Strategic Solution Interim Update
Options Appraisal Process

27 September 2021

from Southern Water

Contents

Please refer to Strategic Solution Interim Update Submission Summary Appendix 1 - Submission Navigation and Glossary for the glossary of terms, definitions and abbreviations for this document.

1 Executive Summary

Southern Water (SW) has entered into an agreement with the Environment Agency (EA) under Section 20 (S20) of the Water Resources Act 1991 under which it is obliged to use all best endeavours to implement the Preferred Strategy (Formerly 'Strategy A') published in Water Resources Management Plan 2019 (WRMP19). The Preferred Strategy included a 75 Ml/d desalination plant at Fawley, and this is referred to as the Base Case for the purposes of this submission.

In addition, Ofwat requested in Price Review 2019 (PR19): Final Determinations that SW also considered a number of alternative solutions to the Base Case. The alternative solutions act as Back-Up Options in case the Base Case cannot be delivered. In addition, the consideration of alternatives is required to support assessments for regulatory requirements and consenting, such as Strategic Environmental Assessment (SEA), Habitats Regulation Assessments (HRA) and Water Framework Directive Assessment (WFDA), and Environmental Impact Assessment (EIA).

SW presented the Base Case and eight alternative Options in its Gate 1 Submission. The Options under consideration following Gate 1 were:

- **Option A.1 (Base Case)** – 75 Ml/d Deployable Output (DO) desalination at Fawley direct to Testwood Water Supply Works (WSW)
- **Option A.2** – 61 Ml/d DO desalination at Fawley direct to Testwood WSW
- **Option B.2** – 61 Ml/d DO recycled water (indirect) sent to Environmental Buffer Lake (EBL) and treated at Otterbourne WSW (Water Recycling Plant (WRP) supplied by Budds Farm Wastewater Treatment Works (WTW))
- **Option B.3** – 61 Ml/d DO recycled water (direct) sent to Otterbourne WSW
- **Option B.4** – 75 Ml/d DO transfer between Havant Thicket Reservoir (HTR) and Otterbourne WSW (augmented with a 15 Ml/d WRP to supplement HTR))
- **Option B.5** – 75 Ml/d DO recycled water (indirect) sent to EBL and treated and at Otterbourne WSW (WRP supplied by Budds Farm and Peel Common WTW)
- **Option D.1** – A combination of 40 Ml/d Desalinated water to a large coastal industrial facility with existing South West Water supply diverted to SW 30 Ml/d. In addition a 40 Ml/d DO recycled water (indirect) sent to environmental buffer lake and treated at Otterbourne WSW (WRP supplied by Budds Farm WTW).
- **Option D.2** – 61 Ml/d DO transfer between HTR to Otterbourne WSW

Option B.1 was not progressed after Regulatory Alliance for Progressing Infrastructure Resilience's (RAPID) Gate 1 Final Decision, which indicated that Option B.1 was not to be developed further following advice from the EA. SW has progressed all other Options, beyond Gate 1, to further assess and determine their feasibility.

Two Options from Gate 1 (B.3 and D.1) were not progressed through the full OAP. For more information in respect of the decision taken for Option D.1 please see Annex 1 Desalination. Option B.3 will be reported on at Gate 2.

The OAP has been designed and implemented in order to identify a Preferred Option from the remaining six Options for Gate 2. The outcome of the Options Appraisal will be rigorously tested and potentially challenged in future consenting and decision-making processes. SW has therefore developed a robust OAP drawing on best practice, policy and guidance. The quantitative and qualitative evidence used to inform the OAP in relation to the Desalination-based Options is reported in this Interim Update. The evidence used to inform the OAP in respect of all other Options will be reported in the Gate 2 submission.

SW has developed and applied, in consultation with key stakeholders, a structured methodology to assess how the Options compared to one another. The purpose is to identify an Option which provides 'Best Value' for customers (as defined by the Water Resources Planning Guideline (WRPG)[1]), whilst also being in conformity with legal and regulatory requirements and meeting SW's Strategic Objectives for the Option.

The OAP undertaken was based on best practice and relevant policy and guidance. The specific steps followed in the Options Appraisal were as follows:

Site and Route Assessment: Which identified and recommended a configuration for each Option.

Consenting Evaluation: Which assessed each of the Options for consenting risks (based on the recommended configurations and the information available at this time) and ranked the Options relative to each other in terms of levels of consenting risk.

Multi-Criteria Decision Assessment (MCDA): Which ranked each of the Options in terms of their ability to address SW's supply duties in a 1-in-200-year drought event.

Decision-making process: Which ranked the Options based on the outcomes of the MCDA and Consenting Evaluation and also assessed against the agreed Water for Life Hampshire (WfLH) Legal and Policy Obligations and Strategic Objectives. It identified an Emerging Preferred Option (EPO), which also met the necessary levels of solution resilience.

This technical annex details the applied OAP, with a focus on how SW has:

- Appendix 1: Engaged with key stakeholders
- Appendix 2: Determined the steps of the OAP
- Appendix 3: Defined and refined the objectives and criteria / consideration of each step
- Appendix 4: Undertaken each of the appraisals
- Appendix 5: Interpreted outcomes to identify an EPO

The objective of the OAP undertaken to date was to rank each of the Options based on the information and evidence currently available. This identified an EPO, and the Options Appraisal work undertaken to date will be further revisited and tested prior to Gate 2, taking into account further information and analysis of future needs, as explained in the Interim Update - Activity plan to Gate 2 forming part of this submission. At Gate 2 SW will provide the Selection Option to take forward to Gate 3 and if appropriate a Back-Up Option.

WRMP19 which stated that the expected deficit could be resolved by a 75 Ml/d SRO, assuming all other parts of the WRMP19 Preferred Strategy were delivered as planned.

However, there are certain risks that have emerged to the WfLH programme since publication in December 2019 of SW's Water Resources Management Plan (WRMP), such as:

- A new bulk supply transfer from South West Water (SWW) of 20 Ml/d confirmed as no longer available due to new concerns about the sustainability of the source
- A new bulk supply from Portsmouth Water (PW) that is assumed to deliver 4 Ml/d less than in the Preferred Strategy as the work needed to develop the new sources may not in all cases be successful

[1] Environment Agency, Natural England and Ofwat, Water Resources Planning Guideline, July 2021, Section 9.1

- Demand reduction measures are assumed to deliver 12 Ml/d less than in the Preferred Strategy because they are continuous programmes where the number of realisable benefits are inherently uncertain

Based on these assumptions, the capacity required from the SRO would increase to c.87 Ml/d. SW considers that it is prudent to take action to mitigate against such risks now, and hence it is necessary to increase the capacity above that specified in WRMP19.

The only Option which could not be scaled to meet the new possible increase in capacity is Option D.2. This is due to finite water in the HTR being insufficient to meet the expected duration and severity of a 1-in-200-year drought at that peak volume. The Desalination-based Options could be increased in size now, but the problems with gaining planning consent, cost and environmental impact would get worse. In addition, SW considered the adaptability of the Option to take into account its ability to be flexible to increasing future needs.

The current OAP ranking based on mitigating against the known risks are detailed in Table 1 below.

