RAPID Gate Three Strategic Resource Option – Hampshire Water Transfer and Water Recycling Project

Supporting Annex 1B: Non-Priority Actions and Recommendations from Gate Two Final Decision

July 2024

Note: All priority actions relating to Hampshire Water Transfer Water Recycling Project (HWTWRP) (previously Option B.4) identified at Gate Two Final Decision have been discussed and resolved with RAPID at checkpoint meetings during Gate Three which was confirmed at the interim update in May 2023 (see Annex 8C: Interim Update).

2. Solution Design

Content Requirements	Source	Response
Provide evidence of the solution representing the best option from a regional perspective and benefits it delivers for the region. Detail the degree of alignment between Southern Water, Portsmouth Water and WRSE decision making.	Recommendation	The WRSE investment model has been developed collaboratively between all member water companies to determine water resource need and deficits across the South East region, incorporating all Southern Water (SW) and Portsmouth Water (PW) water resource zones (WRZ) in Hampshire. The common WRSE methodologies have been applied by PW, SW and other WRSE companies to prepare input data for the WRSE investment model (including baseline DO and option DO). This includes the best value planning methodologies as discussed in Chapter 8: Solution Costs and benefits, to ensure that a broader consideration of value is captured when solution options are selected. The WRSE investment model outputs have been used to populate SW and PW WRMP24 planning tables, providing a regionally coherent understanding of baseline deficits and the need for schemes such as Havant Thicket Reservoir (HTR) and the HWTWRP. The WRMP24 planning tables will replace the WRMP19 planning tables. PW is currently awaiting confirmation from DEFRA as to whether its WRMP24 updates can be published. SW is finalising its WRMP24 tables. The water companies are working together on presenting an aligned picture. The WRSE group will continue to work together to maintain the high level of integration across company WRMP24s, and due to the later publication date of SW revised draft WRMP24, if updates are required to PW 's revised draft WRMP24, they will be made through the WRMP annual review process.
Provide further clarification around the interactions with Portsmouth Water's operating strategy and their water needs to ensure that the proposed operation of Havant Thicket will provide the sufficiency and 1:500 resilience required by the solution.	Non-priority	SW is the beneficiary of the water arising from the HWTWRP, as included as a primary option in WRMP24. A vital component of the scheme is HTR, which will be owned and operated by partners PW. The HWTWRP is an acknowledged scheme in PW's revised draft WRMP, but they derive no direct benefits from it. The combined Pywr model for SW's Western Area WRZ and PW's supply area has been developed to provide a more granular view of the water supply area, reflecting more detail in the network and updating known river and groundwater constraints. The aim of this exercise was to understand how HTR would provide conjunctive-use benefit with the HWTWRP, at key time horizons in the network development (2030s, 2040s and 2050s). The results of the modelling have been used to inform the WRSE investment model, which in turn has been used to update the revised draft Regional Plan and SW's and PW's revised draft WRMP24s. The use of refined datasets and assumptions by companies means that transfers between companies can be more appropriately considered.
Provide detailed evidence of how the solution will be able to meet the	Non-priority	Since Gate Two, both WRSE Regional Model and Pywr model have been updated to ensure that the solution can meet a 1-in-500-year drought scenario. This information is provided and discussed in Chapter 2: Solution Design.

