date at Gate 1	Option B.4	Narrative	Assumptions
RYWR.DGN.00810	EQUIPMENT SELECTED	N/A	Q2 2022	New line added	
RYWR.DGN.00820	(GIVE) - SUFFICIENT DESIGN COMPLETE for PRE-APPLICATION CONSULTATION	N/A	Q1 2022	SW has worked through the interfaces in detail and is now allowing additional design effort to support throughout the consenting and procurement phases of activity. Following the key decision to undertake a two-stage consultation process post Gate 2 there has been further movement within this date.	
RYWR.DGN.00840	(GIVE) - REDLINE for Preferred Route Announcement (PRA) CONFIRMED	Q2 2022	Q3 2022	Due to the addition of a secondary non-statutory process, SW is required to maintain optionality in the route selection for longer. This and further work completed to detail the route development process has resulted in a revised date.	This is dependent on issues identified which delay the process to identifying a preferred route and any necessary survey work can be completed as required (i.e. no issues with seasonality).
RYWR.DGN.00830	(GIVE) - DESIGNS INFORMATION COMPLETE for PROCUREMENT TENDER DOCUMENTATION	N/A	Q1 2023	This is a new key activity that has been included during the development of the schedule.	This activity has been linked to the Statutory Consultation process to mitigate the risks associated with having SRO information in the public domain that is not representative of what is being presented at Statutory Consultation and to limit the potential for change to the

Activity ID	Description	Date at Gate 1	Option B.4	Narrative	Assumptions
					documentation during the tender process due to the incorporation of commentary from interested and affected stakeholders.

Table 111 - Post DPC Award - Construction B.4

Activity ID	Description	Date at Gate 1	Option B.4	Narrative	Assumptions
5	EARLIEST START ON SITE	N/A	Q1 2026	Additional information provided as per design development.	Historical project experience has been used where comparable projects could not be identified in the algorithm raw data. Expert supply chain has been used for discrete schedule area development such as the conveyance pipework.
WBS SUMMARY	BF to WRP - Construction Complete	N/A	Q2 2028		
WBS SUMMARY	HLPS HT to Otterbourne Pre-Disinfection Plant - Construction Complete	N/A	Q3 2027		
WBS SUMMARY	WRP - Construction Complete	N/A	Q2 2029		Construction period data used from international water recycling projects.
WBS SUMMARY	Conveyance Pipework HTR to Otterbourne Pre-Disinfection Plant - Construction Complete	N/A	Q2 2029		Historical project experience has been used where comparable projects could not be identified in the algorithm raw data.
WBS SUMMARY	Conveyance Pipework WRP to HTR- Construction Complete	N/A	Q4 2028		
WBS SUMMARY	BPT HTR to Otterbourne Pre-Disinfection Plant - Construction	N/A	Q4 2026		

Activity ID	Description	Date at Gate 1	Option B.4	Narrative	Assumptions
RYWR.KEY.00040	15 Ml/d WRP to HT. 61 Ml/d to OTTERBOURNE - OPERATIONAL	N/A	Q1 2030		

2.9.5. Gate 3 Schedule Development

Further schedule development work will take place between Gate 2 to Gate 3 as SW moves into the development of the Outline Business Case. SW will be further developing design, consenting and procurement activities to strengthen the underlying data.

SW will also be engaging extensively with stakeholders and the market as it moves into the next phase of activity. This will also shape SW's delivery plans and schedules as the project evolves.

2.10. Cost Modelling

2.10.1. Introduction

Following on from the Gate 1 submission to RAPID in September 2020, SW has undertaken additional work analysing the feasibility and viability of multiple SRO Options as part of the wider WfLH programme. This section focuses on the cost estimate based upon the current design and analysis completed to date, with HTR Options, Options D.2 and B.4 considered in this section.

The following estimates (cost and carbon) have been produced:

- CAPEX
- Risk
- OB
- OPEX
- Capital Carbon
- Operational Carbon
- NPV
- AIC

A summary of the CAPEX for each of the Havant Thicket Reservoir Options (D.2 & B.4) is provided in Table 112.

Table 112 - Gate 2 Solution Comparison and Gate 1 to Gate 2 Journey (cost base 2017/18)

Options		B.4	D.2	CeraMac
Gate 1	CAPEX (£m)	458	176	0
Gate 2	CAPEX (£m)	451	261	158
Gate 2	CAPEX Inc 50% CeraMac (£m)	530	340	

A CeraMac plant is required at Otterbourne WSW, which treats water from multiple sources prior to distribution to customers, in parallel to the delivery of either of the Havant Thicket Reservoir Options. At this stage, modelling has not been completed to confidently determine the ratio of source water being treated by the CeraMac plant, and i.e. inform where costs for funding this plant should be allocated to. As a result, cost for this has been expressed above at 50% of CAPEX as the assumed percentage of this proposed asset which will treat flows produced by these Options, with more detailed modelling to be completed post Gate 2, which will support a more detailed calculation in the allocation of CeraMac costs for each Option.

2.10.2. Key Solution Cost Information, Building on Gate 1 with Reduced Uncertainty in Costs and Benefits:

The solutions considered for the strategic option of Water Recycling are Options D.2 and B.4, as detailed in Section 2.2:

Option B.4 – 15 Ml/d Water Recycling from BF WTW to a smaller WRP at site 72 and pipeline to the proposed HTR. With a total of 75 Ml/d abstracted flows from HTR piped to Otterbourne WSW via a HLPS.
Option D.2 – 75 Ml/d Abstracted flows from HTR piped to Otterbourne WSW via a HLPS

Option B.4 which includes a smaller WRP at Site 72 is comprised of a connection to the FE channel at BF WTW with a directional drill constructed under Langstone harbour to the WRP at site 72. Flows are then passed onto HTR via a pipeline.

Flows are then abstracted from HTR and pumped via the HLPS to Otterbourne WSW.

Option D.2 follows the second half of the B.4 process taking only flows from HTR and pumping via the HLPS to Otterbourne WSW.

Both Options have as part of the scope a CeraMac located at the Otterbourne site. As this asset caters for more than just the flows produced by this project it has been isolated in terms of cost modelling. Thus, for both recycling Options the costs are shown as:

- Solution without inclusion of CeraMac
- CeraMac asset only

In moving from Gate 1 to Gate 2 exercises were undertaken to reduce uncertainty in both costs and benefits of the solutions being considered.

In order to achieve this for the Alternatives / HT Options, the following activities have been undertaken:

- Improved design definition for both the proposed works at BF WTW and HTR. This enabled estimates to be produced on a more granular process level rather than overall solution models.
- Increased definition was provided for both the directional drill connecting BF and the WRP at Site 72 along with the pipeline connecting the WRP to HTR.
- Four Options have been reviewed for the pipe routes between the proposed HLPS and Otterbourne WSW each of which has been priced to understand the relative costs. Additional input was provided by SW's infrastructure delivery partner [redacted] in order to understand the practical constraints in terms of constructability and to ensure that these are represented both in the base cost and risks as necessary.
- The assessment of risk sums has been robustly undertaken in the form of costed risk registers for each individual Option rather than the SW risk percentage uplift utilised at Gate 1.
- OB has been calculated and applied for each individual solution rather than at the higher process levels utilised at Gate 1 the impact of this is described in Table 113 above.
- OB has been calculated as per the ACWG guidance and applied for each individual Option. For more detail on the OB process and values, refer to Section 2.10.7.
- Additional Project Costs (APC) have been revised based on inputs from SMEs such as the statutory undertakers [redacted] Land Managers [redacted] and Environmental Consultants [redacted] The following APC components have been revised:
  - Land - Independent cost benchmarking by [redacted]
  - Power - Desktop quotations provided by [redacted]
  - Pilot Project Costs - Reviewed and updated with project team
  - Planning - Reviewed and updated with project team
  - Public Consultation - Reviewed and updated with project team
  - Legal - Reviewed and updated with project team
  - Environment - Reviewed with SW environment team and [redacted]
- Construction costs have been collated using the [redacted] platform by the SW CIT to ensure a consistent approach with the supply chain. Infrastructure and tunnelling elements have

been priced from first principles utilising current market data in conjunction with [redacted] and [redacted] respectively and linked back to the design information. Process and Desalination (a separate water sourcing solution type considered, refer to documents included as part of SW's Interim Update to RAPID, dated 27 September 2021) plant costs have been derived from a combination of SW and industry cost data and reviewed against market norms. As such the level of granularity of cost and scope has been improved from the information available at Gate 1, which was both at a lower level of granularity of design information and costed largely only using parametric models.

- The reduction in uncertainty regarding the benefits associated with the project can be found in section Level 3B of the overall submission document.

Overall costs of the solution, construction, and operation for each Option:

The overall CAPEX and OPEX, as well as NPV and AIC values over 108 years are detailed below in Table 113 (to cost base 2017/18). The 108 year period was adopted in NPV and AIC calculations, as this is the longest expected component, or asset, lifespan within each of the Options being considered at this stage. This does differ from the All Company Working Group (ACWG) guidance, but this risk was negated as at this stage this approach was applied across all Options considered. For the B.4 and D.2 Options solutions, the CeraMac Plant costs have been removed.

OPEX, NPV and AIC values are for the DO flows and minimum flows. A third operating regime was also modelled, an average flow that assumes 1 year in the 100 operating years will be operating at maximum (DO) flow, with the remaining 99 years' operating at minimum flow.

Table 113 - CAPEX and OPEX Totals, NPV and AIC values (cost base 2017/18) - all costs excluding the CeraMac Plant

OPERATING REGIME	FLOW (Ml/d)	CAPEX (£M)	OPEX (£M/y)	NPV (£M)	AIC (p/m3)
			B.4		
MAX (DO)	75	451	5.8	554	88
MIN	5	451	2.8	483	76
AVERAGE	6.69	451	2.9	486	77
			D.2		
MAX (DO)	75	261	2.2	265	42
MIN	5	261	0.8	231	36
AVERAGE	6.69	261	0.8	231	37

The CAPEX, OPEX at max flow, NPV and AIC values 108 years for the CeraMac Plant only are detailed in Table 114. The operating regime modelled is 75 Ml/d, which represents the process treating incoming flows from the WRPs / HT. While the CeraMac will also treat additional flows from the existing site up to 91 Ml/d, these are not considered here. Note only the operational maintenance costs have been included in the OPEX for the CeraMac plant as it is deemed that sufficient operations assets are available at Otterbourne to cater for the operating of the CeraMac plant, i.e. no additional staffing requirements to maintain the CeraMac plant – this role is assumed to be covered by existing staffing profiles at Otterbourne WSW.

Table 114 The CeraMac is sized at 91 Ml/d which is the output needed for the required pre-disinfection at Otterbourne. The operating regime modelled is 75 Ml/d, which represents the process treating incoming flows from the WRPs / HT. While the CeraMac will also treat additional flows from the existing site up to 91 Ml/d, these are not considered here. Note only the operational maintenance costs have been included in the OPEX for the CeraMac plant as it is deemed that sufficient operations assets are available at Otterbourne to cater for the operating of the CeraMac plant, i.e. no additional staffing requirements to maintain the CeraMac plant – this role is assumed to be covered by existing staffing profiles at Otterbourne WSW.

Table 114 are for the whole 91 Ml/d plant. Alternatively, Table 109 details CAPEX at 50% which is the element of flow driven by this project to enable a comparison with the desalination Options. The operating regime modelled is 75 Ml/d, which represents the process treating incoming flows from the WRPs / HT. While the CeraMac will also treat additional flows from the existing site up to 91 Ml/d, these are not considered here. Note only the operational maintenance costs have been included in the OPEX for the CeraMac plant as it is deemed that sufficient operations assets are available at Otterbourne to cater for the operating of the CeraMac plant, i.e. no additional staffing requirements to maintain the CeraMac plant – this role is assumed to be covered by existing staffing profiles at Otterbourne WSW.

Table 114 - CAPEX and OPEX Totals, NPV and AIC values (cost base 17/18) – CeraMac Plant only

OPERATING REGIME	FLOW (Ml/d)	CAPEX (£M)	OPEX (£M/y)	NPV (£M)	AIC (p/m3)
CeraMac					
ALL REGIMES	75	157	1.1	215	34.0

The CAPEX, 60-year OPEX 60-year NPV and cost/m3 values produced at Gate 1 are summarised in Table 116. Note the OPEX costs are not easily comparable against the new Gate 2 estimates for the following reasons:

- Approach for developing operational regime estimates were different between Gate 1 and Gate 2, most significantly the flow regime considered. Gate 1 attempted to model a flow regime that included a range of potential operating flows in varying years. In Gate 2 OPEX costs are reported for minimum and maximum (DO) flows, as well as an average as described above.
- For Gate 1, power and chemical use were estimated by the costing team. For Gate 2, the power and chemical consumption has been estimated and provided by SW's design team.
- Gate 1 OPEX values were reported as the total operating cost over 60 years. Gate 2 OPEX values are costs per year.
- Gate 1 OPEX costs included OB. This is not included in Gate 2 OPEX estimates (see Section 2.10.7 for further information).

These differences in the approach to preparing OPEX estimates also hinder comparisons of the Gate 1 NPV and cost/m3 values with the new Gate 2 NPV and AIC estimates. Furthermore, the Gate 1 cost/m3 were derived by dividing the NPV by the total throughput expected over 60 years, without discounting of flows, whereas the Gate 2 AIC values divide the NPV value by the discounted whole life throughput.

Table 115 - Gate 1 CAPEX, OPEX and NPV (17/18 base date)

SOLUTION	DO (Ml/d)	CAPEX (£M)	60yr OPEX (£M)	60yr NPV (£M)	Cost /m3 (£/m3, 60year, WLC)
B.4	61	458	597	722	2.99
D.2	61	176	19	158	0.53

Option D.2 costs have increased significantly in real terms between Gate 1 and Gate 2. Table 116 describes the reasons for the change in costs.

Table 116 – Option D.2 real term costs from Gate 1 to Gate 2

[redacted]

The largest difference in operational cost has been driven by power demand and allowance for operational maintenance costs. This difference between Gate 1 and Gate 2 OPEX cost has been driven by an improved understanding of the operational requirements of the Options and more detailed modelling, particularly for power demand. Gate 1 costs were estimated values given the uncertainty in the Option operational requirements at that stage, these have now been updated to account for the level of information now available and will be further updated as the operating scenarios evolve to gain more confidence / detail in Gate 3.

2.10.3. Detail of Capital Expenditure

The CAPEX breakdown for the Options (excluding the CeraMac Plant) are illustrated in Figure 72 below. In order to understand the costs which will not be delivered through the DCO procurement path, the CeraMac plant at Otterbourne has been removed from the scope and highlighted as a stand-alone asset. The CeraMac plant CAPEX breakdown is illustrated in Figure 73.

[redacted]

Figure 70 - Option B.4 & D.2 Alternative / Havant Thicket CAPEX with CeraMac plant removed

[redacted]

Figure 71 - Option B.4 & D.2 Alternative / Havant Thicket CAPEX - CeraMac plant only – 50% of CeraMac value will be required to deliver B.4 or D.2 through this delivery route. With the other 50% being funded from a separate funding stream. (note that additional project costs are taken as c.10% of B5 APCs to reflect assumed allowance for CeraMac only activity)

Summary of the process undertaken to prepare the CAPEX estimate:

The process undertaken to prepare the CAPEX estimates for the Alternatives / HT Options are as follows (please note that elements highlighted in Blue below forms an improved process from Gate 1):

- Appraisal of the Options by the estimating team with the design leads to obtain understanding of scope and known constraints. Discipline specific design and estimating leads appointed to enable the collaborative production of estimates covering the infrastructure, non-infrastructure and tunnelling specific elements of scope.
- Production by the design team of scope (CIT) documents aligned to SW's process drivers, to enable the scope to be represented as a Cost Breakdown Structure (CBS) in order to be priced.
- Third party support procured to collaboratively review constructability of key scope [redacted] (Tunnelling) and [redacted] (Pipeline routes).
- Estimating of Direct Costs for each Option from a combination of SW and Industry data supported by first principles estimating of the pipeline and tunnels elements.
- Estimates combined into comprehensive priced schedule of works in [redacted]
- Estimates reviewed by design leads to ensure that the scope had been correctly interpreted.
- Risk Registers collaboratively populated and costed with relevant SMEs.
- Contractor indirect cost allowances calculated from SW's percentage uplifts (SMART targets) to align with PR19 allowances.
- Additional project costs reviewed with SMEs with external assistance from statutory undertakers [redacted] Land Managers [redacted] and Environmental Consultants [redacted]
- Costs are based upon the same land take considered at Gate 1.
- Client costs calculated from SW's percentage uplifts (SMART targets) to align with PR19 allowances.
- OB calculation collaboratively populated with relevant SMEs in accordance with the ACWG 3 stage approach.
- Costs tested collectively to mitigate against gaps in known data or double counting between base cost, risk, and OB.
- In order for the estimates to align to the PR19 submission to OFWAT all costs have been indexed. Currently all costs are indexed to average 2017/18 in line with the approach taken at Gate 1.

  The price base is the average of 12 months of index, with a mid-point of End September. The factors for each year are April – March averages. Ofwat changed the basis of indexation in April 2020 to Consumer Prices Index Including Owner Occupiers' Housing Costs (CPIH). Hence, the index up to and including March 2020 is be based on monthly outturn Retail Price Index (RPI), converted to April to March annual averages, changing to CPIH on April 2020, using actuals until they run out then a forecast from a recognised source (OBR) This provides an indexation from current Q2-2021 back to 2017/18 of –8.084%.
- CAPEX costs and estimate structure provided to align with the production of OPEX, Carbon, NPV and AIC summaries for each Option.

2.10.4. Details of Operating expenditure

The process undertaken to prepare the OPEX estimates for the HT Options (B.4 and D.2) is as follows:

- OPEX estimates for each Option have been prepared, divided into fixed OPEX and variable OPEX to align with WRSE requirements.
- Fixed OPEX is made up of operational maintenance (calculated as a percentage of CAPEX) and staffing costs, whereas variable OPEX is made up of abstraction charges, transmission and network pumping costs, electricity and consumables used in treatment.

- Two operating regimes were used for deriving variable OPEX for each Option. These operating regimes are consistent with those detailed in Section 2.2, Engineering Technical Design and are as follows:
  - The minimum operating scenario is the lowest flow the Option can operate at and is the usual base case
  - The maximum operating scenario is the flow the Option can deliver in a drought event (DO)
  - A third regime, Average operating scenario, was derived from the minimum and maximum assuming the maximum occurs for 1 year in 100 years and the minimum flows occur for the remaining years

Table 117 - Min, Average, Max Flows for B.4 & D.2

Option	Min flow (Ml/d)	Max flow (Ml/d)	Average Flow (Ml/d)
D.2	6	75	6.69
	Transferred from HTR		
B.4	6	75	6.69
	From the new WRP and HTR – mixed source flow	15 Ml/d from the new WRP. Mixed source transfer of 75Ml/d to Otterbourne WSW	

- The current Bulk Supply Agreement (BSA) notes that PW must fill the reservoir with surplus water from the [redacted] and [redacted] and that economic ownership of this resides with SW. On the basis that that D.2 does not require any additional source to fill the reservoir, there is no further charge to be levied by PW on the content of the reservoir. In the B.4 scenario, the only additional source of raw water that contributes to the filling of the reservoir is the WRP and this is a SW asset fed by a SW source and hence, there will be no additional charge from PW for this water as it is already owned by SW property.
- Staff costs for treatment plants and transfer infrastructure have been based on staffing level assumptions and hourly unit costs provided by SW.
- Chemical costs have been derived using chemical volumes supplied by SW design engineers for the WRP (Option B.4) for a 15 Ml/d operating regime, and pro-rated down for the 6 Ml/d operating regime. Unit costs for chemicals were taken from SW's OPEX tool where available or from industry data.
- Power demand estimates for the infrastructure and non-infrastructure schemes were provided by SW design teams and converted to annual power consumption.
- Operational transport costs were estimated for staff undertaking operations and maintenance activities. These estimates included vehicle leasing and fuel use and were based on unit rates provided by SW.
- The transport and disposal costs for WTW waste (grit, screenings, and sludge) have been derived using unit rates provided by SW and estimated waste quantities.
- Annual operational maintenance costs have been estimated based on a percentage of the initial capital costs at the Option level. These percentages are based on common assumptions used in the water sector for such infrastructure. Civil maintenance was calculated as 0.5% of the Infra and non-infra civil costs whilst M&E maintenance was calculated as 2.5% of the infrastructure and non-infrastructure costs M&E costs which aligns to the approach taken within the WRMP24 exercise.
- The variable OPEX cost per ML was derived by dividing the total variable OPEX by the flow estimated for that Option.

The process undertaken to prepare the Capital Maintenance estimates for the HT Options is as follows:

- CAPEX estimates have been split by asset type and each asset type has been assigned an asset life from 4 to 100 years (based on the proposed standard asset life classes for water resource planning presented in the ACWG cost consistency guidance).
- This allocation has then been used to allocate future capital maintenance / renewal costs for each asset type over the 100-year operation duration used in the NPV and AIC analysis. Capital maintenance / renewals cycles have been taken as starting in year 9 (first operating year).

No additional risk or OBs has been added to the OPEX for Gate 2. The key risk factors affecting potential OPEX costs were identified as being significant changes in unit costs of OPEX consumables such as power and chemicals, or if the scheme needs to run more regularly than currently anticipated. At this point there was not considered the need to apply potential real terms cost inflation for unit rates as this was not seen as a significant risk that could be modelled. To account for the potential for more regular operating requirement a range between the minimum and maximum operating cost has been provided as well as the estimated average operational costs, which accounts for the most likely operating costs.

2.10.5. Net Present Value (NPV) and Average Incremental Cost (AIC)

The Gate 2 NPV and AIC values are presented above.

The approach to calculating the NPV and AIC values has followed process from the ACWG to ensure consistency in the calculation of NPVs and AICs across all SROs. The ACWG Cost Consistency report reviewed approaches to calculation of financing costs and recommended a consistent approach which is summarised in Section 6.3 of the Cost Consistency report.

NPV estimates have been calculated over a 108-year period, comprising 8 years for development and construction followed by 100 years of operation. The 100-year operation duration has been selected as this is the life of the longest lasting asset proposed in any Option (the transfer pipelines, which occur in all Options) in accordance with the latest HM Treasury Green Book recommendations. CAPEX (including maintenance and replacement costs) and OPEX forecasts (both fixed and variable costs) have been profiled over the 108-year analysis period. The Option Financing costs have then been calculated as a stream of annual costs over the life of the Option, using an assumed 2.92% Weighted Average Cost of Capital (WACC). The NPV of all costs has then been calculated using the Treasury Test Discount rate as set out in the HM Treasury Green Book (Appraisal and Evaluation in Central Government, HM Treasury 2018). This is 3.5% for years 0-30 of the appraisal period, 3.0% for years 31-75, and 2.5% for years 76-125.

AIC values have been estimated based on DO. Three denominators are used – minimum utilisation, maximum utilisation, and average utilisation (assuming 99 years of minimum utilisation and 1 year of maximum utilisation). In all cases the denominator (discounted DO over the life of the scheme) is the same - i.e., it is a unit cost for making available a capacity. In each case the flows are discounted over the life of the scheme using the Green Book discount rates.

2.10.6. Carbon Analysis

The process undertaken to prepare the Capital Carbon emissions estimates for the HT Options is as follows:

- The capital carbon assessment was based on scoping information from the CIT costing sheets.
- Capital carbon emissions cover scopes A1-A5, i.e. cradle to built asset. The carbon models used are based on design standards from across the UK industry, with average assumptions for transport distances of products to site.
- Analogous to cost models, the capital carbon models are based on curves created from data points, relating a driver defining the size of the asset to its carbon emissions. The carbon models are not based on the same underlying information as the cost models, and not all cost models have a

directly corresponding carbon model. The size drivers also do not always match. Cost models were mapped to carbon models as closely as possible, with standardised assumptions made where drivers needed converting between units or different estimates of the asset size were required.

- Where costs were developed using a bottom-up approach or based on quotes from suppliers rather than cost models, a general approach to account for additional capital carbon was applied based on the relative proportion of the total cost. For example, if 90% of the total cost was based on cost models and 10% was bottom up, the total capital carbon was scaled up accordingly to account for the additional assets. This approach was taken due to the wide range of assets which had been costed without reference to standard cost models and was a time-effective estimate of the carbon associated with these assets.

The process undertaken to prepare the Operational Carbon emissions estimates for the HT Options is as follows:

- Quantities for power use, chemical use and transport were taken from the operational cost estimates, with power and chemical use estimates provided by the SW design team
- **Power**
  - Emissions factors for grid electricity taken from BEIS Green Book projections and consider projected grid decarbonisation from 2029 to 2100, with the emissions factor assumed to be constant after 2100.
  - BEIS Green Book values always appear to lag 2 years behind the Defra reported value in each year. Therefore, the values used for 2030 correspond to the 2028 value in the Green Book etc.
- **Chemicals**
  - Where available, emissions factors were taken from the Carbon Accounting Workbook (CAW). Chemical quantities were taken from the OPEX calculations, converted into the amount of pure chemical used.
  - Where not accessible from the CAW, an emissions factor for CO_2e was found from an alternative source. Note that no reasonable emissions factor could be located for anti-scalant, and therefore this was assumed to have the same emissions factor to orthophosphoric acid.
- **Transport**
  - Emissions factors were taken from the CAW, which provides tCO_2e/km travelled
  - Assumes operational journeys completed by van, large HGVs (> 33t) used for sludge trucking and smaller HGVs (3.5-3.3 t) for screening and grit transportation
- **Operational maintenance**
  - Carbon emissions associated with operational maintenance were assumed to be negligible and primarily associated with labour rather than significant additional materials use

The whole life carbon estimates comprise the capital carbon emissions, annual operational emissions and additional emissions associated with capital maintenance. The estimated annual carbon emissions profile was based on the whole life cost profile developed for the NPV and AIC cost calculations.

- Years 1-4: planning
  - Assumed no carbon emissions associated with planning phase
- Years 5-8: construction
  - Assumes all capital carbon emissions occur in years 4-8 in proportion to the following CAPEX breakdown:
    - Year 5: Proportional to 25% of planning costs and 20% remaining CAPEX costs
    - Year 6: Proportional to 25% of planning costs and 35% remaining CAPEX costs
    - Year 7: Proportional to 25% of planning costs and 35% remaining CAPEX costs
    - Year 8: Proportional to 25% of planning costs and 10% remaining CAPEX costs
- Years 9-108: operation & capital maintenance

- Capital maintenance emissions were assumed proportional to capital maintenance costs, e.g., if capital maintenance costs in year 13 are 1% total CAPEX, the capital maintenance carbon emissions in year 13 were estimated as 1% of total capital carbon emissions.
- Annual operational carbon emissions were included and calculated as above. As grid decarbonisation projections are included in the analysis, year 1 is assumed to be 2021 and the first operational year is assumed to be 2029.

The monetised cost of carbon was also calculated using the traded and non-traded carbon price forecasts from the Green Book Supplementary Guidance: Valuation of energy use and GHG emissions for appraisal (Table 119, Carbon prices and sensitivities 2010-2100 for appraisal, 2018 £/tCO2, central price). The traded carbon price was applied to power related emissions only, with the non-traded carbon price applied to all other emissions.

The current estimate of emissions provides a view of how much the Options would add to SW's existing emissions once commissioned. Under SW's net zero operational emissions by 2030 commitment these operational emissions will need to be reduced and potentially offset by 2030. The potential costs of offsets have not been included as this would be considered as part of SW's overall net zero and offsetting strategy.

Table 118 summarises the capital carbon, operational carbon (associated with chemical use, power and transport), whole life carbon (includes capital maintenance in addition to operational carbon over 100 years) and the non-discounted monetised cost of carbon.

Table 118 - Capital, operational and whole life carbon estimates and monetised cost of carbon (2018 £/tCO2e)

OPERATING REGIME	FLOW (Ml/d)	CAPITAL CARBON (tCO2e)	OPERATIONAL CARBON (tCO2e)	WHOLE LIFE CARBON (tCO2e)	MONETISED WHOLE LIFE CARBON (£M)
B.4					
MAX (DO)	75	71,000	4,600	363,000	86
MIN	6	71,000	1,100	193,000	41
AVERAGE	6.69	71,000	1,200	195,000	41
D.2					
MAX (DO)	75	42,000	1,500	98,000	18
MIN	6	42,000	100	55,000	7
AVERAGE	6.69	42,000	100	55,000	7
CeraMac					
ALL REGIMES	75	41,000	0	134,000	3

2.10.7. Estimating Uncertainty, Risk and Optimism Bias (OB)

Following the development of the base cost (direct costs) using the priced bill of quantities underpinned by the CIT sheets (quantified schedules of works) received from the relevant Design Teams, consideration must still be given to the remaining uncertainty contained within both the pricing assumptions (e.g., assumed unit rates) and the design assumptions (e.g., assumed ground conditions).

In order to do this, any significant assumptions made during the design and estimating process are interrogated in formal risk workshops to understand the level of variance that remains within these assumptions. Discussion of the assumptions between the design team, estimating team and risk team within the workshop enables each assumption to be assigned, as appropriate, to one of estimating uncertainty, risk or optimism bias and ensures that all of these three elements of the estimate are fully integrated and considered in accordance with each other to avoid either cost duplication or cost gaps.

For clarity, and to prevent this cost duplication throughout the cost estimating process, the three elements are defined as follows:

- Estimating Uncertainty: Percentage ranges around the component costs and productivity rates of the defined scope to account for variance inherent in the input values.
- Risk: Discrete and specific events that have the potential to impact (positive or negative) on the successful achievement of the defined and agreed scope.
- Optimism Bias: A percentage uplift applied to those elements of the Project Delivery that are not sufficiently defined or understood to enable an agreed scope to be defined and therefore discrete, specific risks to be applied. This approach is ensured through the adjustment of the Optimism Bias percentage utilising the information contained within the quantified risk register.

Estimating Uncertainty

Through these integrated discussions, those items where it is appropriate for estimating uncertainty to be applied are identified. Subsequently, on completion of the base cost for each Option estimate, Level 1 costs are generated through a summarisation of the individual costs within the Bill of Quantities. Uncertainty ranges are then applied to these Level 1 costs (summarised major headings from the Bill of Quantities). The ranges are applied in the form of percentages, with each Level 1 summary cost having a negative (e.g., -10%) and a positive (e.g. +20%) percentage applied. These specific uncertainty range percentages were selected based upon the estimating teams' level of confidence in likely level of change to component cost and productivity for the specific Option scopes with the final range reflecting the remaining level of uncertainty associated with the respective element. These estimating uncertainty values are then applied to the BASE cost for each Option to provide a Net Direct Cost. As stated above, where potential variance in an assumption is agreed to be expressed using estimating uncertainty, these specific assumptions are no longer considered as part of the subsequent risk or optimism bias assessments to prevent duplication.

Risk

Through the integrated discussions, those items that are considered specific risks (threat or opportunity) to the agreed design, and therefore scope, are captured on a quantified risk register and their current probability of occurrence and range of cost impacts are estimated and agreed. This process is undertaken for both the infrastructure elements and the non-infrastructure elements of each Option. This ensures that a comprehensive list of discrete risks is identified and allows a fully quantified risk register to be developed for each Option based on the assumptions made during the design process.

In order to estimate the probability for each risk, the probability is assessed in a quantitative manner on a scale of 1% to 99% using group consensus during the facilitated cost risk workshop, with final approval granted by the [redacted]. This approach is in accordance with the wider Risk Management Process as contained within the SW Risk Management Handbook and is explained in more detail in Section 2.7.

When estimating the range of cost impacts for each identified risk, Minimum, Most Likely and Maximum cost impacts are considered. However, it should be noted that given the level of uncertainty that still remains within the Options, the starting point for each range of cost impacts was to populate only the Minimum and the Maximum costs. Only in the event that the integrated discussions agreed that a Most Likely cost could be identified (i.e., we have sufficient knowledge to specifically suggest a Most Likely cost), enabled a Most Likely cost to be included within the Range of cost impacts. Similar to the probability, these values are estimated using group consensus during a facilitated workshop, with final approval granted by the [redacted] All costs are aligned with those values used in the base cost build up.

The risk cost impacts captured initially within the risk register are direct costs only. However, within the cost risk model input sheet, indirect uplifts have then been applied to the individual cost impacts to reflect the application of indirect cost percentages to ensure that the modelled risk value presented within the estimate is aligned to all the other capital costs, which themselves have been uplifted by indirect costs. Following the estimation of the probability and the range of cost impacts for each risk item, and the application of the indirect cost uplifts, the cost risk inputs have been modelled using Monte Carlo simulation within the @Risk software. This has enabled a range of risk output values to be calculated, with the P50 value being selected for inclusion within the cost estimate.

The above risk approach has been applied across all of the Options, except in the event that the integrated discussions agreed that the level of design maturity for a particular element did not support the use of a quantified risk register. For the HT Options, these elements include the BPTs and High Lift Pumps (Option B.4 and D.2). Under these circumstances, the risk approach for these specific elements relied on a percentage uplift approach rather than a list of specific, discrete quantified risks. However, the values resulting from this percentage uplift were still incorporated within the cost risk model and therefore the total risk value for each Option.

The P50 risk values for Options B.4, D.2 and the CeraMac Plant are detailed in Table 119 below, along with the risk percentage when compared to the base cost. In addition, the Gate 1 Base Cost and Risk Values are included for comparison where available.

Table 119 - Risk Values at Gate 1 (Q3 2020 values) versus Gate 2 (Q2 2021 values).

Option	Gate 1 Base Cost	Gate 1 Risk Value*	Gate 1 Risk Percentage*	Gate 2 Base Cost	Gate 2 P50 Risk Value	Gate 2 Risk Percentage
B.4	£226 m	£156 m	69%	£272 m	£130 m	48%
D.2	£90 m	£95 m	106%	£171 m	£65 m	38%
CeraMac	-	-	-	£109 m	£31 m	28%

*At Gate 1, the risk value was applied against the net direct cost portion of the Gate 1 Base Cost only. However, to enable direct comparison of value with Gate 2, the Gate 1 risk value has been uplifted with indirect costs.

Table 120 therefore shows that since Gate 1, the risk percentages and values associated with the cost risks for both Option B.4 and Option D.2 have decreased, as the quantified risk process has superseded the use of percentage uplifts. This shift to a quantified risk approach, resulting from a maturing design, has enabled a more realistic view of the cost risk profile at Gate 2 and in this instance has resulted in a decreasing risk profile as more information is obtained through the design process.

At this stage of design, a preferred pipe route has yet to be selected as the Options are not suitably mature in their design and have not concluded the stakeholder consultation activities as part of the planning process. Therefore, a range of pipe routes were examined as part of the cost estimating exercise with only one pipe route costed as part of the base estimate. To ensure that the costs associated with the alternative pipe routes were not excluded from the cost estimates, these were instead represented within the cost risk model. However, it is necessary to communicate the value associated with these items in order that their contribution to the overall risk value is visible in the event that the risk values are perceived to be high for the stage of the Project Lifecycle.

Therefore, whilst there has been a decrease in the risk value for Option B.4 and Option D.2 since Gate 1, the risk values of £130 m for Option B.4 and £65 m for Option D.2 still appear high at this stage of the lifecycle when represented as a percentage of the base cost (48% and 38% respectively).