Table 1 – Current OAP Ranking based upon decision to mitigate against known risks and potential future supply requirements

OAP Rank	Option	Reason for Ranking
1	Option B.4	Can meet the revised supply demand balance deficit with the earliest completion date and the lowest cost EPO. Currently considered the most adaptable and able to meet future needs, on account of the flexibility and evolvability afforded by their integration with HTR (unique to this Option).
2	Option B.5	Higher capacity provides increased ability to meet known risks and currently, subject to further evaluation as part of the Future Needs Assessment, is not considered as adaptable as EPO.
3	Option B.2	Lower capacity provides less ability to meet known risks and currently, subject to further evaluation as part of the Future Needs Assessment, is not considered as adaptable as EPO.
NA	Option D.2	Cannot meet the expected capacity requirement and cannot be adapted without additional water sources. Less consenting risk than Options A.1 and A.2.
NA	Options A.1 (Base Case) and A.2	Not likely to be consentable at this time at this location, based on the Consenting Evaluation (an IROPI case would need to be made and better performing Options are available).

The only Option which could not be scaled to meet the new possible increase in capacity is Option D.2. This is due to the finite water volume in the HTR being insufficient to meet the expected duration and severity of a 1-in-200-year drought at that peak volume. The Desalination-based Options could be increased in size, but there are considered to be significant consenting risks associated with these Options.

SW has considered the possibilities of using the SRO process to anticipate the needs of both SW and PW to have access to resilient water supplies in an extreme drought (for greater than a 1-in-200-year return period).

Based on work undertaken to date Option B.4 has been identified as the EPO for the following reasons:

- It is in the right location to support both SW and PW customer needs with the shortest possible additional distances for transporting water

- The needs of PW can be readily addressed by adding a junction to the pipe between the reservoir and Otterbourne treatment works
- The WRP could be scaled up to meet higher maximum DOs, and / or sustain a given level of output through a more extreme drought
- Alternatively, the WRP could be constructed in a modular way so that future capacity increases could added once future need was more firmly established

The EPO identified by the OAP and endorsed by the SW Board was **Option B.4.**

The SW Board endorsed this approach and the EPO, presented on 21 September 2021.

Using this criterion, SW summarised that:

a) Options A.1 and A.2 are not considered to be consentable at this location and this time, and will not be progressed further
b) Options B.2 and B.5 currently use similar routes to B.4 and D.2 pipeline routes and would also rely on the Otterbourne WSW but importantly do not rely on the delivery of HTR
c) Options D.2 and B.4 share the route to Otterbourne WSW. Options B.2 and B.5 do not use the reservoir and could take a different route to Otterbourne WSW.

The following actions are included in the Gate 3 Activity Plan (refer to Annex 10 of the Gate 2 submission) to develop a Back-Up Option beyond Gate 2, which are:

- Investigate potential for storage at Otterbourne WSW via an EBL
- Investigate potential alternative routes from the WRP to the Otterbourne EBL
- Investigate whether additional storage capabilities would provide benefits in a greater than 1-in-200-year drought

At Gate 2 SW will identify the Preferred Option, based on the further Options Appraisal work to be undertaken prior to Gate 2, as set out in the Gate 2 Activity Plan forming part of this Interim Update Submission.

As part of this work Option Evolution Plans (OEP) will be prepared for the EPO and Back-Up Options, demonstrating how each Option could evolve beyond Gate 2. This will cover matters such as how the capacity or DO of the Option could evolve and be defined in the context of the move to a 1-in-500-year drought standard, future sustainability reductions and environmental destination.

SW will also consider the scope to deliver an Option which meets the needs of both SW and PW. SW will also assess to the extent possible what the capacity of the Preferred Option would need to be to deliver on the needs of both SW and PW, taking into account the work being carried out for the Regional Plan by Water Resources South East (WRSE).

SW considers that it would be prudent to select a Back-Up Option, in addition to the Preferred Option. For an Option to act as a viable Back-Up Option, it must be consentable and therefore there must be sufficient differentiation in sites, routes and infrastructure to effectively mitigate against consenting or delivery issues.

A Back-Up Option will be selected for Gate 2 from Options B.2 or B.5.

All other remaining Options will be discontinued as at Gate 2.

2 Background and objectives

2.1 Introduction

This document describes the approach that is being taken by SW in relation to Options Appraisal for the selection of an EPO to progress through Gate 2.

It is important that the OAP is robust, as it will underpin the 'need' case for the EPO and requirements for the consideration of alternatives in the context of the Development Consent Order (DCO) application and will support the inclusion of any new SRO in SW's WRMP. It will therefore be tested, not just at Gate 2, but in future regulatory and consenting processes.

The process has therefore:

- Been based on industry guidance and consideration of robust evidence
- Involved appraisal against appropriate criteria and considerations
- Been undertaken by qualified individuals
- Been developed in consultation with key stakeholders
- Been designed to withstand testing in future consenting and decision-making processes

SW has developed and applied, in consultation with key stakeholders, a structured methodology to assess how the Options compare to one another and to select a Preferred Option for progressing through Gate 2.

2.1.1 Potential Future Needs

The Preferred Option for progression through Gate 2, along with other measures identified in WRMP19, will need to address the Supply-Demand-Balance (SDB) deficit in a 1-in-200-year drought event.

The Preferred Option will also need to be assessed for resilience taking into account future needs, and this will be done through revisiting and testing the Options Appraisal work undertaken to date in light of the further Future Needs work set out in the Gate 2 Activity Plan, prior to Gate 2.

This will include consideration of:

- The Outline Options Evolution Plans for each Option
- Emerging WRSE results
- Ability to help meet the deficit in a 1-in-500-year drought event
- Further potential abstraction reductions

These further assessments are important to ensure the resilience of the Preferred Option, and that it will withstand testing at Gate 2 and in future regulatory and consenting processes.

2.1.2 Layout of this Annex

This annex describes the approach and each of the steps undertaken for the OAP. The layout of this document mainly follows the step sequence of the OAP, which is illustrated in a simplified form in Figure 1. Some of the steps were carried out in parallel and were interdependent. The arrows in Figure 1 show the flow of dependencies. A more detailed flow of the process is illustrated in Figure 2.

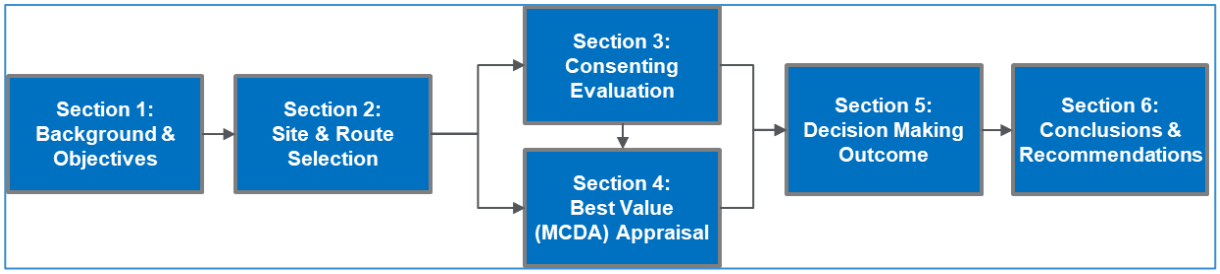

Figure 1 - Layout of document sections of Annex 5, showing high-level dependencies of outcomes

2.2 High-level Overview of the OAP

The steps in the OAP are illustrated in Figure 2 and align with, the following sections of this annex.