<table>
<tr><td>1 in 500 year drought resilience and which upstream inputs will be used.</td><td></td><td></td></tr>
<tr><td>Conduct updated reassessment and refining utilisation assumptions up to 1 in 500 drought resilience for Gate Three using regional modelling outputs.</td><td>Non-priority</td><td>
The latest WRSE regional model run has been updated with the latest supply and demand forecasts, as well the climate projections for the region which includes the consideration of a 1-in-500-year drought event.
To validate the need for the HWTWRP, the solution was modelled in Pywr at three key time intervals, 2038, 2042 and 2051, which were selected on the basis of significant investment changes in the region, such as T2ST coming forward, and used the preferred scenario supply deficit with a 1-in-500-year drought event from 2040. These time intervals reflect scenarios prior to the completion of the T2ST scheme and after its completion.
These Pywr models were solved selecting the HWTWRP under the specific interval conditions, demonstrating the need for the HWTWRP under the specified drought requirements. Furthermore, the model utilised a stochastic time series to derive the hypothetical scenarios of population growth, climate change and environmental destination. This approach uses conservative estimates of the impacts of all factors in question, building additional resilience and providing confidence to the selection of these solutions.
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<tr><td>Undertake Sensitivity analysis to understand how costs increase or decrease when different future scenarios of the solution are considered.</td><td>Non-priority</td><td>
Sensitivity analysis to understand how costs increase or decrease when different future scenarios was undertaken within the WRSE investment model (IVM). The IVM considers costs, along with other metrics, for 9 different future planning situations, as described in Chapter 2: Solution Design. Table 2-1 and Table 2-2 give the total regional cost for each situation for different drivers and the typical cost breakdown for the Social Time Preference Rate (STPR) with Situation 4 being the agreed reported pathway. This information will be provided with the upcoming revised draft WRMP24.
Table 2-1 - Total regional cost for each planning situation.
<table>
<tr><th>NPV (Cost £m)</th><th colspan="9">Planning situation</th></tr>
<tr><td>Metric</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td></tr>
<tr><td>Cost w/ deficit (STPR)</td><td>20,851</td><td>18,147</td><td>17,427</td><td>19,516</td><td>17,994</td><td>17,199</td><td>18,396</td><td>17,484</td><td>16,796</td></tr>
<tr><td>Cost w/o deficit (STPR)</td><td>20,851</td><td>18,147</td><td>17,427</td><td>19,516</td><td>17,994</td><td>17,199</td><td>18,396</td><td>17,484</td><td>16,796</td></tr>
<tr><td>Cost w/ deficit (IGEQ)</td><td>31,746</td><td>26,621</td><td>25,341</td><td>29,206</td><td>26,363</td><td>24,949</td><td>27,188</td><td>25,485</td><td>24,192</td></tr>
<tr><td>Cost w/o deficit (IGEQ)</td><td>31,746</td><td>26,621</td><td>25,341</td><td>29,206</td><td>26,363</td><td>24,949</td><td>27,188</td><td>25,485</td><td>24,192</td></tr>
<tr><td>Cost w/ deficit (LTDR)</td><td>22,962</td><td>19,816</td><td>19,991</td><td>21,408</td><td>19,643</td><td>18,733</td><td>20,122</td><td>19,063</td><td>18,242</td></tr>
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Table 2-2 – Total cost breakdown for each planning situation.
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<tr><th>Cost breakdown (£m)</th><th colspan="9">Planning situation</th></tr>
<tr><td>Metric</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td></tr>
<tr><td>Capex</td><td>2,997</td><td>2,315</td><td>1,963</td><td>2,766</td><td>2,246</td><td>1,857</td><td>2,370</td><td>2,125</td><td>1,736</td></tr>
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<tr><td>Fixed Opex</td><td>3,002</td><td>2,917</td><td>2,868</td><td>2,981</td><td>2,912</td><td>2,860</td><td>2,918</td><td>2,886</td><td>2,831</td></tr>
<tr><td>Fixed Operational Carbon</td><td>472</td><td>472</td><td>472</td><td>472</td><td>472</td><td>472</td><td>472</td><td>472</td><td>472</td></tr>
<tr><td>Embedded Carbon</td><td>202</td><td>151</td><td>131</td><td>184</td><td>144</td><td>122</td><td>159</td><td>139</td><td>118</td></tr>
<tr><td>Variable Opex</td><td>676</td><td>404</td><td>237</td><td>620</td><td>400</td><td>224</td><td>524</td><td>325</td><td>196</td></tr>
<tr><td>Variable Carbon Opex</td><td>48</td><td>25</td><td>12</td><td>43</td><td>24</td><td>11</td><td>34</td><td>18</td><td>9</td></tr>
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<td>SWS to demonstrate operability and the (required) design of the inlet/outlet pipework for Havant Thicket Raw Water Transfer at Gate Three to inform and confirm the overall design of the storage reservoir.
- Should be evidenced by a suitable methodology (e.g., CFD modelling or equivalent).</td>
<td>Non-priority</td>
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Three-dimensional CFD modelling of HTR has been completed using the commercial software MIKE 3 Flow Model FM Hydrodynamic module (release 2022) developed by the Danish Hydraulics Institute (DHI). The Hydrodynamic module is based on the numerical solution of the three-dimensional incompressible Reynolds averaged Navier-Stokes equations invoking the assumptions of Boussinesq.
The CFD study of a portion of the reservoir was proposed to assess the hydrodynamics of the inflows from the Water Recycling Plant (WRP) and the mixing of this recycled water into the reservoir, specifically to inform the orientation of the inlet arrangement. At the time this modelling was undertaken the WRP was still sized at 15 Ml/d, and as such the three scenarios assessed were reflective of this:

Scenario 1: normal operating conditions – reservoir at top water level (TWL, 39.50 m AOD), 15.4 m deep, inflow of 7.5 Ml/d (recycling plant sweetening flow) from a vertical inlet, outflow of 7.5 Ml/d, and an average water temperature (reservoir at 12.5°C and inflow at 16.0°C);
Scenario 2A: drought conditions – reservoir at minimum draw-off level (29.00 m AOD), 4.9 m deep, inflow of 15 Ml/d from a vertical inlet, outflow of 115 Ml/d, and a water temperature typical for summer (reservoir at 22.5°C and inflow at 21.8°C);
Scenario 2B: drought condition with the inlet pointing horizontally (i.e., without the vertical bend).; and
The modelling was carried out in two steps: the first simulation solved the governing equations in a transient manner until steady state was reached in the entire domain, while the second simulation solved the full propagation of a scalar (neutral tracer) injected at the inlet to assess its blending.