Within Option B.4, c.£34 of the overall risk value of £130 m can be attributed to this route optionality. In addition, there are also a number of key risks that have now been identified, that are driving the risk value, specifically the potential for changing the design from a micro tunnel to segmental tunnel at two distinct sections of the pipe route (£15 m) and material cost volatility (£20 m) which comprise 27% of the overall risk value. In order to further reduce the risk value throughout the next stages of the Project Lifecycle, focus will be on information gathering and mitigation in order to manage these risks to an acceptable level. These and other key cost risk drivers impacting on Option B.4 are as follows:

- Change of construction technique from micro tunnel to segmental tunnel for the A3(M) motorway crossing
- (A3M)
- Material volatility
- Change of construction technique from micro tunnel to segmental tunnel (Otterbourne)
- Compensatory habitats
- Schedule delay

Similarly to Option B.4, within Option D.2 the risk value is driven by number of significant cost risks, specifically in relation changing the design from a micro tunnel to segmental tunnel at two distinct sections of the pipe route (£15 m) and material volatility (£11.5 m). The total value of these risks is c.£26.5 m which accounts for approximately 41% of the risk value. As for Option B.4, focus will be on managing these risk items to an acceptable level as the design advances. These and other key cost risk drivers impacting on Option D.2 are listed below:

- Change of construction technique from micro tunnel to segmental tunnel for the A3(M) motorway crossing
- Material volatility
- Change of construction technique from micro tunnel to segmental tunnel (Otterbourne)
- Amendments to launch and reception pits to mitigate environmental constraints
- Schedule delay

Optimism Bias

In order to undertake the OB process, the guidance contained within the HM Treasury Green Book Supplementary Guidance: Optimism Bias has been followed, ensuring that any updated guidance from the ACWG has also been incorporated (see Section 2.10.1.8). This ensured that the appropriate Project Type was applied when commencing the OB assessment and that the appropriate adjustments are made to the OB percentages throughout the assessment.

OB has been applied once to each Option, rather than being applied at a more granular level within each Option. In order to determine the level of OB to be applied to each Option, the Project Type relating to each Option is first confirmed (Stage 1). Throughout all Options, the Project Type has been selected as Non-Standard Civil Engineering, in accordance with the guidance contained within the ACWG technical note. In relation to Option B.4 and D.2, 100% Non-Standard was selected owing to a combination of the WRP being categorised as Non-Standard (Option B.4 only) and the transfer route, whilst initially being selected as Standard, being adjusted to Non-Standard owing to its length, diameter, and particular spatial constraints (Option B.4 and D.2). This provided a Combined Upper Bound OB percentage as detailed in Table 120.

Following agreement between the SW teams of the project type split, each statement within the OB template is assessed for confidence (Stage 2). The templates used at Gate 1 were updated to ensure alignment with the latest ACWG guidance and then utilised as the starting point for the Gate 2 assessment, with the previous confidence levels assessed to understand whether there had been an improvement as more information has been made available, or whether there has in fact been a reduction in confidence as previous clarity has diminished. This provided an Adjusted OB percentage, again as detailed in Table 120.

Prior to this Adjusted OB percentage being applied to the Base Estimate (excluding risk), Stage 3 of the OB assessment was undertaken. This involved mapping the specific risk items from the cost risk model, where appropriate, to the relevant contributory factors within the OB template. Once completed, the confidence level associated with the contributory factor was further assessed in order that the quantified risk inputs were taken into account and to prevent duplication of costs. This generated a Risk Adjusted OB percentage (see Table 120) and this percentage value was then applied to the estimate, excluding the previously calculated total risk value, in order to provide an overall Option Project Cost, subject to AACE range and Indexation adjustments.

Table 120 - Optimism Bias at Gate 1 (Q3 2020 values) versus Gate 2 (Q2 2021 values)

Option	Gate 1 OB Percentage	Gate 1 OB Value	Gate 2 Combined Upper Bound OB Percentage (Stage 1)	Gate 2 Adjusted OB Percentage (Stage 2)	Gate 2 Risk Adjusted OB Percentage (Stage 3)	Gate 2 Risk Adjusted OB Value
B.4	39.8%	£127 m	66%	38.7%	32.9%	£89 m
D.2	25.3%	£23 m	66%	33.8%	27.7%	£47 m
CeraMac	-	-	66%	44.7%	28.9%	£32 m

For Option B.4, similar to the risk profile, the OB percentage and value has reduced from the position at Gate 1. This is owing to a shift of value from OB into the quantified risk register, as well as increasing levels of information improving confidence in delivery. For Option D.2, whilst there has been an increase in the OB percentage and value since Gate 1, the increase in the percentage has only been c.2.5% and has been driven wholly by a change in the selected Project Type (change from a Standard / Non-Standard split to 100% Non-Standard) following updated ACWG guidance. In addition, the change in OB value can be attributed to a significant increase in scope, and therefore base cost, since Gate 1.

Whilst the Green Book recommends applying OB to operating costs and benefits as well as to CAPEX, the Supplementary Green Book Guidance does not provide recommended upper and lower bound adjustment factors for OPEX as there was insufficient data to do so. In the absence of other data to inform what the optimism bias adjustments for OPEX should be the Supplementary Green Book Guidance recommends using sensitivity analysis to test the materiality of OPEX assumptions for investment decisions. Hence, the OPEX values presented in this report do not include optimism bias.

2.10.8. Assumptions and exclusions

Classification of Estimates

Please note that as the design which underpins this estimate remains at an early level of maturity, the estimate is deemed to be of AACE Class 4 accuracy (+30% / -5%). There is a risk that design development may identify alternatives solutions and or methodologies which may have significant cost impact both positively and negatively. As such the current accuracy envelope can only cater for fluctuations in cost of the current solution. Any changes to estimated solutions would require a reassessment of the estimate and confidence level.

Bases of Estimates

- Material prices are based on current 2021 market rates adjusted to PR19 17/18 utilising RPI and CPIH data and while current price volitivity is included within risk allowances no allowance has been made for future fluctuations in supply costs
- All costs are exclusive of Value Added Tax

- The OB percentage used for the CeraMac Plant only estimate is based on the responses provided for the Non-Standard Civil Engineering element of the B2 Option OB assessment, with the Non-Standard Civil Engineering element adjusted to 100% (i.e., 0% Standard Civil Engineering)

Construction General

- An allowance has been included for piling, specifically for all the proposed buildings and selected chemical dosing base slabs
- Where ground conditions are as yet unknown, an additional allowance for piling to other structures has been incorporated into the Risk values
- No allowance has been made for any ground stabilisation works
- No allowance has been made for meeting any additional planning or environmental costs other than those advised within the estimate and risk / OB sums
- No allowance has been made for dealing with any impact that the proposed works may have on any existing or proposed assets plant or foundations
- The SW provided costs such as the allowances for land purchase, DNO, Public Consultations etc are taken at face value and included within the relevant estimates
- No allowance has been made for environmental mitigations for invasive or protected species of fauna and flora unless stated within the estimate and risk / OB sums
- No information is available as to the current ground conditions of the proposed plant
- Process plant and pipework sizing has not yet been finalised. Allowance has been made within the risk register for limited fluctuations in sizing.
- Quantum for Bulk Earthworks Allowances for dealing with Cut / Fill / Disposal have been provided by the designers and adopted by estimating. It would be beneficial for a detailed review to be undertaken in the next phase.
- CeraMac Plant at Otterbourne – the cost for this asset is now identified separately as outside the scope of the DCO mechanism
- The GAC Plant CAPEX cost is included within the B.4 Base Estimate
- The CAPEX cost of the tunnel connection between HTR and the HLPS is included within the Base Estimate
- All works are assumed to be carried out during normal day time working hours
- It is assumed that the working area is not impacted in any way by hazardous working conditions with the exception of the marine works – which are required for Option B.4
- It is assumed that there are no restrictions to access
- For any materials which may be sourced from abroad, no allowance has been made for any fluctuation to these rates for exchange rate or tariff obligations
- No additional allowance has been made for any restrictions placed on the works due to adverse weather conditions other than the factors included within the risk register for prolongation as a result of bad weather
- As the projects are currently at concept stage no quantities have yet been finalised thus all quantities assumed in the preparation of costs are indicative
- No allowance has been made for 3rd party works such as utility upgrades or diversions & connections unless specifically stated otherwise
- Specialist Dewatering is excluded from the base cost. An allowance has been included within the risk values.

Open Cut Pipework -

- Standard working hours are assumed as 50 hr week (apart from critical TM phases and continuous micro tunnelling)

- All crossings assumed to be 1200 diameter sleeve installed by Micro tunnel
- All crossings assumed to be single pipe
- All crossings assumed to have 9 m diameter launch shafts x 9 m deep to formation
- All crossings assumed to have 4.5 m diameter reception shafts x 9 m deep to formation - All shafts to be backfilled with imported aggregate
- 150 mm bed and haunch in fields 30% of arisings to tip replaced with imported granular material Spreading surplus spoil across the easement within fields
- 150 mm bed in roads 100% of arisings to tip replaced with imported granular material
- 25 m easement in fields
- Stock fencing both sides of easement Livestock crossing point every 300 m - Footpath crossing every 500 m
- Land drain crossing in fields every 20 m Clay stank in fields every 25 m
- Allowance has been made for a bend every 167 m of route
- No thrust blocks required - use of anchor gaskets assumed

OPEX assumptions

Cost of water

- Cost of water is based on abstraction costs from the EA. Cost assumed to be £19.23 / ML for ground water abstraction, with factors applied to get costs for other water sources. Desalination schemes assume tidal abstraction, applying a factor of 0.2 (£3.85 / ML) and it's assumed this is reasonable for Havant Thicket Reservoir Options as water from treatment works is diverted from the treatment works to the WRP (for Option B.4) rather than discharged into the local water course, thus changing the existing flow regime and potential causing environmental impact, which has an associated cost. An allowance for EA charges has been applied at this time until the status of the effluent has been determined.

Staff costs

- WRP assumed to require 6 operators and 2 managers, 8hr/day, 365 days a year
- Transfer infrastructure assumed to require 1 operator, 8hr/day, 365 days a year
- Hourly rate for operator assumed [redacted] costs from SW OPEX calculating tool

Chemical costs

- Chemical volumes supplied by SW design engineers for WRPs, for the 15 Ml/d operating regime.
- Chemical requirements for the 15 Ml/d plant operating at 6 Ml/d at 6 Ml/d (Option B.4) were pro-rated down from the 15 Ml/d plant.
- Costs for chemicals taken from SW OPEX tool where available and provided by [redacted] where unavailable. Where chemical costs were only available for concentrations other than those specified, the price was pro-rated accordingly.

Power

- An 'all in' average electricity price of 12 p/kWh has been used (from the SW OPEX tool)

Operational transport costs

- Includes costs of van rental and fuel use for operational maintenance
- For staff transport a trip of 15 miles to site and back each day per Full Time Equivalent (FTE) has been assumed

- Costs of petrol were taken as 25 p per mile
- An estimate of £1500 a year per van has been used after discussion with SW
- The transport and disposal costs of WTW waste have been provided by SW
- The waste disposal volumes have been estimated as 0.025% of the flow as sludge, and 0.005% as grit and screenings
- Includes transport and treatment of sludge produced on site assumes £5 / m3 of sludge for transport, and £140 / tonne of sludge treated

Operational maintenance

- Civil maintenance cost per year is calculated as 0.5% of the Infra and non-infra civil costs
- M&E maintenance cost per year is calculated as 2.5% of Infra and non-infra-M&E costs which aligns to the approach taken within the WRMP24 exercise

NPV and AIC calculations assumptions

- The WACC has been taken as 2.92% in accordance with ACWG guidance. Discount rates are as per the HM Treasury Green Book.
- Planning costs are split 25:25:25:25 for the first 4 years, and construction costs are split 20:35:35:10 over years 5-8.
- 50% of client indirect costs are treated as planning and development costs whilst the remaining client indirect costs are considered construction costs.
- Total direct costs are attributed to a range of asset categories which dictate the capital maintenance regime and WLC. The remaining capital costs (contractor indirect costs and 50% of client indirect costs) are split equally across the asset categories.
- Capital Maintenance lifecycles - The capital maintenance cycles used in the NPV calculations are as follows as per ACWG guidance and are relative to year 9 (first operating year).

2.10.9. Confirmation that Solution Costs are in line with Relevant Methodologies Agreed with Regulators and Relevant Green Book Guidance

- The estimates have been prepared in line with relevant guidance requirements and methodologies.
- The approach to calculating the NPV and AIC values has followed process from the ACWG to ensure consistency in the calculation of NPVs and AICs across all SROs. This includes process aligned with HM Treasury Green Book. The calculation covers a period of 108 years rather than 80 years as detailed above.
- OB – OB assessment approach was aligned to the HM Treasury Green Book Supplementary Guidance: Optimism Bias and the latest guidance from the ACWG to enable consistency of OB assessments across all SROs. Therefore, whilst the OB assessment process undertaken at Gate 1 was initially used, the recent process has ensured that all subsequent guidance has been appropriately incorporated prior to the values being submitted as part of the Gate 2 submission.
- Estimates have been developed in line with WRSE guidance where appropriate.

2.10.10. Summary and Next Steps

In Summary the Gate 2 cost and carbon estimates have benefited from a far more detailed level of design input than was available at Gate 1. The key elements to review for the next stage gate (G3) from a cost perspective is:

- Undertake further investigations to finalise details of the water recycling connections at BF WTW

- Obtain further clarity on planning conditions and site investigation analysis at the proposed WRP facility at Site 72 and site of HLPS
- Undertake further analysis of the pipe routes from the WRP at site 72 to HTR and to Otterbourne WSW respectively
- Work to mitigate and manage key risks
- Undertake detailed market engagement to obtain further surety on key cost and time elements
- Produce detailed construction schedule to enable mapping Quantitative Schedule Risk Analysis (QSRA) threats and opportunities
- Review contract strategy to enable improved market confidence in terms of delivery
- Fully understand key regulatory objectives and requirements from national statutory bodies such as the EA
- Undertake further engagement with relevant stakeholders
- The CeraMac asset at Otterbourne WSW has been ringfenced as being delivered outside the DPC route - A workshop is required to identify any additional elements which may be delivered outside of DPC.

This will enable a marked improvement in cost confidence and a step change in project maturity resulting in a higher level of confidence for business planning.

2.11. Procurement, Ownership, and Operation

2.11.1. Commercial and Procurement Strategy for B.4

2.11.1.1. Introduction and Context

SW has developed a procurement strategy to support the delivery of Option B.4.

The strategy reflects the conceptual design, the current cost profile, the relevant risks and required schedule for delivery. This section sets out the procurement strategy[13] along with an assessment of the solution's suitability for delivery through the DPC model. This section addresses the requirements of RAPID Gate 2[14], as well as the key requirements of Control Point B within the DPC process[15]. This section includes:

- A summary of the scope of the DPC-delivered project, the key interfaces with non-DPC works and the Competitively Appointed Provider (CAP) Agreement to be tendered
- The framework for the DPC eligibility assessment, a summary of the results and a conclusion as to the suggested delivery route for the solution
- Details of the procurement plan, including a procurement and contract timetable
- An explanation as to the level of design maturity and technical readiness that SW intends to reach by the point of Contract Notice
- Confirmation of the preferred tender and commercial models
- Evidence of internal approval for the procurement approach
- An outline of the anticipated contractual arrangements with the CAP, and a summary of key activities to develop the key commercial terms as the programme develops

Key conclusions of SW's procurement strategy detailed in this section are summarised below. The development of the procurement approach has been subject to SW's internal programme governance process, and the conclusions have been reviewed by SW's external technical and legal advisers.

- The eligibility assessment carried out based on Ofwat's guidance and utilising the information available about the solution at this time indicates that the solution[16] is considered somewhat suitable for delivery under a DPC model. This is because the solution passes the size test's totex threshold, is considered 'somewhat discrete', and offers greater Value for Money (VfM) when compared to delivery through in-house (D&B) procurement. This assessment also depends on:
    - RAPID's guidance and principle that solutions are assumed to be suitable for DPC unless clearly demonstrated otherwise[17].
    - A value for money (VfM) analysis based on Ofwat's standard assumptions. The VfM analysis will need to be reviewed as the project evolves, and as further market engagement feedback is obtained during subsequent Gates and Control Points.
- The proposed procurement plan for the CAP aims to maximise competition and deliver best value for customers. The procurement plan takes the project's critical path into consideration, reflects risk and opportunity, and is designed to ensure that the process is run productively and efficiently. SW anticipates that the procurement will be launched as a Competitive Dialogue, or similar (compliant with the Utilities Contract Regulations 2016). SW anticipates running a multi-stage tender process

[13] SW has allocated internal resource to the production of its procurement strategy and associated documentation. This will be aligned to APM best practice and will be prepared as SW works towards Control Point C and RAPID Gate 3.
[14] RAPID (Feb 2021) Accelerated gate two submission template, page 7.
[15] Ofwat (Feb 2020) Appendix 2: Direct Procurement for Customers; Briefing Note on the Procurement Process for 2020-2025, page 24.
[16] As detailed in section 2.11.1.2, the solution contains elements that will be procured through DPC and elements that will be delivered through SW's capital delivery model. For the purpose of this section 'solution' refers to the elements of the works that are shown as 'In scope for DPC'.
[17] RAPID (Feb 2021) Standard gate one submission template, page 6.

including a pre-qualification stage, a two stage Invitation to Tender (ITT), and a preferred bidder stage leading into financial close.

- By the point of contract notice, SW will have developed a level of design that is sufficient for the planning process, whilst retaining sufficient optionality to ensure that minimal constraint is applied to bidders' designs.
- SW has identified the late model with early market engagement as the preferred tender model for the B.4 solution. Under this model the solution will be tendered out as Design, Build, Finance, Operate & Maintain (DBFOM), after SW obtains the requisite consents and the solution is ready for detailed design and construction.
- The procurement approach is consistent with SW's internal governance processes for a project of this size and nature.
- The proposed commercial model reflects the technical features and expected utilisation of the solution and the feedback received from the informal market engagement undertaken to date[18] and is expected to evolve further as the project develops. SW is considering offering a fixed price contract with a 20-year operational term (plus construction) with an end-of-contract bullet payment (linked to the residual value of each asset) as part of the DPC model. Payment to the CAP is envisaged to start post commissioning and will be primarily based on availability charge for each asset (the HT Transfer and the WRP) combined with volumetric elements to cover variable OPEX linked to each asset's utilisation[19], with tailored performance targets and associated incentives/penalties applied to each.
- The cost of the water transferred through the solution will not be relevant to the CAP payment mechanism as this will be addressed separately through the BSA between SW and PW.

The views presented here are based on several assumptions that will need to be tested and validated as the scope of the solution is developed further.

- The identification of Option B.4 as the Preferred Option is explained in Annex 5, Options Appraisal Process. For the purpose of this section, the procurement and commercial strategy has been developed based on SW's analysis of the below solutions:
  - B.5 (61Ml/d Deployable Output (DO) recycled water (indirect) sent to an environmental buffer and treated at Otterbourne WSW) and
  - D.2 (61Ml/d DO raw water transfer from HTR to WSW)

  This is because OptionB.4 contains a smaller WRP with a similar risk profile to that considered for solution B.5, and also incorporates solution D.2 within its project scope. Whilst this has allowed SW to develop a strategy for submission at Gate 2, it will be necessary to test the proposed approach with the market in order to confirm its commercial viability and attractiveness to the market.
- The findings of the informal market engagement undertaken in respect of B.5 and D.2 have informed the development of the procurement and commercial strategy for Option B.4 insofar as it is analogous with the features of Option B.4. Informal market engagement in this section refers to the one undertaken with respect of B.5 and D.2 solutions. It will be important to test this specific solution with the market as there are some important differences in the nature of the DPC scope under the combined solution.
- Further, SW is currently undertaking a Project Alignment Review in conjunction with PW to better understand the necessary interfaces between the B.4 solution and the HTR. This exercise involves consideration of the works that will be required at the HTR and any associated risks. It is intended to generate a clearer understanding of how the interfaces between the HTR and the proposed solution

[18] The tender and commercial models for Option B.4 have been prepared on the basis of the commercial models prepared for solution B.5 and D.2. The commercial model for B.4 has been informed by the findings of the informal market engagement undertaken in respect of B.5 and D.2 insofar as it is analogous with the features of the B.4 solution, however, it will be important to test this specific solution with the market as there are some important differences in the nature of the DPC scope under the combined solution.
[19] SW anticipates that the HT Transfer and WRP will each have different operating regimes. See section 2.11.1.2 for additional detail.

would work in practice and as such it is likely to have implications for the project's commercial and procurement strategy, potentially requiring SW to re-evaluate its assessment of the solution's 'discreteness' as part of the DPC eligibility assessment. As the Project Alignment Review is scheduled to conclude after SW has submitted its Gate 2 report, any relevant findings will be included in future submissions.

SW will continue its analysis of the solution's suitability for DPC as part of Control Point C and will further document, test and validate the suggested delivery route and progress the commercial model as part of the Gate 3 submission and Control Point C.

External advisers and assurance

SW has commissioned the following external capability to support in the development of its commercial and procurement strategy:

Table 121 - SW's external advisers

Position	In role
Commercial and procurement support	[redacted]
Legal and commercial support	
External assurance[20]	
Technical subject matter expertise	Various providers commissioned to support SW with specifical technical and engineering aspects of the project

2.11.1.2. A summary of the scope of the DPC delivered project

This section sets out the components of the Option B.4 which are within the scope of a potential DPC procurement and summarises the key assumptions that underpin the procurement and commercial strategy. It also considers the anticipated appetite for the project within the market and provides an overview of Ofwat's DPC process.

B.4 is a combination of a 15Ml/d recycled water supplement to the HTR (to enable a 61Ml/d DO into supply from HTR to Otterbourne WSW) and a direct transfer to Otterbourne Water Supply Works (WSW) from HTR with abstraction from the reservoir and the construction of a high-lift pumping station (HLPS). Section 2.2. Engineering Technical Design includes further detail on the technical aspects of the scope.

Scope of the DPC procurement

The scope set out under the DPC model is built upon a series of working assumptions regarding the nature of the solution. The scope and assumptions set out in this section remain subject to further development and change. The table below details the elements of the solution that SW considers in and out of scope for delivery through the DPC procurement and provides the rationale in each case.

The scope set out is underlined by the principle that capital works required on sites where an Appointee has existing operating assets or is already undertaking significant capital works (namely Otterbourne WSW, [redacted] and the HTR) will be undertaken by the relevant Appointee, with ownership of the works to transfer from the CAP at the relevant site boundary, for example the footprint set out in the planning

[20] See Annex 7: Assurance for additional detail on SW's assurance approach.

determinations for the HTR. This assumption, along with the other set out in this section, remain subject to further refinement and challenge as the project develops.

It is also noted that the solution will interface with the HTR, which itself is a separate project currently being delivered by PW.

A series of key assumptions underline the scope set out above and the procurement and commercial strategy developed so far. These assumptions are reflected throughout this section and are set out in Table 124 below. These items have been captured within either the Water for Life Hampshire (WfLH) Programme Level Risk Register or the relevant Project Level Risk Register and will be reviewed, and actively managed, in accordance with the Water for Life Hampshire (WfLH) Risk Management Strategy and Process.

Table 122 - Key assumptions for the procurement and commercial strategy

Issue	Assumption
Commercial	
In B.4 (and as for solution D.2) the CAP will have a limited level of control over the main source of water supply.	It is assumed that the CAP's interface with PW and the control of flows through the CAP's assets will be determined by the terms of the BSA agreed between SW and PW. It is assumed that the agreement between SW and PW will be in place prior to or at the time when the CAP agreement becomes unconditional to co-ordinate the operation of the assets for 'sweetening' and a 1-in-200-year drought also governing access rights and interfaces for the CAP with PW.
SW and PW are collaborating on the delivery of Option B.4	The DPC solution will be procured by SW and the non-DPC interface projects will be delivered by SW and PW individually or separately; however, the exact nature of each Appointee's role in the delivery of the solution is yet to be defined.
Appointees (SW and PW) will not be able to transfer water quality risk to the CAP contractually under the DPC model.	Ofwat has reinforced that it is ultimately the Appointee's responsibility to ensure that water quality standards are maintained. Whilst SW may nonetheless seek contractual provisions in the CAP agreement to ensure acceptable standards are maintained, it will still hold the risk of regulatory action or penalty.
SW's regulatory obligations require the asset to be operational by 2027.	The commercial approach adopted will need to be in line with SW's All Best Endeavours (ABE) obligation to deliver the solution by the 2027 deadline.
The commercial analysis undertaken is based on the Gate 2 cost estimates	It is assumed that the commercial analysis of the solution will be revisited in future RAPID and DPC submissions as the cost estimates are developed further.
Capital expenditure	

Table 123 - Summary of project scope considered for DPC

Project scope	Works	Rationale
In scope for DPC	Pipeline to transfer up to 75 Ml/d of water from abstraction intake structure to the boundary of Otterbourne WSW; c.40 km (Route 3 at 43km or Route 4 at 31km) at 800mm diameter	These works comprise the core components of the proposed asset which will be constructed and operated by the CAP. As such, these works have been identified as part of the scope for the DPC-delivered project. There are several routes for the HT Transfer under consideration. At present, it appears likely that the transfer route may change to one which tracks the connection between the WRP and HTR back to the WRP, before splitting off and travelling west towards Otterbourne. Changes of this nature will also affect the length of the pipeline required and the location of the HLPS along the route of the transfer.
	One high-lift pumping station, one secondary pumping station and a Break Pressure Tank	
	Water Recycling Plant with a capacity of circa 15Ml/d	
	Circa 5km pipeline to transfer up to 15Ml/d recycled water from the WRP to the new HTR, including connection into the reservoir	
Out of scope for DPC, but required to facilitate DPC works[21]	Modifications to outlet channels at [redacted] to transfer circa 19Ml/d wastewater during drought conditions via a short (circa 0.5km) pipeline to the WRP;	This is a gravity connection between SW's and the CAP's assets that will be constructed on SW's existing assets. SW considers that it may be inefficient and introduce a logistical challenge and additional contractual complexity between SW and the CAP, and so for this reason, SW intends that asset ownership will change at the boundary of SW's operational sites ([redacted] and Otterbourne WSW).
	Waste connection back into the Long Sea Outfall from WRP	SW considers that it may be inefficient and introduce a logistical challenge and additional contractual complexity between SW and the CAP, and so for this reason, SW intends that asset ownership will change at the boundary of SW's operational sites ([redacted] and Otterbourne WSW).
	Reception connection at the boundary of Otterbourne WSW to receive the incoming water transfer.	
	All infrastructure scope within the HTR footprint (identified as recycled water supply intake and raw water abstraction to boundary of reservoir footprint)	Infrastructure within the HT reservoir footprint is not within SW's control and ownership to allocate to the CAP to construct and operate.
Out of scope for DPC[22]	HTR and associated infrastructure under PW's scope	PW are currently developing the HTR and associated infrastructure under a separate arrangement.
	Transfer beyond Otterbourne. Any upgrades required at or beyond Otterbourne treatment works	Works at Otterbourne WSW are associated with a Drinking Water Inspectorate (DWI) improvement notice and are also planned to be delivered with regard to future demands imposed by the introduction of flows from Havant Thicket Reservoir. Due to the nature of these works they are to be assessed for their DPC eligibility separately to the SRO project.

[21] SW recognises that the delivery of the DPC solution will be dependent upon the delivery of the out-of-scope elements which are required to facilitate the works. These works will also involve interfaces between CAP- and Appointee- controlled assets. As mentioned above in relation to the Project Alignment Review, the timing for the delivery of and interface with these works will be further investigated as the project develops and greater detail will be set out in future RAPID and DPC submissions.
[22] These works are included for reference, as they refer to assets which are related to the proposed solution and its connection into SW's and PW's networks, but are to be delivered separately, and would still be delivered irrespective of whether this solution was progressed.

There are several components that will be needed to connect to the WRP and HT Transfer to the Havant Thicket Reservoir that will be delivered by PW	As noted earlier, components within the HTR footprint are considered to be outside of the scope for DPC. The works required at the HTR to facilitate the connections to the WRP and the HT transfer are to be addressed within the [redacted].
Works will be required at Otterbourne WSW and [redacted] to facilitate the connection of CAP assets.	The scope does not include any additional works on existing sites within SW's current operation, nor does it include the upgrade on Otterbourne WSW. This is because of the complexity and risk involved were SW and the CAP to both undertake construction and/or operation on the same simultaneously. For elements of the works which are out of the DPC scope, SW anticipates that it or PW will procure them through their capital delivery model, although the exact arrangements are yet to be agreed[23].
The recommended contract length is driven by the significant renewal CAPEX event expected in OY21	The current contract length is assumed to be 20 years (post-construction). This is driven by a large lump-sum renewal CAPEX requirement in OY21, without which a longer contract length of c.25-30 years may be more suitable, subject to market engagement. The lump-sum CAPEX in OY21 is driven by the replacement of the mechanical and electrical components of each asset.
Operations & output requirements	
The two assets will be operated mostly independently from each other	As each asset's output capacity is different (the WRP will output 15ml/d and the HT Transfer will transfer up to 79ml/d at maximum capacity (to facilitate a DO of 75ml/d)), it is assumed that there will not be a strict operational dependency between the two. It is assumed that the operational regimes will function independently, except for drought circumstances (1-in-500-year drought scenario), where both are likely to be operated at an increased capacity simultaneously.
The primary fill of Havant Thicket is by the [redacted] pumps, which is not in the CAPs control.	It is assumed that water will always be made available in a 1-in-200-year drought scenario. WRP usage will be based upon a pre-agreed supply/demand model between PW and SW and developed prior to the CAP Award. We assume the agreement will be based on this model and set-out filling and abstraction scenarios based on various levels.
The CAP may not have access to SW's data and monitoring to predict when the network will require additional supply	To facilitate effective asset operation, the agreement with the CAP will include network data sharing, including systems to forecast need. The CAP will be primarily responsible for operating and maintaining the assets.
Variability in future output requirements (e.g., in c.30 years there may be additional reliance on the WRP to top up the HTR)	The future needs assessment and options evolution may vary the output required from each asset from that envisaged in the existing design. The commercial model is assumed to have the flexibility to deal with future changes in output requirements for the WRP.
Future modelling of water resources needs requirements beyond 2040 may affect the future HTR operating model	There will be clarity about the usage of the reservoir before the CAP agreement is signed, or the DPC model will have the flexibility to deal with future changes contractually. The operational regime at the WRP will be driven principally by the flow levels at the HTR (including the balance between spring and recycled water).

[23] See Section 2.11.1.4 for further information on the alternative procurement routes considered.

SW has considered the likely impact of these assumptions in the development of its commercial and procurement strategy. For example, the proposed operating terms in the commercial model take into account the assumed operating model for each asset, and the assumed interfaces with SW and PW's assets. Further, the selected contract term takes account of the assumed renewal capex profile, and the procurement plan factors in the assumptions made around the completion and fill of the HTR. SW continues to test its approach in all areas and will remain alive to how changes in these assumptions will affect the future development of the approach for Option B.4.

Market appetite

Initial informal market engagement was undertaken in respect of solutions B.5 and D.2 to inform the Gate 2 submission and the development of the procurement strategy[24]. This exercise was undertaken in April and May 2021[25]. Insofar as SW considers that the comments received can be applied to Option B.4 they have been included and discussed throughout the commercial and procurement strategy, however, future market engagement will be essential to determine the market's views of the solution's scope and specific characteristics. In particular, it will be important to understand whether the combination of two different asset types (WRP and Transfer) within one DPC solution or the smaller size of the WRP (15ml/d vs. 61ml/d) will affect the market's interest in the solution and its perception of risk in delivery.

Participants were engaged on the scope and nature of the B.5 and D.2 solutions, the indicative tender timeline and tender model, in addition to key contractual terms within the commercial model. The results of this informal engagement indicate that there is significant appetite within the market to compete for each asset type, as most bidders expressed an interest in both WRPs and direct transfer assets. Engagement with construction contractors and investors revealed that:

- Participants were familiar with direct transfer assets as a mature and well-understood asset class. The estimated value of this asset alone was considered attractive and large enough to allow a CAP to unlock efficiencies
- Participants with experience in process engineering solutions believed that they would be able to generate innovative and competitive bids for a direct transfer asset
- Participants considered that the complexity of the water recycling solution could unlock opportunities for innovation and efficiencies, allowing bidders to submit competitively priced bids
- Ground risk, landowners, environmental approvals and permitting were emphasised as key risks in the delivery of direct transfer assets
- Potential bidders recognised that the solution would require engagement with multiple parties and would require a CAP with experience with managing multiple stakeholders

Ofwat DPC process

Ofwat expects companies to identify the most appropriate route for the delivery of the solution[26], considering both in-house and DPC models and selecting the option that presents greatest benefit to customers. As part of each of the business case submissions as required by Ofwat's DPC Control Point process, SW is required to set out its preferred procurement approach, providing justification and reasoning for the decision. The key Ofwat Control Points for the DPC procurement are:

- Control Point A will be submitted as part of the Control Point B submission
- Control Point B – the Strategic Outline Case (SOC) will address the chosen strategic supply option
- Control Point C – The procurement plan, setting out the detail of the procurement and contract strategy

[24] See Annex 5: Options appraisal for details on the identification of Option B.4 as the Preferred Option.
[25] Informal market engagement exercises have also been undertaken in 2019, as part of SW's Gate 1 submission.
[26] Ofwat (2020) Direct Procurement for Customers: Briefing Note on the Procurement Process for 2020-2025

- Control Point D - The full suite of procurement documents and the form of the CAP agreement
- Control Point E – The submission of the Outline Business Case, re-affirming that DPC continue to offer Value for Money for Customers when compared to the in-house counterfactual
    - "Ofwat's consent is required under the Appointee's licence conditions before it can commence the procurement" (i.e. issue the Find-a-Tender service (FTS) Contract Notice); and
- Control Point F – The submission of the Full Business Case, setting out the nature and terms of the deal that has been achieved through the competitive procurement process
    - "Ofwat consent is required for the Appointee to enter into the CAP Agreement" (i.e. Contract Award)

SW intends to submit its SOC shortly after its Gate 2 submission[27], which will address Ofwat's requirements as set out in the DPC Briefing Note[28] and include additional detail on the procurement strategy.

2.11.1.3. DPC eligibility assessment

Eligibility assessment framework

To ascertain the solution's eligibility for delivery through the DPC model, SW has applied a three-step framework based on Ofwat's DPC process guidance[29]:

1. A size test based on the £100m threshold for whole life costs
2. An assessment of the discreteness of the asset; and
3. A quantitative Value for Money (VfM) assessment

Table 124 outlines the objectives of each step in the framework, the basis of assessment for each test, and the impact of each test's outcome on the solution's eligibility for delivery through the DPC delivery route. SW's Gate 1 submission[30] contains further detail on the approach and methodology of the DPC eligibility assessment framework.

Table 124 - DPC eligibility assessment framework

	1. Size	2. Discreteness	3. Value for Money (VfM)
Objective	Assess the size of the solution(s) against Ofwat's threshold.	Assess the separability of the solution(s) based on Ofwat guidance published as part of its PR19 methodology.	Assess the solution's scope to deliver customer VfM through quantitative analysis.
Test	Solution costs will be considered on a nominal and real basis, including: • Development costs • Initial CAPEX • Renewal CAPEX	Consider specific operational and technical considerations of the asset within the wider context of SW's network based on 4 key criteria: 1. Stakeholder interactions and statutory obligations 2. Interoperability considerations	To determine if a solution will have greater scope to deliver customer VfM if undertaken via DPC, solutions will undergo analysis comparing the NPV cost to customers of the Factual and Counterfactual: • Factual: A solution carried out by a third-party provider under DPC arrangements • Counterfactual: A solution carried out by SW under the PR19 framework.