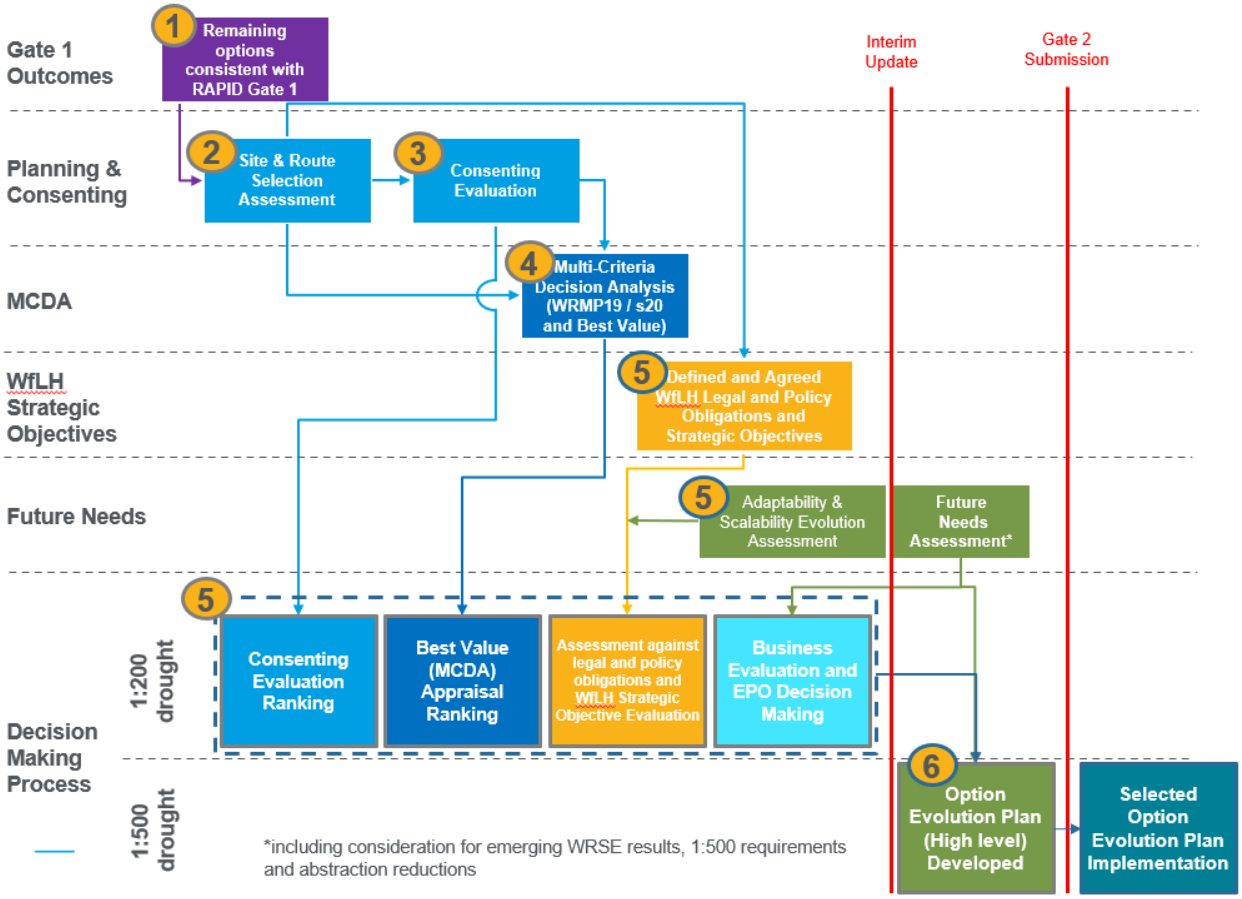

Figure 2 - High level overview of the steps in the OAP – annex sections shown in orange circles

This figure illustrates the different layers of analysis that informed the decision-making process. These are briefly described below:

Gate 1 Outcomes: The Options that were presented and carried forward at Gate 1. Note that certain Options were not taken through the OAP.

Site and route selection: Site and route selection work was undertaken following Gate 1 in order to identify a single site and route configuration for each Option. This work identified a recommended configuration for each of the Options. Refer to section Site and Route Selection of this annex for further detail of the site and route selection work.3

Consenting Evaluation: The configurations identified through the site and route selection work for each Option were assessed in the Consenting Evaluation, which considered potential consenting risks (refer to section 4.1 of this annex). The output of the Consenting Evaluation was a ranking of the Options based on their level of consenting risk.

MCDA: The configurations identified through the site and route selection work for each Option were also assessed in a MCDA against a number of criteria relevant to considering a 'Best Value' solution, including customer, environmental, societal and deliverability criteria. The assessments undertaken for the Consenting Evaluation have also informed the MCDA, in terms of environmental and social impacts. Refer to section 4 of this annex for further details. The outcome of the MCDA was a ranking of the Options based on the criteria included in the MCDA.

WfLH Strategic Objectives: The configurations identified through the site and route selection work for each Option were assessed against the WfLH agreed Legal and Policy Obligations and Strategic Objectives, taking into account information from the Consenting Evaluation and MCDA (refer to Appendix 1).

Future Needs: Considered the emerging WRSE results, 1-in-500-year drought requirements and abstraction reductions (refer to Annex 4 for the Water Resources modelling).

Decision-making process: The decision-making process (refer to Section 6 of this Annex) identified an EPO, which met the necessary levels of solution resilience, by considering:

- The Consenting Evaluation and the MCDA
- The performance of each Option against key identified Legal and Policy Obligations and Strategic Objectives for the Option
- The Adaptability Assessment
- Whether or not to propose a Back-Up Option

Option Evolution Plan: An OEP will be undertaken following the Interim Update and prior to the Gate 2 Submission. This will consider the steps to be taken to further evolve and develop the EPO and Back-Up Options, and to seek to further optimise its ability to contribute to resolving the deficit in a 1-in-500-year drought scenario, and any further sustainability reductions.

The development of the Strategic Objectives, which the Options have been assessed against during the decision-making process, is described in Section 7 Decision-Making Process.

2.3 Strategic Regional Options at RAPID Gate 1

SW presented the Base Case Option and eight strategic alternatives, in the Gate 1 Submission. The Options presented by SW at RAPID accelerated Gate 1 are detailed in Table 2.