Initial tests were carried out to define the appropriate size of the reservoir’s portion to be assessed, which was extended until regions where the velocity gradients were insignificant and scalar concentration was sufficiently low (<10%). The model scenarios 1 and 2A consisted of a single mesh block with the vertical inlet at the centre, sides of 80m by 80m and higher than water depth, while for scenario 2B the dimensions were changed to 100m by 60m to better capture the spread of the horizontal inlet jet (Figure 2-1).
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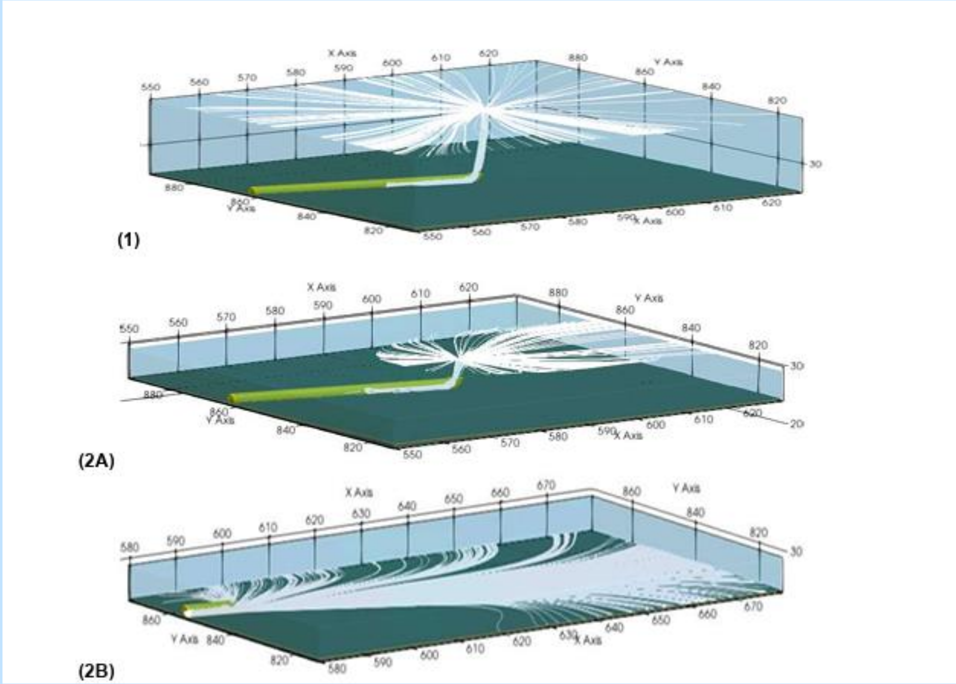
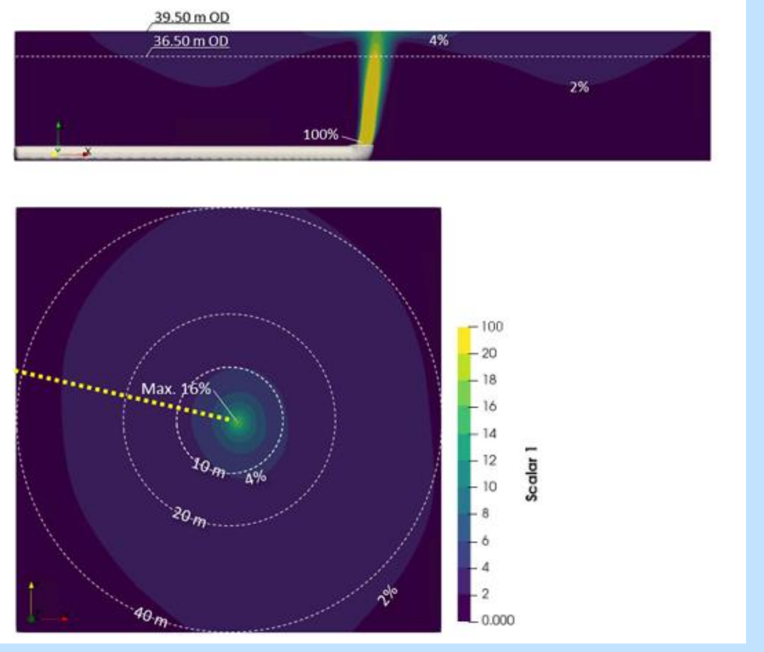
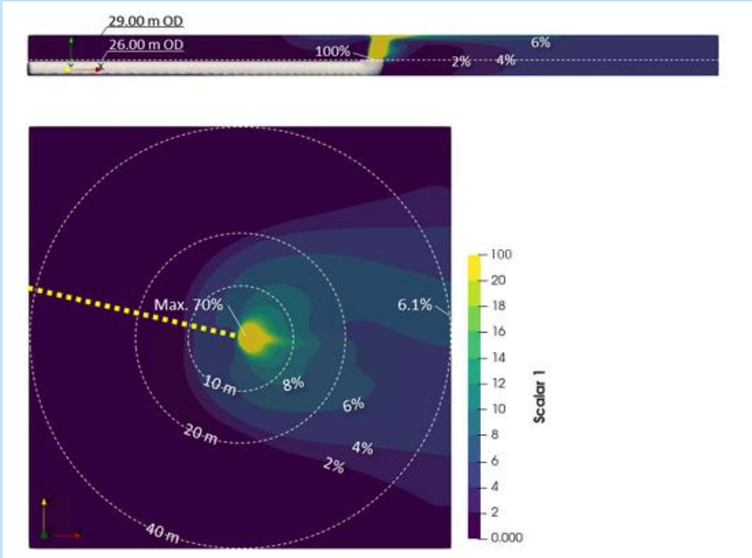
- 

Figure 2-1 - Streamlines in Scenarios 1, 2A and 2B (isometric view)

In the normal operating conditions scenario of Scenario 1 (Figure 2-2), the 7.5 Ml/d discharge from the vertical inlet caused a straight het that reached the water surface with reduced velocities (<0.07m/s) and a scalar concentration of 16% of the inlet concentration. The flow spread to all directions at the top layer and the blending caused the concentration to drop to 4.5% at 10m away and to approximately 2% at 40m away. The scalars took approximately 2.8 hours to start exiting the domain.