[27] Milestone dates for SW's DPC activities are available in section 2.9. Schedule – Direct Procurement for Customers (DPC) Control Points.
[28] Ofwat (2020) Appendix 5 – Direct Procurement for Customers – Briefing Note on the Procurement Process for 2020-2025.
[29] Ofwat (February 2020) Appendix 2: Direct Procurement for Customers; Briefing Note on the Procurement Process for 2020-2025.
[30] Southern Water (28 September 2020) Strategic Solution Gate 1 Submission; Annex 11 Commercial Strategy

	1. Size	2. Discreteness	3. Value for Money (VfM)
	• OPEX	3. Output type and stability 4. Asset and operational failures	Several assumptions will be considered under both scenarios. A VfM assessment provides the impact on the costs to customers of completing the solution under different approaches.
Outcome	Solutions that are within close proximity to the Ofwat threshold, are technically suitable and could provide scope for customer VfM when considered under the qualitative assessment, will undergo a quantitative assessment for customer VfM.		Solutions that are shown to provide customer VfM through the DPC delivery route are suitable for DPC and progressed where appropriate through the RAPID gated process and Ofwat's DPC Control Points.

The eligibility assessment indicates that the solution is considered somewhat suitable for delivery under a DPC model. Further detail on the findings from the size test, discreteness test and VfM analysis are provided below in this section.

As solution-specific inputs are developed further the value for money test will also be refined from a high-level assessment based on Ofwat's standard assumptions to one specifically tailored to the solution. This will include market views on financing inputs such as debt terms and gearing, and a more detailed commercial model and risk allocation.

SW is also cognisant of its s20 obligation to deliver the programme to the committed 2027 date. The timetable constraints and the evolving understanding of the solution's critical path will be an important factor in the selection of the appropriate delivery route for the solution.

Scope of the DPC eligibility assessment

The DPC eligibility assessment presented below considers Option B.4 as a combination of the HT Transfer and the WRP. SW has also considered the DPC eligibility of the HT Transfer and the WRP on an individual basis and has concluded that each would satisfy the eligibility assessment in terms of size, discreteness and value for money[31]. SW intends to conduct further market engagement (as it progresses towards RAPID Gate 3 and DPC Control Point C) which will consider (inter alia) whether the market prefers the solution as a combined or individual packages.

Size test

The forecast total expenditure (TOTEX) over the contract life (including a construction period of 4 years and a 20-year operation period) on a real basis is £0.46-0.52bn[32], and the TOTEX over the whole asset life (including a construction period of 4 years and an 85-year weighted average asset life between the WRP and HT Transfer) is £0.96-1.22bn[33]. The solution therefore exceeds the £100m threshold and passes the size test.

The cost estimates reflect the latest view and are based on a series of assumptions and includes allowances for estimating uncertainty, risk and optimism bias (see Section 2.10 Cost Modelling for further information) that will be further refined as the solution develops.

Project discreteness test

[31] Further details on the DPC eligibility of the individual assets will be set out in the Strategic Outline Case.
[32] Minimum utilisation scenario totex estimate: £0.459bn. Average utilisation scenario totex estimate £0.461bn. Maximum utilisation scenario totex estimate: £0.521bn.
[33] Based on an asset life of 100 years. Minimum utilisation scenario totex estimate: £0.956bn. Average utilisation scenario totex estimate £0.964bn. Maximum utilisation scenario totex estimate: £1.217bn.

SW has applied a discreteness assessment based on four key criteria, each of which have been equally weighted: stakeholder interactions and statutory obligations, interoperability considerations, output type and stability, and asset and operational failures.

Under an assessment against Ofwat's technical guidance, the solution presents a mix of characteristics that make it more suitable for DPC and some characteristics that may make it less suitable for DPC when assessed against Ofwat's technical guidance. Stakeholder challenges and interoperability considerations between SW, PW, other stakeholders and the CAP will require a clear approach and effective management. However, separable inputs and outputs for each asset will allow SW to establish clear output criteria for each asset and as the performance of them is not intrinsically linked to the other, service failures can be managed separately. For these reasons and recognising Ofwat's guidance that solutions are assumed to be suitable for DPC unless clearly demonstrated otherwise, the solution can be considered discrete and suitable for delivery through DPC[34].

Table 125 - Option B.4 DPC eligibility assessment - Discreteness test - Summary

Key criteria / considerations	Assessment by criteria	Overall assessment
a) Stakeholder interactions and statutory obligations	Characteristics somewhat less suitable for DPC	The Havant Thicket Direct Transfer with additional WRP solution (B.4) exhibits some characteristics which make it more suitable for DPC, and some which suggest it may be less suitable. Overall, the analysis (based on Ofwat's guidance) suggests that the solution should be considered 'discrete' and somewhat suitable for DPC.
b) Interoperability considerations	Characteristics somewhat less suitable for DPC	
c) Output type and stability	Characteristics somewhat more suitable for DPC	
d) Asset and operational service failures	Characteristics somewhat more suitable for DPC	

a) Stakeholder interactions and statutory obligations

This criterion considers the number of stakeholders and regulators who are likely to be involved in the delivery of the solution, the frequency of that involvement and the prospect of regulatory enforcement against SW for issues in delivery.

- **Number of stakeholders -** The assessment highlighted that a variety of stakeholders (including customers, local interested parties, third-party finance providers, industry and environmental regulators and government) were likely to be involved. Each will have differing concerns and objectives. The CAP will also need to interface effectively with PW's HTR to ensure effective asset operation.
- **Planning and consents –** Continuing negotiations with landowners and the DCO process are the areas that will require special focus and effort from the CAP, particularly for the WRP which is more likely to be seen as a challenge due to the first-of-a-kind nature of the solution and stakeholder perception of recycled water. It will also be necessary to work with PW to vary the existing planning permissions for the HT reservoir. It is also likely that the CAP will need to observe Security and Emergency Measures Direction (SEMD) protocols for assets within the HTR footprint.
- **Frequency of involvement -** Among these stakeholders are local councils and landowners, with whom continuous engagement will be required during design, construction and into the operations phase in order for the solution to be delivered successfully and to schedule. Further, this solution will employ water recycling on a larger scale than has previously been seen in the UK, and due to its role

[34] The solution's eligibility may be considered further once the Project Alignment Review (PAR) between Southern Water and Portsmouth Water has concluded, providing additional information on the level of interface between SW, PW and the CAP, and the potential consequences of these interfaces in terms of stakeholder interaction and operating regime design.

in resolving wider water resilience issues, would likely draw national interest. In the event of an asset or operational failure, the need to manage and co-ordinate multiple third parties under enhanced external scrutiny has the potential to increase the cost and risk associated with the planning and implementation of a response.

- **Prospect of regulatory enforcement –** SW will continue to hold statutory, regulatory and legal responsibility for water quality throughout delivery. The CAP is not envisaged to be responsible for the volume or quality of water passing through the HT Transfer provided there is no deterioration between the point of entry and exit, however customers' and the DWI's concerns about the 'wholesomeness' of recycled water produced by the WRP hold the potential to delay solution development and negatively impact SW's reputation. SW will likely be obliged to produce a Water Safety Plan (WSP) for the DWI based on sampling data, and so would expect a high level of DWI involvement, with increased monitoring and close attention to continuing water quality standards. SW's ability to manage this reputational risk would be lessened under the DPC arrangement where the CAP would be responsible for asset operation and would be expected to rectify any issues before SW could exercise contractual step-in rights. However, SW will seek to mitigate this risk through contractual terms that require the CAP to provide regular inspection reports and share monitoring information.

The CAP will need to work proactively with PW as well as industry and local stakeholders to ensure that the planning and consents are achieved, and the solution is delivered within required timescales. Public concerns surrounding recycled water are likely to pose a significant challenge for the successful implementation of the solution. Whilst these concerns are inherent to the solution type rather than the delivery model itself, it is nonetheless likely that they will manifest in additional complexity, increased DWI scrutiny and stakeholder interaction, all of which presents additional challenge and may raise costs under a DPC delivery. Given the 2027 deadline set by DEFRA/the EA for the delivery of this solution and the nascent state of the DPC market, there exists a risk of delay in the project finance process which, if not properly managed, may jeopardise SW's delivery against committed timescales. For these reasons, the stakeholder interactions and statutory obligation characteristics of the solution make it somewhat less suitable for DPC.

b) Interoperability

This criterion considers the number, type, and nature of interfaces between the asset and SW's and PW's network, the nature of the asset operation (active or passive), its separation by physical location, and the potential to generate economies of scope.

- **Number and type of interfaces –** Each asset will have upstream and downstream physical interfaces with SW or PW. The WRP is an active asset, which has an upstream interface with SW at [redacted] and a downstream interface with the HTR. There will also be a return interface between the WRP and the Long Sea Outfall, owned by SW. The transfer asset has an upstream interface with the HTR and a downstream interface with the Otterbourne WSW.
- **Nature of the asset operation –** Each asset is expected to be governed by a different operating regime, with the WRP feeding into the HTR at a different rate to the HT Transfer's rate of abstraction[35]. Both assets will operate at a minimum 'sweetening' flow of c.6ml/d. The reservoir water level and the balance of spring/recycled water at the HTR will be the principal driver for the level of WRP usage, whereas the need for additional supply in SW's network will drive usage of the HT Transfer. The CAP will also need to co-ordinate with SW and PW's water supply networks. Both assets will require power connections, however the power supply for the WRP is significant and relies on supply agreements with [redacted][36]. The risk is further enhanced with the difficulty to prepare back-up power supply on site due to the size.

[35] There are other offtakes from the HTR, including the 21ml/d BSA agreed between SW and PW outside of the scope of this project, and any additional abstraction by PW to supply its own network.
[36] Future development of scope will provide greater information on the power requirements for each asset, informing SW's view of the level of risk that may involve. SW may also consider testing power requirements with the market in market engagement exercises to ascertain the significance of this risk.

- **Co-ordination with SW's and PW's networks –** If used as drought-only assets, there will be limited integration between the CAP's assets and the day-to-day operation of SW's and PW's wider networks beyond a requirement for regular communication on water quality monitoring and ramp rates.
- **Physical location separation** – Both assets will be constructed on separate sites. As a principle, the CAP's responsibility is assumed to end at the boundary of SW's existing sites ([redacted] and Otterbourne WSW) and PW's existing sites (HTR). Therefore, the CAP will not undertake construction on any live sites and so does not risk disruption to SW's or PW's existing operations outside of the commissioning period.
- **Potential to generate economies of scope –** The limited experience of water recycling schemes and water recycling technology within SW's existing network suggests there will be limited loss of efficiency through third party management, reducing the impact of asset separation. The low level and nature of operational running costs of the HT Transfer also suggests that loss of synergy will be limited through the separation of the HT Transfer from SW's operation. There could be some loss of synergies associated with central management and overheads (HR/finance/IT etc) where the DPC entity does not have an established infrastructure to support its operations. However, there is a potential for the efficiency gains from the DPC entity to outweigh loss synergies.

This assessment has shown that the combination of two assets (WRP and HT Transfer) with several interfaces (including PW's HTR in-between) poses an interoperability challenge that will need to be carefully addressed. The distinct operating regimes for each asset will need to be calibrated properly in the context of SW's and PW's wider networks, and the addition of a 3rd party CAP increases the complexity of the interoperability characteristics of Option B.4. Coordination and regular information flow across interfaces (including communication required on water quality monitoring and ramp rates) can be managed but responsibilities will need to be clearly defined. These considerations indicate that Option B.4 may be less suitable for delivery through DPC.

c) Output type and stability

This criterion assesses the day-to-day source of supply, resilience, volatility of output and any available alternative sources of supply.

- **Day-to-day source of supply –**The CAP is not expected to manage the day-to-day source of supply into the HT Transfer and the WRP. For the WRP, SW will be responsible for the quality of effluent provided for treatment. For the HT Transfer, the [redacted] will determine the quantity and quality of the water entering the asset. The CAP will be responsible for the quality of the recycled water output from the WRP and must ensure that no detriment occurs to the water passing through the HT Transfer.
    - For the WRP, sampling of input wastewater quality will be critical to calibrate the treatment required, as the concentration of undesirable elements in the water is likely to be high and may also change over time[37]. As the CAP's design will be reliant upon the sampling data, and the membrane technology used in the recycling process can be compromised where quality worsens beyond anticipated levels, the CAP is likely to undertake additional sampling activity to support its technical design. SW's pilot trial will support this process, and whilst the CAP is likely to wish to undertake its own sampling (potentially duplicating some cost), the sampling data SW collects in advance of CAP appointment will help to inform and potentially de-risk the CAP's design.
    - For the HT Transfer, SW can expect a high degree of confidence in the output type and stability of the asset. The design includes standard pumps and break tanks which are

[37] SW is currently undertaking a pilot trial for the water recycling scheme. The trial is being used to calibrate SW's estimates for baseline operational costs. The pilot is currently at a relatively small scale but may be scaled up in future to better SW's objectives and reflect the size of the WRP asset. The current programme assumes that the trial will continue for c.1-year post-award, as the CAP may wish to integrate the trial as part of its own activity, or otherwise have access to the results obtained.

commonly used in other direct transfer solutions. As this technology is well-tested, a CAP should be well placed to manage its operation effectively and minimise any asset stability risk.

- **Resilience** – The technology risks associated with the assets are well known and can be efficiently mitigated under a 3rd party delivery. The HT Transfer includes standard pumps and break tanks which are commonly used in other similar solutions. At the WRP, step changes in the quality of water supplied to the WRP may affect the CAP's performance and resilience of supply. The technology includes the use of membranes that could be compromised if the quality of the effluent input worsened, which could increase maintenance costs. Equally, enduring improvements in the quality of effluent supplied may benefit the CAP, who may be able to achieve a longer than expected asset life / CAPEX replacement cycle. Monitoring equipment should allow the CAP to effectively identify any potential asset resilience issues before they manifest and address them without negatively impacting the availability of either asset. Given there is limited experience of water recycling technology within SW's network, a third party with experience of this kind of asset is considered to be best placed to manage the technology risk associated with the WRP.
- **Volatility of output quantity** - Future developments in the WRMP/WRSE and increased sustainability obligations set by the EA and quality obligations enacted by the DWI may lead to increases in/change to the use of each asset over time. SW will be able to address this uncertainty through the payment mechanism within the CAP agreement, allowing for flexibility to accommodate for periods of increased use. SW anticipates that an output-linked (volumetric) component will be included within the payment mechanism, which if carefully calibrated can ensure that it does not lead to over or underutilisation of the assets at the expense of cheaper water sources and will need consider other sources of supply for the HTR.
- **Volatility of output quality** – Whilst SW will retain ultimate responsibility for water quality, the CAP agreement will need to ensure that the output water quality is compliant with applicable standards.
    - The specifications for the WRP will need to clearly define the necessary output water quality, taking into consideration the quality of effluent provided to the WRP.
    - For the HT Transfer, the CAP will be responsible for ensuring that the input water quality meets the output quality. Through an agreed specification and detailed design, the CAP should be capable of ensuring that no detriment will occur to water quality whilst passing through the asset, and so SW anticipates that risk in this area will be minimal.
- **Available alternative sources of supply** – Whilst BF WTW will be the sole source of supply for the WRP, the HTR will have multiple sources (including [redacted] and as such will not be directly dependent upon the WRP. For the HT Transfer, these alternative sources will mitigate the impact should the WRP be taken out of operation. The CAP will not be responsible for obtaining alternative sources of supply for the HT Transfer, as the asset will be supplied from the HTR on the basis of a Bulk Supply Agreement (BSA) between SW and PW.

Whilst complexity and uncertainty exist around future asset output requirements, these issues are expected to be addressed primarily through arrangements reached between SW and PW. Alternative sources of supply for the HTR are available, creating additional resilience for the operation of the HT Transfer, and variability in output can be accommodated for both assets through the DPC commercial arrangements and payment mechanism, combining availability based and output-based payments as required. These characteristics make the solution somewhat more suitable for delivery through DPC.

d) Asset and operational service failures

This criterion evaluates the simplicity and complexity of the asset, the presence or technology precedent, the impact of failure on customers and the maturity of the supply chain.

- **Simplicity and complexity** - Operating a WRP of this scale requires a more complex process chain (including several stages of water treatment) and uses membranes not typically employed in smaller water recycling assets. Operational failures have the potential to impact flow levels and water quality at the HTR. Although failures will impact supply to SW's customers and may also compromise the operation of Otterbourne WSW, transfer assets rely on straightforward technology and are simple to operate meaning failure should be unlikely to occur. Failures of this kind will likely damage SW's reputation and may prompt action by SW's regulators, particularly in a drought-scenario. A CAP with experience in operating assets of similar nature could minimise the risk of asset and operational service failures.

- **Technology precedent** – A WRP of this scale would be a first-of-a-kind (FOAK) in the UK, however the technology is well understood globally. The transfer asset class is mature, with substantial precedent in the UK. The likelihood of asset failure due to technological limitations is considered to be low.
- **Impact of failure on customers** – Should either asset fail during a drought period, the likely consequences will include reputational damage and penalties for failure to comply with statutory water quality obligations. SW would likely look to employ contractual measures (such as performance deductions) to encourage the CAP to manage the asset properly and prevent these kinds of circumstances from arising, albeit this will need to be balanced if undue risk pricing is to be avoided. Whilst operational failures pose a risk, these can be addressed through contractual step-in provisions that will help to mitigate risk.
- **Maturity of the supply chain** – Informal market engagement has shown that potential bidders are comfortable with the nature of the asset and the technology involved in its operation, which should minimise the risk of service failures.

Whilst there is a significant reputational risk associated with operational service failures, the technology risks are well understood for transfer assets, which should de-risk the potential for failures to occur. Additional complexity is present for the WRP, but it is expected that the successful CAP will be able to demonstrate experience with this kind of asset and such mitigate against this risk. Further, the assets are separated by the HT reservoir, and so a failure of one asset will not necessarily negatively impact the other, e.g. if the WRP failed this would not necessarily preclude abstraction for the transfer. The characteristics of this solution can be considered somewhat more suitable for DPC.

Value for Money assessment

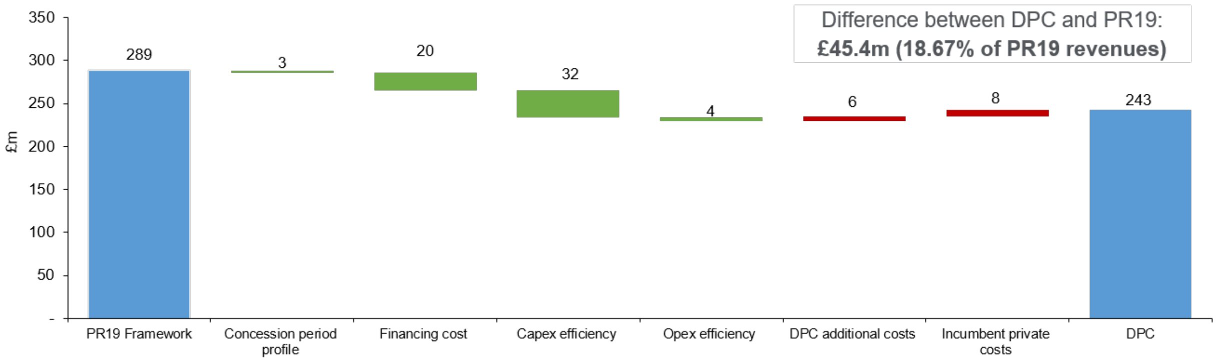
VfM analysis considers the costs to customers under the Factual (DPC) case versus delivery under the Counterfactual (In-house) case. Revenues are calculated under both cases and then discounted at the Social Time Preference Rate (STPR) to generate a Net Present Value (NPV)[38]. The difference in NPV between the two cases and key value drivers are compared to determine the VfM of delivery via DPC. The difference between the Factual and Counterfactual is calculated based on solution-specific inputs (such as Gate 2 cost estimates), macroeconomic factors, and Ofwat's standard assumptions which include a mid-case assumption and an upper- and lower-case sensitivity (for example gearing of 85% in the mid-case, 90% in the upper and 80% in the lower-case).

Figure 72 illustrates the results of the VfM analysis under the mid-case, showing the key value drivers between the Factual and Counterfactual cases. Under the mid case scenario, delivering the scheme under DPC would result in lower costs to customers than if the scheme was delivered in-house by SW under the PR19 framework. The cost to customers in NPV terms of B.4 under the factual scenario (DPC) is £243m compared with £289m under the counterfactual (PR19). The difference in the costs to customers is £45.4m which is equivalent to *c*.19% of the PR19 revenues. The key value drivers under the DPC model are the benefits from cheaper financing costs (£20m) and the benefits from CAPEX (£32m) and OPEX (£4m) efficiency. The 20-year operations period results in a smaller scope for potential savings for OPEX versus CAPEX compared to longer term contracts. These benefits are offset to some extent by the impact of the

[38] More details on the approach and methodology of the VfM model are set out in the Gate 1 submission, however, note that the Gate 2 value for money analysis set out in this document reflects the updated cost estimate developed for the Gate 2 submission.

additional costs to the DPC and the incumbent private costs effect (made up of procurement and bidder costs and contract management costs) which would not be incurred if SW were to deliver the asset.

Value driver analysis



Total costs to customers discounted to the start of construction (2026); total useful life based on weighted asset life of D.2 and WRP equal to 85 years due to model functionalities

Figure 72 - VfM analysis results (mid case)

Figure 70 below illustrates the results of the sensitivity analysis for the scenarios set out by Ofwat in its standard assumptions. Under all scenarios delivery of the B.4 solution is shown to have greater value for customers under a DPC model based on the approach and assumptions provided by Ofwat.

Variables	Assumptions under different cases*			DPC compared with in-house NPV	
	Low	Mid	High	Low	High
Contract life (years)	20	20**	40	**	(28.9)
Depreciation rate (%)	25% faster	As per in-house	*Not specified*	(45.4)	*Not specified*
Equity IRR, real (%)	10%	8%	7%	(22.7)	(56.8)
Gearing (%)	80%	85%	90%	(25.1)	(65.9)
Capex efficiency (%)	5%	10%	15%	(28.7)	(62.0)
Opex efficiency (%)	5%	10%	15%	(43.4)	(47.4)
Procurement costs (% of Capex)	2%	1%	0.5%	(40.3)	(47.9)
Bidder costs (% of Capex)	3%	2%	1%	(42.5)	(48.2)
Contract mgmt. costs (annual)	£300k	£150k	*Not specified*	(42.6)	*Not specified*

* Scenarios as specified in Ofwat assumptions within IAP 'Direct Procurement for Customers detailed actions'
** Under the mid case SW assumes a 20-year contract length in line with the proposed commercial model for DPC versus the 25-year contract suggested by Ofwat's standard assumptions.

VfM of DPC improves vs Mid-Case
VfM of DPC deteriorates vs Mid-Case

Figure 73 - Sensitivity analysis

Overall, based on Ofwat's IAP standard VfM assumptions, and current cost projections for B.4, delivery under a DPC framework would deliver greater value for customers from a VfM standpoint. This result, however, does not reflect solution-specific inputs from the market (for example, debt terms and gearing).

To enable the most accurate value for money analysis, the assumptions and inputs used to compare the Factual (DPC) and Counterfactual (In-house) cases should be tailored to reflect the nature of the solution. This should include considerations of the technical characteristics of the asset, its risk profile and the proposed contractual model. However, as the technical aspects of the solution and the commercial model are still in development, there is limited scope to establish solution-specific assumptions at this stage. As such SW has not adjusted or otherwise changed any of Ofwat's standard assumptions at Gate 2. SW will revisit the value for money analysis once these aspects have been developed, specifically at Control Points C (Procurement Plan) and E (Outline Business Case).

Review of Ofwat's standard assumptions

At Initial Assessment of Plans (IAP) stage of PR19 Ofwat recognised that there are significant differences in the assumptions used in the VfM analysis by companies to identify the NPV differential between the Factual (DPC) and Counterfactual (In-house) models. To address this, Ofwat set out a series of standard assumptions[39] which were used for the purpose of the value for money assessment set out in this document.

Whilst Appendix 9 of the PR19 final methodology[40] provides some rationale for Ofwat's assumptions and references to some data sources, many of the assumptions do not appear to be supported by sufficient evidence or are sourced from an underlying evidence base which has not been made publicly available (for example, Ofwat's estimate for contract management costs[41]). Other assumptions are underlined by datasets that are either small (and hence does not appear to be representative) or are focused on older precedents[42]. Ofwat has focused on the Offshore Transmission Owner (OFTO) model as a principal source of precedent for the DPC model. Whilst there are similarities between the characteristics of the OFTO and DPC models, the former appoints a provider responsible only for the operation and maintenance of assets that have already been constructed, resulting in a fundamentally different risk profile to DPC projects[43].

To better understand the position of Ofwat's standard assumptions within the observable range for applicable precedents and similar projects SW has carried out an initial benchmarking exercise, focusing primarily on Ofwat's financing cost and efficiency assumptions. This exercise has considered precedents from a selection of comparable projects across various infrastructure sectors including, but not limited to:

- Energy, such as Offshore Transmission Owner (OFTO) and Interconnector projects
- Waste, water and energy from waste (EfW) projects
- Social housing, education, accommodation and other similar infrastructure projects
- Transport infrastructure projects, including bridges, tunnels, roads and rail transit

The review of precedents was based on a desktop research using a combination of publicly available information and anonymised commercially sensitive data provided by our advisors. This review has not considered any of the qualitative or intangible benefits or costs of DPC.

Overall, our desktop analysis suggested that the Ofwat standard assumptions are broadly within the range observed for comparable projects and precedents (albeit in the lower end of the range in some instances) for a "typical" DPC project. Some of our key observations are set out below.

- **Efficiency assumptions (CAPEX and OPEX)** – The Ofwat efficiency assumptions are applied on top of the estimated cost for in-house delivery. The approach does not take into account the maturity of the cost data, SW's inhouse procurement model for these projects, and the residual risks that will need to be borne by SW. SW will continue to review the efficiency assumptions considering the above factors in subsequent stages of the Gate submissions. There may be limited scope to improve

[39] Ofwat (2019) Southern Water Direct procurement for customers detailed actions
[40] Ofwat (2017) Appendix 9: Direct Procurement for Customers
[41] Ofwat states that it has assumed Appointee contract management costs based on its own assumed DPC management costs, however it does not explain how this value has been derived.
[42] Ofwat primarily relies on CEPA 2016 (Evaluation of OFTO Tender Round 2 and 3 Benefits) for evidence of financing savings, however this document references reported secondary market returns in UK PFI between 2003 and 2011; a period covering the 2008 financial crisis and exhibiting different market conditions.
[43] Given that financing costs are typically reflective of project risk, the OFTO asset class can be used to draw comparisons with the anticipated cost of debt for DPC projects' operations period, however this may not be reflective of the financing efficiency that could be achieved by a provider responsible for arranging whole-life financing.

upon these assumptions through market engagement, as potential bidders may be unwilling to reveal information that might harm their competitive advantage or will not be in a position to provide more meaningful data until much later in the process. This means that SW will supplement the VfM analysis with robust sensitivity analysis to address uncertainty until the actual values obtained through bid submissions can be used in the solution's value for money analysis.

- **Procurement and bid costs** – Ofwat's standard assumptions and the precedents do not account for the first-of-a-kind premium that will likely be applicable for the first cohort of DPC projects. In addition, it is likely that the final choice of Option will involve desalination or water recycling plants (effluent re-use for potable water). In both cases the technologies involved are largely or entirely new to the UK and will require significant input from contactors overseas. To the best of our knowledge there are no UK suppliers of either technology on a 'turnkey' basis. The regulatory and policy frameworks for using these technologies in public water supply are also immature in the UK. For these reasons, the assumptions given by Ofwat are likely to underestimate the actual costs that incumbents and bidders will incur throughout the process. A robust bottom-up costing exercise will be undertaken to firm up initial assumptions and reduce uncertainty once there is more clarity and certainty about the structure and timings of the procurement process.
- **Cost of Equity and other financing assumptions** – For the same reasons as set out above for the procurement and bid costs, the initial DPC projects will be considered by the market to carry a higher risk and thus financing costs of these early DPC projects are likely to be subject to a first-of-a-kind premium. This can be seen in several other programmes including the initial OFTO Tender Rounds (which had a higher cost of equity). This is currently not reflected in Ofwat's standard assumptions.
- **Breadth of observed ranges** – At this early stage in SW's RAPID process, the benchmarked ranges are relatively wide and reflect the level of detail currently available about key project terms. As the solution is progressed through the DPC process and more clarity is gained over scope, risk allocation and the contractual model, SW will look to identify which of the available precedents provides the most accurate comparison to the solution. In particular, it may be possible to identify project deals which are comparable to the solution (including risk allocation and commercial terms) and thus provide a more suitable benchmark.
- **Time frame** – Ofwat does not set out a timeframe for the DPC process but SW has a fixed timeframe in which it needs to commission the solution driven by the s20 agreement with the EA to use "all best endeavours" to have the WRMP strategy, including the Options being considered here as candidates for DPC, by 2027. The fixed timeframe could also influence costs, as it will compress the time available for optimising design and capital costs, the process of identifying and negotiating risk allocations satisfactory to all parties and the time available for CAP contract development. Bidders will be aware that SW has fixed timescales, and this could act against finding the provider and set of contracts that provide best value for SW's customers. As context the recently completed bulk supply agreement contract for Portsmouth Water to build and operate the HTR on behalf of SW took c.3 years to negotiate, at a multimillion-pound cost to SW.

In summary, SW will refine the assumptions used in the VfM analysis based on solution-specific detail and market feedback obtained during the later stages of the procurement process. Although the correct assumptions to be used under the Factual (DPC) model of the value for money analysis will ultimately only be available once bidders provide their final bids at ITT stage 2, SW has identified a number of activities that hold the potential to improve the VfM assumptions in future Gate submissions:

- Undertaking further sensitivity and scenario analyses that reflect solution-specific risks and opportunities;
- Reviewing and updating the assumptions – especially those related to financing costs, financing assumptions, procurement costs and contract management costs - to reflect the first of a kind nature of SW's solution;
- Reviewing the cost efficiency assumptions to reflect the maturity of the costs for in-house delivery, and SW's approach to inhouse procurement for this solution;

- Further benchmarking of the costs of debt and equity to reflect the risk profile of the SW's solution more closely, and to reflect changes in macroeconomic factors and market conditions;
- Better reflection of the efficiencies built into the Price Review process (frontier shift and efficiency challenges) for in-house delivery route; and
- Reviewing the non-financial implications of the DPC model, including its impact on timelines and SW's licence obligations

2.11.1.4. Procurement plan, including procurement and contract timetable

This section sets out SW's approach to the CAP procurement, including the anticipated timetable, the stages of the procurement process and the evaluation framework that will be applied to identify the CAP. It also considers the activities that SW will undertake outside of the CAP procurement to facilitate solution delivery.

Procurement routes considered

Whilst SW's analysis has recommended that the solution is suitable for delivery under the DPC model, SW has also considered the applicability of procurement routes other than DPC. Examples of current capital delivery routes under SW's capital delivery model include:

- AMP7 frameworks with SW's three delivery partners, with a specific focus on larger projects and programmes
- A Low Complexity Delivery Route (LCDR) which sits outside of the more complex delivery partner contract route, providing additional supply chain capability and capacity to complement the existing supply chain partners and reducing the overheads on smaller-value infrastructure and non-infrastructure projects whilst also creating resilience and commercial competition
- The Studies and Investigations (S&I) framework (see the *Key pre-DPC activities to implement the preferred tender model and commercial model* sub-section later in this section for more information)
- The AMP7 Strategic Solutions Partner (SSP) framework, which provides project management and PMO support, in additional to engineering and technical solutions

For large infrastructure projects SW's framework agreements may not be suitable, as they are not designed for works of this scale and technical complexity. This means that were the solution to be delivered in-house, SW would likely conduct a new published procurement process to appoint a provider for the design and construction of the works.

SW's analysis of procurement routes has also shown that large-scale design and build procurement models typically include Early Contractor Engagement (ECE) to safeguard solution design as well as optimise risk balance, providing more cost efficient and predictable contract values and delivery timescales. The nature of risks identified for this solution further assert the benefit of ECE. SW's approach to procuring ECE support is discussed in more detail below.

Timeline of procurement under the DPC model

Figure 74 illustrates that SW has set out the anticipated timeline for the procurement of the solution, including its pre-DPC activities, governance, and submissions to Ofwat as part of the DPC process. At the date of the submission of this report, the timelines (including the underlying breakdown of response periods) are still subject to further change in the future iterations of the schedule. As such, a high-level view of the plan up to CAP award is provided at this time, covering the key activities in aggregate (business case development, design and planning, CAP procurement etc.) without showing a breakdown for each individual task. For the purpose of this report, please refer to Section 2.9 (Schedule) for additional information on planned activities and for key dates relating to DPC Control Points and RAPID gates.

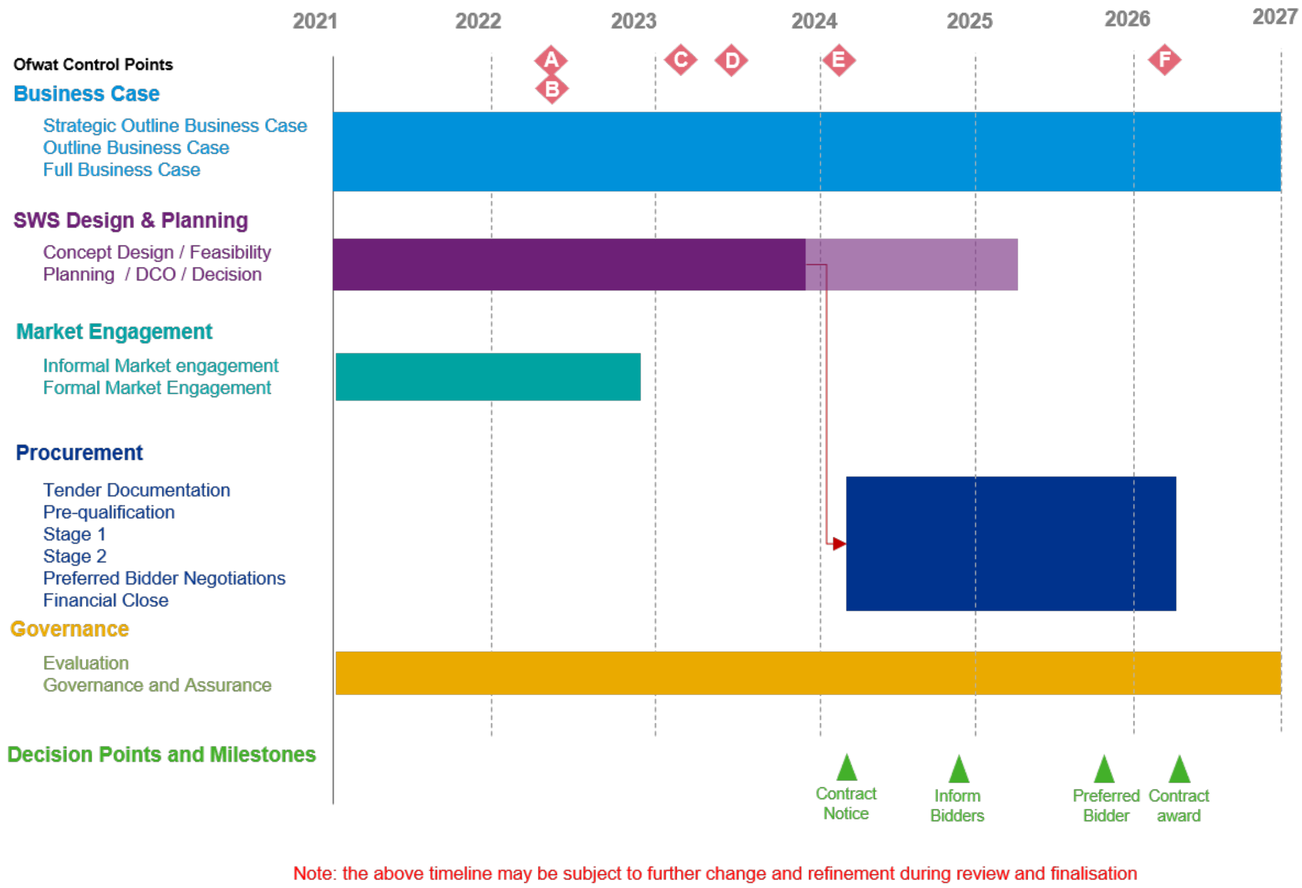


Figure 74 - DPC procurement timeline

CAP procurement plan

Development of the CAP procurement plan

At this stage, SW has developed initial thinking on the likely CAP procurement plan. The plan will be expanded upon as SW works towards the delivery of Control Point C (Procurement plan), which will include a greater level of detail. SW is focused on developing a CAP procurement plan that is designed to maximise competition and deliver best value for customers. The plan takes the solution's critical path into consideration, reflects risk and opportunity, and is designed to ensure that the process is run productively and efficiently. It has been prepared in conjunction with SW's external procurement, commercial and legal advisers. The procurement process will be run in a fair and transparent manner, and in compliance with the requirements of the Utilities Contract Regulations 2016.