Table 2 - RAPID Accelerated Gate 1 Base Case and alternative fall-back Strategic Regional Options

Configuration Type	Option No.		Option Description
Desalination	A.1		75 Ml/d of drinking water produced by desalination plant in Fawley area supplying the Hampshire Southampton West Water Resource Zone (HSW WRZ), with the interface between the new and existing distribution system located at Testwood WSW.
	A.2		61 Ml/d of drinking water produced by desalination plant in Fawley area supplying the HSW WRZ, with the interface between the new and existing distribution system located at Testwood WSW.
Water recycling	B.1* (indirect)		Budds Farm wastewater treatment works transfer to new WRP 61 Ml/d, bulk transfer to lower Itchen. New 61 Ml/d abstraction (Lower Itchen) transferred for treatment at Otterbourne WSW.
	B.2 (indirect)		Budds Farm wastewater treatment works transfer to new WRP 61 Ml/d, bulk transfer to a new constructed and lined environmental buffer. Abstraction and transfer for treatment at Otterbourne water supply works.
	B.3* (direct)		Budds Farm wastewater treatment works transfer to new WRP (61 Ml/d), transfer direct to Otterbourne for treatment.
	B.4 (indirect)		Budds Farm WWTW transfer to new WRP transfer to Havant Thicket, then 75 Ml/d direct raw water transfer to Otterbourne for treatment. Since Gate 1 the capacity of the raw water plant has been reduced from 61 Ml/d to 15 Ml/d.
	B.5 (indirect)		Peel Common WTW transfer to a new WRP, Budds Farm WTW transfer to new WRP, A new WRP (75 Ml/d), bulk transfer to an 'environmental buffer' (Otterbourne Lake).
Alternatives	D.1*		40 Ml/d desalinated water for industrial use to at a large coastal industrial facility. The existing 30 Ml/d supply to the large coastal industrial facility site is redirected to the HSW WRZ and re-purposed for drinking water supply, in addition to the proposed 20 Ml/d bulk supply from Knapp Mill. Additional 41 Ml/d WRP utilising effluent from Budds Farm WTW. This is a cumulative 81 Ml/d when both the Desalination and Water Recycling Components are operating at full capacity.
	D.2		61 Ml/d raw water transfer from the reservoir to Otterbourne WSW. This Option would operate concurrently with the planned 21 Ml/d treated water transfer from the reservoir to SW's distribution network via PW's Gaters Mill asset and is designed to meet the water resource requirements of a 1-in-200-year drought event. The 21 Ml/d and 61 Ml/d transfers will abstract and transfer water using separate infrastructure.

* Denotes discontinued.

2.4 Options taken through the OAP

SW progressed each of the Options, detailed in Table 3, beyond Gate 1 to further assess their feasibility. Three of the Options presented at Gate 1 were discontinued and as such were not included in the OAP.

The RAPID accelerated Gate 1 Final Decision (January 2021) stated “Option B.1 (61 Ml/d to Lower Itchen) should be eliminated from further investigations”. This was because of concerns raised by Natural England (NE) and the EA about the potential impact of the discharge on the integrity of the River Itchen Special Area of Conservation (SAC) in terms of flow and quality. This Option was therefore discontinued after Gate 1.

Options B.3 and D.1 were discontinued in July 2021. Option D.1 ranked towards the bottom of the hierarchy at Gate 1, and following further technical investigation after Gate 1, significant risks around the feasibility and deliverability of this Option were identified. As a result, Option D.1 is considered too unreliable for it to be a genuine alternative to the Base Case, particularly in the context of the urgent need to meet the duty to supply through the Water for Life – Hampshire Programme. It was down selected from the Programme in July 2021. For further information in respect of Option D.1 please see Annex 1 Desalination. The decision taken around Option B.3 will be reported at Gate 2.

The technical development of Option B.4 (refer to Annex 2 Water Recycling) has reduced the required output of the WRP from 61 Ml/d to 15 Ml/d. The initial WRP, to deliver 61 Ml/d into supply in combination with the HTR, was shown to be over-sized to meet the 1-in-200-year drought requirement. This was endorsed by the WfLH Steering Group.

The Options included in the OAP are detailed in Table 3:

Table 3 – Options assessed in the OAP

Configuration Type	Option No.	Option Name
Desalination	A.1	75 Ml/d DO desalination at Fawley direct to Testwood WSW (Base Case)
	A.2	61 Ml/d DO desalination at Fawley direct to Testwood WSW
Water Recycling	B.2 (indirect)	61 Ml/d DO recycled water (indirect) sent to EBL and treated at Otterbourne WSW (WRP supplied by Budds Farm WTW)
	B.5 (indirect)	75 Ml/d DO recycled water (indirect) sent to EBL and treated at Otterbourne WSW (WRP supplied by Budds Farm and Peel Common WTW)
HTR transfers	D.2	61 Ml/d DO – raw water transfer from HTR to Otterbourne WSW
	B.4 (indirect water recycling supplement to HTR)	75 Ml/d DO recycled water (indirect) sent to HTR and transferred to and treated at Otterbourne WSW

2.4.1 Evidence Base Considered in the OAP

SW needed to base their assessments, scoring and ranking on robust evidence so that it can withstand testing at Gate 2 and in future planning and decision-making processes. SW considered a range of evidence base at various stages of the OAP. These included:

- Draft Gate 2 submission – Annex 4: Water Resources Modelling (v0.8)

- Current SRO Delivery Schedules (see Annex 1,2,3 Schedule chapter)
- Consenting Evaluation slides 12th August 2021
- MCDA Results
- Adaptability Assessments
- Legal and Policy Obligations Assessment
- Assessment of the Options against the Strategic Objectives
- Carbon impacts derived from the Consenting Evaluation and MCDA
- Evolvability of Supply workshop output; (see Appendix 7, A 1.3)
- Scalability of Supply workshop output. (see Appendix 7, A 1.4)

2.4.2 Stakeholder Engagement

SW engaged with the key stakeholders in relation to each step of the OAP. The detail of the stakeholder engagement for each step is discussed in the relevant sections of this annex. A high-level representation of the engagement is detailed in Table 4.

Table 4 - Key stakeholders engaged by SW on steps of the OAP and outcomes

	Site & Route Selection	Consenting Evaluation	Best Value (MCDA) Appraisal	Decision-making
RAPID	☑	☑	☑	☑
Ofwat	☑	☑	☑	☑
EA	☑	☑	☑	☑
DWI	☑	☑	☑	☑
NE	☑	☑	☑	☑
MMO	☑	☑	☑	☑
Local Planning Authority (LPA)	☑	☑		
SW Customer Action Group			☑	
WRSE			☑	

For further detail on the stakeholder engagement for:

- Site and route selection and planning and Consenting Evaluation refer to section 2; and
- Best Value (MCDA) appraisal refer to section 4

2.5 Regional and SW Programme Objectives

2.5.1 Objectives for Potential Future Needs

There are risks that have emerged to the WfLH programme since publication in December 2019 of our WRMP, such as:

- A new bulk supply transfer from SWW of 20 Ml/d confirmed as no longer available due to new concerns about the sustainability of the source
- A new bulk supply from PW that is assumed to deliver 4 Ml/d less than in the selected strategy as the work needed to develop the new sources may not in all cases be successful
- Demand reduction measures are assumed to deliver 12 Ml/d less than in the selected strategy because they are continuous programmes where the number of realisable benefits is inherently uncertain

Should all these delivery issues and risks occur, the capacity required from the SRO could increase to around 87 Ml/d. SW considers that it is prudent to take action to mitigate against these delivery risks now, and hence there is a requirement to increase the capacity above that specified in WRMP19.