In the drought conditions of scenario 2A (Figure 2-3), the 15 Ml/d discharge from vertical inlet (scenario 2A) produced a jet that reached the shallow water surface with higher velocities (<0.18m/s) and a scalar concentration of 70%. The blending also happened within the lower layers and the concentration dropped to 12% at 10m away and to near 6% at 40m away. The scalars took approximately1.4 hours to start exiting the domain.

		•  *Figure 2-2 - Scalar concentration at vertical section longitudinal to the pipe (top) and horizontal section at water level (39.5m) (bottom) in scenario 1.* The horizontal inlet alternative of scenario 2B was successful in eliminating the 70% concentration hotspot in the drought condition, as the jet spread mostly at the bottom of the reservoir. The vertical dispersion of the scalars from the bottom up, however, resulted in maximum concentrations between 8% and 9% at the top layer farther away from the inlet. The scalars took approximately 1.7 hours to start exiting the domain.

		 *Figure 2-3 - Scalar concentration at vertical section longitudinal to the pipe (top) and horizontal section at water level (29.0mOD) (bottom) in scenario 2A.*
Portsmouth modelling: Demonstrate operability and the (required) design of the inlet/outlet pipework for Havant Thicket Raw Water Transfer at Gate Three to inform and confirm the overall design of the storage reservoir. - Should be evidenced by a suitable methodology (e.g., CFD modelling or equivalent).	Non-priority	Following the agreement with PW to pursue the preferred tunnel option alignment works it was agreed to collaboratively undertake the water quality modelling. Due to the previous CFD modelling on the discharge arrangement orientation being undertaken with the 7.5 - 15 Ml/d WRP DO range and the change to a comingled inlet discharge, it was determined that the conclusion of the previous modelling needed to be tested. PW commissioned analysis of comingled inflow temperature estimates and simulated bottom reservoir water temperatures to confirm the location and orientation of the inlet pipework identified in the previous CFD modelling exercise was still relevant. As part of this modelling the increase flow range from the WRP of 10 - 60 Ml/d was used. The conclusion of the additional modelling identified a horizontal orientation of the outlet as the recommended solution based on this analysis of comingled inflow temperature estimates and simulated bottom reservoir water temperatures (with and without bubble plume destratification operations). It is recommended that the vertical placement of the outlet be a sufficient distance above the sediments (~1-2 m) to not cause local scouring.
Provide explanation and rationale for the triggers to utilisation of the	Non-priority	The pipeline from HTR to Otterbourne WSW has a ‘sweetening’ flow of 20 Ml/d to ensure the assets remain operational. The WRP will need to match this sweetening flow unless there are flows available from BHS or the reservoir is within the

solution. Assess the impact on Havant Thicket reservoir storage levels in a 1 in 200 year drought of potential abstraction changes in PW's Farlington demand zone.		top operational band, in these situations the WRP will “turned down” to a minimum flow of 10 Ml/d. The WRP has a minimum flow requirement of 10 Ml/d to ensure the process remains operational. Beyond this, utilisation of the transfer to Otterbourne WSW is the greatest up to 90 Ml/d and this is primarily driven by SW’s environmental destination. The WRP utilisation increases to 60 Ml/d in most years for the reported pathway (Situation 4) to sustain the reservoir storage levels. The model results that are presented for 2042 and 2051 highlight this demand from the WRP and, although the model aims to utilise the transfer based on the level of the storage reservoir, this operates at a maximum capacity consistently to align with the WRSE BVP results. The spring flow transfer to support the filling of HTR is triggered in the model for winter months when more water is available, after first supporting PW’s WRZ. After a severe (1-in-200-year) or extreme (1-in-500-year) drought the transfer from BHS to HRT is again triggered to aid recovery, but only after PW’s need has been met. The DO from the WRP (excluding conjunctive use benefits from HTR) has been determined across various adaptive planning ‘Situations’ and drought scenarios (see Figure 2-4)