SW has considered the resourcing and governance requirements of the procurement process in the development of its approach and the timetable set out above. To achieve a fully assured and competitive process, SW will ensure that appropriate resources are available as required to ensure that SW can:

- Maintain and manage the competitive dialogue with bidders
- Conduct the necessary evaluations at each stage of the process within the timescales set out
- Give effect to its programme and procurement governance and assurance processes

Other relevant factors that have been considered in the development of the procurement plan include (but are not limited to) the complexity of the process, the required duration at each stage and the requirements of the UCRs. The following factors are specific to procurement under DPC or to the nature of the solution, and as such have also been considered in procurement design:

- The DPC model is novel and as such the market is still forming. While there are parallels with other procurement routes, precedent for the use of concepts or approaches applied elsewhere (such as in PPP/PFI deals) has not yet been established for DPC.
- The plan also recognises the significant investment required by bidders to participate in the procurement competition. With these considerations, an effective and valuable procurement that confidently delivers for customers is contingent upon attracting a sufficient volume of compelling and credible prospective bidders. SW has undertaken significant market research to understand the constraints and considerations for CAP bidders to determine whether they will invest in the tender process[44]. The plan reflects the findings.

As SW progresses beyond Gate 2, it's procurement plan and documentation will be subject to extensive internal challenge and external assurance (including legal review) as they are developed and agreed prior to the formal commencement of the procurement process. This will include any submissions as required under RAPID's gated process and Ofwat's DPC Control Points, and as such the CAP procurement plan remains subject to further amendment as the solution matures.

Market engagement in advance of the procurement process

In line with the selected tender model (late with early market engagement), SW intends to conduct structured formal and informal engagement with the market (including contractors and finance providers) throughout SW's procurement development process and initial design phase[45]. This is intended to enhance transparency and promote dialogue with bidders, and to prevent the unfair exclusion of any interested parties. SW's approach will continue to be informed by and may be updated to reflect the results of future market engagement exercises.

SW anticipates that through market engagement it will also be able to outline the stages and timetable of the procurement process to interested parties. This will be important as it will allow and prompt those interested in the solution to form bidding parties (for example joint ventures, and other forms of consortia), ready for the formal commencement of the procurement process.

Prior to the formal launch of the competitive tender process, SW will formally notify organisations of the forthcoming opportunity through the release of a prior information notice (PIN). The audience for this market engagement will be kept as wide as possible, as SW aims to reach all available suppliers, including those that may subcontract to the CAP. Bidders' ability to form and submit a competitive tender will be contingent on supplier support through the procurement process. It is therefore beneficial to promote this opportunity to both potential CAPs and the wider supply chain. From this market engagement, SW will seek voluntary responses from interested parties who wish to provide feedback on the proposed procurement plan and contract. This will not have impact on the bidder's ability to bid in the procurement. This will be followed by a briefing presentation in which SW will seek to address questions bidders may have relating to the information submission as well as the procurement process. As this briefing will interface with the entire market, key members of SW's senior leadership team will participate in and deliver this briefing[46]. Should this market engagement prompt significant challenges to the procurement strategy, SW can reassess and chose to conduct further market engagement.

Procurement process

[44] Market engagement undertaken in respect of solutions B.5 and D.2.
[45] SW will keep appropriate records of all engagement exercises undertaken in advance of the procurement exercise.
[46] This briefing, along with any other materials shared in advance of the procurement, will be made available to all interested parties.

SW's procurement process is set out in Figure 75 and comprises a Selection Questionnaire (SQ)[47] period launched at Contract Notice, followed by a two-stage Invitation to Tender (ITT) process, leading into Financial Close and Contract Award. Figure 75 shows this process, however, the exact response and assessment periods for each procurement stage are still under development[48].

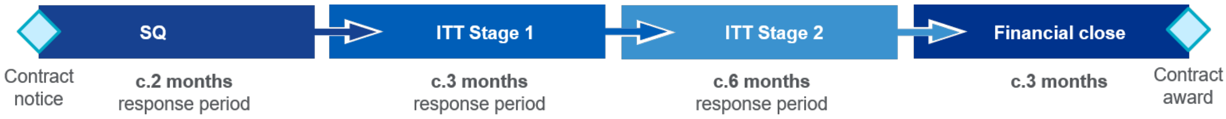


Figure 75 - Procurement stages and response periods

Upon publication of formal contract notice, and in line with its obligations under the Utilities Contract Regulations[49], SW will release all appropriate documentation. Full disclosure of procurement documentation at this initial stage will allow the market to appraise the opportunity and make an informed decision on whether to participate in the competition. The documents published will include, but are not limited to:

- All assessment documentation for each stage of the process, including the questionnaires for SQ and ITT stages 1 and 2
- The evaluation criteria to be applied at each stage
- The draft of the CAP agreement
- All applicable technical documentation and requirements

SW plans to launch the procurement as a Competitive Dialogue, or similar (subject to regulation changes), that facilitates discussion with bidders during the procurement process[50]. This approach will allow SW to engage directly with bidders throughout the process to discuss aspects of the solution and their submitted proposals (once ITT stage 1 submissions have been made). Engagement throughout the process should lead to the submission of final tenders that are compelling, competitive, and fully satisfy the objectives of the procurement process.

SW has scheduled a c eight-week period from Contract Notice to SQ response. This will test the capability and capacity of CAP bidders relative to solution requirements. It is imperative that this process is thorough to ensure that appropriate bidders are selected to progress to the next stage. It is also important that the submission requirements are appropriately detailed to allow for a thorough assessment of bidder capability, whilst balancing the need to ensure that the costs bidders incur in preparation of their responses are not prohibitive to participation in the process. At SQ, bidders will likely be assessed on a mixture of their certification, policy compliance and previous experience of successfully delivering comparable solutions.

SW will assess all responses received at SQ stage. Once complete, the results of SW's detailed assessment will be assured and confirmed through SW's established programme and procurement governance processes. SW anticipates inviting the four highest scoring CAP bidders to prepare a tender. However, this may be as few as three, or as high as six, depending on the quality of SQ responses and relative proximity of scoring. SW anticipates that by progressing four bidders beyond SQ stage, it will maintain effective competition during the ITT stages of the tender. Under this approach, SW also considers that effective competition could be maintained should one bidder drop out of the process once the ITT stage has commenced.

[47] SQ stands for Selection Questionnaire under the Find-a-Tender (FTS) UK procurement process, replacing the OJEU PQQ, or pre-qualification questionnaire.
[48] Please refer to section 2.9 Schedule for current durations
[49] Utilities Contract Regulations 2016, regulation 73 - Electronic availability of procurement documents
[50] Whichever procurement route SW follows will be compliant with the Utilities Contract Regulations 2016.

The ITT will be a multi-stage process[51]. ITT stage 1 will span a c.three-month period from invitation to the submission of responses. This submission will cover aspects of price and proposals on the technical solution, including elements relating to construction, operation and maintenance. Bidders' proposals need not be fully complete at ITT stage 1; however, the purpose of this stage is to understand bidders' proposed solutions so that SW can engage in meaningful dialogue with those bidders who are taken forward to ITT stage 2. SW anticipates that it will invite three of the four ITT stage 1 bidders to progress to stage 2[52]. To enable SW to meaningfully assess responses received at ITT stage 1 and to down select to the bidders who will progress to stage two, SW must be able to assess and fix some components of bidders' stage 1 submissions. The exact components that will be fixed are yet to be determined but will likely include some components of a bidder's pricing schedule. This approach is additionally beneficial as it allows SW to limit bidders' costs, as only those with a realistic prospect of winning the competition will be taken through to ITT stage 2.

Stage two will require bidders to prepare a full tender over a c.six-month period. While the previous c.three-month tender stage has been scheduled with consideration to the costs bidders would incur, stage two reflects a duration sufficient (for bidders that have progressed to this point in the competition) to develop a full proposal, which will include (but is not limited to) the bidders' design and final price to deliver the works. Bid costs are likely to be the most significant at this stage, as bidders produce detailed designs and finalise their responses. At this stage, competition between participants will work to drive for the best possible proposals at the lowest possible costs.

During stage two, SW may request interim non-binding draft submissions from the bidders. This will enable SW to ensure bids are developed to a high standard and ensure that any necessary clarifications are addressed. It will also enable effective, transparent, and fair competitive dialogue through to award and will help to secure the quality of responses. Where SW receives interim updates during ITT stage 2 this may also help to make the final assessment process more efficient as SW will have the opportunity to understand and consider developments prior to final response submission, although the feedback process will need to be managed and controlled closely to avoid leading or guiding bidders.

Key procurement dependencies

There is a dependency upon the completion of the development of the HTR, which is anticipated to be the primary source of supply for this asset.

SW will progress its DCO application in tandem with the procurement process. SW's current programme timetable provides for the submission of its DCO application in late 2023, with determination anticipated to be given in early 2025. This means that:

- The full details of SW's application will be available to bidders in advance of the procurement process, and that determination would be given before the end of the procurement process, allowing bidders to reflect any changes in their submissions.
- SW will be responsible for managing the risk that changes resulting from the DCO approval cause disruption to procurement process, for example where approval is dependent upon a key change that has the potential to influence bidders' responses. Should the DCO process result in some variability of solution, this will be managed through communications with all CAP bidders and in line with procurement regulations. In an extreme case, changes resulting from the DCO process may require a restart of the procurement process.
- Whilst SW anticipates that full approval will be achieved prior to award, procurement timescales may need to be adjusted to reflect any changes. It is noted that the DCO application process sits on the

[51] SW recognises the time and cost implications of the two-stage tender process; however, it considers that the benefits of this approach (limiting bidders' costs by focusing the competition early on those with a realistic prospect of winning and allowing sufficient time for the internal governance approval processes) are sufficient to warrant this approach. SW's approach has been subject to external legal review.
[52] The volume of bidders progressed may increase to four, depending on the quality of submissions and relative scores of responses.

critical path for the solution, meaning that delays to the DCO process will likely have a knock-on effect on the CAP procurement process and timetable.

Key procurement risks

SW has identified a series of key risks to the procurement process, as set out in Table 126 below. At this stage, this is a high-level non-exhaustive list of potential key risks to procurement that will be considered in more detail as the procurement plan is developed further. SW has set out its early views of potential risk mitigations, however, these also remain subject to refinement as the plan development progresses.

Table 126 - Procurement risks

Procurement risk	Description	Outline view of potential mitigations
Lack of market appetite for the solution	The risk that the market does not consider the solution attractive, meaning no or limited responses are received to the Contract Notice. Factors that may affect market appetite could include, inter alia: • Negative perception of the commercial model (incl. outline terms of the CAP agreement). • Concern over programme timeline, including dependency with DCO process.	This risk is best mitigated through engagement with prospective bidders in advance of the procurement process, allowing SW to share information on the solution, including key commercial terms, and obtain feedback from the market in advance of Contract Notice. This process will help to ensure that prospective bidders are well-informed about the solution and will allow SW to understand and address any concerns held by the market.
Limitation / absence of supply chain capacity	The risk that there is insufficient capacity in the market to deliver a solution of this nature, likely due to engagement on other similar solutions, resulting in a diminished level of competition.	SW's engagement with the market to date has indicated that this is sufficient capacity in the market for the solution, however SW will continue to monitor this risk through future engagement exercises.
Delay to the procurement process	The risk that the procurement process is delayed, resulting in additional cost and affecting SW's ability to meet its s20 obligations for the delivery of the solution. Causes of delay could include, inter alia: • Bidder requests for additional time to prepare responses. • Delayed or extended governance processes. • Delays in parallel activities, such as the DCO application process. • Legal challenge (discussed below)	Mitigations against delay include: • The development of a clear procurement timeline based on past experience of similar solutions, giving due consideration to key dependencies, and allowing sufficient time for each activity • Providing bidders with as much information as possible at the outset and engaging frequently throughout to ensure clarifications are addressed • Legal input throughout the design and implementation of the procurement process
Diminished competition in the procurement process	The risk that one or more bidders exit the procurement process, resulting in a diminished level of competition between remaining participants.	Measures to ensure competition is maintained include: • Limiting the need for bidder investment in the early stages of the process, so that the prospect of 'sunk costs' does not deter participation

Procurement risk	Description	Outline view of potential mitigations
		• Holding a reserve bidder from PQQ into ITT stage 1 in case one of the successful bidders exits the process[53] • Reducing the competition to a smaller number of bidders at ITT stage 1 so that remaining bidders have a greater chance of winning and are less likely to exit the process • Inviting 3 bidders to ITT Stage 2 so that competitive tension can be maintained even if one of the bidders exists the process
Legal procurement challenge	The risk that unsuccessful bidders challenge the conduct of the procurement process, or the application of the assessments, suggesting that the Utilities Contract Regulations 2016 have not been followed.	It is not possible to exclude bidders' right to raise a legal challenge against the procurement process, however all of SW's procurement processes are managed in compliance with the UCR 2016, and its procurement plan will be subject to continuing legal review as it is being developed.

CAP tender evaluation framework and assessment criteria

This section presents the evaluation framework for the SQ and ITT stages. Figure 76 illustrates the evaluation process with indicative timings for each stage that will be tested and verified further.

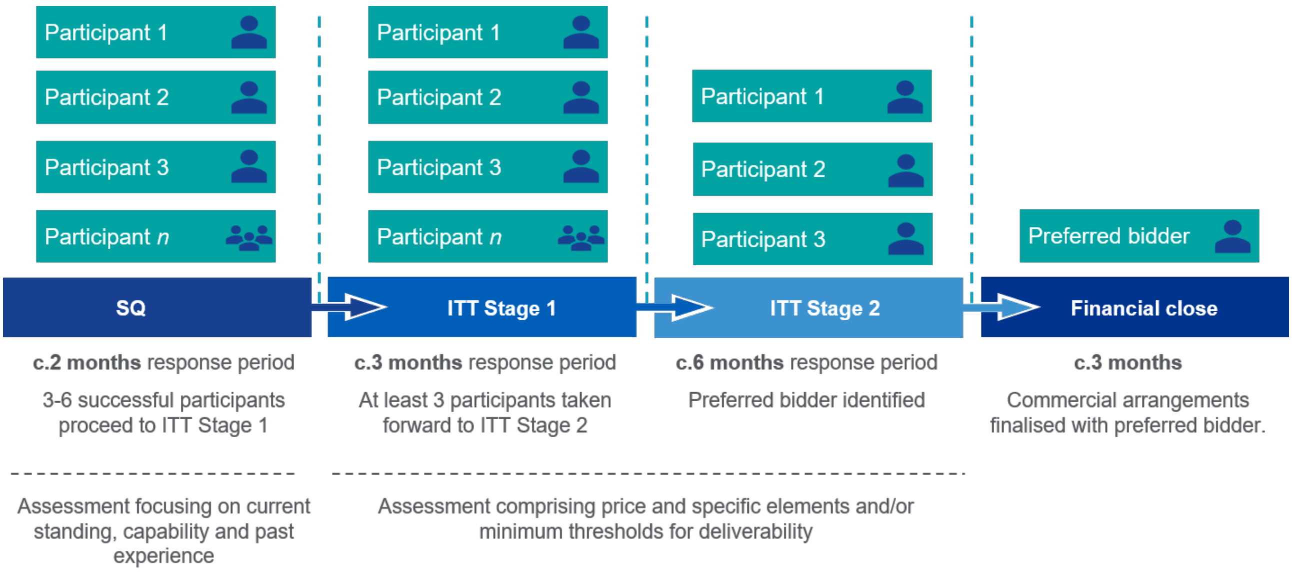


Figure 76 - Evaluation process

Each stage of the evaluation process will aim to achieve different objectives:

- **SQ** - Assesses the bidders' competence and ability to deliver the solution on a backward-looking basis. Bidders that demonstrate historical competency based on a minimum threshold on a pass or fail basis are be passed to the next stage. It is expected that the SQ will focus on the identity and financial credibility and capability of bidders and so as part of the SQ SW will likely assess bidders' structure, financial statements and performance, and experience delivering similar solutions. SW will

[53] If SW wishes to include a right to hold a reserve bidder, then this will be clearly stipulated in the procurement documentation.

consider the depth of these assessments (i.e. light-touch review or detailed assessment of all bidder parties) as the evaluation framework is developed further. Depending on the number of bidders achieving a pass there may be further down-selection to take c.3-6 bidders through the next stage based on the best SQ responses.

- **ITT stage 1** - Assesses the bidders' solution deliverability, and potentially to a smaller extent on their indicative prices (elements of which may be fixed at this stage), to identify 3 bidders to proceed to ITT Stage 2 for detailed design. Bidders that demonstrate robust financial, commercial and technical deliverability on an overall scoring basis may be passed to the next stage. SW will consider whether to set any minimum thresholds for deliverability and will seek an understanding of a bidder's delivery model, the structure of their planned activities, their approach to risk mitigation and their plan to secure and maintain the necessary skills and capabilities throughout the life of the contract. At this stage SW will look to reach a balance, requiring bidders to provide enough information to undertake a deliverability assessment without incurring unnecessary bid costs. As part of the calibration of the deliverability assessment SW will also consider the time and effort requirement of the bid evaluation.
- **ITT stage 2** - Assesses developments in deliverability against design requirements but is likely to be driven by the price. The most economically advantageous tender (MEAT) will win. Further deliverability assessment will focus on the design activities carried out by bidders and will test that the design proposed by bidders fits minimum requirements of various technical elements, reflecting developments in SW's consenting and permitting activity. At this late stage, SW's primary aim will be to drive value for money for customers through competitive tension whilst ensuring that the bidders' proposed solution is fit for purpose.

The detailed evaluation criteria for each stage will need to cover technical, commercial and legal aspects of the solution, taking into account SW's and Ofwat's objectives. The evaluation framework will be designed such that it is fair, transparent and fully documented, ensuring that any potential challenges from losing bidders can be robustly defended, so that the risk of such a challenge is minimised.

Key pre-DPC activities to implement the preferred tender model and commercial model

Recognising the time-sensitive nature of some aspects of solution development, it will be necessary for SW to undertake certain pre-DPC activities to support the implementation of the preferred tender and commercial models. A variety of activities are currently under consideration including, but not limited to, early feasibility works[54], enabling works[55] and pre-DPC construction works, however, these are reflective of the level of detail currently available; and it is likely that some areas will evolve in terms of scope and priority as the solution develops further.

Conflict of interest

SW has engaged a variety of suppliers to support its solution development. Where frameworks have been established, due consideration has been given to conflict of interest, ensuring that appropriate safeguards are in place for frameworks suppliers who may also participate in the DPC procurement process. SW has established conflict of interest arrangements with all suppliers engaged to date. Similar arrangements will be sought with suppliers engaged in the future, and SW will continue to actively manage any potential conflicts of interest as the solution develops.

Studies & Investigations framework

[54] Feasibility studies identify the practicality of a project, considering relevant contextual factors (economic, commercial, technical, regulatory etc.) in order to determine whether a project should be progressed.
[55] Enabling works is a generic description for the site preparation works that take place prior to work under the main CAP construction contract. The term also covers the statutory and non-statutory works required to gain Development Consent Order (DCO) and Direct Procurement for Customers (DPC) approvals.

To support its pre-DPC activities SW has established several specialist Studies & Investigations (S&I) frameworks. This follows an extensive programme of market and stakeholder engagement and a competitive procurement process. The majority of the enabling works packages are within the scope covered by SW's S&I Framework and can be procured through this route. Other packages will either be procured through the Catchment Management Specialist Framework, or for packages which cannot be procured using existing frameworks a procurement decision will need to be made. Call-off from these frameworks has been used to secure the majority of pre-DPC and pre-DCO workstreams. This is following a fully competitive OJEU[56]/FTS[57] procurement where 23 lots were awarded across the 5 S&I frameworks[58].

The specialist frameworks have been established with due consideration to conflict of interest, ensuring that appropriate safeguards are in place for frameworks suppliers who may also participate in the DPC procurement process. Similar arrangements will be sought with suppliers engaged in the future, and SW will continue to actively manage any potential conflicts of interest as the solution develops.

Enabling works

SW's procurement approach for its pre-DPC activity has been developed in two phases. Phase 1 focuses on meeting SW's early feasibility needs. Phase 2 comprises enabling works and pre-DPC construction works. The majority of work packages under Phase 1 have been delivered to budget and within required timescales. In the most part, these packages relate to obtaining consents (including planning, consenting, environmental constraints, permitting, and other environmental considerations) and as such include a variety of surveys in support of SW's Gate 2 submission, DCO preparation and Environmental Impact Assessments (EIA).

For Phase 2 of its pre-DPC activity, SW will continue to utilise the established S&I frameworks. The contents of Phase 2 have been in development during Q2 and Q3 of 2021. It will include additional sub-strategies which focus on pieces of work that lie on the critical path and must be completed in order to achieve DCO approval and allow for a CAP to be appointed. This phase of activity is being prepared in consultation with key stakeholders including regulators (EA, NE, Ofwat etc.) and other members of the delivery team and will include but is not limited to:

- Environmental technical appraisals and studies
- Modelling, including Cormix and 3D modelling
- Support activities to further SW's optioneering, DCO and EIA processes
- Terrestrial ecology surveys, including bats, breeding birds, Hazel Dormouse and badgers
- Aquatic ecology surveys, including river habitat and corridor surveys

SW intends to agree its procurement acquisition strategy for Phase 2 in 2021. The scope of this second phase of pre-DPC activity remains under development, once this has been agreed SW will develop a strategy for the allocation of these works between lots.

For its future enabling works packages, SW has identified the relevant suppliers within the S&I framework and is in the process of engaging suppliers on each framework to better understand their capacity relating to the different packages required. Actions related to the identification of pre-DPC suppliers will include:

- Verifying the capacity of existing framework suppliers to undertake specific packages of work.
- Proactively maintaining conversations with suppliers to understand their long-term capacity. This may allow SW to secure resource for a longer term and understand whether added value can be gained from awarding bulk packages to specific suppliers.

[56] OJEU refers to the Official Journal of the European Union, contains public sector contract tenders and notices from every EU member country.
[57] FTS refers to the Find-a-Tender service, which is a UK procurement portal launched following the UK's exit from the European Union.
[58] The 5 S&I frameworks include Catchment Management Strategy and Delivery, Wastewater investigations, Environmental monitoring, assessment & implementation, Asset investigations and flow monitoring, and Water Resourcing Management and Investigations.

- Identifying those packages of work that will not be awarded to framework suppliers and develop procurement routes for such packages.

DCO planning support services

To support in the development of its DCO strategy and its application and consultation process SW requires input from a variety of services and specialisms. Of these, planning and consenting support services are required urgently, as an in-house planning team does not exist. SW has sought Board approval to make a direct award to [redacted] (under the S&I framework) who will provide interim support until December 2021, by which time the tender for the DCO partner will have concluded. SW will not preclude [redacted] from competing in the procurement process for the full support works but has ensured that appropriate conflict provisions (such as information barriers) are in place to prevent any unfair advantage.

DCO consultation

The activities required within the DCO consultation are also urgent and there is currently no internal resource that can fulfil the consultation resourcing requirements needed for this SRO. The activities required fit within the SSP (Strategic Solutions Partners framework) service scope and can be procured under the SSP framework. The SSP is composed of [redacted] with subcontractors [redacted], . [redacted] are believed to have the required experience and capability to deliver DCO consultations. SW is currently preparing to engage the suppliers on this framework to test their capability and will then assess the most appropriate procurement route. SW are currently exploring contract Options for the DCO consultation package.

Pre-DPC engineering and design surveys

In addition to enabling works, SW will also undertake some pre-DPC construction activity. The packages of work and schedules for delivery for these construction works are currently in development, however amongst the packages identified thus far there is a focus on design support required for this solution. SW is currently reviewing which of these work packages can be undertaken by internal resource. For work packages where external resources are required a full scope of work for the packages will be developed that SW will procure using the SSP framework, S&I framework, EIA, or may undertake a separate procurement (compliant with the 2016 Utilities Contract Regulations) to make an award to a supplier who can support SW with these requirements.

Technical advisory service

Additionally, [redacted] are currently providing a technical advisory service to SW for this solution. At present SW's contract is with [redacted] rather than directly with [redacted] To date, several potential opportunities for further works have been identified which require further investigation. SW intends to examine the current sourcing method and put forward an optimal approach for delivery as the solution develops further.

Early Contractor Engagement

Early contactor engagement (ECE) denotes the introduction of a contractor's skillset in the early stages of a project to bring design 'buildability' and cost efficiency to the pre-construction phase. SW recognises the unique, large and complex nature of its WfLH programme, and therefore considers that it will benefit from contractor expertise extending across SROs and the DCO and DPC processes. It is anticipated that ECE support will be needed throughout solution development, procurement and potentially beyond CAP award, however the long-term scope for the ECE is yet to be determined. At this time, SW is developing its ECE strategy and engaging with relevant suppliers. As the WfLH programme develops, a detailed schedule of activity for the ECE will be developed, however to date SW has identified the following requirements:

- Constructability reviews and construction schedule development (including the production of construction phase plans)
- Advice on the necessary mechanical and electrical systems, commissioning durations, tunnelling approach and other discrete areas as applicable
- Support through SW's statutory consultation process
- Tender evaluation during the assessment stages of the procurement process, focusing on technical questions
- Reviewing sub-contractors' RAMS (risk assessment method statements)

These requirements will be further improved or extended during negotiation/dialogue sessions SW has planned as part of the Competitive Procedure with Negotiations procurement route which will be conducted to engage a suitable ECE contractor. SW will seek ECE parties who can demonstrate an extensive background in civil and mechanical engineering, a history of experience in similar or major infrastructure projects, and experience of working with clean water assets.

To secure the support it requires, SW proposes to undertake a competitive procedure with negotiation procurement process (with a pre-qualification stage and two-stage tender) to engage two non-DPC ECE parties, with award anticipated for July 2022. SW anticipates that these ECE parties will be engaged on an NEC Option C (target cost) or E (cost reimbursable) basis, over a 9-12-month period, working in parallel and competing for a single award for the construction period.

The successful ECE party will be integrated into SW's Water for Life Hampshire team and will initially be required to undertake a review of the WfLH outline solution design statements (and associated documents / plans / drawings, specifications and schedules) currently under development. The design/buildability resource is expected to deliver a number of agreed outcomes regarding the design/buildability of the WfLH solution including, but not limited to:

- Providing design and constructability input, including review of key documentation, implementation of best practices and (where possible) standardisation, and the development of a constructability plan.
- To create and maintain a constructability lessons-learned database and cost-effective design modification database.
- To undertake constructability workshops prior to the CAP tender process, focused on the discussion of concepts and sharing of input, developing a plan for constructability implementation during project execution and the identification of opportunities and concerns.
- To provide discrete areas of advice, for example in relation to underground works, major crossings (watercourses, road crossings, critical services etc.) and for works in specific environmental conditions.
- To review and assist with the development of a variety of DCO design deliverables.

To address its urgent needs for support in its construction and commissioning schedule development (whilst it procures formal ECE support) SW has engaged early buildability construction management (BCM) support under its SSP framework.

2.11.1.5. Design maturity

Detailed information on SW's design development can be found at the following locations in this document:

- The anticipated level of design maturity can be found in sections 2.2 Engineering Design, 2.3 Network Infrastructure and 2.4 Site and Route Selection.
- Detail on solution risks and their potential to impact the development of design maturity can be found in section 2.7 Risk Management.

- Detail on SW's planning and consenting strategy (including environmental impact assessments) can be found in Section 2.8 Planning and Consenting.

To facilitate the procurement process, SW will ensure that the design process balances the certainty required for the purpose of planning applications and the DCO approval process (sufficient to mitigate the risk that planning is not achieved), with the need to maintain a level of flexibility and optionality that will allow bidders to demonstrate their knowledge and skillset, and to add value to the final solution design. A less tightly defined scope will provide bidders opportunity to develop the most efficient and cost-effective engineering solutions.

SW's current programme timetable provides for the submission of its DCO application in late 2023, with determination anticipated to be given in early 2025. This means that the details of SW's application will be available to bidders in advance of the procurement process, and that determination would be given before the end of the procurement process, allowing bidders to reflect any changes in their submissions[59].

Engineering documentation provided for the tender process will be split between "rely-upon information", which will be associated with information that has been used to inform the planning applications, and the remaining information (provided "for information only"), which will be provided to enable the bidders to submit a detailed submission that can be normalised for evaluation.

Informal market engagement feedback

As part of its Gate 2 solution development, SW ran a series of informal market engagement meetings[60] with potential bidders. Key feedback collected on design maturity is as follows:

- Since the detailed design is expected to be developed by the bidders, initial design carried out by SW should still give bidders the flexibility to innovate whilst adhering to planning process requirements
- Potential bidders believe that an optimum pre-tender design leaves room for change and improvement
- Participants suggested that SW should progress the design envelope enough to meet the DCO approval requirements without limiting the CAP's ability to drive innovation and cost savings
- Participants were favourable towards SW engaging with an early design contractor to help develop the initial design especially in preparation for the DCO approval
- Participants highlighted that clarity on the level and scope of the initial design and SW's expectations for the detailed design will be key to developing bid submissions as part of the tender process
- A water recycling asset will interact and interface with operating assets. For the tender, more information on the interfaces is required to develop a bid submission.
- Direct Transfer assets are considered to be relatively simple with a well-understood technology and a mature market

This feedback is consistent with the late model, under which bidders will expect SW (as incumbent) to have secured the necessary planning permissions based on a reference design. SW will work with its ECI contractors to ensure that the planning, consenting and DCO processes do not unduly restrict the ability of bidders to optimise their designs.

2.11.1.6. Confirmation of preferred tender model and commercial model

Tender model

[59] Material changes arising from the DCO determination may require that the procurement process is restarted.
[60] To date, market engagement exercises have been undertaken in 2019, as part of SW's Gate 1 submission and as part of SW's Gate 2 submission. Solutions B.5 and D.2 were tested with the market.

The late tender model with early market engagement has been identified as the preferred tender model for Option B.4. Under this model the solution is tendered out as a DBFOM[61] after SW obtains the requisite consents.

To reach this decision, SW developed and applied an assessment framework against the four potential tender models identified at Gate 1, then conducted internal workshops to down-select two models to be tested with the market as part of SW's Gate 2 informal market engagement which focused on solutions B.5 and D.2 on an individual basis [62] Bringing together feedback from the informal market engagement where relevant with SW's assessment, the late tender model with early market engagement was selected as the preferred model[63].

As the informal market engagement covered solutions B.5 and D.2, it will be important to understand the capacity and capability of the supply chain and the appetite from bidders (including investors and lenders) to participate in a single DPC solution which combines two different asset types.

Table 127 below details the stages of tender model review.

Table 127 - Preferred tender model stages of review

Review stage	Scope
Initial review of tender models	Four tender models assessed that have been identified for further progression at Gate 1: a) late with early design, b) late with early market engagement, c) late with novation of early designer or d) late with split D&B from finance
Workshops with key SW SMEs	Preference for late with early market engagement
Informal market engagement feedback	Preference for late with early market engagement

Key justifications for the selection of late model with early market engagement are:

- The late model (or a version thereof) is necessitated by SW's timetable constraints. Were SW to follow the early model, the procurement of the CAP and planning application process would typically be undertaken sequentially. Given the time required for each of these activities, SW would be unable to meet its timetable obligations. Under the late model, SW is able to pursue the necessary planning and consents in parallel with its procurement process to enable the solution to be delivered as quickly as possible once a CAP is appointed. The late model is therefore the most time-efficient of the Options considered.
- Tendering the full spectrum of DBFOM activities will lead to a more straightforward risk allocation between the CAP and SW and will minimise the number of interfaces required at the early stages of the solution.
- The late with early market engagement Option emerged as the clear preference of potential bidders. Potential bidders believe that under the proposed late model with early market engagement they would be able to offer greater value for money through the integration of all DBFOM activities into one proposal, facilitating innovation, minimising interface risks and ensuring overall alignment of risk allocation.
- Although there are limited examples of water recycling plants on this scale in the UK, there is a wide pool of international contractors expected to drive competition from D&B perspective and therefore

[61] Design, Build, Finance, Operate and Maintain
[62] The late tender model with early market engagement, and the late tender model with split D&B from finance.
[63] At Gate 1, SW's assessment of the appropriate tender model did not consider the D.2 solution (as that submission focused on other solution configurations), however the findings are considered to be applicable for this solution, as they are generic for large infrastructure investments that are considered suitable for delivery under the DPC model.

there is less need for SW to propose the late split model in order to keep competitive tension throughout the tender process.

- Based on the technical specifications of the transfer solution, there is less interest from the market to have separate D&B contractors being selected by SW. By integrating the DBFOM activities into one proposal, bidders will be incentivised to put forward proposals with a better value for money as they will be able to optimise their bids based on their experience on other similar direct transfer solutions.

Under this tender model SW will play a key role in the need identification, Option selection, design and consenting activities. The project hand over to the CAP will occur before the detailed design stage, once consent has been obtained based on the initial design developed by SW. The CAP will be responsible for the detailed design, construction, operation, maintenance and financing of the solution. Under this model the ownership of the solution would sit with the CAP for the duration of the contract term, after which it would be transferred back to SW, or if SW chose to re-tender, transferred to a new owner. Figure 77 sets out the key activities under the late model with early engagement for SW and CAP.