2.5.2 SW Programme Objectives for West Hampshire

The SW WfLH programme objectives have evolved and been refined since the Gate 1 submission and have now been classified into Legal and Policy Requirements and Obligations and Strategic Objectives (refer to Appendix 1 for this detail).

The Strategic Objectives have been created to ensure that the EPO Option has been considered from all appropriate perspectives and can provide the ‘best fit’ to national objectives, in addition to providing Best Value for SW Customers.

The final split between the eight Legal and Policy Requirements and Obligations and the five Strategic Objectives is illustrated in Figure 3. The full wording of the obligations is contained in Appendix 1, A.1.1.5.

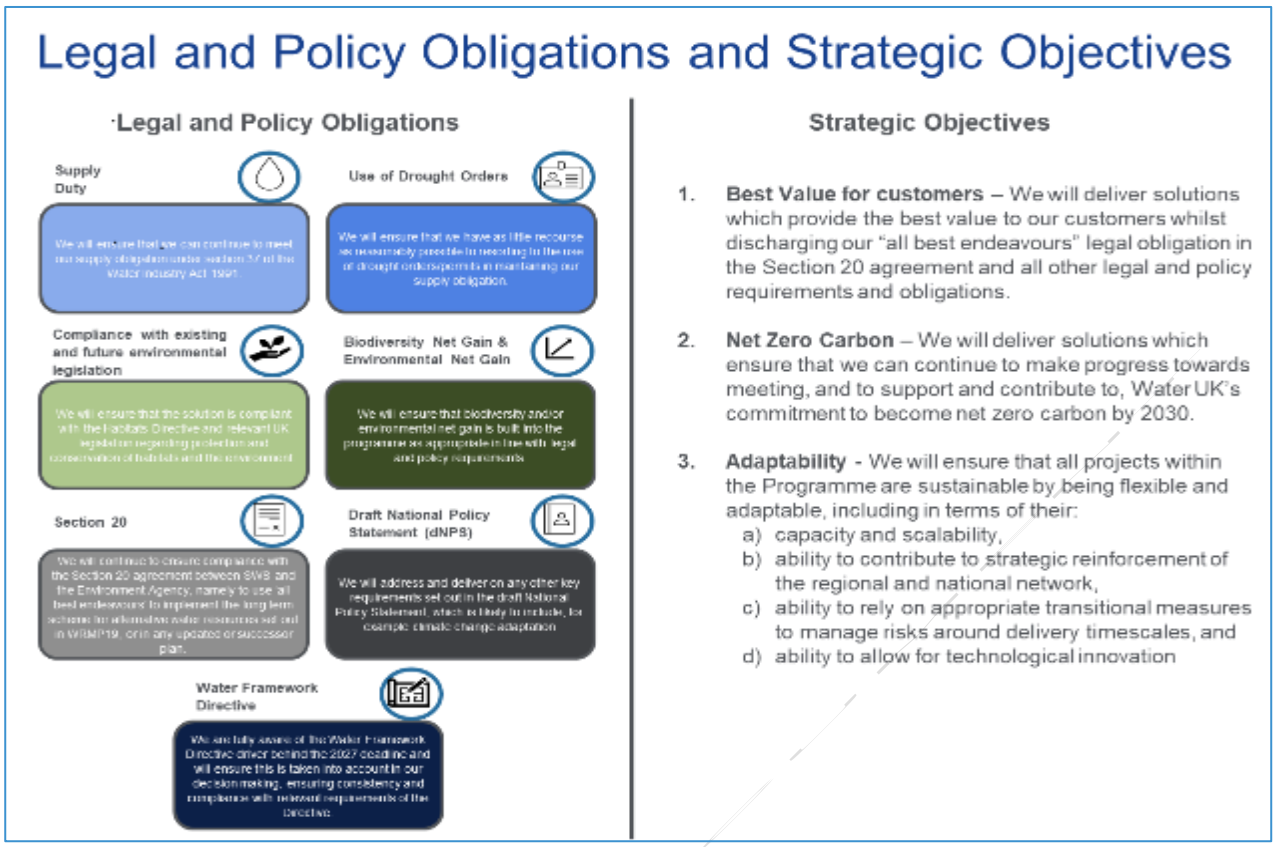

Figure 3 – The Legal and Policy Requirements and Obligations and Strategic Objectives for WfLH Programme

3 Site and Route Selection

3.1 Approach

3.1.1 Introduction

The purpose of the site and route selection stage was to identify the most deliverable site and route for each Option, identifying:

- Land site(s) for process plant
- Site(s) for marine intake and outfall (if relevant)
- Corridor(s) for a pipeline route
- Other key infrastructure / components

3.1.2 Site and Route Selection Process Overview and Modifications since Gate 1

The RAPID Gate 1 submission outlined the proposed site selection process for identifying potential suitable sites for each of the desalination (Annex 9.1) and water recycling (Annex 9.2) Options. The approach proposed was a staged process that tested the performance of parcels against a series of criteria. The methodology outlined at Gate 1 was:

- Stage 0 – Development of the site selection process and methodology including determination of a search envelope for the components of each Option
- Stage 1 – Identification of terrestrial and marine parcels based on initial physical requirements
- Stage 2a – Sensitive receptor proximity appraisal
- Stage 2b – Identification of major development and an appraisal of their compatibility with the process components for each Option
- Stage 3 – Assessment against regional and local planning policies, engineering criteria and proximity to additional receptors not considered at Stage 2a
- Route selection – Development of route Options for each land and marine parcel identified in stages 0-3
- Stage 4 – Spatial assessment of the process components to identify a list of configurations which consists of site and route
- Stage 5 – Optioneering, connectivity and network feasibility to identify best performing configuration that is then taken forwards as the EPO

Following Gate 1, the methodology was reviewed and developed to ensure that it delivered a robust planning led Optioneering process as outlined in the Remediation Action Plan (RAP), March 2021 and to take account of new and emerging circumstances that have evolved as a result of ongoing engineering and feasibility assessments, further environmental studies and engagement with stakeholders.

The modified process was applied to desalination, water recycling and Havant Thicket raw water transfer solutions. This was designed to ensure that preferred locations were identified for each Option for inclusion within the subsequent OAP, and that the identification of configurations for each Option took into account the potential to be consented prior to the Consenting Evaluation and a MCDA which form part of the OAP.

The changes made to the methodology after Gate 1 comprised:

- Refinement to Stage 0 to further develop and justify the proposed areas of search that form the basis for the subsequent stages of the process

- Inclusion of an initial Stage 1b for the desalination solution to ensure that robust geographical configurations were developed comprising each key infrastructure component
- Inclusion of Stage 3b for the desalination solution to rationalise the number of potential parcels being taken forwards into Stage 4 of the site selection process

Previously the site selection process proposed two separate Stages 4 and 5. However, the revised approach combined these stages into a single process that considered the sites and the routes to determine the best configuration for each Option. Combining the two stages allowed sites and routes to be considered together thereby ensuring that potential cumulative consenting risks were understood.