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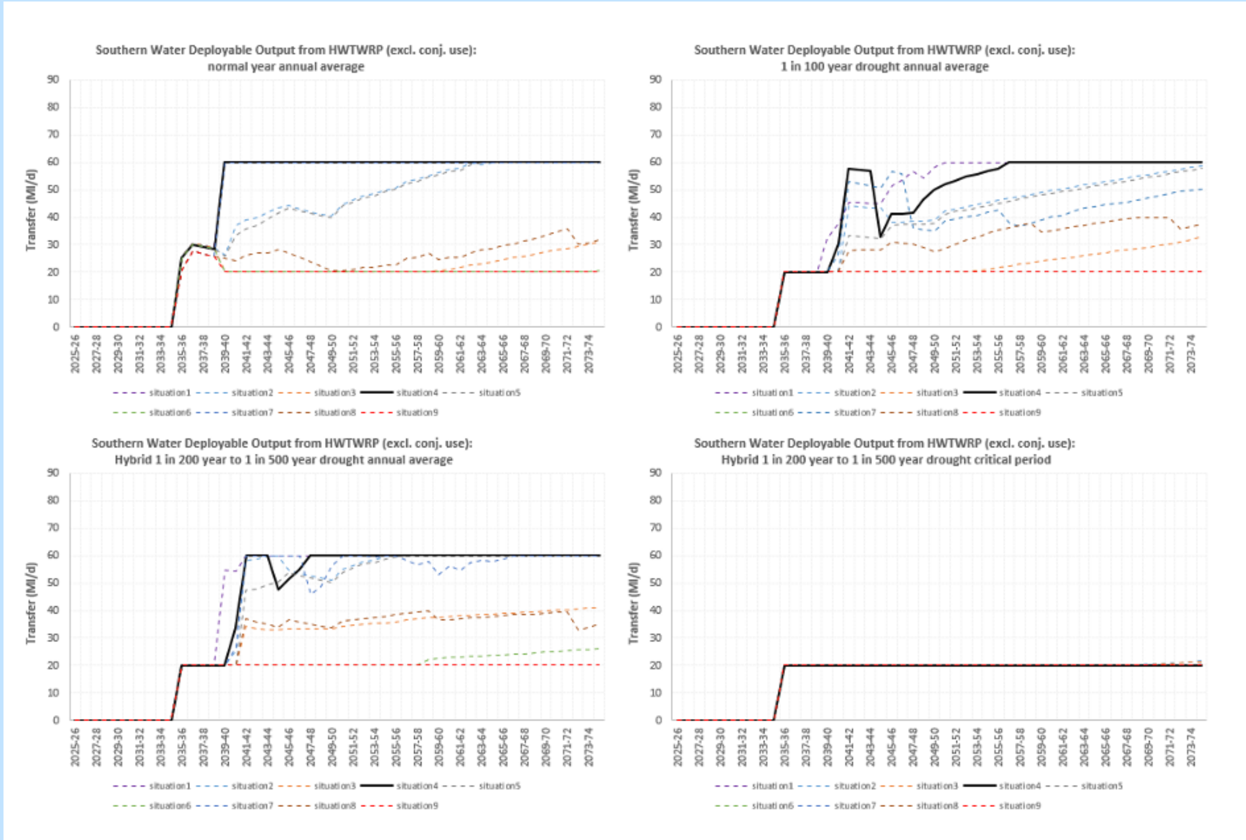

Figure 2-4 - SW deployable output linked to the HWTWRP, excluding conjunctive use benefits[1].

During operation the increase in transfer from HTR will be driven by network demand from Otterbourne WSW with a corresponding reduction on abstraction from the existing ground and surface water sources. Following a demand from Otterbourne WSW the overall system operator will assess whether the WRP will need to be “ramped up” to balance increase in abstraction from HTR, whether supplementary flows are available from BHS or whether capacity within HTR will be utilised. It is expected that the following hierarchy will be followed to balance storage capacity against OPEX and carbon cost when additional flows are called for at Otterbourne; BHS flows, WRP flows, reservoir capacity.
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<tr>
<td>Provide costs in the All Company Working Group template.</td>
<td>Non-priority</td>
<td>Costs have been provided as part of Chapter 8: Solution Costs and Benefits in the All Company Working Group template.</td>
</tr>
</table>

Solution scalability, and how it meets a needs envelope of 75 to 95 Ml/d (Annex 13 section 3.1.2) has been accounted for within initial regional modelling.	Non-priority	Gate Two, Annex 12, considered the key elements impacting the supply demand balance, which had the needs envelop of 75 – 95 Ml/d, along with the Additional Regional Needs of an extreme drought, Portsmouth Water's needs and future environmental destination and reviewed the modelled supply demand balance. The Future Need Statement concluded: "It is therefore proposed that the evolved SROs should be capable of producing 90 Ml/d of raw water to meet a future need of 87 Ml/d. It would therefore be capable of satisfying the Future Need as stated by SW modelling, as well as aligning to WRSE draft results, to a 2040 horizon." The max capacity of the HWTWRP is a 90 Ml/d transfer to Otterbourne WSW and this aligns with the current WRSE modelling.
Collaboration proposition for Gate Three, Southern Water should work with Portsmouth Water to understand and update any changes to need and possible deficits following the modelling and revision to Portsmouth's WRMP19 planning tables.	Recommendation	The combined Pywr model for the SW Western Area WRZ and PW's supply area (which is a single WRZ) has been developed to provide a more granular view of the water supply area, reflecting more detail in the network and updating known river and groundwater constraints for the upcoming revised draft WRMP24. The results of the modelling have been used to inform the WRSE investment model, which in turn has been used to update the need in the revised draft regional plan, for the HWTWRP, and in SW's and PW's revised draft WRMP24s. The use of the model has also confirmed there are no deficits in this area for the proposed Situation 4 scenario. More detail on this can be found in Annex 2: Solution Design.
Conduct reassessment and refining conjunctive use assumptions for Gate Three using regional modelling outputs.	Recommendation	The regional modelling cannot assess or refine the conjunctive use for the HWTWRP, however this can be done within the Pywr joint model with PW and was the initial reason for this modelling exercise. This activity was completed in February 2023 and fed into the WRSE modelling to support the WRSE revised draft regional plan, August 2023. SW is continuing to work with WRSE and PW to ensure close model alignment between the WRSE regional system simulation model and the solution modelling used by SW. This is outlined further in Annex 2: Solution Design.