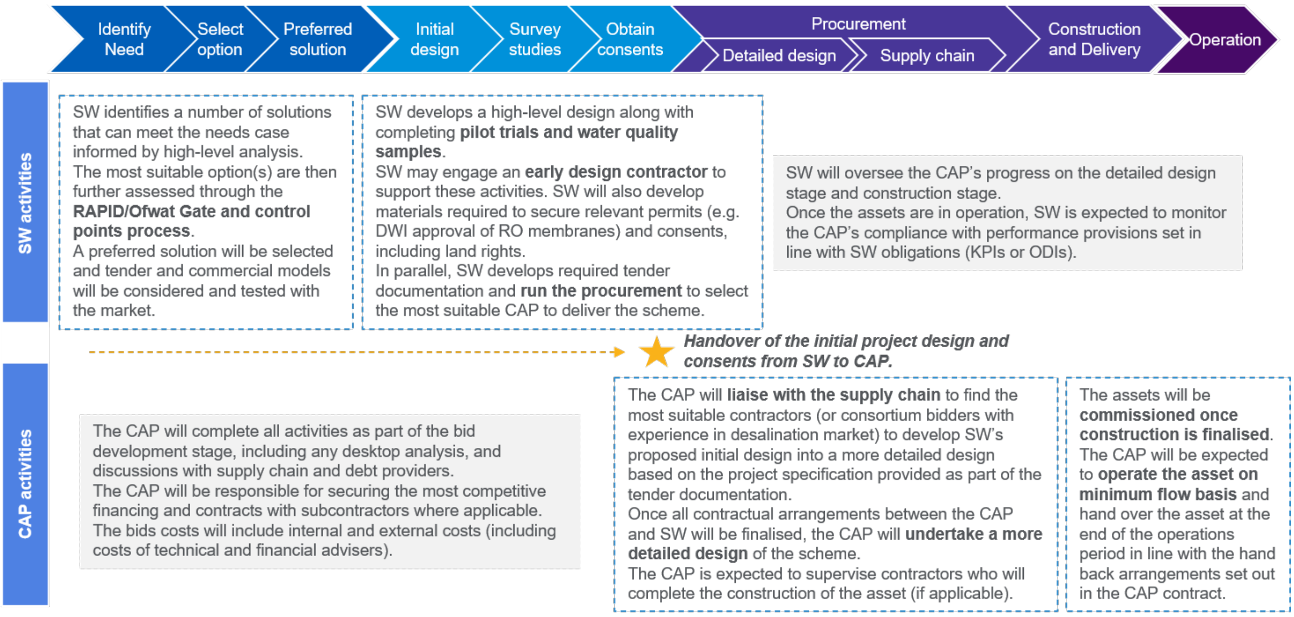


Figure 77 - Indicative activities under late model with early engagement[64]

Commercial model

The commercial model reflects the selection of the late tender model with early market engagement as the preferred model. The proposed commercial model reflects both the current understanding of the solution and the feedback received from the informal market engagement undertaken to date[65]. It will evolve as the solution develops. The commercial model also incorporates a variety of inputs from the wider industry, including Ofwat's DPC guidance, internal workshops with SW SMEs and analysis of precedents from PFI/PPP type projects in the water, energy, rail, and wider infrastructure sector that share similar risk profile, business model, asset type, or appointee structure to the solution.

The commercial model covers key contractual principles and main categories of risk allocation, both of which have been tested with market engagement participants. It also considers the combination of two different asset types within one contractual and commercial framework, and how this is likely to affect the necessary terms between SW and CAP.

[64] Note that the banner of stages along the top of Figure 74 is indicative for a typical infrastructure development process only and may differ in practice for Option B.4. For example, SW plans to pursue consents in parallel with the procurement process.
[65] Feedback obtained in relation to solutions B.5 and D.2

Key drivers for the commercial mode

The commercial model for Option B.4 is driven by a number of key factors related to the anticipated construction and operation of the HT Transfer and WRP, and their interface with SW and PW. Table 128 details out how these drivers will impact upon the commercial model.

Table 128 - Key drivers for the commercial model for Option B.4

Factor	Impact on commercial model
Combination of solutions in one package	
The CAP will be responsible for two different asset types (a WRP and a HT Transfer), within the same contract.	• Separate operating regimes will be established for the HT Transfer and the WRP, reflecting that they will operate mostly independently. • Different availability and volumetric payments will be required for each asset. • Performance incentives will need to be tailored to each asset type. • Future consideration of incentives will need to consider the application of joint incentives across both assets. • The portfolio effect of two assets within one agreement may de-risk the CAP agreement for bidders. • The CAP contract will need to reflect any applicable ODIs that will be affected by asset operation.
Different asset lives for the WRP and the HT Transfer. • WRP = 60 years • HT Transfer = 100 years	• The residual value associated with each asset will be separate, requiring individual calculation based on each asset's remaining life • There will need to be a mechanism to account for greater / lesser than expected asset deterioration and remaining expected asset life at the point of hand back.
Depending on the CAP's construction timetable, it may be possible that one asset is delivered before/after the other.	• Separate commissioning tests will be required for each asset. • Commissioning is anticipated to be dependent upon the fill of the HTR, meaning that a single commissioning event is assumed once an appropriate flow level has been reached at the reservoir.
The CAP will have performance obligations in respect of both assets.	• Step-in rights will need to balance the need to give the CAP the opportunity to remedy performance failures with the need for SW to step in and address issues before sanctions or penalties are applied. • To try to separate the two assets contractually within the CAP agreement for the purpose of step-in rights will involve significant complexity and risk, likely outweighing any benefits gained by allowing the CAP to retain control of the other asset. For this reason, step-in rights will likely cover both assets.
Future modelling may change the usage of the HT Transfer and/or WRP also driven by the HTR, requiring additional supply from the WRP, potentially at sustained levels.	• The volumetric elements of the payment mechanism and incentives will need to accommodate for volatility in future usage patterns. • If future operational regime changes are anticipated to occur near the end of the contract term, this could influence whether it is better to end the contract before the changes are required, or to accommodate them within the CAP agreement. • SW will need to understand the magnitude of potential future changes in usage and associated capex requirements for further developing the contractual arrangements with the CAP.
Reduced operating regime – 15ml/d output (B.4 WRP) vs. 75ml/d (B.5 WRP)	

The WRP will no longer be the primary source of supply for the pipeline (as in B.5) With a smaller scope of operating responsibility, the potential for the CAP to deliver significant operational savings over contract term with respect of the WRP will be reduced.	• In the overall revenue model (comprised of both HT Transfer and WRP revenues) the WRP will be a (relatively) smaller component in comparison to the HTR. The performance obligations and payment terms will need to ensure that appropriate performance is maintained for each asset throughout the contract term.
Both assets interface with the HTR	
The WRP has a downstream interface with the HTR, and the HT Transfer has an upstream interface with the HTR. There is a water quality interface between the WRP and the HTR. Where the CAP fails to achieve its water quality obligations for the WRP, this would have a detrimental effect upon PW's HTR.	• The input/output relationship between assets will be separated by the HTR. Separate water quality assessments will apply to the output of the WRP and the water transferred through the HT Transfer. • There will need to be an interface arrangement between PW and CAP. The terms of the interface arrangements are yet to be developed in detail, but are anticipated to cover (inter alia) provisions around access rights, interfaces, non-performance (by PW or the CAP), damages, etc. It is assumed that the provisions of the interface agreement will be negotiated and set out in the BSA between PW and SW developed alongside CAP Award.
Interface between SW and CAP around input/output from [redacted] to the WRP	
Where there is material variation in the quality of effluent provided to the WRP from [redacted] this might impact the CAP's ability to meet its performance obligations. Where there is an enduring increase or decrease in the quality of the effluent provided to the WRP, this will affect the CAP's ability to make operational savings and the asset life of the WRP components.	• Performance requirements will need to reflect a situation where SW renders the CAP unable to meet its obligations. • SW may elect to recoup any operational savings the CAP makes through betterment in the effluent provided by SW; however, this may be difficult to achieve without exposing SW to the parallel risk that effluent quality worsens requiring SW to meet additional costs.

The contract with the CAP

SW considers that a fixed price contract with the CAP, on a design, build, finance, operate & maintain basis is the most suitable Option. A fixed price contract provides the greatest protection for SW and customers from price increases. As the expertise in delivering direct transfer and WRP assets is expected to come from bidders, they are considered to be best placed to bear the risk of cost overruns.

Table 128 below details SW's high-level proposal for how the contract with the CAP would be structured with more detailed considerations discussed further below.

Table 128 - Overview of proposed commercial model

Area	Proposed approach
Contract length	• Subject to any future changes in the projected renewal cost profile, the recommended (operational) contract length is 20 years. This is primarily driven by the renewal sum CAPEX in year 21 of operations (which would be inefficient for a CAP to finance).
End of contract asset treatment	• Bullet payments made from SW to CAP based on the end of contract value for each individual asset. The end of contract asset values will be driven by the renewal cost and depreciation profile assumed for each asset under the DPC model. • At the end of the contract, the assets will be either transferred to SW's RCV based on the end of contract asset value or retendered by SW.

Area	Proposed approach
Termination	• Termination rights should be included in the contract terms allowing SW or CAP to terminate the contact based on pre-defined scenarios or targets. SW may monitor the risk of a CAP not complying with SW's statutory obligations by introducing performance target caps that could trigger step-in rights. • Where step-in rights or termination provisions were triggered, this would apply to both assets simultaneously.
Payment mechanism	• A hybrid model primarily based on availability charge combined with a volumetric element to cover variable OPEX linked to the utilisation of the HT Transfer and WRP individually, reflecting the fact that the two assets will be operated mostly independently. • Payment to CAP will start post commissioning. A separate availability payment will be made for each asset once commissioned. • A fixed price contract. • Refinancing gains to be shared 50:50 between the CAP and the customers. • Operational penalties/incentives will be introduced as part of the CAP agreement, tailored to the operation of each asset.
Acceptance and late service commencement	• Separate commissioning tests will be required for each asset. (Commissioning is anticipated to be dependent upon the fill of the HTR, meaning that a single commissioning event is assumed once an appropriate flow level has been reached at the reservoir.) • Liquidated damages for late service commencement for the two assets set independently. • May include financial incentives for timely asset delivery, e.g. early delivery bonuses. • Individual, clearly defined criteria and processes for the commissioning and acceptance of each asset.
Operational performance	• A separate operational regime will be established for the HT Transfer and for the WRP given they will be operated mostly independently except in a drought scenario (1-in-500-year). • Most risks are expected to be transferred to the CAP, e.g. process risk, leakage, response time and critical spares. Some will be shared between the parties (e.g. volume uncertainty). • The portfolio benefit generated through risk reduction and separate payment mechanism provisions etc. will likely lead to potential cost savings for consumers (in addition to lower procurement and contract administration cots). • Ofwat has stated that SW (and PW) will retain statutory and licence responsibility for water quality, although contractual provisions to ensure quality will likely still be sought with the CAP. The CAP will be responsible for the quality of the output from the WRP. The CAP will be required to maintain the water quality through the pipe and prevent any variations in water quality between the entry and exit points. Availability and water quality expectations will be captured through performance specifications in the CAP contract. • Option B.4 is characterised by increased interoperability risk. Interfaces between the CAP and PW will be informed by the BSA between SW and PW. • Regular (yearly or biyearly) condition assessment of each asset will be included in the CAP contract.

- Following consideration of several different factors, an **operational term**[66] of 20 years has been assumed. This is driven primarily by the renewal CAPEX profile for the solution, which forecasts significant expenditure (for the replacement of mechanical and electrical) components in operational year 21[67]. If financed by a CAP this would require the maintenance of inefficient cash reserves throughout the

[66] Here, operational term refers to the operational period which begins once the asset has been successfully commissioned.
[67] Based on the Gate 2 cost estimate profile, c.£77m of renewal CAPEX will be required in OY21.

contract term, which diminishes the value for money provided by the solution. Assuming a straight-line depreciation over the asset life the large renewal CAPEX in operational year 21 significantly increases the bullet payment at the end of the contract should a term beyond 20 years be selected. SW will continue to monitor the solution's developing cost profile and if changes in the renewal CAPEX profile allow for a longer contract period to be selected then the assumed contract term may be updated to reflect a period of c.25-30 years, provided that this option continues to present a positive value for money outcome.

The selected length is consistent with SW's long-term objectives, and with other factors considered. Bidders stated a preference for a shorter contract[68], and the term aligns with a typical length for bank financing, which is considered the most likely financing route for this solution because of its first-of-a-kind nature. Further, shorter terms also allow bidders to fix their O&M costs[69], creating opportunity to drive additional efficiency.

- Taking the above into account for the **end of contract asset treatment**, SW has elected to make bullet payments to the CAP at the end of the contract term for each of the assets (HT Transfer and WRP). This approach reflects the difference between the asset lives, 100 years for the HT Transfer and 60 years for the WRP, and the 20-year term of the CAP agreement, ensuring that customer affordability is not compromised in favour of full repayment over the term.

  Whilst bullet payments will be made, this may be subject to an assessment of each assets condition at hand back[70]. Once finalised, each asset's depreciation profile will drive the size of the bullet payment, however these are yet to be determined and will be subject to further calibration. Market engagement has shown that bidders are open to and generally supportive of the inclusion of a bullet payment. It will be key to understand how the potential size of the bullet payments may impact bidders' appetite to participate in the procurement and their submitted prices. SW may look to test the financial implications of various depreciation profiles to ascertain their impact upon customer benefit, SW's credit rating, counterparty risk, and to consider questions related to intergenerational fairness (such as bill impact and affordability). At the end of the CAP contract, the assets will either be retendered to find another provider or will return to SW's control, with an addition made to SW's RCV equal to the remaining value of the assets.

- **Termination rights** are typical for PPP/PFI project finance arrangements and will be expected by the market, in particular for certain no fault (e.g. force majeure), Appointee default (e.g. non-payment) and CAP default scenarios.

  Ofwat has recognised that the requirements of SW's licence and other statutory obligations cannot be transferred to the CAP. SW must retain the contractual right to address service failures, which may result in adverse effects for customers and liability for SW. As such, SW is likely to seek automatic step-in rights where certain water quality standards are compromised[71] (for example where cryptosporidium is detected), and to introduce a "termination for convenience" clause, whereby the contract can be terminated at SW's will without the need for cause, providing a safeguard for SW in its activities as water undertaker. Given that this solution involves two assets in combination, SW anticipates that the contractual complexity and risk involved in de-linking the assets for the purpose of step-in and termination provisions may be significant. For this reason, SW assumes that these rights will be exercised across both assets simultaneously.

[68] In the market engagement conducted to date, bidders expressed a preference for a contract term of 30 years or below.
[69] Bidders would likely seek contractual mechanisms that would allow maintenance costs to be adjusted in the event of a longer-term agreement.
[70] Asset condition at hand back could be accounted for through several different approaches, including (inter alia) a deduction from the residual value payment, a deduction from the availability charge (where asset deterioration had been identified earlier in the contract term), and/or the imposition of a requirement for the CAP to post security. The relative merits/demerits of each approach will be considered further as the commercial model continues to develop. Additionally, consideration will be given to the potential process for asset handover, and how a new provider or SW could be given confidence in the end of contract surveys and inspections undertaken by the original CAP. It will also be important to ensure that evidence exists to demonstrate that the maintenance regime has been adhered to over the life of the contract.
[71] During market engagement, one bidder suggested that termination rights should be based on performance-related penalties.

- With regard to the **payment mechanism**, a hybrid model will include an availability-based payment for each asset (likely linked to the provision of a set minimum-flow level) and a volumetric element covering variable operational expenditure reflecting each asset's utilisation level (e.g. an increased level of pumping station operation, or increased output from the WRP). Variable costs will also be based on a schedule, that is, defined costs at different levels of operation. The existence of separate availability payments means that the CAP will not be penalised across both assets if one is unavailable. This approach reflects the limited operational dependence between the assets and provides a flexibility that is likely to be attractive to the market.

  This approach reflects the solution's position as a resilience measure and will increase the value for money for customers, who will pay for asset utilisation (above an agreed minimum flow) only where it is required for example in drought conditions. Further, performance penalties and incentives (tailored to the detailed operational characteristics of each asset within the solution) may also be employed to ensure that the CAP is appropriately incentivised to maintain each asset's availability in times of need. SW will also consider additional components of the payment mechanism which may help to drive additional value for money, including a refinancing gain share[72] (expressed through a reduction in customer charges) and the potential for the indexation of revenue streams, subject to further analysis.

- **Acceptance and late service commencement** provisions will need to ensure that the CAP is financially incentivised to ensure timely delivery in line with SW's All Best Endeavours obligation to deliver the by 2027. However, it will also need to avoid creating a disproportionate downside exposure that would be reflected in bid prices.

  The payment mechanism will meet this objective in part, as revenues to the CAP will not commence until each asset is commissioned, in line with Ofwat's guidance[73]. However, given SW's need to implement the solution in time for its 2027 regulatory deadline, liquidated damages and early-delivery bonuses may be implemented to ensure committed schedules are achieved[74]. During market engagement, bidders have noted that clear acceptance criteria will be crucial to ensuring that the asset can enter operation in line with both SW's and the CAP's expectations. An independent certifier / verifier may also be engaged, providing both parties with guidance and allowing for an independent and objective view of acceptance. SW currently anticipates that the CAP will only be able to commission both assets once the HTR has reached an acceptable water level, so that the balance between spring and recycled water can be maintained. The commissioning processes and timetables for the HT Transfer and WRP will be different, with separate acceptance criteria; SW will continue to investigate how commissioning will be achieved as the initial design is further developed.

- **Operational performance** requirements will be separate for the HT Transfer and the WRP and will be informed by the BSA between SW and PW. SW recognises that it will not be able to transfer responsibility for water quality obligations to the CAP but will nonetheless seek to ensure that appropriate contractual provisions are put in place (tailored to each asset) which will ensure that standards are maintained.

  SW does not envisage that the CAP will be responsible for the volume of water transferred through the HT Transfer. Here, the CAP's primary operational performance obligation will be to ensure the availability of the asset and that there is no detriment to water quality whilst transferring water through the constructed pipe. To this end, water quality monitoring is likely to be used to confirm that no change has occurred between the entry and exit points. SW will also look to ensure asset condition inspections are undertaken regularly as this will inform the asset's deterioration profile.

  SW anticipates that performance obligations will apply to the quality of the recycled water output from the WRP. SW will design output specifications that will inform the CAP's detailed design for the WRP to ensure that the constructed asset is capable of providing recycled water at a level of quality that is acceptable for input into the HTR. The CAP's performance obligations at the WRP will also consider the

[72] The 50:50 refinancing gain currently proposed is based on existing PFI guidance and precedent.
[73] This position aligns with Ofwat's DPC principle that customers should not pay for assets until they are in receipt of the benefit they provide.
[74] Acceptance, commissioning and liquidated damages provisions will need to account for the works being undertaken by Southern Water and Portsmouth Water, which will need to be complete in order for the CAP to achieve commissioning.

WRP's dependency upon [redacted] for effluent input including, for example, what happens if the supply of effluent is interrupted, or if the quality of effluent improves or worsens.

The contractual arrangements between the CAP and SW will be outlined in more detail as the commercial model is developed further and will be reflective of a more developed understanding of solution risks.

Risk allocation

The principles bulleted below underline the high-level risk allocation exercise that has been undertaken to date:

- Ofwat's DPC principles state that risks should be allocated to those best able to manage them.
- Risk allocation impacts bidders' appetite to participate in the CAP tender and submit a bid.
- The information shared with bidders will affect their willingness to accept ownership of risk. The more information is shared with bidders during the procurement the more likely they will accept responsibility for a particular risk.
- Bid prices will be reflective of the level of information shared and the overall allocation of risks between the parties.
- SW may consider reopeners for risks that cannot reasonably be managed by the CAP.

Table 129 below details some of the key risks that are applicable to the delivery of the solution within the DPC model. Risks are allocated at a high-level between customers, the CAP and SW, reflecting the party principally responsible for each risk, or whether a particular risk is expected to be shared between parties.

SW has tested its outline risk allocation with the market through an informal market engagement exercise[75]. Participants were provided with a version of the table below that included a summary explanation of the risk and the rationale for its allocation. The exercise provided SW with valuable feedback on individual risks, which has been incorporated into the explanations set out below. Overall, participants agreed that the proposed risk allocation was appropriate, noting its similarity with other comparable solutions.

Table 129 - High-level allocation of risk between parties

Risks and considerations	Customer	CAP	SW
Consenting			
Planning			
Reference design			
Detailed design			
Ground conditions			
Programme			
Sub-contractor performance			
Asset handover			
Commissioning			
Land access rights			
Construction Costs			

[75] Solutions B.5 and D.2 were tested with the market.

Risks and considerations	Customer	CAP	SW
Operating costs			
Interoperability / Interface			
Finance			
Regulatory (Ofwat/RAPID/DWI)			
Availability risk			
Operational performance			
Force majeure			
Change in law			
Bad debt			
Other risks *Other risks to be considered as part of the risk allocation include ecology risk, water conditions risk, first of a kind risk, risk related to stakeholders, power, grid capacity, DCO, archaeology, incentives, 3rd party providers, liabilities and guarantees, operating concession, asset hand back/condition, consents, uninsurable events, etc.*			

At a high level, the risk allocation in the table above reflects the use of the late model for the procurement of the CAP. As is typical for the late model, SW will assume responsibility for planning, consenting, reference design and other early risks associated with the activities it will undertake in advance of contract award to support the delivery of the scheme. Should any of these risks materialise SW will bear the costs associated (including once CAP appointment has occurred), for example costs associated with the granted DCO and any other consenting activities undertaken pre-award.

Once an award has been made, the CAP will take ownership for detailed design, programme and project management (including the management of sub-contractor performance), construction, financing, operation, maintenance, and other delivery risks. It will be responsible for delivering the solution in line with all DCO conditions and for managing any associated risks. Under a fixed price contract, the CAP will also assume the risk of cost overruns during both construction and operation.

Some risks will be more complex in their allocation, leading to a sharing of responsibility between parties, typically between SW and the CAP, but in some instances with costs also passed through to customers. SW has engaged with market participants about risk allocation[76] and found support for the positions adopted.

- **Ground risk** - Ground risk represents one of the most significant challenges to the delivery of large assets, particularly during the construction phase. Understanding the environment typically requires a programme of surveys, studies, and investigations to be undertaken, generating information that can be used to allocate risk based on the specific characteristics of the area in question[77]. SW currently anticipates that the CAP will assume the risk of standard ground condition variations, whilst SW will retain unforeseeable ground condition risk, although it is noted that bidders are only likely to accept risk exposure for ground conditions where a sufficient level of geotechnical and topographical information is made available as part of the tender process[78].
- **Land and access rights** - Risks related to land and access rights will also be shared between SW and the CAP. SW will bear the initial risk as it acquires the necessary rights, before granting the

[76] During the market engagement exercise, SW showed participants a version of Table 6 – High-level allocation of risk between parties, with a selection of summary points beneath each item as a prompt for discussion.
[77] It is commonplace for a Geotechnical Baseline Report to be developed and used to allocate risk between parties through a series of baselined parameters.
[78] The level of information shared with bidders during the tender process will impact the contingency built into bids.

rights to the CAP to enable them to comply with their commitments and obligations under the agreement. The CAP must ensure that it complies with the terms of any rights as set by SW, who will likely seek to ensure that it has a route to compensation where liability arises in response to the CAP's conduct or activity. SW will need to also consider to any reputational issues arising through the CAP's activities, and as such will likely look to work proactively with the CAP throughout delivery and operation.

- **Interface risk** - The interface risk is defined by the relationship between the CAP, SW and PW. As the assets will connect with Portsmouth Water's asset at the HTR, and SW's assets at [redacted] and the Otterbourne WSW, the CAP will need to understand and effectively manage the interface requirements at each end during the construction phase. As this risk will not be solely managed by the CAP, it is expected that the interface risk will be shared. A clear specification will be essential for the CAP to ensure that it can develop an acceptable design. Once operational, interoperability is expected to be manageable provided that a clear operating interface regime is established, supported by information sharing between the CAP, SW and PW. The [redacted] is expected to contain the key details of the anticipated flow levels (minimum 'sweetening' flow and increased levels) for each asset. The CAP will be responsible for ensuring that the assets ae available and operated efficiently as required. The systems and technology used by the CAP will also need to work together with SW's and PW's systems.
- **Change in law risk** - Regulatory change and change in law will need to be monitored throughout delivery and has the potential to significantly impact all facets of solution delivery. At the national level, general changes in law (that is, changes to working time regulations, national minimum wage, and so on) are likely to be borne by the CAP who will be expected to consider these factors as it prepares its bid. SW's current assumption is that specific changes to the regulatory framework (including changes in Ofwat's / RAPID requirements) will likely impact both parties and will be shared between SW, the CAP and customers in some instances. Market engagement participants have challenged this position, suggesting that SW may be best placed to manage this risk. During the procurement, bidders will look to understand the regulatory requirements that currently apply to the solution and the potential scope for changes. Where regulatory change is perceived to be likely or significant, this will be reflected through increases in bid prices.
- **Operational risks** - SW intends for the CAP to operate the assets throughout contract term, and as such expects the CAP to assume responsibility for most operational risks, including process, leakage and response time (in the event of a water quality incident or service interruption). Further, it is anticipated that the payment mechanism will be linked to availability, incentivising the CAP to operate the assets effectively and maintain performance levels. SW cannot transfer operational risk to the CAP entirely, retaining responsibility for its statutory and licence obligations as water undertaker along with the associated penalties arising from service interruptions and water quality issues. The associated risk to reputation will also continue to be held by SW. As the solution's principal purpose is to provide resilience in dry weather conditions, it is likely that any service failures during a period of increased asset operation (such as during a drought) would both damage SW's reputation and render it subject to regulatory penalty. To address this exposure, SW will likely look to ensure that contractual mechanisms are in place to allow it to recoup any penalty costs from the CAP.
- **Bad debt** - Under the DPC model, the Tender Revenue Stream (TRS) will be paid to the CAP by SW. In turn, SW will recover these revenues from customers through the charges regime. Ofwat has stated its preference for certainty in the tender revenue stream, and that the current regulatory (building-block) mechanism for the recovery of customer bad debt will therefore continue to apply for DPC revenues. On this basis, this risk will be shared between SW who bears the initial cost of under-recovery, and customers from whom the charges will be recovered in future years.

As stated above, SW has developed its commercial model to a level of detail necessary for its Gate 2 and Control Point B submissions. SW will continue to develop the commercial model and risk allocation as solution development progresses beyond these submissions.

2.11.1.7. Internal approval of procurement approach

SW operates a defined governance process for the approval of the 'Strategy' stage of any procurement with a value over £250k. The Strategy stage is the point at which the preferred procurement route, the process for tender evaluation and award, the supplier payment and contract management approach are all set-out.

Authority for approval of the Procurement Strategy is delegated dependant on the value of the procurement, the thresholds for delegated authority approval are set out in the Procurement Gateways Approvals. All procurements valued over £5m must be approved by both the Head of Procurement and the relevant Functional Director. Additionally, the Procurement Strategy for all Material CAPEX Agreements (such as the CAP agreement) valued over £25m must be approved by SW's board.

SW is also working in conjunction with PW in respect of the proposed solution, and as such this submission is made jointly between both companies. Further, SW is currently undertaking a Project Alignment Review with PW, through which the solution's interfaces with the HTR will be investigated so that the technical and commercial understanding of the solution can be further developed. The outputs of this review will be reflected in future RAPID gate and DPC Control Point submissions.

2.11.1.8. Commercial arrangements

Outline contractual arrangements with the CAP

SW has considered those contractual arrangements which are essential to establishing the commercial model for the CAP. These are set out in Section 2.11.1.6 above and are summarised further in this section**Error! Reference source not found.** As the solution develops, a broader range of contractual arrangements will be considered at a greater level of depth in preparation for the procurement process.

Key activities to develop commercial arrangements with the CAP

The commercial terms outlined in this document are at the principal level and SW will further document, test and validate the suggested delivery route as part of the Gate 3 submission and Control Point C. This will include:

- **Conducting further market engagement** - including but not limited to:
  - **Prior information notice –** SW will issue a pre- call for competition notice requesting suppliers (including contractors and finance providers) to express interest in pre-market engagement. SW will clarify objectives to potential bidders, describe the anticipated procurement process and contract structure to receive feedback.
  - **Regulatory framework –** SW will use the market engagement to inform bidders about the regulatory framework underpinning the delivery of the solution and give them confidence in the process through the representation of RAPID.
  - **Market perspective specific to Option B.4 –** As discussed throughout this submission, SW has not yet tested Option B.4 with the market, and instead developed key assumptions based on feedback received in relation to Options B.5 and D.2. Future market testing on the particular aspects of Option B.4 will therefore be critical to understanding the appetite of the market and for the future development of the commercial and procurement strategy for the solution, including (inter alia):
    - **The proposed DPC scope**, SW will present different variations of packaging the DPC solution. The potential Options include separate DPC processes for WRP and

Transfer assets and one combined DPC for both assets. SW will seek market view and feedback on which Option would be most attractive from investors' perspective and which market believes a CAP would be able to deliver up to required standard of quality.

  - **The proposed tender model**, including whether this needs to be tailored further to match this specific solution, and to inform SW's activities prior to CAP award.
  - **The proposed commercial model**, to understand the implications of offering two assets in a combined package and whether this introduces any opportunity or challenge. Further, to understand the market's perspective on how the combination of both assets within one solution will affect the solution's risk profile, and the potential future role of an ITA.

- **One-on-one sessions** – targeted sessions with parties that responded to the project information notice in order to test and seek market feedback on commercial and procurement considerations contemplated by SW to support the development of commercial and tender arrangements.

- **Developing details of the commercial DPC arrangements** - including, but not limited to:
  - **Payment mechanism terms** –calibration of the operational incentives/penalties, review of the proposed financial gain share mechanism (including performance deductions), establishing the approach to indexation, considering potential pass-through items, reopeners, compensation and relief events.
  - **Residual values and depreciation profiles** – further calibration of the depreciation profile for each asset to understand the impact upon customer bills and the residual value payable at the end of contract term. This will provide greater understanding as to how the obligation to make this payment will impact SW's credit rating, and to provide confidence to bidders of SW's position as a contractual counterparty.
  - **Approach to commissioning** – considering the benefits of a possible staged approach and potential revenue payment to CAP during the commissioning period.
  - **Bid cost reimbursement** – considering whether bid cost reimbursement is necessary to drive interest, and if so, what would represent the optimal level of reimbursement that would drive competition in the bidding process while minimising costs to customers.
  - **Collaboration** – looking at how ongoing improvement and efficiency can be achieved through the DPC model.
  - **Termination and termination payments** – exploring monitoring requirements, minimum performance targets and required step-in rights, as well as the associated termination payments in various termination scenarios.
  - **Refinancing** – exploring details and terms under which CAP could be allowed to refinance the project and execute equity sale. SW will consider provisions required for any potential benefits to be shared with SW/consumers.
  - **Acceptance and late service commencement** – Assessing the right level of liquidated damages; considering the role of the Independent Technical Advisor (ITA) and an independent certifier / verifier facilitating acceptance, commissioning, maintenance, solution handover, evaluating the efficacy of a bonus payment to facilitate/incentivise timely delivery and end of contract period asset health check.
- **Refining the risk allocation** - Refining risk allocation to reflect the details of the commercial model focusing on the risks that will be shared between the CAP and SW, such as planning risk, ground conditions, land access rights and ownership, operation and interoperability, water quality risk, 3rd party providers, regulatory risk and change in law and force majeure events. Each of these risks will be assessed individually along with potential mitigants. Sharing arrangements will be calibrated based a tailored approach to ensure market interest for the tender process and a value for money outcome for customers. SW will explore which change control mechanisms are required for efficient

risk sharing arrangements that provide adequate protection against price increases and thus safeguard the value to customers under the DPC model. Risk allocation will be informed by feedback collected from potential bidders as part of the market engagement exercise. As part of the risk allocation SW will consider the regulatory framework to ensure there is no misalignment between the CAP contract and SW's regulatory framework that could put customer value at risk.

Further activities to develop the procurement strategy

SW will also undertake the following activities to further develop and enhance its procurement strategy:

- **Continuing the value for money analysis -** SW will confirm the solution's suitability for DPC as part of Control Point C by revisiting the value for money analysis based on latest information on solution scope and cost information and considering other factors that may impact the value proposition under a DPC model.
    - SW will revisit Ofwat's standard VfM assumptions and will use the market engagement to set the key inputs in the VfM analysis to ensure the results are reflective of the nature of the solution and a possible future CAP tender outcome to the extent possible.
    - SW will develop and use a robust financial model bringing together key aspects of the solution delivery, such as cost profiles, maintenance regime, financings costs, depreciation profile, etc. to capture all key cost factors which may influence value for money under the DPC model. The costs may be further impacted by the boundary considerations of what will be included in the DPC scope (e.g. within the HT footprint). SW will also consider whether the solution is suitable for a DPC model in light of the current timeline. Specifically, SW will assess how the DPC model may impact the overall delivery schedule, SW's ability to meet its obligation under s.20 and what mitigation can be considered to address the risk of any delay.
- **Developing the evaluation framework** - including, but not limited to:
    - Developing a detailed tender design and evaluation framework to be applied to bidders as part of the procurement. The SQ and ITT evaluation criteria, questions and evaluation guidance will need to be prepared in line with the objectives set for the procurement process as a whole as well as for the individual stages. For each tender stage, SW will develop detailed project plan up to contract award with indicative timings set against key activities that will feed into the critical path. In developing the tender design, SW will review and build on the lessons learnt from relevant examples of tender processes applied for large infrastructure projects and standardised PFI/PF2 procurements.
    - A financial model will need to be developed capable of comparing the DPC 'Factual' case against the SW-delivered 'Counterfactual' for the purpose of carrying out the VfM assessment. This financial model will be used solely by SW, and bidders may be required to submit their own financial models, depending on the agreed characteristic of the tender design.
    - As part of the tender design development, key considerations will include the level of technical detail/design expected as part of the bid submission, whether bidders will be required to provide fully committed financing, delivery plan, risk mitigants, etc. SW will consider what solution specific information and documentation will need to be provided to bidders at each tender stage. SW will also consider how collaboration can be applied throughout the tender process to mitigate procurement risk. As part of this work, SW will prepare a negotiation plan, outlining those commercial terms that are non-negotiable as well as the process for negotiating with bidders (and Ofwat[79]) throughout the tender process.
- **Refining the critical path -** Refining the implementation plan to reflect emerging views on the outline design and DCO processes. This will include consideration of the critical path under both

[79] SW notes Ofwat's requirement that it should be notified of changes agreed to during the procurement that materially impact customer charges. The nature of SW's engagement with Ofwat during the procurement process is yet to be determined.

DPC and non-DPC delivery routes, interdependencies across DCO, outline design, procurement, the trade-offs between various configurations of the overall process and input/output relationships between activities.

- SW will identify key risks to the delivery timeline and establish possible mitigants to the keep the solution's schedule in line with SW's legal and regulatory obligations. SW will assess what activities could be brought forward and what ECE work could be delivered before DCO approval to accelerate the overall solution delivery. As part of this SW will investigate the opportunity to decouple specific activities from the scope of the DPC procurement and bring forward activities either through the appointment of an ECE contractor or by reimbursing costs to facilitate the CAP's mobilisation and progress with specific aspects of the design. SW will carefully examine how accelerating certain activities will impact on the CAP's ability to innovate and drive value to customers. The recommended approach will aim to balance the timeline constraints with retaining flexibility in the process for the CAP.
- SW will consider what activities are required to deliver the non-DPC elements of the solution and under what arrangements these will be delivered as part of its capital delivery model. SW will seek to establish delivery timeline and delivery risk register to investigate how the delivery of non-DPC elements could be aligned to the critical path under the DPC route. SW will review and identify which elements can enable or potentially threaten CAP's timely delivery of the solution.
- SW will continue to consider both DPC and in-house procurement Options in the context of the solution's critical path. SW will review its programme to determine at which point in time a switch from the DPC model to in-house delivery may delay the overall schedule and may put timely delivery of the solution at risk. Findings from the work on the implementation plan will be considered when establishing the solution's suitability for DPC.