A modified approach was developed for Stage 4 comprising the development of a series of Consenting Evaluation criteria, having regard to the policy within the draft National Policy Statement (dNPS) for Water Resources Infrastructure (November, 2018), the National Planning Policy Framework (NPPF) (July, 2021), South Inshore and Offshore Marine Plan (July, 2018), the Marine Policy Statement (March, 2011), Environmental Impact Assessment Regulations 2017, the Water Framework Directive 2000 / 60 / EC and the Conservation of Habitats and Species Regulations 2017.

The criteria were then applied to determine the consenting risks associated with alternative geographical locations for the infrastructure components (terrestrial parcels, marine intakes, marine outfalls, pumping stations and connecting pipelines). The output of Stage 4 recommended a configuration for each Option (parcel, pipeline, etc) that could be subject to the Stage 5 Consenting Evaluation (that formed part of the OAP). Stage 4 also included back checking of previously discounted or ‘held’ parcels at Stage 3b. This was to verify previous decisions and confirm that Options were appropriately tested for their consentability.

Stakeholder feedback about Stages 0 to 3 was also incorporated into Stage 4 of the site selection process.

This evidence-based site / route selection process used the environmental and engineering technical design information to inform the evaluation and determine the level of consenting risk.

The subsequent sections of this annex outline the site / route selection process which covered all Options (desalination, water recycling and Havant Thicket raw water transfer). The outputs for each stage of the process for each Option are summarised in the Annex 1,2,3 documents as well as being provided within this annex.

The primary changes made to the proposed methodology were also discussed with the regulators (EA, NE, RAPID and Marine Management Organisation (MMO) and other stakeholders (e.g., local authorities, Historic England) were briefed on the overall OAP. Refer to section 3.1.3, which outlines the stakeholder engagement for the site and route selection process.

3.1.3 Engagement with Stakeholders Regarding the Site and Route Selection

Since the Gate 1 submission, SW has been regularly engaging with its Regulators on the development and implementation of the site and route selection process (as detailed in the Gate 1 determination RAP). The purpose of this engagement was to update regularly on progress but also to explain and seek feedback on the different stages and steps in the process, the methodology and assessment criteria behind it and the technical inputs required to inform it. SW’s regulators were regularly engaged on the emerging outputs of SW’s work to ensure a ‘no surprises’ approach, and including the feedback received has enhanced the process, informed the technical assessments and tailored the engagement in line with expectations and requirements.

Engagement on the site and route selection process has also taken place with other key stakeholders through bespoke briefings and SW’s regular stakeholder forums, including the Practitioners Group and

Senior Stakeholder Group. The key purpose of this engagement was to keep stakeholders informed of these key activities leading up to and informing Gate 2.

During the development of the site selection methodology and the completion of the site selection process to Stage 4, a series of meetings were held with key stakeholders to:

- Explain the modified process and how this integrates with wider environmental and engineering assessments
- Seek comment on the evaluation criteria that were to be used for both the site selection process and the subsequent Consenting appraisal, and
- To present the results of the site selection process

Table 5 details the key engagement stages with regulators and other stakeholders regarding the site, route and scheme selection processes leading up to Gate 2 and how that feedback, where received, has influenced the site selection process.

Table 5 - Engagement with Key Regulators and Key Stakeholders regarding the Site Selection Process

Date of Meeting	Stakeholders	Purpose of Engagement	Feedback Received
April 2021	EA / NE	Non-statutory stakeholder engagement to present the results of Stages 0 to 3b and to present the updated site selection process.	Received informal feedback about Stage 3b clusters work to inform scheme development and the Stage 4 site selection.
April 2021	EA / NE	Meeting to discuss the relative benefits of each cluster and parcel associated with each solution drawing upon EA / NE knowledge. Opportunity to share the revised stages 4-5 site selection approach.	Feedback received during the meeting regarding potential consenting risks for each cluster. Identified need for further discussion about the Stage 4 and 5 evaluation criteria with attendees.
Late May 2021	LPAs / County Authorities / NE / Environment Agency / Historic England / DWI / OFWAT / MMO, ABP, AONB Unit	Non-statutory stakeholder engagement about Stages 1 – 3b and methodology for the site and route selection process and the Consenting Evaluation and wider Options Appraisal.	No specific commentary provided.
June 2021	RAPID, NE, PW, EA, Ofwat, DWI, Department for Environment Food and Rural Affairs (Defra), MMO	Regulatory Practitioner Workshop – included presentation on the site and route selection process and the Consenting Evaluation approach including the evaluation criteria.	Provided feedback on some of the criteria to ensure appropriate marine and terrestrial coverage. Criteria were also supplied after the meeting including some supplementary slides to facilitate comments post meeting.
June 2021	EA, NE, Consumer Council for Water, South Downs National Park Authority (SDNPA), CPRE, RSPB	Meeting included presentation of the site and route selection process and the Consenting Evaluation.	No specific comments raised about the criteria during the meeting.

Date of Meeting	Stakeholders	Purpose of Engagement	Feedback Received
June / July / Aug / Sep 2021	Local planning authorities, including the New Forest National Park Authority, SDNPA, New Forest District Council, Winchester City Council, Eastleigh Borough Council, Portsmouth City Council, Fareham Borough Council and Hampshire County Council.	Progress briefings held with Local Planning Authorities in June / July 2021 and then again in September 2021 to update on activities being undertaken between Gate 1 and Gate 2 and present the outcomes of the site/ route selection and OAPs respectively.	The briefings were welcomed by all authorities and provided confidence that relevant policy matters were being addressed in the site selection and OAPs to ensure a robust outcome.
July 2021	EA, NE, Ofwat, Defra, PW	Presentation of the site selection outcomes.	Confirmed broad agreement to the process undertaken.
August 2021	EA / NE / MMO	To receive feedback from the EA / NE and MMO on the site and route selection outcomes.	Confirmed broad agreement to the process undertaken.

The next sections present the methodology and the results for desalination, water recycling and water transfer Options. The methodology and the results are presented for each Option in turn, by stage, to reflect the fact that modifications were made to the future stages of the process based on application of the method and the subsequent results.

The technical information relating to Site and Route selection can be found in the Site and Route chapters of Annex 1, 2, 3.

3.1.4 Site and Route Selection – Desalination

The following sections present details of the site and route selection process and outcomes for desalination. The site selection methodology and results for Stages 0 to 3 are supported by the following technical reports:

1. Strategy A Desalination Alternatives to Base Case at Fawley Site Selection Stage 0- 3 Output Report – Text for Gate 2 Update (September 2021)
2. Desalination Site Selection Framework, Desalination Site Selection Criteria Supporting Report (September 2021)

3.1.4.1 Site Selection Stage 0 – Desalination

Stage 0 comprised the identification of a search envelope for various components, split into a terrestrial search envelope for the desalination plant and a marine search area for the marine intake and outfall. The search envelopes were based on a set of agreed engineering and operational requirements and environmental parameters. Much of this work was completed for Gate 1 but the modifications to the process post Gate 1 resulted in review and backcheck of the search criteria to ensure earlier assumptions remained robust.