[1] Portsmouth Water Revised Draft WRMP24 Appendix 1C: Southern Water and Portsmouth Water Common Understanding

3. Drinking Water Quality

Content Requirements	Source	Response
Undertake effluent sampling to understand nature of the effluent throughout the year to confirm suitability of WRP which takes effluent from Budds Farm. Include details of chosen pre-disinfection design for Otterbourne WSW as required by the DWI Notice . Note this is a statutory requirement as opposed to a 'target date' as referenced in 2.2.6 Page 43 of Technical Document.	Gate Two Non-Priority	Following a year-long pilot trial at Otterbourne Water WSW and discussions about ceramic membranes with other UK water companies, it has been concluded that ceramic membranes will provide an appropriate pre-disinfection treatment solution for both the groundwater and River Itchen sources at Otterbourne WSW. An assessment of the reservoir modelled water quality parameters (from GHD's output) will be carried out prior to finalising the design of the ceramic membrane plant. There are number of ongoing legal instruments (final enforcement orders) with specific deadlines at Otterbourne WSW. Further information on the progress of the design and construction of the proposed pre-disinfection process, will be provided to the DWI in line with these enforcement requirements. As set out above, to ensure resilience of supply during drought conditions, the WRP will supplement flows to HTR. Further confidence in HTRs full capability is to be assessed using the findings of the HTR modelling exercise being conducted by GHD. This is using data from the water recycling pilot plant study and BHS and will be completed prior to Gate Four. PW and SW will assess the potential quality of the new 'blended' source water to meet the requirements of a well-developed drinking water safety plan. This will be used to evaluate the proposal for a new pre-disinfection process at Otterbourne WSW and assess the impacts, if any, on Farlington WSW owned and operated by PW.
Demonstrate equivalence between the final effluent at Peel Common WTW and Budds Farm WTW in order to confirm suitability of the WRP that treats final effluent from Budds Farm prior to blending with water in Havant Thicket reservoir.		This was identified as a priority action at Gate Two and has since been resolved as agreed with RAPID and the DWI April 2022.

4. Environmental

Content Requirements	Source	Response
Monitor and collect data to further support the conclusions drawn in the HRA and SEA process as to date many conclusions are not supported with relevant data and evidence.	Gate Two Non-Priority	Since Gate Two, a comprehensive suite of environmental surveys has commenced (as set out in Annex 6: Programme and Planning) and detailed assessments are underway. Environmental Technical Working Groups (TWGs) and EIA Working Groups have been established to facilitate engagement on all environmental aspects of the scheme, including on the scope and outcomes of the project-level HRA. The environmental assessments supporting Gate Two were undertaken at a strategic level and were used to support and inform site selection and options appraisal process for all options presented at Gate Two. The principles of HRA were applied to support option selection, recognising that full assessments were required for the project-level DCO application. A number of data gaps were identified at Gate Two, namely around baseline surveys, detailed assessments and modelling (e.g. a hydrogeological impact assessment, dispersion modelling etc) and it was identified that further engagement was required with NE. Furthermore, it was recognised that the HRA would need to reflect the evolving design of the HWTWRP, which was not fixed at Gate Two. The outcomes of the assessments and surveys completed to date will be presented within the PEIR submitted as part of the Statutory Consultation in summer 2024. Key milestones are detailed within Chapter: 6 Programme and Planning. The Strategic Environmental Assessment (SEA) was undertaken at an early stage in the development of the HWTWRP, prior to a detailed survey programme and progression of scheme development/outline design. The project-level EIA and survey programme will be used to ensure that conclusions around environmental effects are supported by a robust evidence base.
Conduct reassessment of the temporary and permanent habitat loss currently stated for Biodiversity Net Gain and Natural Capital Assessments.	Gate Two Non-Priority	Since Gate Two, Phase 1 Habitat Surveys, National Vegetation Classification Surveys and UK Habitat Classification surveys have been undertaken across the route of the HWTWRP. These have guided the scheme development process and will be used to provide an accurate assessment of the baseline Biodiversity Units . The reassessment of the temporary and permanent habitat loss presented at Gate Two has been undertaken based on the EIA Scoping Area . This will be updated and refined following Statutory Consultation, which will consider changes to the HWTWRP made in response to consultation feedback.
Establish risk that during operation of WRP substances usually present with the WTW final effluent may become more concentrated and exceed EQS for Eastney discharge.	Gate Two Non-Priority	The multi-barrier treatment process at the water WRP will remove contaminants using a combination of separation processes (through the use of an integrated membrane system), producing a concentrated reject flow, and destructive processes (using ultra violet light applied at a high fluence in combination with an advanced oxidation process using hydrogen peroxide) decomposing any remaining contaminants into non-hazardous products. The separation processes at the WRP are microfiltration/ultrafiltration (MF/UF), reverse osmosis (RO), and granular activated carbon (GAC) adsorption. GAC adsorption is a polishing process and most of the contaminants removed by this