In parallel to the validation of the suggested delivery route, SW's activities to secure key approvals as part of the pre-tender preparation and to prepare for the CAP tender must also continue. These will include, but are not limited to:

- Further development of SW's initial design to a level sufficient for the procurement and planning processes
- Procuring support for the DCO consultation and planning processes
- Obtaining DCO approval to facilitate the CAP's delivery of the solution. The procurement documentation and project agreement will need to reflect any conditions imposed as part of the granted DCO.
- Completing the Control Points (A, B, C, D, E and F) in Ofwat's DPC process
- Procuring an Independent Technical Adviser (ITA) as per the requirement from Ofwat and SW's licence obligations

2.11.2. Commercial and Procurement Strategy for D.2

2.11.2.1. Introduction and Context

SW has developed a procurement strategy to support the delivery of the direct transfer (Option D.2). This draft section has been written before SW has completed its OAP to determine the best value option of those available at Gate 2. Throughout this report, the option considered excludes the addition of a WRP. Option B.4 builds on the direct transfer with the addition of a 15 ml/d WRP, but this has been excluded from the DPC scope. SW has also developed a report and carried out market engagement on the recycling Option B.5, which adds a larger WRP of 75 ml/d to a new environmental buffer at the Otterbourne treatment works. In the event that Option D.2 is selected as the Preferred Option, SW will consider separately whether the smaller WRP is suitable for DPC as a stand-alone project, and whether the WRP should be added to the in-scope definition of the DPC project for D.2.

The strategy reflects the conceptual design, the current cost profile, the relevant risks and required schedule for delivery. This section sets out the procurement strategy[80] along with an assessment of the solution's suitability for delivery through the DPC model. This section addresses the requirements of RAPID[81], as well as the requirements of Ofwat [82]. This section includes:

- A summary of the scope of the DPC-delivered project and the CAP Agreement to be tendered
- The framework for the DPC eligibility assessment, a summary of the results and a conclusion as to the suggested delivery route for the solution
- Details of the procurement plan, including a procurement and contract timetable
- An explanation as to the level of design maturity and technical readiness that SW intends to reach by the point of Contract Notice
- Confirmation of the preferred tender and commercial models
- Evidence of internal approval for the procurement approach
- An outline of the anticipated contractual arrangements with the CAP, and a summary of key activities to develop the key commercial terms as the programme develops

Key conclusions of SW's procurement strategy detailed in this section are summarised below. The development of the procurement approach has been subject to SW's internal programme governance process, and the conclusions have been reviewed by SW's external technical and legal advisers.

- Assuming an availability based, simple point-to-point connection, the DPC eligibility assessment carried out on the basis of information available at this time indicates that the solution[83] is considered somewhat suitable for delivery under a DPC model. This assessment also depends on:
  - RAPID's guidance and principle that solutions are assumed to be suitable for DPC unless clearly demonstrated otherwise[84]
  - A VfM analysis based on Ofwat's standard assumptions. The VfM analysis will need to be reviewed as the project evolves, and as further market engagement feedback is obtained during subsequent gates and Control Points
- The proposed procurement plan for the CAP aims to maximise competition and deliver best value for customers. The procurement plan takes the project's critical path into consideration, reflects risk and opportunity, and is designed to ensure that the process is run productively and efficiently. SW anticipates that the procurement will be launched as a Competitive Dialogue, or similar (compliant with the Utilities Contract Regulations (UCR) 2016). SW anticipates running a multi-stage tender process including a pre-qualification stage, a two stage Invitation to Tender (ITT), and a preferred bidder stage leading into financial close.
- By the point of contract notice, SW will have developed a level of design that is sufficient for the planning process, whilst retaining sufficient optionality to ensure that minimal constraint is applied to bidders' designs
- SW has identified the late model with early market engagement as the preferred tender model for the direct transfer solution. Under this model the solution will be tendered out as Design, Build, Finance, Operate & Maintain (DBFOM), after SW obtains the requisite consents and the solution is ready for detailed design and construction
- The procurement approach is consistent with SW's internal governance processes for a project of this size and nature

[80] SW has allocated internal resource to the production of its procurement strategy and associated documentation. This will be aligned to APM best practice and will be prepared as SW works towards Control Point C and RAPID Gate 3.
[81] RAPID (Feb 2021) Accelerated gate two submission template, page 7.
[82] Ofwat (Feb 2020) Appendix 2: Direct Procurement for Customers; Briefing Note on the Procurement Process for 2020-2025, page 24.
[83] As detailed in section 2.11.1.2, the solution contains elements that will be procured through DPC and elements that will be delivered through SW's capital deliver model. For the purpose of this section 'solution' refers to the elements of the works that are shown as 'In scope for DPC'.
[84] RAPID (Feb 2021) Standard gate one submission template, page 6.

- The proposed commercial model reflects the technical features and expected utilisation of the solution and the feedback received from the informal market engagement undertaken to date. It is expected to evolve further as the project develops. SW is considering offering a fixed price contract with a 20-year operational term (plus construction) with an end-of-contract bullet payment as part of the DPC model. Payment to the CAP is envisaged to start post commissioning and will be primarily based on availability charge combined with a volumetric element to cover variable OPEX[85] linked to asset utilisation with performance targets and associated incentives / penalties.

The views presented here are based on several assumptions that will need to be tested and validated as the scope of the solution is developed further. SW will continue its analysis of the solution's suitability for DPC as part of Control Point C and will further document, test and validate the suggested delivery route and progress the commercial model as part of the Gate 3 submission and Control Point C.

External Advisers and Assurance

SW has commissioned the following external capability to support in the development of its commercial and procurement strategy as detailed in Table 130 below:

Table 130 - SW's external advisers

Position	In role
Commercial and procurement support	[redacted]
Legal and commercial support	
External assurance	
Technical subject matter expertise	Various providers commissioned to support SW with specifical technical and engineering aspects of the project

2.11.2.2. A Summary of the Scope of the DPC Delivered Project

This section sets out the components of Option D.2 which are within the scope of a potential DPC procurement. It also considers the results of informal market engagement and summarises the anticipated appetite for the project within the market.

D.2 is a Direct Transfer to Otterbourne WSW from HTR with abstraction from the reservoir and the construction of a HLPS. Section 2.2. Engineering Technical Design includes further detail on the technical aspects of the scope.

While there are other configurations being considered within Gate 2, given that the solution has not yet undergone detailed design, SW considers that relatively minor differences in solution design that are captured within other configurations would not change market participants' views on the relative attractions and disadvantages of the solution and hence the procurement and commercial strategy developed for D.2 can be extrapolated to other configurations at this stage.

As shown in Section 2.2 Engineering Design, SW is contemplating a combination of Option D.2 HT with the Option B.4, which is a supplementary raw water source through the provision of a 15 Ml/d WRP. SW's procurement strategy as set out in this section has been developed for the direct transfer (D.2) solution only. If it is decided that the combination scenario this is the Preferred Option these procurement and commercial strategies will need to be updated accordingly. An analogy could be drawn between the procurement strategy developed for Option B.5 (another water recycling plant SRO considered by SW at Gate 2) and the

[85] While the transfer is largely a passive asset, increased demand will require additional operational activity (with an associated cost) at the associated pumping station.

proposed Option B.4, however the significantly smaller size of the WRP under Option B.4 (15 Ml/d compared to 75 Ml/d for B.5) may materially change the procurement strategy, and so it may be necessary to reassess the DPC eligibility assessment, commercial model, evaluation framework and implementation plan to confirm whether any adjustments are required.

Scope of the DPC Procurement

The scope set out under the DPC model is built upon a series of working assumptions regarding the nature of the solution. The scope and assumptions set out in this section remain subject to further development and change. Table 131 below details the elements of the solution that SW considers in and out of scope for delivery through the DPC procurement.

Table 131 - Summary of project scope considered for DPC

Project scope	Works	Rationale
In scope for DPC	• A reservoir offtake from the HTR • A pressurized pipeline transfer from HT to Otterbourne of c.30-35 km length[86] • A HLPS	These works comprise the core components of the proposed asset which will be constructed and operated by the CAP. As such, these works have been identified as part of the scope for the DPC-delivered project.
Out of scope for DPC, but required to facilitate DPC works	• HTR and associated infrastructure • Option B.4 – a new WRP at 15 ml/d	OW is developing the HTR and associated infrastructure under a separate arrangement; however, this asset will form the source of supply for the raw water direct transfer asset. SW intends to further consider whether Option B.4 will be suitable for delivery through DPC, however for the purpose of this report it has been assumed that Option B.4 is not within scope for DPC.
Out of scope for DPC	• Transfer beyond Otterbourne • Any upgrades required at or beyond Otterbourne treatment works	Works at Otterbourne WSW are associated with a DWI notice and are also planned to be delivered as part of the WfLH programme. These works are out of scope for DPC because Otterbourne WSW is an existing asset, currently operated by SW. For a CAP to conduct the necessary works it would likely be necessary to transfer the asset to the CAP, which would likely be less efficient than if SW undertakes the works itself. Also, an asset transfer from SW to the CAP would significantly increase the complexity of the proposed deal.

The current assumptions that underline this scope are as follows[87]:

- It is assumed that the scope of the Direct Transfer solution being considered for DPC is 30-35 km of underground pipeline. This pipeline is under 1 m diameter (with pipe-jacking / tunnelling in specific sections) and will transfer 61-75 ml/d raw water from the HLPS to Otterbourne WSW. It would also include a new gravity abstraction from HTR, to the RWPS.
- The scope of the CAP agreement focuses on the infrastructure costs of transfer, HLPS and gravity abstraction. This is separate from the commodity (i.e. water) the asset will transfer. The CAP will have limited responsibility for the volume or quality of the water transferred through the pipeline. The

[86] See section 2.2. Engineering design for additional information on route optionality and pipeline length.
[87] Significant changes in solution scope may fundamentally change the recommended procurement and contractual approach. This may be for a variety of reasons, such as where there is change in the skillset required for construction, or where a different allocation of risk is implied. SW's approach will continue to be refined as the solution is further developed.

CAP will be responsible only for ensuring there is no detriment to the quality of the water during the use of the infrastructure (covered by the DPC scope), which will be monitored through real-time monitoring and data sharing.

- The CAP will not be party to the bulk supply agreement between PW and SW.
- The scope does not include any additional works on existing sites within SW's current operation, nor does it include the upgrade on Otterbourne WSW.
- For elements of the works which are out of the DPC scope, SW anticipates that it will procure them through its capital delivery model, although the exact arrangements are yet to be agreed[88].

Key Assumptions for the Procurement Approach

The following assumptions are applicable to the analysis of the procurement approach at this stage in project development:

- The commercial analysis undertaken is based on the Gate 2 cost estimates, which will develop further and will be revisited in future RAPID and DPC submissions.
- The asset's primary purpose is to provide drought resilience in line with established resilience criteria[89]. As such it will typically be operated at a minimum flow level, and at peak flow as required.
- SW's regulatory obligations require the asset to be operational by 2027 (expected delivery 2030).

SW has considered the likely impact of these assumptions in the development of its commercial and procurement strategy. SW continues to test its approach in all areas and will remain alive to how changes in these assumptions will affect the future development of the approach for Option D.2.

Market Appetite

Initial informal market engagement[90] was undertaken to inform the Gate 2 submission and the development of the procurement strategy. Participants were engaged on the nature of the solutions under consideration, the indicative tender timeline and tender model, in addition to key contractual terms within the commercial model. The results of this informal engagement indicate that there is significant appetite to compete for a solution of this nature within the market. Engagement with construction contractors and investors revealed that participants were familiar with direct transfer assets and were comfortable with the anticipated scope of the CAP's responsibility. Key feedback on the solution was as follows:

- The estimated value of the project was considered attractive and large enough to allow a CAP the scope to unlock efficiencies
- Participants with experience in process engineering solutions believed that they would be able to generate innovative and competitive bids for a direct transfer asset
- Contractors and strategic investors who do not have experience in direct transfer assets expressed concern about risks in the solution associated with land access rights, negotiations with landowners, environmental approvals and permitting
- The project will require engagement with multiple parties and would require a CAP with experience with managing multiple stakeholders
- One participant with experience in assets that have more complex operational requirements expressed that they may be less able to add value to a direct transfer asset

[88] See Section 2.11.1.4 for further information on the alternative procurement routes considered.
[89] See section 2.2.3 Resilience Benefits for full details.
[90] The informal market engagement exercise for this solution was undertaken in April and May 2021.

Ofwat DPC process

Ofwat expects companies to identify the most appropriate route for the delivery of the project[91], considering both in-house and DPC models and selecting the option that presents greatest benefit to customers. As part of each of the business case submissions as required by Ofwat's DPC Control Point process, SW is required to set out its preferred procurement approach, providing justification and reasoning for the decision. The key Ofwat Control Points for the DPC procurement are:

- Control Point A will be submitted as part of the Control Point B submission
- Control Point B – the Strategic Outline Case (SOC), addressing the chosen strategic supply option
- Control Point C – The procurement plan, setting out the detail of the procurement and contract strategy
- Control Point D - The full suite of procurement documents and the form of the CAP agreement
- Control Point E – The submission of the Outline Business Case, re-affirming that DPC continues to offer VfM for customers when compared to the in-house counterfactual
  - "Ofwat's consent is required under the Appointee's licence conditions before it can commence the procurement" (i.e. issue the Find-a-Tender service (FTS) Contract Notice); and
- Control Point F – The submission of the Full Business Case, setting out the nature and terms of the deal that has been achieved through the competitive procurement process
  - "Ofwat consent is required for the Appointee to enter into the CAP Agreement" (i.e. Contract Award)

SW intends to submit its SOC shortly after its Gate 2 submission[92], which will address Ofwat's requirements as set out in the DPC Briefing Note[93] and include additional detail on the procurement strategy.

2.11.2.3. DPC Eligibility Assessment

Eligibility Assessment Framework

To ascertain the project's eligibility for delivery through the DPC model, SW has applied a three-step framework based on Ofwat's DPC process guidance[94]:

1. A size test based on the £100 m threshold for WLCs
2. An assessment of the discreteness of the asset and
3. A quantitative VfM assessment

Table 132 outlines the objectives of each step in the framework, the basis of assessment for each test, and the impact of each test's outcome on the solution's eligibility for delivery through the DPC delivery route. SW's Gate 1 submission[95] contains further detail on the approach and methodology of the DPC eligibility assessment framework.

[91] Ofwat (2020) Direct Procurement for Customers: Briefing Note on the Procurement Process for 2020-2025
[92] Milestone dates for SW's DPC activities are available in section 2.9. Schedule – Direct Procurement for Customers (DPC) Control Points.
[93] Ofwat (2020) Appendix 5 – Direct Procurement for Customers – Briefing Note on the Procurement Process for 2020-2025.
[94] Ofwat (February 2020) Appendix 2: Direct Procurement for Customers; Briefing Note on the Procurement Process for 2020-2025.
[95] Southern Water (28 September 2020) Strategic Solution Gate 1 Submission; Annex 11 Commercial Strategy

Table 132 - DPC eligibility assessment framework

	4. Size	5. Discreteness	6. Value for Money (VfM)
Objective	Assess the size of the solution(s) against Ofwat's threshold.	Assess the separability of the solution(s) based on Ofwat guidance published as part of its PR19 methodology.	Assess the solution's scope to deliver customer VfM through quantitative analysis.
Test	Solution costs will be considered on a nominal and real basis, including: • Development costs • Initial CAPEX • Renewal CAPEX • OPEX	Consider specific operational and technical considerations of the asset within the wider context of SW's network based on 4 key criteria: 5. Stakeholder interactions and statutory obligations 6. Interoperability considerations 7. Output type and stability 8. Asset and operational failures	To determine if a solution will have greater scope to deliver customer VfM if undertaken via DPC, solutions will undergo analysis comparing the NPV cost to customers of the Factual and Counterfactual: • Factual: A solution carried out by a third-party provider under DPC arrangements • Counterfactual: A solution carried out by SW under the PR19 framework Several assumptions will be considered under both scenarios. A VfM assessment provides the impact on the costs to customers of completing the solution under different approaches.
Outcome	Solutions that are within close proximity to the Ofwat threshold, are technically suitable and could provide scope for customer VfM when considered under the qualitative assessment, will undergo a quantitative assessment for customer VfM.		Solutions that are shown to provide customer VfM through the DPC delivery route are suitable for DPC and progressed where appropriate through the RAPID gated process and Ofwat's DPC Control Points.

The eligibility assessment indicates that the solution is considered somewhat suitable for delivery under a DPC model. Further detail on the findings from the size test, discreteness test and VfM analysis are provided below in this section.

As project specific inputs are developed further the VfM test will also be refined from a high-level assessment based on Ofwat's standard assumptions to one specifically tailored to the solution. This will include market views on financing inputs such as debt terms and gearing, and a more detailed commercial model and risk allocation.

SW is also cognisant of its s.20 obligation to deliver the programme to the committed 2027 date. The timetable constraints and the evolving understanding of the project's critical path will be an important factor in the selection of the appropriate delivery route for the project.

Size Test

The forecast Total Expenditure (TOTEX) over the contract life (including a construction period of 4 years and a 20-year operation period) on a real basis is £0.26-0.37 bn[96], and the TOTEX over the whole asset life (including a construction period of 4 years and a 100 year asset life) is £0.41-0.949 bn[97]. The solution therefore exceeds the £100 m threshold and passes the size test.

The cost estimate has been updated for Gate 2. It is based on a series of assumptions and includes allowances for estimating uncertainty, risk and OB (see Section 2.10 Cost Modelling for further information) that will be further refined as the solution develops.

[96] Minimum utilisation scenario totex estimate: £0.259bn. Average utilisation scenario totex estimate £0.260bn. Maximum utilisation scenario totex estimate: £0.366bn.
[97] Based on an asset life of 100 years. Minimum utilisation scenario totex estimate: £0.410bn. Average utilisation scenario totex estimate £0.415bn. Maximum utilisation scenario totex estimate: £0.949bn.

Project Discreteness Test

SW has applied a discreteness assessment based on four key criteria, each of which has been equally weighted: stakeholder interactions and statutory obligations, interoperability considerations, output type and stability, and asset and operational failures.

At Gate 1, SW set out Option D.2 as an additional solution proposal for consideration and noted that this solution would be assessed to determine its suitability for delivery through DPC at Gate 2[98]. The assessment has been undertaken using the same framework as applied at Gate 1 and is consistent with Ofwat's guidance.

Under an assessment against Ofwat's technical guidance, the solution exhibits characteristics that make it more suitable for delivery under the DPC model. The project will require effective stakeholder management if it is to be delivered within required timescales, however the asset's nature and operational characteristics are well-understood by industry and the market, with manageable interfaces and limited risk of service failure. As such, the solution can be considered discrete, and suitable for delivery through DPC.

Table 133 – Solution D.2 DPC eligibility assessment - Discreteness test - Summary

Key criteria / considerations	Assessment by criteria	Overall assessment
e) Stakeholder interactions and statutory obligations	Characteristics somewhat <u>more</u> suitable for DPC	Direct transfer (D.2) solution has characteristics making it 'discrete' and somewhat suitable for DPC.
f) Interoperability considerations	Characteristics somewhat <u>more</u> suitable for DPC	
g) Output type and stability	Characteristics somewhat <u>more</u> suitable for DPC	
h) Asset and operational service failures	Characteristics somewhat <u>more</u> suitable for DPC	

Stakeholder interactions and statutory obligations

This criterion considers the number of stakeholders and regulators who are likely to be involved in the delivery of the solution, the frequency of that involvement and the prospect of regulatory enforcement against SW for issues in delivery.

- **Number of stakeholders -** The assessment highlighted that a variety of stakeholders (including customers, local interested parties, third-party finance providers, industry and environmental regulators and government) were likely to be involved. Each will have differing concerns and objectives.
- **Frequency of involvement -** Among these stakeholders are local councils and landowners, with whom continuous engagement will be required during design, construction and into the operations phase in order for the project to be delivered successfully and to schedule. These interactions may be difficult for a CAP to manage without an existing relationship with local stakeholders, however the location of the sites required for the works are relatively small, which should help to de-risk the planning and consenting process for delivery.
- **Prospect of regulatory enforcement -** The DWI will have a significant level of involvement in the project, however as the CAP will not be responsible for the volume or quality of the water transferred, this risk will remain with SW. The CAP must simply ensure that the quality of the water does not deteriorate between entry to and exit from the asset.

[98] Southern Water (2020) Strategic Solution Gate 1 Submission: Preliminary Feasibility Assessment – Additional Solution Proposal, page 35

The CAP will need to work proactively with industry and local stakeholders to ensure that the project is delivered within required timescales, however the level of engagement required is not unusual for a project of this nature and should be within the capability of the CAP to manage. Further, the nature of the solution is familiar, and the CAP is not expected to be responsible for managing DWI involvement in the process, limiting exposure. For these reasons, the stakeholder interactions and statutory obligation characteristics of the solution make it somewhat more suitable for DPC.

Interoperability

This criterion considers the number, type, and nature of interfaces between the asset and SW's network, the nature of the asset operation (active or passive), its separation by physical location, and the potential to generate economies of scope.

- **Number and type of interfaces -** Two physical interfaces: an upstream interface with PW's impounding reservoir and a downstream interface with SW's WSW. The downstream interface will require works (to be conducted by SW) to facilitate the flows from the asset. Close co-ordination with the CAP would be necessary to align timetables for delivery and commissioning. The asset's location is mostly separate from SW's live operation sites, and so does not risk disrupting SW activity.
- **Nature of the asset operation -** When in use, the asset will require monitoring, a power supply and co-ordination between upstream and downstream interfaces. Monitoring information must flow not only to SW and Portsmouth Water, but also to the EA and DWI. The regular communication required on water quality monitoring and ramp rates is considered to be efficiently manageable through a CAP.
- **Physical location separation** – The asset is mainly located on a separate physical site to SW's existing assets and will interface at the Otterbourne delivery point.
- **Potential to generate economies of scope –** The low level and nature of operational running costs suggests that there will be only a limited loss of synergies through the separation of the asset from SW's operation.

Under this assessment, the solution is shown to be sufficiently separable from SW's network, with interfaces that are well-defined and manageable. Interoperability requirements will need to give due consideration to the anticipated regime of operation of the asset between SW, PW and the CAP to ensure that information requirements are met. Losses in synergy through the introduction of a third party are anticipated to be limited. The characteristics of HT suggest a discrete asset suitable for delivery through the DPC model.

Output type and stability

This criterion assesses the day-to-day source of supply, resilience, volatility of output and any available alternative sources of supply.

- **Day-to-day source of supply** - SW can expect a high degree of confidence in the output type and stability of the asset. The design includes standard pumps and break tanks which are commonly used in other direct transfer projects. As this technology is well-tested, a CAP should be well placed to manage its operation effectively and minimise any asset stability risk.
- **Resilience** – With the exception of the HLPS, the asset is largely passive and requires very little operation. Monitoring equipment should allow the CAP to effectively identify any potential asset resilience issues before they manifest and address them without negatively impacting the availability of the asset.
- **Volatility of output** – The CAP will be responsible for ensuring that the input water quality meets the output quality. Through an agreed specification and detailed design, the CAP should be capable of ensuring that no detriment will occur to water quality whilst passing through the asset, and so SW anticipates that risk in this area will be minimal.

- **Available alternative sources of supply** – The CAP will not be responsible for obtaining alternative sources of supply, as the asset will be supplied from the HTR on the basis of a BSA between SW and PW.

The solution's output type and stability are relatively simple and manageable, with a limited technological risk profile to be assumed by a CAP. These characteristics make the solution somewhat more suitable for delivery through DPC.

Asset and operational service failures

This evaluates the simplicity and complexity of the asset, the presence or technology precedent, the impact of failure on customers and the maturity of the supply chain.

- **Simplicity and complexity** - Operational failures have the potential to impact supply to SW's customers and may also compromise the operation of Otterbourne WSW. Failures of this kind will likely damage SW's reputation and may prompt action by SW's regulators.
- **Technology precedent** - The maturity of the technology suggests that a CAP will likely be able to manage the asset efficiently and avoid significant service failures.
- **Impact of failure on customers** - The consequences of asset failure during a drought period will likely include reputational damage and penalties for failure to comply with statutory water quality obligations. SW would likely look to employ contractual measures (such as performance deductions) to encourage the CAP to manage the asset properly and prevent these kinds of circumstances from arising, albeit this will need to be balanced if undue risk pricing is to be avoided.
- **Maturity of the supply chain** – Informal market engagement has shown that potential bidders are comfortable with the nature of the asset and the technology involved in its operation, which should minimise the risk of service failures.

Whilst there is a significant reputational risk associated with operational service failures, the likelihood of such an event is limited given the simplicity of the asset and widespread adoption as a technology. The characteristics of this solution pose limited risk of service failure and can be considered somewhat more suitable for DPC.

Value for Money (VfM) assessment

VfM analysis considers the costs to customers under the Factual (DPC) case versus delivery under the Counterfactual (In-house) case. Revenues are calculated under both cases and then discounted at the Social Time Preference Rate (STPR) to generate a NPV[99]. The difference in NPV between the two cases and the key value drivers are compared to determine the VfM of delivery via DPC. The difference between the Factual and Counterfactual is calculated based on project specific inputs (such as Gate 2 cost estimates), macroeconomic factors, and Ofwat's standard assumptions which include a mid-case assumption and an upper- and lower-case sensitivity (for example gearing of 85% in the mid-case, 90% in the upper and 80% in the lower-case).

Figure 78 illustrates the results of the VfM analysis under the mid-case, showing the key value drivers between the Factual and Counterfactual cases. Under the mid case scenario, delivering the scheme under DPC would result in lower costs to customers than if the scheme was delivered by SW under the PR19 framework. The cost to customers in NPV terms of D.2 under the factual scenario (DPC) is £134 m compared with £160 m under the counterfactual (PR19). The difference in the costs to customers is £25.4 m which is equivalent to c.19% of the PR19 revenues. The key value drivers under the DPC model are the benefits from cheaper financing costs (£13 m) and the benefits from CAPEX efficiency (£19 m). The 20-year operations period results in a smaller scope for potential savings for OPEX versus CAPEX compared to

[99] More details on the approach and methodology of the VfM model are set out in the Gate 1 submission, however, note that the Gate 2 value for money analysis set out in this document reflects the updated cost estimate developed for the Gate 2 submission.

longer term contracts. These benefits are offset to some extent by the impact of the additional costs to the DPC and the incumbent private costs effect (made up of procurement and bidder costs and contract management costs) which would not be incurred if SW were to deliver the asset.

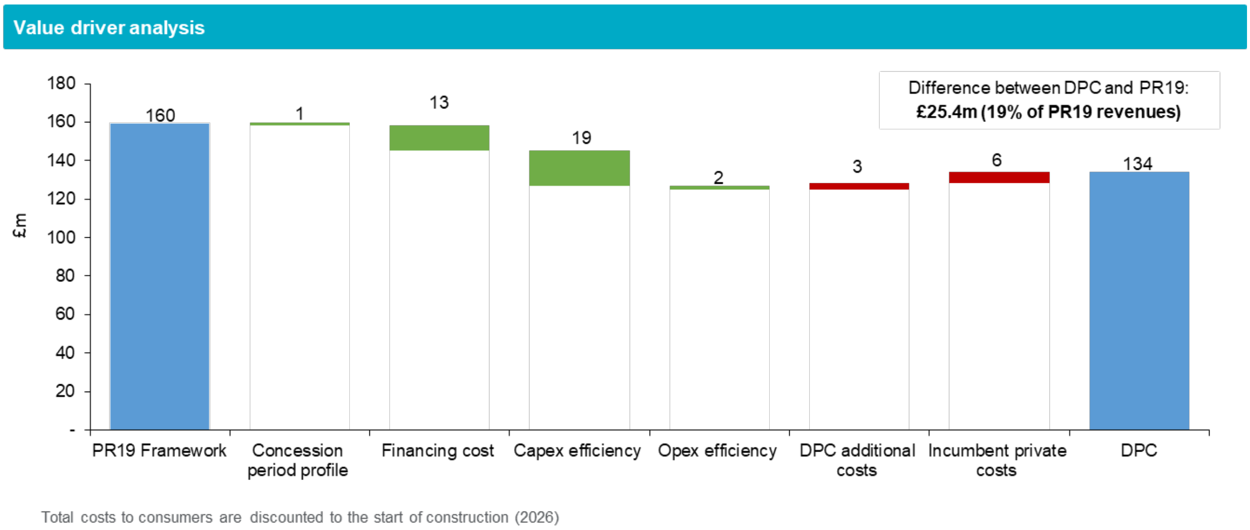


Figure 78 - Direct Transfer D.2 VfM analysis results (mid case)

The Figure below illustrates the results of the sensitivity analysis for the scenarios set out by Ofwat in its standard assumptions. Under all scenarios delivery of the desalination plant is shown to have greater value for customers under a DPC model based on the approach and assumptions provided by Ofwat.

Variables	Assumptions under different cases*			DPC compared with in-house NPV	
	Low	Mid	High	Low	High
Contact life (years)	20	20**	40	**	(22.3)
Depreciation rate (%)	25% faster	As per in-house	*Not specified*	(22.5)	*Not specified*
Equity IRR, real (%)	10%	8%	7%	(11.8)	(32.3)
Gearing (%)	80%	85%	90%	(13.2)	(37.5)
Capex efficiency (%)	5%	10%	15%	(15.8)	(35.1)
Opex efficiency (%)	5%	10%	15%	(24.6)	(26.3)
Procurement costs (% of Capex)	2%	1%	0.5%	(22.5)	(26.9)
Bidder costs (% of Capex)	3%	2%	1%	(23.8)	(27.1)
Contract mgmt. costs (annual)	£300k	£150k	*Not specified*	(22.6)	*Not specified*

* Scenarios as specified in Ofwat assumptions within IAP 'Direct Procurement for Customers detailed actions' Totex scheme profile is based on SW's final Gate 1 costs assumptions
** Under the mid case SW assumes a 20-year contract length in line with the proposed commercial model for DPC versus the 25-year contract suggested by Ofwat's standard assumptions.

VfM of DPC improves vs Mid-Case
VfM of DPC deteriorates vs Mid-Case

Figure 79 - Sensitivity analysis

Overall, based on Ofwat's Initial Assessment of Plans (IAP) standard VfM assumptions, and current cost projections for D.2, delivery under a DPC framework would deliver greater value for customers from a VfM standpoint. This result, however, does not reflect project specific inputs from the market (for example, debt terms and gearing).

To enable the most accurate VfM analysis, the assumptions and inputs used to compare the Factual (DPC) and Counterfactual (In-house) cases should be tailored to reflect the nature of the solution. This should include considerations of the technical characteristics of the asset, its risk profile and the proposed contractual model. However, as the technical aspects of the solution and the commercial model are still in development, there is limited scope to establish project-specific assumptions at this stage. As such SW has not adjusted or otherwise changed any of Ofwat's standard assumptions at Gate 2. SW will revisit the VfM analysis once these aspects have been developed, specifically at Control Points C (Procurement Plan) and E (Outline Business Case).

Review of Ofwat's Standard Assumptions

At IAP stage of PR19 Ofwat recognised that there are significant differences in the assumptions used in the VfM analysis by companies to identify the NPV differential between the Factual (DPC) and Counterfactual (In-house) models. To address this, Ofwat set out a series of standard assumptions[100] which were used for the purpose of the VfM assessment set out in this document.

Whilst Appendix 9 of the PR19 final methodology[101] provides some rationale for Ofwat's assumptions and references to some data sources, many of the assumptions do not appear to be supported by sufficient evidence or are sourced from an underlying evidence base which has not been made publicly available (for example, Ofwat's estimate for contract management costs[102]). Other assumptions are underlined by datasets that are either small (and hence does not appear to be representative) or are focused on older precedents[103]. Ofwat has focused on the Offshore Transmission Owner (OFTO) model as a principal source of precedent for the DPC model. Whilst there are similarities between the characteristics of the OFTO and DPC models, the former appoints a provider responsible only for the operation and maintenance of assets that have already been constructed, resulting in a fundamentally different risk profile to DPC projects[104].

To better understand the position of Ofwat's standard assumptions within the observable range for applicable precedents and similar projects SW has carried out an initial benchmarking exercise, focusing primarily on Ofwat's financing cost and efficiency assumptions. This exercise has considered precedents from a selection of comparable projects across various infrastructure sectors including, but not limited to:

- Energy, such as OFTO and Interconnector projects
- Waste, water and Energy from Waste (EfW) projects
- Social housing, education, accommodation and other similar infrastructure projects
- Transport infrastructure projects, including bridges, tunnels, roads and rail transit

The review of precedents was based on a desktop research using a combination of publicly available information and anonymised commercially sensitive data provided by SW's advisors. This review has not considered any of the qualitative or intangible benefits or costs of DPC.

Overall, SW's desktop analysis suggested that the Ofwat standard assumptions are broadly within the range observed for comparable projects and precedents (albeit in the lower end of the range in some instances) for a "typical" DPC project. Some of SW's key observations are set out below.

[100] Ofwat (2019) Southern Water Direct procurement for customers detailed actions
[101] Ofwat (2017) Appendix 9: Direct Procurement for Customers
[102] Ofwat states that it has assumed Appointee contract management costs based on its own assumed DPC management costs, however it does not explain how this value has been derived.
[103] Ofwat primarily relies on CEPA 2016 (Evaluation of OFTO Tender Round 2 and 3 Benefits) for evidence of financing savings, however this document references reported secondary market returns in UK PFI between 2003 and 2011; a period covering the 2008 financial crisis and exhibiting different market conditions.
[104] Given that financing costs are typically reflective of project risk, the OFTO asset class can be used to draw comparisons with the anticipated cost of debt for DPC projects' operations period, however this may not be reflective of the financing efficiency that could be achieved by a provider responsible for arranging whole-life financing.