The terrestrial search envelope was defined by the following factors:

- Western extent located at Bournemouth, approximate National Grid Reference, 409999 (Easting) 090956 (Northing). This was identified due to the potential for connectivity with the Knapps Mill WSW to Testwood WSW pipeline being installed during AMP7.
- Eastern extent located at Eastney, approximate National Grid Reference, 468474 (easting) 099514 (Northing). This was extended to potentially identify locations where a transfer pipeline to Testwood WSW could be routed to avoid crossing through National Parks and other statutory designated sites.

- Northern extent, initially no further than 5 km from the coastline between the Western and Eastern extents and referred to as an initial 5 km check point. This was limited to 5 km initially as any increase in distance from the coast would result in an increase in emissions and embedded carbon from additional pumping and installation of pipework infrastructure, and
- The application of the coastal resilience line (Report Ref: Water for Life Hampshire: Coastal Study for Site Selection Assessment - PB9638-RHD-ZZ-XX-RP-Z-0001, dated 21 July 2020). The coastal resilience line was formed through the assessment of coastal geomorphology and management policies, to identify projected future rates of coastal change and zones susceptible to sea flooding in order to identify areas along the coastline where major infrastructure development would not be suitable.

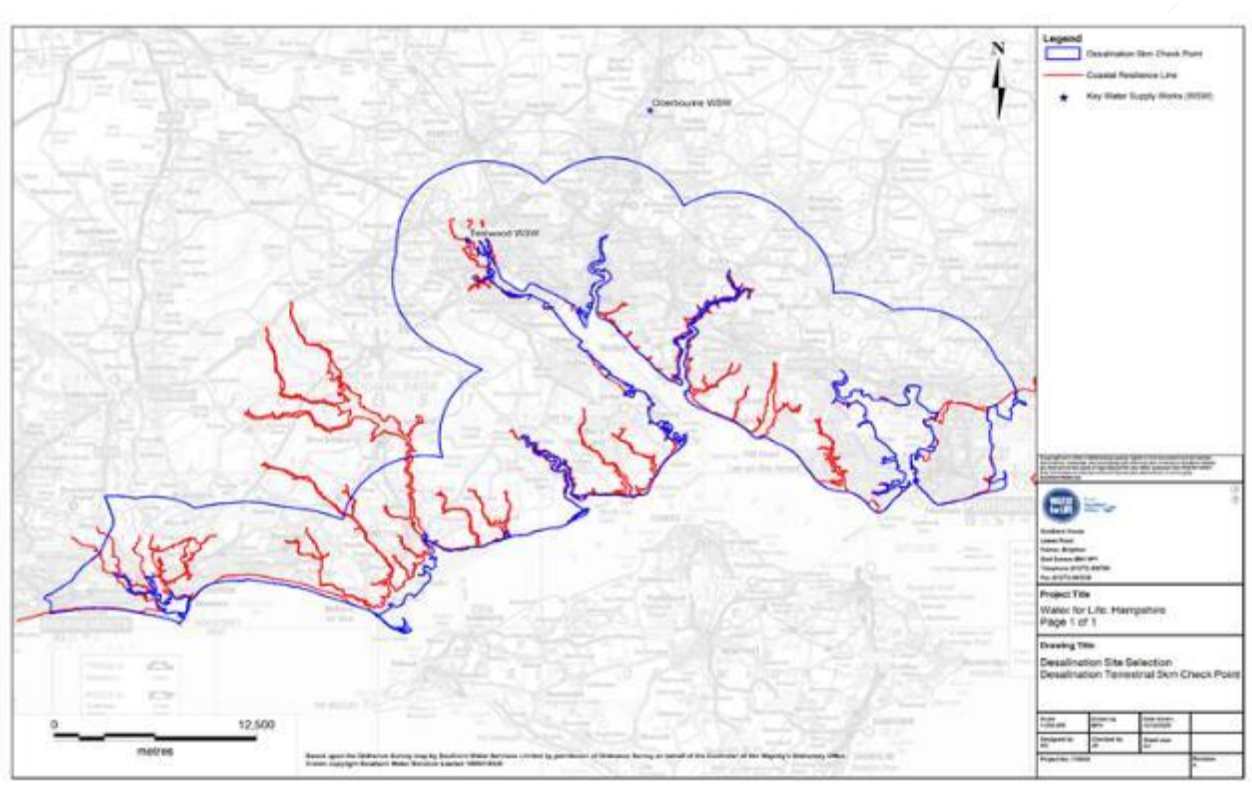

Figure 5 - Desalination Terrestrial Search Envelope

Figure 5 illustrates the terrestrial search envelope.

The marine search envelope was defined using the following parameters-

- A distance of no more than 800 m seaward from the terrestrial parcel to the end of the intake, based on the use of a passive wedge wire screen. The 800 m distance limit was established as the passive wedge wire screens require an air burst system to clean the screens. This system prevents marine fauna from entering the intake. The air burst system uses compressors to direct air down the pipework exiting from small nozzles and due to the size of compressors available and the head loss created in a long, small diameter pipe, the air would not exit the nozzles at a high enough pressure should the pipework be longer than 800 m. This was chosen as an environmentally and technically more acceptable solution than the mechanical intake screen.
- There is no technical distance limitation for the outfall, although locations nearer to the coastline are preferable from a construction and cost perspective. Therefore, the same 800 m envelope was initially used for the outfall as well as for the intake, and
- The envelope ran parallel to the Eastern and Western extent of the terrestrial search envelope

Figure 6 illustrates the marine search envelope.