		process will be retained by the GAC and will therefore not be discharged to the marine environment. The MF/UF and RO processes each produce a liquid waste stream during normal operation, with MF/UF reject containing elevated suspended solids concentrations, and the RO reject containing dissolved substances removed and concentrated by the process. The process reject from the WRP shall be returned to Budds Farm WTW to be blended with the unused final effluent for subsequent discharge along the Eastney Long Sea Outfall (LSO). The contaminant load removed by the WRP originated in the Budds Farm WTW final effluent, and the WRP will concentrate this load into a smaller volume for discharge to the Solent. There is a risk that the increased concentration in the new combined discharge will exceed an established Environmental Quality Standard (EQS). To address this risk, SW is currently conducting sampling for the complete list of substances with an EQS defined by legislation, policy and guidance in England. The sampling data shall be assessed using the EA's H1 assessment methodology, as defined by Operational Instruction LIT 13134, to identify which substances could represent a significant risk of marine pollution. The findings of the H1 assessment shall identify which substances should be included for further investigation by dispersion modelling. The results of the H1 assessment and subsequent investigatory actions shall be reported to the EA for discussion during subsequent permit discussions. A draft position statement was issued to the EA on the 29th of August 2023 and a written response from the EA has not yet been received. This position statement detailed the findings of SW's preliminary H1 assessment, using the sampling data collected up to that point, capturing a portion of the EQS substances. The next iteration of the position statement shall be issued when a minimum of 12 samples have been collected (this is the minimum requirement specified in the EA guidance) and analysed for each EQS substance to a limit of detection sufficient to undertake the H1 assessment. It should be noted that various treatment chemicals will be employed across the WRP, both for conditioning of water undergoing treatment, and during cleaning operations. These chemicals will be the source of any additional contaminant load present in the WRP discharge. This additional loading will include alkalinity, hardness, biochemical oxygen demand (BOD), chemical oxygen demand (COD), total organic carbon (TOC), organic nitrogen, organic phosphorous, sodium, chloride, and sulphate. These contaminant loads have been evaluated in the mass balance produced as part of the WRP design and will be considered as part of the H1 assessment and modelling.
Outline detailed assessment of potential ecological impacts of proposed pipeline route options.	Gate Two Non-Priority	As part of the EIA process, ecological surveys undertaken across the HWTWRP pipeline corridor have informed the scheme development process in terms of avoiding sensitive habitats and species where possible. The PEIR submitted at Statutory Consultation will include chapters on Terrestrial, Freshwater and Marine Biodiversity, report on baseline conditions (including results of available surveys), a preliminary assessment of likely significant effects and emerging proposals for mitigation.
Mapping linked to the Local Nature Recovery Strategy and Biodiversity Opportunity Area's (BOA's) should be used to identify opportunities for net gain.	Gate Two Non-Priority	This will be considered as part of the Biodiversity Net Gain Assessment submitted as part of the Environmental Statement and DCO submission.
Conduct assessment of the vulnerability of the solution to disruption of supply from incidents that may affect groundwater quality.	Gate Two Recommendation	PW has catchment risk assessments and treatment processes in place to deal with any hazards that are expected to be encountered at BHS, as the groundwater sources for HTR are already a key source of PW's BAU water supply. PW have instrumentation to shut-down pumping or raise an alarm if certain WQ parameters, that can be measured by online instrumentation, are not met.

Extend factoring in trenchless construction at watercourse crossings beyond the Main River to include ordinary watercourses and other environmentally-sensitive areas.	Gate Two Recommendation	Crossing sensitivity analysis has been undertaken for each crossing type, including ordinary water courses and other environmentally sensitive areas, to determine if mitigation such as working width reduction or trenchless crossing are appropriate to minimise/avoid impacts of watercourses and the surrounding environment. This analysis has sought to avoid impact in the first place through the use of the scheme development avoidance criteria. The approach to crossing sensitivity and avoidance is discussed in more detail in Annex 2: Solution Design.
Evaluate the potential benefits of cooperating with the catchment partnership's Test & Itchen INNS assessment.	Gate Two Recommendation	The EIA includes the assessment of INNS as part of the Terrestrial Biodiversity chapter. Data collected as part of the Catchment Partnership's Test and Itchen INNS Assessment will be requested from the Environment Agency and Wessex Rivers Trust and used where available and applicable. This data will benefit the HWTWRP by providing additional data to inform the INNS assessment and mitigation proposals. Opportunities for data sharing and collaboration with the Test and Itchen Catchment Partnership will be explored, which may enhance their understanding and management of INNS within the River Itchen catchment.
Outline the benefits that will be delivered from the renewable energy opportunities identified in respect of emission reductions, timings and costs. Provide further details of how you will seek to influence decarbonisation of supply chain emissions.	Gate Two Recommendation	The HWTWRP is currently developing a renewables strategy to achieve optimal decarbonisation of power demand. Due to the stage of design development (particularly in regard to the energy demand of the water recycling plant, which will be a significant driver of power demand), quantified analysis has not yet been undertaken. Over the next design phase, the team will be: • Finalising the scale of power demand and demand profile of the transfer and water recycling plant elements at different utilisation rates; • Conducting an assessment of scale of renewable generation required to meet this demand and identifying optimal sizing etc.; • Going through a screening exercise to identify feasible renewable generation options (e.g., considering cost, land availability, planning constraints etc.); and • Finalising a renewables strategy following this screening exercise It is important to note that this strategy will focus on being location-based in its decarbonisation efforts, i.e., aiming to procure power from a renewable energy source in close proximity to the scheme.