- **Efficiency assumptions (CAPEX and OPEX)** – The Ofwat efficiency assumptions are applied on top of the estimated cost for in-house delivery. The approach does not take into account the maturity of the cost data, SW's inhouse procurement model for these projects, and the residual risks that will need to be borne by SW. SW will continue to review the efficiency assumptions considering the above factors in subsequent stages of the Gate submissions. There may be limited scope to improve upon these assumptions through market engagement, as potential bidders may be unwilling to reveal information that might harm their competitive advantage or will not be in a position to provide more meaningful data until much later in the process. This means that SW will supplement the VfM analysis with robust sensitivity analysis to address uncertainty until the actual values obtained through bid submissions can be used in the project's VfM analysis.
- **Procurement and bid costs** – Ofwat's standard assumptions or the precedents do not account for the first-of-a-kind premium that will likely be applicable for the first cohort of DPC projects. In addition, it is likely that the final choice of option will involve desalination or water recycling plants (effluent re-use for potable water). In both cases the technologies involved are largely or entirely new to the UK and will require significant input from contactors overseas. To the best of SW's knowledge there are no UK suppliers of either technology on a 'turnkey' basis. The regulatory and policy frameworks for using these technologies in public water supply are also immature in the UK. For these reasons, the assumptions given by Ofwat are likely to underestimate the actual costs that incumbents and bidders will incur throughout the process. A robust bottom-up costing exercise will be undertaken to firm up initial assumptions and reduce uncertainty once there is more clarity and certainty about the structure and timings of the procurement process.
- **Cost of Equity and other financing assumptions** – For the same reasons as set out above for the procurement and bid costs, the initial DPC projects will be considered by the market to carry a higher risk and thus financing costs of these early DPC projects are likely to be subject to a first-of-a-kind premium. This can be seen in several other programmes including the initial OFTO Tender Rounds (which had a higher cost of equity). This is currently not reflected in Ofwat's standard assumptions.
- **Breadth of observed ranges** – At this early stage in SW's RAPID process, the benchmarked ranges are relatively wide and reflect the level of detail currently available about key project terms. As the solution is progressed through the DPC process and more clarity is gained over scope, risk allocation and the contractual model, SW will look to identify which of the available precedents provides the most accurate comparison to the project. In particular, it may be possible to identify project deals which are comparable to the solution (including risk allocation and commercial terms) and thus provide a more suitable benchmark.
- **Time frame** – Ofwat does not set out a timeframe for the DPC process, but SW has a fixed timeframe in which it needs to commission the solution driven by the Section 20 agreement with the EA to use "ABE" to have the WRMP strategy, including the options being considered here as candidates for DPC, by 2027. The fixed timeframe could also influence costs, as it will compress the time available for optimising design and capital costs, the process of identifying and negotiating risk allocations satisfactory to all parties and the time available for CAP contract development. Bidders will be aware that SW has fixed timescales, and this could act against finding the provider and set of contracts that provide best value for SW's customers. As context the recently completed bulk supply contract for PW to build and operate the HTR on behalf of SW took c.3 years to negotiate, at a multimillion-pound cost to SW.

In summary, SW will refine the assumptions used in the VfM analysis based on project-specific detail and market feedback obtained during the later stages of the procurement process. Although the correct assumptions to be used under the Factual (DPC) model of the VfM analysis will ultimately only be available once bidders provide their final bids at ITT stage 2, SW has identified a number of activities that hold the potential to improve the VfM assumptions in future Gate submissions:

- Undertaking further sensitivity and scenario analyses that reflect project-specific risks and opportunities

- Reviewing and updating the assumptions – especially those related to financing costs, financing assumptions, procurement costs and contract management costs - to reflect the first of a kind nature of SW's project
- Reviewing the cost efficiency assumptions to reflect the maturity of the costs for in-house delivery, and SW's approach to inhouse procurement for this solution
- Further benchmarking of the costs of debt and equity to reflect the risk profile of the SW's project more closely, and to reflect changes in macroeconomic factors and market conditions
- Better reflection of the efficiencies built into the Price Review process (frontier shift and efficiency challenges) for in-house delivery route
- Reviewing the non-financial implications of the DPC model, including its impact on timelines and SW's licence obligations

2.11.2.4. Procurement Plan, including Procurement and Contract Timetable

This section sets out SW's approach to the CAP procurement, including the anticipated timetable, the stages of the procurement process and the evaluation framework that will be applied to identify the CAP. It also considers the activities that SW will undertake outside of the CAP procurement to facilitate project delivery.

Procurement Routes Considered

Whilst SW's analysis has recommended that the project is suitable for delivery under the DPC model, SW has also considered the applicability of procurement routes other than DPC. Examples of current capital delivery routes under SW's capital delivery model include:

- AMP7 frameworks with SW's three delivery partners, with a specific focus on larger projects and programmes
- A Low Complexity Delivery Route (LCDR) which sits outside of the more complex delivery partner contract route, providing additional supply chain capability and capacity to complement the existing supply chain partners and reducing the overheads on smaller-value infrastructure and non-infrastructure projects whilst also creating resilience and commercial competition
- The Studies and Investigations (S&I) framework (see the *Key pre-DPC activities to implement the preferred tender model and commercial model* sub-section later in this section for more information)
- The AMP7 Strategic Solutions Partner (SSP) framework, which provides project management and Project Management Office (PMO) support, in additional to engineering and technical solutions

For large infrastructure projects such as the desalination solution, SW's framework agreements may not be suitable, as they are not designed for works of this scale and technical complexity. This means that were the project to be delivered in-house, SW would likely conduct a new published procurement process to appoint a provider for the design and construction of the works.

SW's analysis of procurement routes has also shown that large-scale design and build procurement models typically include ECI to safeguard solution design as well as optimise risk balance, providing more cost efficient and predictable contract values and delivery timescales. The nature of risks identified for this project further assert the benefit of ECI. SW's approach to procuring ECI support is discussed in more detail below.

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Error! Reference source not found. SW has illustrated the anticipated timeline for the procurement of the solution, including its pre-DPC activities, governance, and submissions to Ofwat as part of the DPC process. At the date of the submission of this report, the timelines (including the underlying breakdown of response periods) are still subject to further change in the future iterations of the schedule. As such, a high-level view of the plan up to CAP award is provided at this time, covering the key activities in aggregate (business case development, design and planning, CAP procurement etc.) without showing a breakdown for each individual task. For the purposes of this report, please refer Section 2.9 (Schedule) for additional information on planned activities and for key dates relating to control point and gateways.

CAP Procurement Plan

Development of the CAP procurement plan

At this stage, SW has developed initial thinking on the likely CAP procurement plan. The plan will be expanded upon as SW works towards the delivery of Control Point C (Procurement plan), which will include a greater level of detail. SW is focused on developing a CAP procurement plan that is designed to maximise competition and deliver best value for customers. SW designed its CAP procurement plan in a manner that will maximise competition and deliver best value for customers. The plan takes the project's critical path into consideration, reflects risk and opportunity, and is designed to ensure that the process is run productively and efficiently. It has been prepared in conjunction with SW's external procurement, commercial and legal advisers. The procurement process will be run in a fair and transparent manner, and in compliance with the requirements of the UCR 2016.

SW has considered the resourcing and governance requirements of the procurement process in the development of its approach and the timetable set out above. To achieve a fully assured and competitive process, SW will ensure that appropriate resources are available as required to ensure that SW can:

- Maintain and manage the competitive dialogue with bidders
- Conduct the necessary evaluations at each stage of the process within the timescales set out
- Give effect to its programme and procurement governance and assurance processes

Other relevant factors that have been considered in the development of the procurement plan, include (but are not limited to) the complexity of the process, the required duration at each stage and the requirements of the UCRs. The following factors are specific to procurement under DPC or to the nature of the solution, and as such have also been considered in procurement design:

- The DPC model is novel and as such the market is still forming. While there are parallels with other procurement routes, precedent for the use of concepts or approaches applied elsewhere (such as in Public Private Partnership (PPP) / Private Finance Initiative (PFI) deals) has not yet been established for DPC.
- The plan also recognises the significant investment required by bidders to participate in the procurement competition. With these considerations, an effective and valuable procurement that confidently delivers for customers is contingent upon attracting a sufficient volume of compelling and credible prospective bidders. SW has undertaken significant market research to understand the constraints and considerations for CAP bidders to determine whether they will invest in the tender process. The plan reflects the findings.

As SW progresses beyond Gate 2, its procurement plan and documentation will be subject to extensive internal challenge and external assurance (including legal review) as they are developed and agreed prior to the formal commencement of the procurement process. This will include any submissions as required under RAPID's gates process and Ofwat's DPC control points, and as such the CAP procurement plan remains subject to further amendment as the project matures.

Market engagement in advance of the procurement process

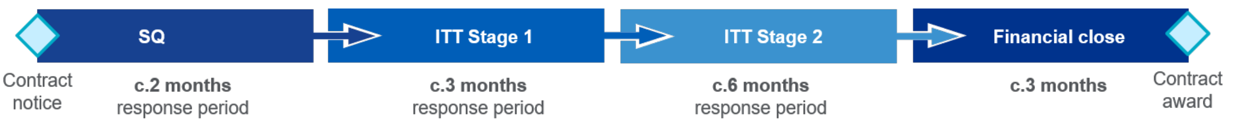
In line with the selected tender model (late with early market engagement), SW intends to conduct structured formal and informal market engagement with the market (including contractors and finance providers) throughout SW's procurement development process and initial design phase. This is intended to enhance transparency and promote dialogue with bidders, and to prevent the unfair exclusion of any interested parties. SW's approach will continue to be informed by and may be updated to reflect the results of future market engagement exercises.

SW anticipates that through market engagement it will also be able to outline the stages and timetable of the procurement process to interested parties. This will be important as it will allow and prompt those interested in the project to form bidding parties (for example joint ventures, and other forms of consortia), ready for the formal commencement of the procurement process.

Prior to the formal launch of the competitive tender process, SW will formally notify organisations of the forthcoming opportunity through the release of a Prior Information Notice (PIN). The audience for this market engagement will be kept as wide as possible, as SW aims to reach all available suppliers, including those that may subcontract to the CAP. Bidders' ability to form and submit a competitive tender will be contingent on supplier support through the procurement process. It is therefore beneficial to promote this opportunity to both potential CAPs and the wider supply chain. From this market engagement, SW will seek voluntary responses from interested parties who wish to provide feedback on the proposed procurement plan and contract. This will not have impact on the bidder's ability to bid in the procurement. This will be followed by a briefing presentation in which SW will seek to address questions bidders may have relating to the information submission as well as the procurement process. Given this briefing interface the entire market and the key members of SW's senior leadership team will participate and deliver in this briefing. Should significant challenges to the procurement strategy be prompted in this market engagement, SW can reassess and chose to conduct further market engagement.

Procurement process

SW's procurement process is illustrated in Figure 83 and comprises a Selection Questionnaire (SQ)[105] period launched at Contract Notice, followed by a two-stage ITT process, leading into Financial Close and Contract Award.



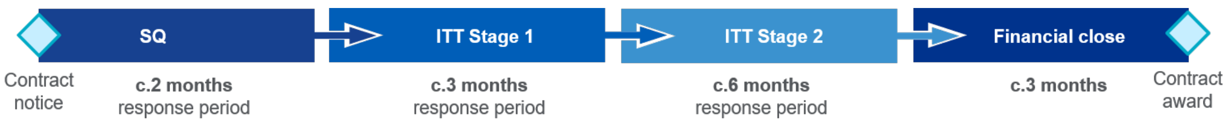


Figure 80 illustrates this process, however, the exact response and assessment periods for each procurement stage are still under development[106].

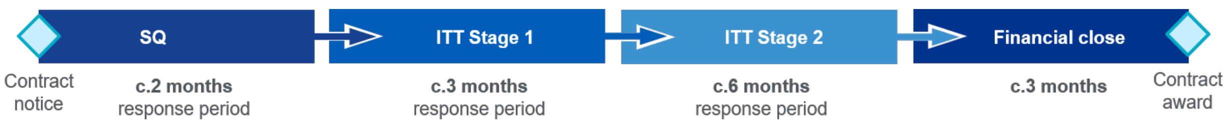


Figure 80 - Procurement stages and response periods

[105] SQ stands for Selection Questionnaire under the Find-a-Tender (FTS) UK procurement process, replacing the OJEU PQQ, or pre-qualification questionnaire.
[106] Please refer to section 2.9 Schedule for current durations

Upon publication of formal contract notice, and in line with its obligations under the UCRs[107], SW will release all appropriate documentation. Full disclosure of procurement documentation at this initial stage will allow the market to appraise the opportunity and make an informed decision on whether to participate in the competition. The documents published will include, but are not limited to:

- All assessment documentation for each stage of the process, including the questionnaires for SQ and ITT stages 1 and 2
- The evaluation criteria to be applied at each stage
- The draft of the CAP agreement
- All applicable technical documentation and requirements

SW plans to launch the procurement as a Competitive Dialogue, or similar (subject to regulation changes), that facilitates discussion with bidders during the procurement process[108]. This approach will allow SW to engage directly with bidders throughout the process to discuss aspects of the solution and their submitted proposals (once ITT stage 1 submissions have been made). Engagement throughout the process should lead to the submission of final tenders that are compelling, competitive, and fully satisfy the objectives of the procurement process.

SW has scheduled a c.seven-week period from Contract Notice to SQ response. This will test the capability and capacity of CAP bidders relative to project requirements. It is imperative that this process is thorough to ensure that appropriate bidders are selected to progress to the next stage. It is also important that the submission requirements are appropriately detailed to allow for a thorough assessment of bidder capability, whilst balancing the need to ensure that the costs bidders incur in preparation of their responses are not prohibitive to participation in the process. At SQ, bidders will likely be assessed on a mixture of their certification, policy compliance and previous experience of successfully delivering comparable projects.

SW will assess all responses received at SQ stage. Once complete, the results of SW's detailed assessment will be assured and confirmed through SW's established programme and procurement governance processes. SW anticipates inviting the four highest scoring CAP bidders to prepare a tender. However, this may be as few as three, or as high as six, depending on the quality of SQ responses and relative proximity of scoring. SW anticipates that by progressing four bidders beyond SQ stage, it will maintain effective competition during the ITT stages of the competition. Under this approach, SW also considers that effective competition could be maintained should one bidder drop out of the process once the ITT stage has commenced.

The ITT will be a multi-stage process[109]. ITT stage 1 will span a c.three-month period from invitation to the submission of responses. This submission will cover aspects of price and proposals on the technical solution, including elements relating to construction, operation and maintenance. Bidders' proposals need not be fully complete at ITT stage 1; however, the purpose of this stage is to understand bidders' proposed solutions so that SW can engage in meaningful dialogue with those bidders who are taken forward to ITT stage 2. SW anticipates that it will invite three of the four ITT stage 1 bidders to progress to stage 2[110]. To enable SW to meaningfully assess responses received at ITT stage 1 and to down select to the bidders who will progress to stage two, SW must be able to assess and fix some components of bidders' stage 1 submissions. The exact components that will be fixed are yet to be determined but will likely include some components of a bidder's pricing schedule. This approach is additionally beneficial as it allows SW to limit bidders' costs, as only those with a realistic prospect of winning the competition will be taken through to ITT stage 2.

[107] Utilities Contract Regulations 2016, regulation 73 - Electronic availability of procurement documents
[108] Whichever procurement route SW follows will be compliant with the Utilities Contract Regulations 2016.
[109] SW recognises the time and cost implications of the two-stage tender process; however, it considers that the benefits of this approach (limiting bidders' costs by focusing the competition early on those with a realistic prospect of winning and allowing sufficient time for the internal governance approval processes) are sufficient to warrant this approach. SW's approach has been subject to external legal review.
[110] The volume of bidders progressed may increase to four, depending on the quality of submissions and relative scores of responses.

Stage two will require bidders to prepare a full tender over a c.six-month period. While the previous c.three-month tender stage has been scheduled with consideration to the costs bidders would incur, stage two reflects a duration sufficient (for bidders that have progressed to this point in the competition) to develop a full proposal, which will include (but is not limited to) the bidders' design and final price to deliver the works. Bid costs are likely to be the most significant at this stage, as bidders produce detailed designs and finalise their responses. At this stage, competition between participants will work to drive for the best possible proposals at the lowest possible costs.

During stage two, SW may request interim non-binding draft submissions from the bidders. This will enable SW to ensure bids are developed to a high standard and ensure any necessary clarifications are addressed. It will also enable effective, transparent, and fair competitive dialogue to award and will help to secure the quality of responses. Where SW receives interim updates during ITT stage 2 this may also help to make the final assessment process more efficient as SW will have the opportunity to understand and consider developments prior to final response submission.

Key procurement dependencies

There is a dependency upon the completion of the development of the HTR, which is anticipated to be the primary source of supply for this asset.

SW will progress its DCO application in tandem with the procurement process. SW's current programme timetable provides for the submission of its DCO application in late 2023, with determination anticipated to be given in early 2025. This means that:

- The full details of SW's application will be available to bidders in advance of the procurement process, and that determination would be given before the end of the procurement process, allowing bidders to reflect any changes in their submissions
- SW will be responsible for managing the risk that changes resulting from the DCO approval cause disruption to procurement process, for example where approval is dependent upon a key change that has the potential to influence bidders' responses. Should the DCO process result in some variability of solution, this will be managed through communications with all CAP bidders and in line with procurement regulations.
- Whilst SW anticipates that full approval will be achieved prior to award, procurement timescales may need to be adjusted to reflect any changes. It is noted that the DCO application process sits on the critical path for the project, meaning that delays to the DCO process will likely have a knock-on effect on the CAP procurement process and timetable.

Key procurement risks

SW has identified a series of key risks to the procurement process, as detailed in Table 134**Error! Reference source not found.** below. At this stage, this is a high-level non-exhaustive list of potential key risks to procurement that will be considered in more detail as the procurement plan is developed further. SW has set out its early views of potential risk mitigations, however, these also remain subject to refinement as the plan development progresses.

Table 134 - Procurement risks

Procurement risk	Description	Outline view of potential mitigations
Lack of market appetite for the project	The risk that the market does not consider the project attractive, meaning no or limited responses are received to the Contract Notice. Factors that may affect market appetite could include, inter alia:	This risk is best mitigated through engagement with prospective bidders in advance of the procurement process, allowing SW to share information on the project, including key commercial terms, and obtain feedback from the market in advance of Contract Notice. This process will help to ensure that prospective

Procurement risk	Description	Outline view of potential mitigations
	• Negative perception of the commercial model (incl. outline terms of the CAP agreement) • Concern over programme timeline, including dependency with DCO process	bidders are well-informed about the project and will allow SW to understand and address any concerns held by the market.
Limitation / absence of supply chain capacity	The risk that there is insufficient capacity in the market to deliver a project of this nature, likely due to engagement on other similar projects, resulting in a diminished level of competition.	SW's engagement with the market to date has indicated that there is sufficient capacity in the market for the project, however SW will continue to monitor this risk through future engagement exercises.
Delay to the procurement process	The risk that the procurement process is delayed, resulting in additional cost and affecting SW's ability to meet its S.20 obligations for the delivery of the project. Causes of delay could include, inter alia: • Bidder requests for additional time to prepare responses • Delayed or extended governance processes • Delays in parallel activities, such as the DCO application process • Legal challenge (discussed below)	Mitigations against delay include: • The development of a clear procurement timeline based on past experience of similar projects, giving due consideration to key dependencies, and allowing sufficient time for each activity • Providing bidders with as much information as possible at the outset and engaging frequently throughout to ensure clarifications are addressed • Legal input throughout the design and implementation of the procurement process
Diminished competition in the procurement process	The risk that one or more bidders exit the procurement process, resulting in a diminished level of competition between remaining participants.	Measures to ensure competition is maintained include: • Limiting the need for bidder investment in the early stages of the process, so that the prospect of 'sunk costs' does not deter participation • Holding a reserve bidder from PQQ into ITT stage 1 in case one of the successful bidders exits the process • Reducing the competition to a smaller number of bidders at ITT stage 1 so that remaining bidders have a greater chance of winning and are less likely to exit the process • Inviting 3 bidders to ITT Stage 2 so that competitive tension can be maintained even if one of the bidders exists the process
Legal procurement challenge	The risk that unsuccessful bidders challenge the conduct of the procurement process, or the application of the assessments, suggesting that the UCR 2016 have not been followed.	It is not possible to exclude bidders' right to raise a legal challenge against the procurement process, however all of SW's procurement processes are managed in compliance with the UCR 2016, and its procurement plan will be subject to continuing legal review as it is being developed.

CAP Tender Evaluation Framework and Assessment Criteria

This section presents the evaluation framework for the SQ and ITT stages.

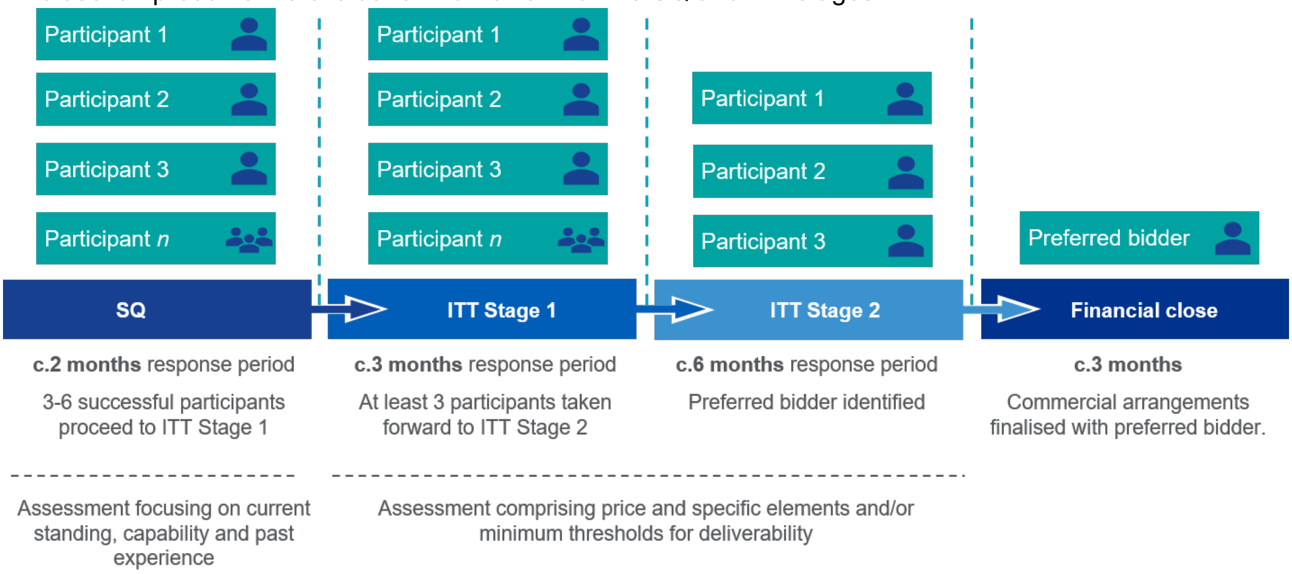


Figure 81 illustrates the evaluation process with indicative timings for each stage that will be tested and verified further.

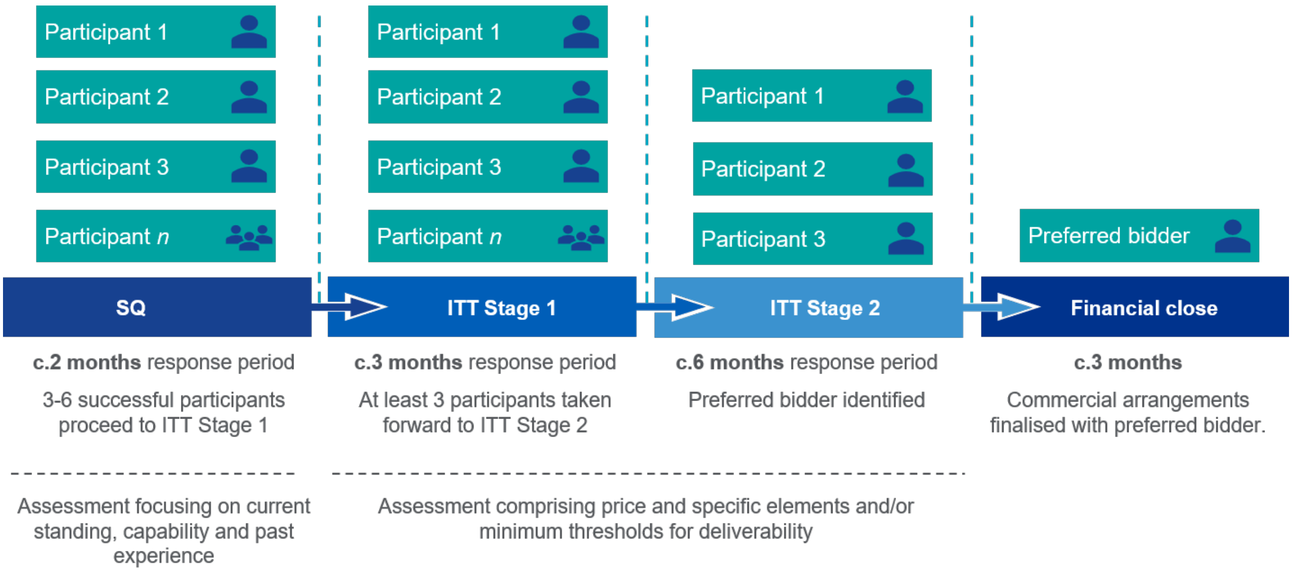


Figure 81 - Evaluation process

Each stage of the evaluation process will aim to achieve different objectives:

- **SQ** - Assesses the bidders' competence and ability to deliver the solution on a backward-looking basis. Bidders that demonstrate historical competency based on a minimum threshold on a pass or fail basis are to be passed to the next stage. It is expected that the SQ will focus on the identity and financial credibility and capability of bidders and so as part of the SQ SW will likely assess bidders' structure, financial statements and performance, and experience delivering similar projects. SW will consider the depth of these assessments (i.e. light-touch review or detailed assessment of all bidder parties) as the evaluation framework is developed further. Depending on the number of bidders achieving a pass there may be further down-selection to take c.3-6 bidders through the next stage based on the best SQ responses.

- **ITT stage 1** - Assesses the bidders' project deliverability, and potentially to a smaller extent on their indicative prices (elements of which may be fixed at this stage), to identify 3 bidders to proceed to ITT Stage 2 for detailed design. Bidders that demonstrate robust financial, commercial and technical deliverability on an overall scoring basis may be passed to the next stage. SW will consider whether to set any minimum thresholds for deliverability and will seek an understanding of a bidder's delivery model, the structure of their planned activities, their approach to risk mitigation and their plan to secure and maintain the necessary skills and capabilities throughout the life of the contract. At this stage SW will look to reach a balance, requiring bidders to provide enough information to undertake a deliverability assessment without incurring unnecessary bid costs. As part of the calibration of the deliverability assessment SW will also consider the time and effort requirement of the bid evaluation.
- **ITT stage 2** - Assesses developments in deliverability against design requirements but is likely to be focused on determining the best solution proposed at the optimal price. The Most Economically Advantageous Tender (MEAT) will win. Further deliverability assessment will focus on the design activities carried out by bidders and will test that the design proposed by bidders fits minimum requirements of various technical elements, reflecting developments in SW's consenting and permitting activity. At this late stage, SW's primary aim will be to drive VfM for customers through competitive tension whilst ensuring that the bidders' proposed solution is fit for purpose.

The detailed evaluation criteria for each stage will need to cover technical, commercial and legal aspects of the project, taking into account SW and Ofwat objectives. The evaluation framework will be designed such that it is fair, transparent and fully documented, ensuring that any potential challenges from losing bidders can be robustly defended, so that the risk of such a challenge is minimised.

Key Pre-DPC Activities to Implement the Preferred Tender Model and Commercial Model

Recognising the time-sensitive nature of some aspects of the project development, it will be necessary for SW to undertake certain pre-DPC activities to support the implementation of the preferred tender and commercial models. A variety of activities are currently under consideration including, but not limited to, early feasibility works[111], enabling works[112] and pre-DPC construction works, however, these are reflective of the level of detail currently available; and it is likely that some areas will evolve in terms of scope and priority as the project develops further.

Conflict of interest - SW has engaged a variety of suppliers to support its project development. Where frameworks have been established, due consideration has been given to conflict of interest, ensuring that appropriate safeguards are in place for frameworks suppliers who may also participate in the DPC procurement process. SW has established conflict of interest arrangements with all suppliers engaged to date. Similar arrangements will be sought with suppliers engaged in the future, and SW will continue to actively manage any potential conflicts of interest as the project develops.

S&I framework - To support its pre-DPC activities SW has established several specialist S&I frameworks. This was following an extensive programme of market and stakeholder engagement and a competitive procurement process. The majority of the enabling works packages are within the scope covered by SW's S&I Framework and can be procured through this route. Other packages will either be procured through the Catchment Management Specialist Framework, or for packages which cannot be procured using existing frameworks a procurement decision will need to be made. Call-off from these frameworks has been used to

[111] Feasibility studies identify the practicality of a project, considering relevant contextual factors (economic, commercial, technical, regulatory etc.) in order to determine whether a project should be progressed.
[112] Enabling works is a generic description for the site preparation works that take place prior to work under the main CAP construction contract. The term also covers the statutory and non-statutory works required to gain Development Consent Order (DCO) and Direct Procurement for Customers (DPC) approvals.

secure the majority of pre-DPC and pre-DCO workstreams. This is following a fully competitive OJEU[113] / FTS[114] procurement where 23 lots were awarded across the 5 S&I frameworks[115].

The specialist frameworks have been established with due consideration to conflict of interest, ensuring that appropriate safeguards are in place for frameworks' suppliers who may also participate in the DPC procurement process. Similar arrangements will be sought with suppliers engaged in the future, and SW will continue to actively manage any potential conflicts of interest as the project develops.

Enabling works - SW's procurement approach for its pre-DPC activity has been developed in two phases. Phase 1 focuses on meeting SW's early feasibility needs. Phase 2 comprises enabling works and pre-DPC construction works. The majority of work packages under Phase 1 have been delivered to budget and within required timescales. In the most part, these packages relate to obtaining consents (including planning, consenting, environmental constraints, permitting, and other environmental considerations) and as such include a variety of surveys in support of SW's Gate 2 submission, DCO preparation and EIAs.

For Phase 2 of its pre-DPC activity, SW will continue to utilise the established S&I frameworks. The contents of Phase 2 have been in development during Q2 and Q3 of 2021. It will include additional sub-strategies which focus on pieces of work that lie on the critical path and must be completed in order to achieve DCO approval and allow for a CAP to be appointed. This phase of activity is being prepared in consultation with key stakeholders including regulators (EA, NE, Ofwat etc.) and other members of the delivery team and will include but is not limited to:

- Environmental technical appraisals and studies
- Modelling, including Cormix and 3D modelling
- Support activities to further SW's optioneering, DCO and EIA processes
- Terrestrial ecology surveys, including bats, breeding birds, Hazel Dormouse and badgers
- Aquatic ecology surveys, including river habitat and corridor surveys

SW intends to agree its procurement acquisition strategy for Phase 2 in 2021. The scope of this second phase of pre-DPC activity remains under development, once this has been agreed SW will develop a strategy for the allocation of these works between lots.

For its future enabling works packages, SW has identified the relevant suppliers within the S&I framework and is in the process of engaging suppliers on each framework to better understand their capacity relating to the different packages required. Actions related to the identification of pre-DPC suppliers will include:

- Verifying the capacity of existing framework suppliers to undertake specific packages of work.
- Proactively maintaining conversations with suppliers to understand their long-term capacity. This may allow SW to secure resource for a longer term and understand whether added value can be gained from awarding bulk packages to specific suppliers.
- Identifying those packages of work that will not be awarded to framework suppliers and develop procurement routes for such packages.

DCO planning support services - To support in the development of its DCO strategy and its application and consultation process SW requires input from a variety of services and specialisms. Of these, planning and consenting support services are required urgently, as an in-house planning team does not exist. SW has sought Board approval to make a direct award to [redacted] (under the S&I framework) who will

[113] OJEU refers to the Official Journal of the European Union, contains public sector contract tenders and notices from every EU member country.
[114] FTS refers to the Find-a-Tender service, which is a UK procurement portal launched following the UK's exit from the European Union.
[115] The 5 S&I frameworks include Catchment Management Strategy and Delivery, Wastewater investigations, Environmental monitoring, assessment & implementation, Asset investigations and flow monitoring, and Water Resourcing Management and Investigations.

provide interim support until December 2021, by which time the tender for the DCO partner will have concluded. SW will not preclude [redacted] from competing in the procurement process for the full support works but has ensured that appropriate conflict provisions (such as information barriers) are in place to prevent any unfair advantage.

DCO consultation - The activities required within the DCO consultation are also urgent and there is currently no internal resource that can fulfil the consultation resourcing requirements needed for this SRO. The activities required fit within the SSP framework service scope and can be procured under the SSP framework. The SSP is composed of [redacted] with subcontractors [redacted]. [redacted] are believed to have the required experience and capability to deliver DCO consultations. SW is currently preparing to engage the suppliers on this framework to test their capability and will then assess the most appropriate procurement route. SW is currently exploring contract options for the DCO consultation package.

Pre-DPC engineering and design surveys - In addition to enabling works, SW will also undertake some pre-DPC construction activity. The packages of work and schedules for delivery for these construction works are currently in development, however amongst the packages identified thus far there is a focus on design support required for this solution. SW is currently reviewing which of these work packages can be undertaken by internal resource. For work packages where external resources are required a full scope of work for the packages will be developed that SW will procure using the SSP framework, S&I framework, EIA, or may undertake a separate procurement (compliant with the UCR 2016) to make an award to a supplier who can support SW with these requirements.

ECI - ECI denotes the introduction of a contractor's skillset in the early stages of a project to bring design 'buildability' and cost efficiency to the pre-construction phase. SW recognises the unique, large and complex nature of its WfLH programme, and therefore considers that it will benefit from contractor expertise extending across SROs and the DCO and DPC processes. It is anticipated that ECI support will be needed throughout project development, procurement and potentially beyond CAP award, however the long-term scope for the ECI is yet to be determined. At this time, SW is developing its ECI strategy and engaging with relevant suppliers. As the WfLH programme develops, a detailed schedule of activity for the ECI will be developed, however to date SW has identified the following requirements:

- Constructability reviews and construction schedule development (including the production of construction phase plans)
- Advice on the necessary mechanical and electrical systems, commissioning durations, tunnelling approach and other discrete areas as applicable
- Support through SW's statutory consultation process
- Tender evaluation during the assessment stages of the procurement process, focusing on technical questions
- Reviewing sub-contractors' Risk Assessment Method Statements (RAMS)

These requirements will be further improved or extended during negotiation / dialogue sessions SW has planned as part of the Competitive Procedure with Negotiations procurement route which will be conducted to engage a suitable ECI contractor. SW will seek ECI parties who can demonstrate an extensive background in civil and mechanical engineering, a history of experience in similar or major infrastructure projects, and experience of working with clean water assets.

To secure the support it requires, SW proposes to undertake a competitive procedure with negotiation procurement process (with a pre-qualification stage and two-stage tender) to engage two non-DPC ECI parties, with award anticipated for July 2022. SW anticipates that these ECI parties will be engaged on an New Engineering Contract (NEC) option C (target cost) or E (cost reimbursable) basis, over a 9-12-month period, working in parallel and competing for a single award for the construction period.

The successful ECI party will be integrated into SW's WfLH team and will initially be required to undertake a review of the WfLH outline project design statements (and associated documents / plans / drawings, specifications and schedules) currently under development. The design / buildability resource is expected to deliver a number of agreed outcomes regarding the design / buildability of the WfLH project including, but not limited to:

- Providing design and constructability input, including review of key documentation, implementation of best practices and (where possible) standardisation, and the development of a constructability plan
- Creating and maintaining a constructability lessons-learned database and cost-effective design modification database
- Undertaking constructability workshops prior to the CAP tender process, focused on the discussion of concepts and sharing of input, developing a plan for constructability implementation during project execution and the identification of opportunities and concerns
- Providing discrete areas of advice, for example in relation to underground works, major crossings (watercourses, road crossings, critical services etc.) and for works in specific environmental conditions
- Reviewing and assisting with the development of a variety of DCO design deliverables

To address its urgent need for support in its construction and commissioning schedule development (whilst it procures formal ECI support) SW has engaged early Buildability Construction Management (BCM) support under its SSP framework.

2.11.2.5. Design Maturity

Detailed information on SW's design development can be found at the following locations in this document:

- The anticipated level of design maturity can be found in sections 2.2 Engineering Design, 2.3 Network Infrastructure and 2.4 Site and Route Selection
- Detail on project risks and their potential to impact the development of design maturity can be found in section 2.7 Risk Management
- Detail on SW's planning and consenting strategy (including EIA) can be found in section 2.8 Planning and Consenting.

To facilitate the procurement process, SWs will ensure that the design process balances the certainty required for the purpose of planning applications and the DCO approval process (sufficient to mitigate the risk that planning is not achieved), with the need to maintain a level of flexibility and optionality that will allow bidders to demonstrate their knowledge and skillset, and to add value to the final solution design. A less tightly defined scope will provide bidders opportunity to develop the most efficient and cost-effective engineering solutions.

SW's current programme timetable provides for the submission of its DCO application in late 2023, with determination anticipated to be given in early 2025. This means that the details of SW's application will be available to bidders in advance of the procurement process, and that determination would be given before the end of the procurement process, allowing bidders to reflect any changes in their submissions.

Engineering documentation provided for the tender process will be split between "rely-upon information" (information that has been used to inform the planning applications) and the remaining information (provided "for information only") that will be provided to enable the bidders to submit a detailed submission that can be normalised for evaluation.

Informal Market Engagement Feedback

As part of its Gate 2 solution development, SW ran a series of informal market engagement meetings[116] with potential bidders. Overall, the Direct Transfer solution is seen as a simple solution with a well-understood technology and a mature market. Key feedback collected on design maturity was as follows:

- Since the detailed design is expected to be developed by the bidders, initial design carried out by SW should still give bidders the flexibility to innovate whilst adhering to planning process requirements
- Potential bidders believe that an optimum pre-tender design leaves room for change and improvement
- Participants suggested that SW should progress the design envelope enough to meet the DCO approval requirements without limiting the CAP's ability to drive innovation and cost savings
- Participants were favourable towards SW engaging with an early design contractor to help develop the initial design especially in preparation for the DCO approval

This feedback is consistent with the late model, under which bidders will expect SW (as incumbent) to have secured the necessary planning permissions based on a reference design. SW will work with its ECI contractors to ensure that the planning, consenting and DCO processes do not unduly restrict the ability of bidders to optimise their designs.

2.11.2.6. Confirmation of Preferred Tender Model and Commercial Model

Tender Model

The late model with early market engagement tender has been identified as the preferred tender model for the Direct Transfer solution. Under this model the solution is tendered out as a DBFOM[117] after SW obtains the requisite consents.

To reach this decision, SW has developed and applied an assessment framework against the four potential tender models identified at Gate 1. Internal workshops were conducted to down-select 2 models to be tested with the market as part of SW's Gate 2 informal market engagement[118]. Bringing together feedback from the informal market engagement with SW's assessment, the late tender model with early market engagement was selected as the preferred model[119].

Table 135 details the stages of tender model review.

Table 135 - Preferred tender model stages of review

Review stage	Scope
Initial review of tender models	Four tender models assessed that have been identified for further progression at Gate 1: a) late with early design, b) late with early market engagement, c) late with novation of early designer or d) late with split D&B from finance
Workshops with key SW SMEs	Preference for late with early market engagement
Informal market engagement feedback	Preference for late with early market engagement

[116] To date, market engagement exercises have been undertaken in 2019, as part of SW's Gate 1 submission and as part of SW's Gate 2 submission.
[117] Design, Build, Finance, Operate and Maintain
[118] The late tender model with early market engagement, and the late tender model with split D&B from finance.
[119] At Gate 1, SW's assessment of the appropriate tender model did not consider the D.2 solution (as that submission focused on other solution configurations), however the findings are considered to be applicable for this solution, as they are generic for large infrastructure investments that are considered suitable for delivery under the DPC model.

Key justifications for the selection of late model with early market engagement are:

- The late model (or a version thereof) is necessitated by SW's timetable constraints. Were SW to follow the early model, the procurement of the CAP and planning application process would typically be undertaken sequentially. Given the time required for each of these activities, SW would be unable to meet its timetable obligations. Under the late model, SW is able to pursue the necessary planning and consents in parallel with its procurement process to enable the solution to be delivered as quickly as possible once a CAP is appointed. The late model is therefore the most time-efficient of the options considered.
- Tendering the full spectrum of DBFOM activities will lead to a more straightforward risk allocation between the CAP and SW and will minimise the number of interfaces required at the early stages of the project.
- Based on the technical specifications of this solution, there is less interest from the market to have separate D&B contractors being selected by SW. By integrating the DBFOM activities into one proposal, bidders will be incentivised to put forward proposals with a better value for money as they will be able to optimise their bids based on their experience on other similar direct transfer projects.

Under this tender model SW will play a key role in the need identification, option selection, design and consenting activities. The project hand over to the CAP will occur before the detailed design stage, once consent has been obtained based on the initial design developed by SW. The CAP will be responsible for the detailed design, construction, operation, maintenance and financing of the solution. Under this model the ownership of the solution would sit with the CAP for the duration of the contract term, after which it would be transferred back to SW, or if SW chose to re-tender, transferred to a new owner. Figure 82 illustrates the key activities under the late model with early engagement for SW and CAP.

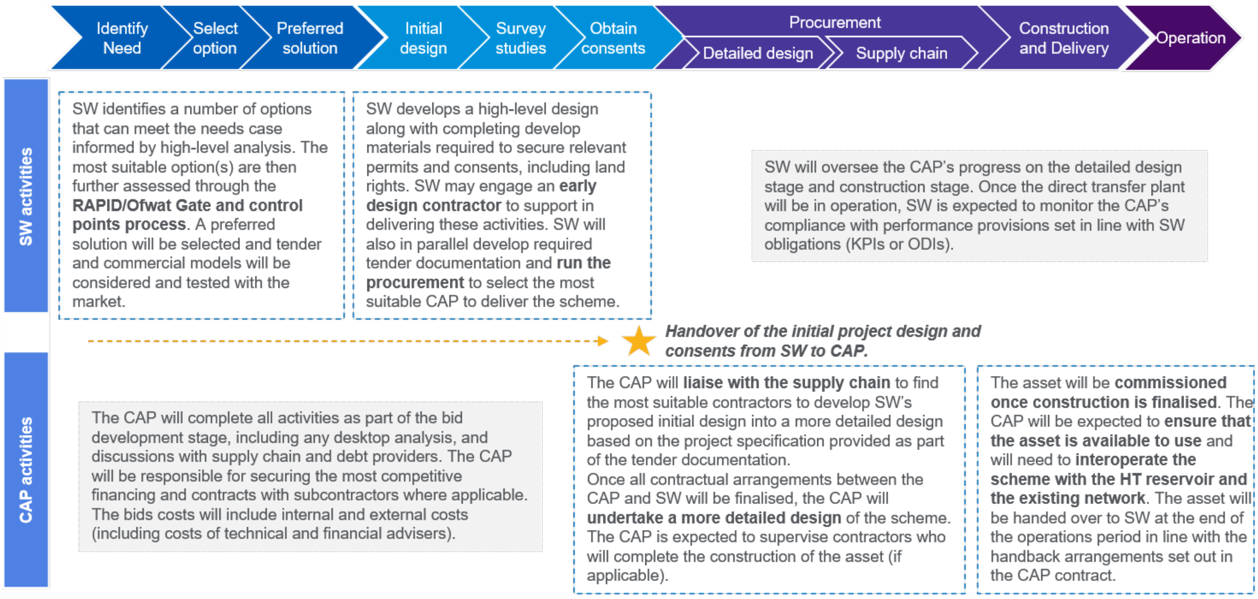


Figure 82 - Indicative activities under late model with early engagement[120]

Commercial model

The commercial model further develops the work carried out as part the Gate 1 submission and is built upon the basis of the late tender model with early market engagement being identified as the preferred model. The proposed commercial model reflects both the current understanding of the solution and the feedback

[120] Note that the banner of stages along the top of Figure 85 is indicative for a typical infrastructure development process only and may differ in practice for Option D.2. For example, SW plans to pursue consents in parallel with the procurement process.

received from the informal market engagement undertaken to date. It will evolve as the project develops. The commercial model also incorporates a variety of inputs from the wider industry, including Ofwat's DPC guidance, internal workshops with SW SMEs and analysis of precedents from PFI / PPP type projects in the water, energy, rail, and wider infrastructure sector that share similar risk profile, business model, asset type, or appointee structure to the solution.

The commercial model covers key contractual principles and main categories of risk allocation, both of which have been tested with market engagement participants.

Contract with the CAP

SW considers that a fixed price contract with the CAP, on a design, build, finance, operate & maintain basis is the most suitable option. A fixed price contract provides the greatest protection for SW and customers from price increases. As the expertise in delivering direct transfer assets is expected to come from bidders, they are considered to be best placed bear the risk of cost overruns.

Table 137 details SW's high-level proposal for how the contract with the CAP would be structured before the issues are discussed below.

Table 136 - Overview of proposed commercial model

Area	Proposed approach
Contract length	• The recommended operational term is 20 years. This is primarily driven by the renewal sum CAPEX in year 21 of operations (which would be inefficient for a CAP to finance). • The contract will also cover a design implementation period of 1 year[121] and the construction period of 4 years
End of contract asset treatment	• A bullet payment will be made to the CAP based on the end of contract asset value • At the end of the contract, the asset will either be retendered by SW or transferred to SW's control and an amount equivalent to the end of contract asset value added to SW's RCV
Termination	• Contract terms should include termination rights, allowing SW or CAP to terminate the contact based on pre-defined scenarios or targets, such as default scenarios, force majeure, or non-payment by SW
Payment mechanism	• Payment to CAP will start post commissioning • Hybrid model primarily based on availability charge combined with a volumetric element to cover variable OPEX linked to asset utilisation • Refinancing gains to be shared 50:50 between the CAP and the customers[122] • Performance targets with associated incentives / penalties
Acceptance and late service commencement	• Liquidated damages for late service commencement • Financial incentive for timely asset delivery • Clearly defined criteria and process for acceptance
Operational performance	• Most risks are expected to be transferred to the CAP, e.g. EA water quality risk, process risk, leakage, response time and critical spares • Some will be shared between the parties (e.g. DWI water quality risk, volume uncertainty

- An **operational term**[123] of 20 years has been selected as the term that achieves the best alignment between the nature of the solution, the asset lives of its principal components, the appetite of

[121] This timescale is an estimation only at this stage. SW anticipates that the CAP's design activity will be predominantly undertaken during the procurement process, and that post-award, the CAP will place the necessary orders with its supply chain and put in place arrangements for delivery. See section 2.9 Schedule for further information on the anticipated timetable for project delivery.
[122] SW anticipates that a refinancing event may take place post-commissioning. The current 50:50 assumption is in line with Ofwat's guidance but will be tested further to ensure that the CAP is appropriately incentivised to reduce financing costs.
[123] Here, operational term refers to the operational period which begins once the asset has been successfully commissioned.

stakeholders (such as SW's regulators), the market, the available financing solutions, the project's value for money proposition and SW's long-term objectives.

- The solution's **renewal CAPEX profile** forecasts significant expenditure in operational year 21[124]. If financed by a CAP this would require the maintenance of inefficient cash reserves throughout the contract term, which diminishes the value for money provided by the project. Assuming a straight-line depreciation over the asset life the large renewal CAPEX in operational year 21 significantly increases the bullet payment at the end of the contract should a term beyond 20 years be selected. Further, the selected contract length matches bidders' preference for a shorter contract[125], and aligns with the typical length for bank financing, which is considered the most likely financing route for this solution due to its first-of-a-kind nature. Shorter terms also allow bidders to fix their O&M costs[126], creating opportunity to drive additional efficiency. In all, these factors coalesce to present a 20-year operational term as the optimal length.
- Taking the above into account for the **end of contract asset treatment**, SW has elected to make a bullet payment to the CAP at the end of the contract term. This approach reflects the difference between the 100-year life of the asset and the 20-year term of the CAP agreement, ensuring that customer affordability is not compromised in favour of full repayment over the term.

  Whilst a bullet payment will be made, this may be subject to an assessment of the asset condition at hand back[127]. Once finalised, the asset depreciation profile will drive the size of the bullet payment, however this is yet to be determined and will be subject to further calibration. Market engagement has shown that bidders are open to and generally supportive of the inclusion of a bullet payment. It will be key to understand how the potential size of the bullet payment may impact bidders' appetite to participate in the procurement and their submitted prices. SW may look to test the financial implications of various depreciation profiles to ascertain their impact upon customer benefit and consider questions related to intergenerational fairness (such as bill impact and affordability). At the end of the CAP contract, the asset will either be retendered to find another provider to take over the asset, or will return to SW's control, with an addition made to SW's RCV equal to the remaining value of the asset.
- **Termination rights** are typical for PPP / PFI project finance arrangements and will be expected by the market, in particular for certain no fault (e.g. force majeure), Appointee default (e.g. non-payment) and CAP default scenarios.

  Ofwat has recognised that the requirements of SW's licence and other statutory obligations cannot be transferred to the CAP. SW must retain the contractual right to address service failures, which may result in adverse effects for customers and liability for SW. As such, SW is likely to seek automatic step-in rights where certain water quality standards are compromised[128] (for example where cryptosporidium is detected), and to introduce a "termination for convenience" clause, whereby the contract can be terminated at SW's will without the need for cause, providing a safeguard for SW in its activities as water undertaker.
- With regard to the **payment mechanism**, a hybrid model will include an availability-based payment (likely linked to the provision of a set minimum-flow level) and a volumetric element covering variable operational expenditure reflecting the level of asset utilisation (e.g. an increased level of pumping station

[124] Based on the Gate 2 cost estimate profile, c.£77m of renewal CAPEX will be required in OY21.
[125] In the market engagement conducted to date, bidders expressed a preference for a contract term of 30 years or below.
[126] Bidders would likely seek contractual mechanisms that would allow maintenance costs to be adjusted in the event of a longer-term agreement.
[127] Asset condition at hand back could be accounted for through several different approaches, including (inter alia) a deduction from the residual value payment, a deduction from the availability charge (where asset deterioration had been identified earlier in the contract term), and/or the imposition of a requirement for the CAP to post security. The relative merits/demerits of each approach will be considered further as the commercial model continues to develop. Additionally, consideration will be given to the potential process for asset handover, and how a new provider or SW could be given confidence in the end of contract surveys and inspections undertaken by the original CAP. It will also be important to ensure that evidence exists to demonstrate that the maintenance regime has been adhered to over the life of the contract.
[128] During market engagement, one bidder suggested that termination rights should be based on performance-related penalties.

operation). Variable costs will also be based on a schedule, that is, defined costs at different levels of operation.

This approach reflects the solution's position as a resilience asset and will increase the value for money for customers, who will pay for asset utilisation (above an agreed minimum flow) only where it is required for example in drought conditions. Further performance penalties and incentives (tailored to the detailed operational characteristics of the solution) may also be employed to ensure that the CAP is appropriately incentivised to maintain the asset's availability in times of need. SW will also consider additional components of the payment mechanism which may help to drive additional value for money, including a refinancing gain share[129] (expressed through a reduction in customer charges) and the potential for the indexation of revenue streams, subject to further analysis.

- **Acceptance and late service commencement** provisions will need to ensure that the CAP is financially incentivised to ensure timely delivery. It will need to avoid creating a disproportionate downside exposure that would be reflected in bid prices.

  The payment mechanism will meet this objective in part, as revenues to the CAP will not commence until the asset is commissioned, in line with Ofwat's guidance[130]. However, given SW's need to implement the solution in time for its 2027 regulatory deadline, liquidated damages and early-delivery bonuses may be implemented to ensure committed schedules are achieved. During market engagement, bidders have noted that clear acceptance criteria will be crucial to ensuring that the asset can enter operation in line with both SW's and the CAP's expectations. An independent certifier / verifier may also be engaged, providing both parties with guidance and allowing for an independent and objective view of acceptance.
- SW does not envisage that the CAP will be responsible for the volume of water transferred through the asset. The CAP's primary **operational performance** obligation will be to ensure availability of the asset and that there is no detriment to water quality whilst transferring water through the constructed pipe. To this end, water quality monitoring is likely to be used to confirm that no change has occurred between the entry and exit points. SW will also look to ensure asset condition inspections are undertaken regularly as this will inform the asset's deterioration profile.

The contractual arrangements between the CAP and SW will be outlined in more detail as the commercial model is developed further and will be reflective of a more developed understanding of project risks.

Risk allocation

The principles bulleted below underline the high-level risk allocation exercise that has been undertaken to date:

- Ofwat's DPC principles state that risks should be allocated to those best able to manage them.
- Risk allocation impacts bidders' appetite to participate in the CAP tender and submit a bid.
- The information shared with bidders will affect their willingness to accept ownership of risk. The more information is shared with bidders during the procurement the more likely they will accept responsibility for a particular risk.
- Bid prices will be reflective of the level of information shared and the overall allocation of risks between the parties.
- SW may consider reopeners for risks that cannot reasonably be managed by the CAP.

The table below details some of the key risks that are applicable to the delivery of the solution within the DPC model. Risks are allocated at a high-level between customers, the CAP and SW, reflecting the party principally responsible for each risk, or whether a particular risk is expected to be shared between parties.

[129] The 50:50 refinancing gain currently proposed is based on existing PFI guidance and precedent.
[130] This position aligns with Ofwat's DPC principle that customers should not pay for assets until they are in receipt of the benefit they provide.

SW has tested its outline risk allocation with the market through an informal market engagement exercise. Participants were provided with a version of the table below that included a summary explanation of the risk and the rationale for its allocation. The exercise provided SW with valuable feedback on individual risks, which has been incorporated into the explanations set out below. Overall, participants agreed that the proposed risk allocation was appropriate, noting its similarity with other comparable projects.

Table 137 - High-level allocation of risk between parties

Risks and considerations	Customer	CAP	SW
Consenting			
Planning			
Reference design			
Detailed design			
Ground conditions			
Programme			
Sub-contractor performance			
Asset handover			
Commissioning			
Land access rights			
Construction Costs			
Operating costs			
Interoperability / Interface			
Finance			
Regulatory (Ofwat / RAPID / DWI)			
Availability risk			
Operational performance			
Force majeure			
Change in law			
Bad debt			
Other risks *Other risks to be considered as part of the risk allocation include ecology risk, water conditions risk, first of a kind risk, risk related to stakeholders, power, grid capacity, DCO, archaeology, incentives, 3rd party providers, liabilities and guarantees, operating concession, asset hand back/condition, consents, uninsurable events, etc.*			

At a high level, the risk allocation in the table above reflects the use of the late model for the procurement of the CAP. As is typical for the late model, SW will assume responsibility for planning, consenting, reference design and other early risks associated with the activities it will undertake in advance of contract award to support the delivery of the scheme. Should any of these risks materialise SW will bear the costs associated (including once CAP appointment has occurred), for example costs associated with the granted DCO and any other consenting activities undertaken pre-award.

Once an award has been made, the CAP will take ownership for detailed design, programme and project management (including the management of sub-contractor performance), construction, financing, operation, maintenance, and other delivery risks. It will be responsible for delivering the solution in line with all DCO conditions and for managing any associated risks. Under a fixed price contract, the CAP will also assume the risk of cost overruns during both construction and operation.

Some risks will be more complex in their allocation, leading to a sharing of responsibility between parties, typically between SW and the CAP, but in some instances with costs also passed through to customers. SW has engaged with market participants about risk allocation[131] and found support for the positions adopted.

- **Ground risk** - Ground risk represents one of the most significant challenges to the delivery of large assets, particularly during the construction phase. Understanding the environment typically requires a programme of surveys, studies, and investigations to be undertaken, generating information that can be used to allocate risk based on the specific characteristics of the area in question[132]. SW currently anticipates that the CAP will assume the risk of standard ground condition variations, whilst SW will retain unforeseeable ground condition risk, although it is noted that bidders are only likely to accept risk exposure for ground conditions where a sufficient level of geotechnical and topographical information is made available as part of the tender process[133].
- **Land and access rights** - Risks related to land and access rights will also be shared between SW and the CAP. SW will bear the initial risk as it acquires the necessary rights, before granting the rights to the CAP to enable them to comply with their commitments and obligations under the agreement. The CAP must ensure that it complies with the terms of any rights as set by SW, who will likely seek to ensure that it has a route to compensation where liability arises in response to the CAP's conduct or activity. SW will need to also consider to any reputational issues arising through the CAP's activities, and as such will likely look to work proactively with the CAP throughout delivery and operation.
- **Interface risk** - The interface risk is defined by the relationship between the CAP, SW and PW. As the asset will connect with PW's asset at the HTR, and SW's Water Supply Works at Otterbourne, the CAP will need to understand and effectively manage the interface requirements at each end during the construction phase. As this risk will not be solely managed by the CAP, it is expected that the interface risk will be shared. A clear specification will be essential for the CAP to ensure that it can develop an acceptance design. Once operational, interoperability risk is not likely to be significant (provided that the asset does not adversely affect water quality) as the asset requires minimal operation, and the BSA between SW and PW will govern the flows through the asset. The CAP will be responsible for ensuring that the asset is available and operated efficiently as required. The systems and technology used by the CAP will also need to work together with SW's and PW's systems.
- **Change in law risk** - Regulatory change and change in law will need to be monitored throughout the project and has the potential to significantly impact all facets of project delivery. At the national level, general changes in law (that is, changes to working time regulations, national minimum wage, and so on) are likely to be borne by the CAP who will be expected to consider these factors as it prepares its bid. SW's current assumption is that specific changes to the regulatory framework (including changes in Ofwat's / RAPID requirements) will likely impact both parties and will be shared between SW, the CAP and customers in some instances. Market engagement participants have challenged this position, suggesting that SW may be best placed to manage this risk. During the procurement, bidders will look to understand the regulatory requirements that currently apply to the project and the potential scope for changes. Where regulatory change is perceived to be likely or significant, this will be reflected through increases in bid prices.
- **Operational risks** - SW intends for the CAP to operate the asset throughout contract term, and as such expects the CAP to assume responsibility for most operational risks, including process, leakage and response time (in the event of a water quality incident or service interruption). Further, it is

[131] During the market engagement exercise, SW showed participants a version of Table 6 – High-level allocation of risk between parties, with a selection of summary points beneath each item as a prompt for discussion.
[132] It is commonplace for a Geotechnical Baseline Report to be developed and used to allocate risk between parties through a series of baselined parameters.
[133] The level of information shared with bidders during the tender process will impact the contingency built into bids.

anticipated that the payment mechanism will be linked to availability, incentivising the CAP to operate the asset effectively and maintain performance levels. SW cannot transfer operational risk to the CAP entirely, retaining responsibility for its statutory and licence obligations as water undertaker along with the associated penalties arising from service interruptions and water quality issues. The associated risk to reputation will also continue to be held by SW. As the asset's principal purpose is to provide resilience in dry weather conditions, it is likely that any service failures during a period of increased asset operation (such as during a drought) would both damage SW's reputation and render it subject to regulatory penalty. To address this exposure, SW will likely look to ensure that contractual mechanisms are in place to allow it to recoup any penalty costs from the CAP.

- **Bad debt** - Under the DPC model, the Tender Revenue Stream (TRS) will be paid to the CAP by SW. In turn, SW will recover these revenues from customers through the charges regime. Ofwat has stated its preference for certainty in the tender revenue stream, and that the current regulatory (building-block) mechanism for the recovery of customer bad debt will therefore continue to apply for DPC revenues. On this basis, this risk will be shared between SW who bears the initial cost of under-recovery, and customers from whom the charges will be recovered in future years.

As stated above, SW has developed its commercial model to a level of detail necessary for its Gate 2 and Control Point B submissions. SW will continue to develop the commercial model and risk allocation as solution development progresses beyond these submissions.

2.11.2.7. Internal Approval of Procurement Approach

SW operates a defined governance process for the approval of the 'Strategy' stage of any procurement with a value over £250 k. The Strategy stage is the point at which the preferred procurement route, the process for tender evaluation and award, the supplier payment and contract management approach are all set-out.

Authority for approval of the Procurement Strategy is delegated dependant on the value of the procurement, the thresholds for delegated authority approval are set out in the Procurement Gates Approvals. All procurements valued over £5 m must be approved by both the Head of Procurement and the relevant Functional Director. Additionally, the Procurement Strategy for all Material CAPEX Agreements (such as the CAP agreement) valued over £25 m must be approved by SW's board.

SW is also working in conjunction with PW in respect of the proposed solution, and as such this submission is made jointly between both companies.

2.11.2.8. Commercial Arrangements

Outline contractual arrangements with the CAP

SW has considered those contractual arrangements which are essential to establishing the commercial model for the CAP. These are set out in Section 2.11.1.6 above.As the project develops, a broader range of contractual arrangements will be considered at a greater level of depth in preparation for the procurement process.

Key activities to develop commercial arrangements with the CAP

The commercial terms outlined in this document are at the principle level and SW will further document, test and validate the suggested delivery route as part of the Gate 3 submission and Control Point C. This will include:

- **Conducting further market engagement** - including but not limited to the issuance of non-call for competition notice released requesting suppliers (including contractors and finance providers) to express interest in pre-market engagement. SW will clarify objectives to potential bidders and describe the anticipated procurement process and contract structure to receive feedback. SW will use the market engagement to inform bidders about the regulatory framework underpinning the delivery of the solution and give them confidence in the process through the representation of RAPID at the market engagement.

- **Developing the detail of the commercial DPC arrangements** - including, but not limited to:
  - **Payment mechanism terms** – calibration of the operational incentives / penalties, review of the proposed financial gain share mechanism, establishing the approach to indexation and considering potential pass through items
  - **Approach to commissioning** – considering the benefits of a possible staged approach and potential revenue payment to CAP during the commissioning period
  - **Bid cost reimbursement** – considering whether bid cost reimbursement is necessary to drive interest, and if so, what would represent the optimal level of reimbursement that would drive competition in the bidding process while minimising costs to customers
  - **Collaboration** – looking at how ongoing improvement and efficiency can be achieved through the DPC model
  - **Termination and termination payments** – exploring monitoring requirements, minimum performance targets and required step-in rights, as well as the associated termination payments in various termination scenarios
  - **Acceptance and late service commencement** – Assessing the right level of liquidated damages; considering the role of the Independent Technical Advisor (ITA) and an independent certifier / verifier facilitating acceptance, commissioning, maintenance, solution handover and evaluating the efficacy of a bonus payment to facilitate / incentivise timely delivery
- **Refining the risk allocation** - Refining risk allocation to reflect the details of the commercial model focusing on the risks that will be shared between the CAP and SW, such as planning risk, ground conditions, sea and marine works, land access rights and ownership, interoperability, water quality risk, 3rd party providers, regulatory risk and change in law and force majeure events. Each of these risks will be assessed individually along with potential mitigants. Sharing arrangements will be calibrated based a tailored approach to ensure market interest for the tender process and a value for money outcome for customers. SW will explore which change control mechanisms are required for efficient risk sharing arrangements that provide adequate protection against price increases and thus safeguard the value to customers under the DPC model. Risk allocation will be informed by feedback collected from potential bidders as part of the market engagement exercise. As part of the risk allocation SW will consider the regulatory framework to ensure there is no misalignment between the CAP contract and SW's regulatory framework that could put customer value at risk.

Further activity to develop the procurement strategy

SW will also undertake the following activities to further develop and enhance its procurement strategy:

- **Continuing the VfM analysis -** SW will confirm the solution's suitability for DPC as part of Control Point C by revisiting the VfM analysis based on latest information on solution scope and cost information and considering other factors that may impact the value proposition under a DPC model.
  - SW will revisit Ofwat's standard VfM assumptions and will use the market engagement to set the key inputs in the VfM analysis to ensure the results are reflective of the nature of the solution and a possible future CAP tender outcome to the extent possible.
  - SW will develop and use a robust financial model bringing together key aspects of the solution delivery, such as cost profiles, maintenance regime, financings costs, depreciation profile, etc. to capture all key cost factors which may influence value for money under the DPC model. SW will also consider whether the solution is suitable for a DPC model in light of the current timeline. Specifically, SW will assess how the DPC model may impact the overall delivery schedule, SW's ability to meet its obligation under s.20 and what mitigation can be considered to address the risk of any delay.
- **Developing the evaluation framework** - Developing a detailed tender design and evaluation framework to be applied to bidders as part of the procurement. The SQ and ITT questions and evaluation guidance will need to be prepared in line with the objectives set for the procurement process as a whole as well as for the individual stages. A financial model will need to be developed capable of comparing the DPC 'Factual' case against the SW-delivered 'Counterfactual' for the purpose of carrying out the VfM assessment. As part of the tender design development key

considerations will include the level of technical detail / design expected as part of the bid submission, whether bidders will be required to provide fully committed financing, delivery plan, risk mitigants, etc. SW will also consider how collaboration can be applied throughout the tender process to mitigate procurement risk. As part of this work, SW will prepare a negotiation plan, outlining those commercial terms that are non-negotiable as well as the process for negotiating with bidders (and Ofwat[134]) throughout the tender process.

- **Refining the critical path** - Refining the implementation plan to reflect emerging views on the outline design and DCO processes. This will include consideration of the critical path under both DPC and non-DPC delivery routes, interdependencies across DCO, outline design, procurement, the trade-offs between various configurations of the overall process and input / output relationships between activities.
  - SW will identify key risks to the delivery timeline and establish possible mitigants to the keep the solution's schedule in line with SW's legal and regulatory obligations. SW will assess what activities could be brought forward and what ECI work could be delivered before DCO approval to accelerate the overall solution delivery. As part of this SW will investigate the opportunity to decouple specific activities from the scope of the DPC procurement and bring forward activities either through the appointment of an ECI contractor or by reimbursing costs to facilitate the CAP's mobilisation and progress with specific aspects of the design. SW will carefully examine how accelerating certain activities will impact on the CAP's ability to innovate and drive value to customers. The recommended approach will aim to balance the timeline constraints with retaining flexibility in the process for the CAP.
  - SW will continue to consider both DPC and in-house procurement options in the context of the project's critical path. SW will review its programme to determine at which point in time a switch from the DPC model to in-house delivery may delay the overall schedule and may put timely delivery of the solution at risk. Findings from the work on the implementation plan will be considered when establishing the solution's suitability for DPC.

In parallel to the validation of the suggested delivery route, SW's activities to secure key approvals as part of the pre-tender preparation and to prepare for the CAP tender must also continue. These will include, but are not limited to:

- Further development of SW's initial design to a level sufficient for the procurement and planning processes
- Procuring support for the DCO consultation and planning processes
- Obtaining DCO approval to facilitate the CAP's delivery of the solution. The procurement documentation and project agreement will need to reflect any conditions imposed as part of the granted DCO
- Completing the Control Points (A, B, C, D, E and F) in Ofwat's DPC process
- Procuring an Independent Technical Adviser (ITA) as per the requirement from Ofwat and SW's licence obligations

[134] SW notes Ofwat's requirement that it should be notified of changes agreed to during the procurement that materially impact customer charges. The nature of SW's engagement with Ofwat during the procurement process is yet to be determined.

3. Appendix A – Full Gantt Chart D.2 and B.4

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Option B.4 - Full Gantt Chart

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4. Appendix B – Critical Path Schedule D.2 and B.4

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

5. Appendix C – Future Opportunities

During our Gate 2 activities, we have had a rigorous focus on risk and opportunity. Where possible we have sought to include key opportunities within the optimised delivery schedule. We have identified a number of opportunities that have not been incorporated into our core schedules at this stage. This is generally because, at the current level of assessment, they would clash with a wider obligation of ours (such as optimising VfM for Customers) or we need to engage further with market providers to understand risk appetite. We will however be exploring these opportunities further within the next phase of activity and, where relevant, will form part of our next phase of market and specialist engagement to fully quantify the risk appetite and costs. These opportunities will be explored jointly with PW.

Table 138 below details an initial appraisal that has been completed for these opportunities. We will be seeking to quantify these further within the next stage of the project, ahead of RAPID Gate 3.

From reviews at this stage we consider that for opportunities 2,4 and 5 there may be a possible 6 months of viable opportunity. For Option 5 we are assessing the opportunities jointly with PW, depending on the outcome of the initial viability assessments expected end October 2021. Even if we are able to reduce the date until the commissioning, the project will still be unlikely to meet the target date due to the construction periods required for the HTR. These dates have been included in the schedule.

Table 138 – Initial appraisal of potential future opportunities

Opportunity No.	Opportunity Title	Opportunity Description	Approximate Time Saving	Opportunity cost	Reason not carried forward to main schedule at this stage	Gate activities where 3 opportunities will be explored
1	24 hr working	Contract is awarded based on an instruction for the CAP to undertake construction with extended hours. 24/7 – 4 workforces Rotating three shift pattern - Day (8-hr), Swing (8-hr), Night (8-hr).	20% of overall Desalination plant construction	C.110% CAPEX Increase (Calculation does not include higher labour rates for night-time or weekend working)	Significant concerns around: • Very high-cost impact for relatively low time benefit (poor VfM for Customers) • Ability to secure planning consent • Customer and stakeholder impact • Construction team welfare	• DPC Stage 3 development phase • DCO development and non-statutory engagement process
2	'Smart construction' Option	Contract is awarded based on an instruction for the CAP to undertake construction with extended hours. Double shift pattern – 10hr day shift and 5hr night shift (or 50% workforce capacity at night).	10% of overall Desalination plant construction	C.20% CAPEX Increase (Calculation does not include higher labour rates for night-time or weekend working)	Significant concerns around: • High-cost impact for relatively low time benefit (poor VfM for Customers) • Ability to secure planning consent • Customer and stakeholder impact	• DPC Stage 3 development phase • DCO development and non-statutory engagement process
3	No ground investigation required post contract	SW procure suppliers to undertake the necessary investigations to ensure that the successful CAP can price the risk and not need to undertake further GI post contract award.	TBC	£4 m Assumes; Both route corridors need to be proven Only one route per crossing (road, rail, water course). Likely multiple would be needed. Terrestrial site GI based	Concerns around: • Risk transfer for marine tunnelling operations • Market appetite and acceptability • Post contracts change potential • Lack of design clarity for Desalination Building limits GI scoping	• DPC Stage 3 development phase • Design development and survey activities

Opportunity No.	Opportunity Title	Opportunity Description	Approximate Time Saving	Opportunity cost	Reason not carried forward to main schedule at this stage	Gate activities where 3 opportunities will be explored
				on existing layout not multiple optionality.		
4	Conveyance pipe opportunities.	Building on Option 3, we would undertake the conveyancing pipeline design earlier in the delivery process, possibly in the later stages of the tender process	12 months float on Conveyance Pipework	Unquantifiable at this time	Concerns around: • Risk transfer for marine tunnelling operations • Market appetite and acceptability • Post contracts change potential • Requirement to purchase significant long lead items such as pipes or valves may limit schedule opportunity	• DPC Stage 3 development phase • Design development and survey activities
5	Earlier commissioning of the HTR	The HTR is commissioned earlier than that current date which is determined by the ODI target completion date meaning that commissioning water and transfer water is available sooner.	Under review -view is to save at least 6 months	Unquantifiable at this time	Concerns around: Opportunity assessment remains on-going, outcome expected Nov 2021. Scope and risk for each of the 6 early delivery opportunities need to be quantified following review with PW.	• Initial opportunities to be explored during Gate 3