6. Programme and Planning

Content Requirements	Source	Responses
Conduct assessment of the relative ratios of spring water and recycled water of the output from Havant Thicket Reservoir under a range of scenarios e.g. two successive dry winters.	Gate Two Non-Priority –	An assessment is being completed using both Pywr (as discussed in Chapter 2: Solution Design) and more granular reservoir modelling to understand the changing ratios over the life of the asset. The outputs of this modelling will then be used to understand the different water quality (WQ) matrices and whether there is any identified impact. The next Pywr model run is forecast to be completed by March 2024, focussed on the operation of the reservoir and its relationship with the WRP and PW's BHS Source. WQ modelling Assessments are currently being conducted under a range of scenarios. These will determine the relative ratios of spring water and recycled water that HTR will output. These assessments are based on the following scenarios: • Baseline scenario – 15-year. duration covering the fill phase of the reservoir, classic operation (as per the approved PW TCPA) and the HWTWRP phase; • Operational variation – 3-year durations covering different operational strategies for the HWTWRP phase; and • Drought scenario – for a 1-in-500-year drought including the circa 2-year dry winters proceeding a drought where the spring source is unavailable and the recovery of the reservoir post drought. These assessments will continue into Q2 2024 and preliminary findings will be qualitatively assessed as part of the PEIR. The PEIR will be consulted on as part of the forthcoming Statutory Consultation. Thereafter, a full Environmental Statement will be prepared to support the DCO application. This timing of this information and availability of outputs will be communicated to RAPID through checkpoint meetings. Further assessments are planned to follow the availability of outputs from the Pywr modelling.
Outline constraints on timing of construction activities to protect fisheries and ornithological interests, and how they extend the timescale for delivery of the solution.	Gate Two Non-Priority	To avoid impact to bird nesting season, hedgerow removal will commence prior to the nesting season. All main river crossings will be trenchless and at a suitable/appropriate depth to avoid or mitigate potential impacts to fisheries. The EA has been engaged and consulted on regarding the proposed approach to construction at river crossings and the associated risks. Further information as to the approach and management of risk and the considerations made with respect to the environment as discussed in Chapter 2: Solution Design and Chapter 4: Environmental.
Further details required on land and planning strategy: • Land lifecycle • Strategy for effective delivery • Explanation of how the approach will support the effective and efficient delivery of achieving planning consent,	Gate Two Recommendation	The additional detail on the approach to land and planning strategy are set out in Chapter: 6 Programme and Planning, covering all the key areas as requested.

land acquisition and delivery of the solution. • Consideration given to the necessary systems, resources, processes, and governance required to the deliver this key area of work as well as how a good customer journey for all those effected by the delivery of the solution will be ensured.		

8. Solution Cost and Benefits

Content Requirements	Source	Responses
Provide sensitivity analysis to understand how costs increase or decrease when different future scenarios of the solution are considered.	Gate Two Recommendation	This is covered within the WRSE revised draft Regional Plan and will be covered in the upcoming revised draft WRMP24 modelling to determine the preferred solution variables.

9. Stakeholder and Customer Engagement

Content Requirements	Source	Responses
Prior to Gate Three we will require Southern Water, as a minimum, to have completed all statutory consultation required at pre-application phase for Hampshire Water Transfer, as required by the planning process.	Gate Two Non-Priority	This has been superseded by RAPID Gate Three Version 1 guidance (August 2022) and unchanged in RAPID Gate Three Version 3 guidance (January 2024). Please see Chapter 6: Programme and Planning for all DCO pre-application activities and progress.

10. Board Statement and Assurance

Content Requirements	Source	Responses
Southern Water must ensure that its Board provides effective oversight of its obligations under the section 20 agreement and that one or more solutions are in place and operating by the end of 2030. We expect Board assurance for Gate Three to include a statement that the Board is satisfied that progress on solutions is commensurate with solutions being in place and operating by the end of 2030.	Gate Two Non-Priority	During Gate Three, following with engagement with RAPID, the EA and Board members at SW, it has been confirmed that 2030 is not viable as an "operational ready" date for the HWTWRP. The upcoming revised draft WRMP24 has identified dates for the SRO which have been signed off by the SW Board, inclusive of the Section 20 requirements. For Gate Three SW's Board has signed off the "operational ready" date for the HWTWRP for March 2034.
Consider changes to assurance processes to ensure that shortfalls in the quality of the work are avoided at Gate Three.	Gate Two Non-Priority	The assurance processes have been revised since Gate Two, to ensure additional time for assurance to be included within the schedule for review and feedback of the Gate Three submission. Lessons learnt from the Gate Two Final Decision and submission process have been incorporated. Further information can be found in Chapter 10: Board Statement and Assurance.
Ensure that where external assurance identifies issues with the work it has undertaken that it addresses these issues and/or provides a response to these issues.	Gate Two Non-Priority	Assurances have been revised to allow sufficient time to address issues identified by Jacobs (independent external assurance). SMEs from PW and SW have provided response to the issues and recommendations identified, for inclusion in the final submission. See Jacobs final report, Annex 10: Board Statement and Assurance for further detail.