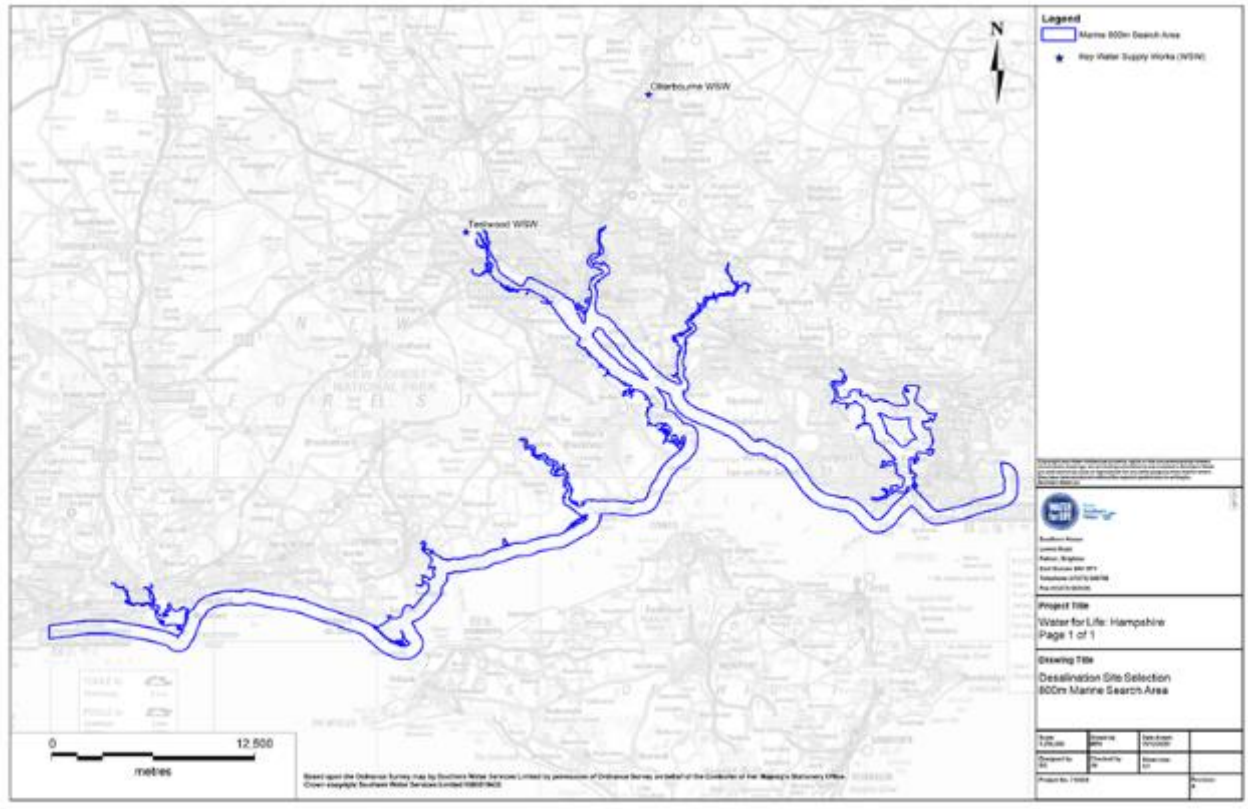

Figure 6 - Desalination Marine Search Envelope

3.1.4.2 Site Selection Stage 1 – Desalination

Following the identification of appropriate search envelopes, the next stage of the process was to identify and plot parcels that could potentially fulfil the technical requirements for the relevant infrastructure for each solution. Table 6 details the criteria that were used for the terrestrial land parcels and Table 7 details the criteria for the marine parcels.

Table 6 - Stage 1 -Terrestrial Land Parcel Requirements for Desalination

Element	Desalination
Land Use	Densely developed residential areas (towns/cities) - private residences, care homes, hospitals, schools, universities, places of worship, burial grounds, holiday parks, hotels, retail parks, leisure parks Key transport infrastructure - railways, airports, classified roads, ports Key utilities - power stations, gas and electricity substations
Land Conditions	Avoidance of the following land conditions: Marsh Mudflat Cliff face Open Water

Element	Desalination
Land Parcel Size	61 Ml/d - Minimum of 40,470m^2 + 4,047m^2 for construction 75 Ml/d - Minimum of 48,564m^2 + 4,047m^2 for construction

Table 7 - Stage 1 – Marine Parcel Criteria for Desalination

Element	Desalination
Water depth (intake)	Minimum water depth at end of intake 3 m at Lowest Astronomical Tide (LAT)
Hydrodynamics and Water depth (outfall)	Areas where there is a minimum average current speed of 0.3 m/s and a minimum mean LAT of 5 m.
Marine Spatial Allocations	Anchorage areas Disposal and dredging areas Naval base exclusion zones

Following the definition of the search areas for desalination at Stage 0, 159 terrestrial parcels, 38 marine intake parcels and 15 marine outfall parcels were identified at Stage 1. The location of the parcels is illustrated in Figure 7.

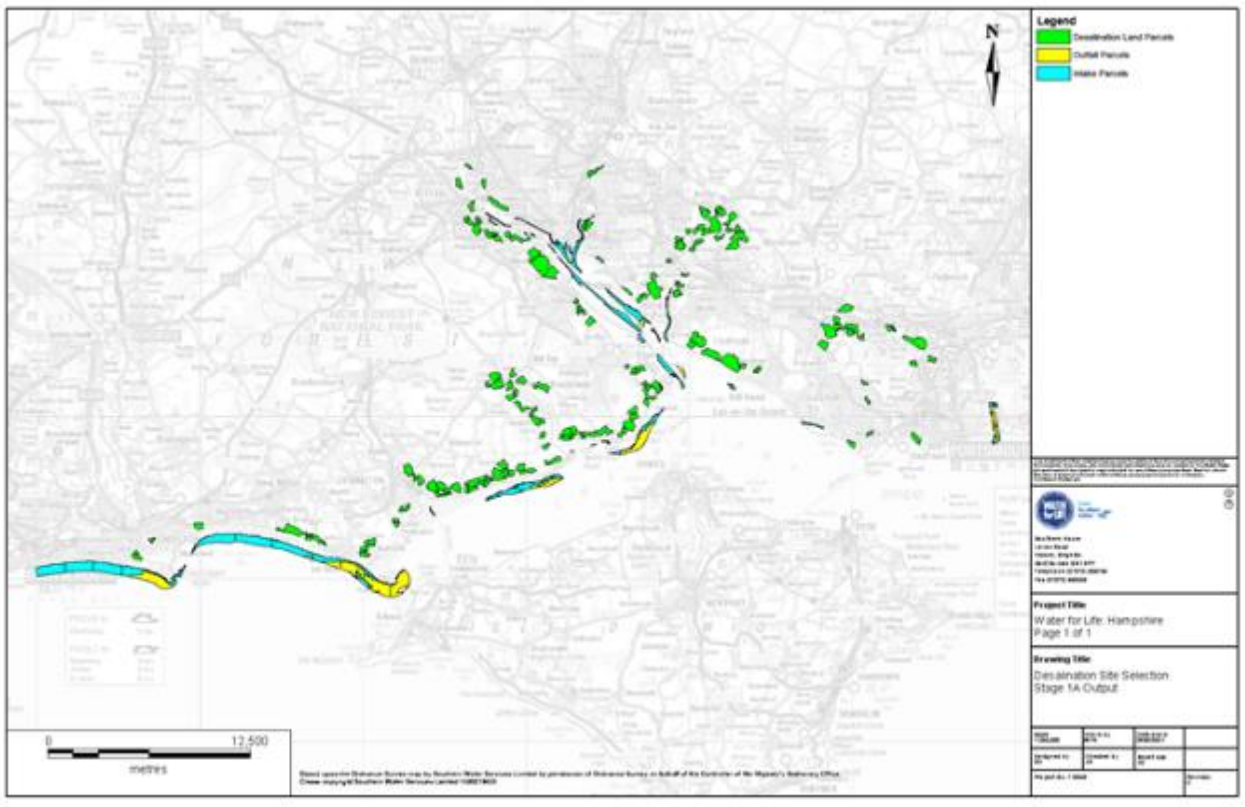

Figure 7 - Desalination Terrestrial and Marine Parcel Site Selection Stage 1 Output

Desalination – Stage 1b

Due to the large extent of the terrestrial search envelope of 707 km^2 and any increase in distance from the coast resulting in an increase in emissions and embedded carbon, the application of Stage 1 for the terrestrial parcel was carried out in 500 m search bands commencing from the coast and moving inland. A suitable parcel was one that avoided certain land uses and conditions as detailed in Table 6 but met the minimum size requirement. The size of the parcels identified was determined in the first instance by local conditions and natural and physical boundaries; these boundaries include but are not limited to primary / main roads and secondary roads.

The marine intake and outfall parcels were identified using the criteria detailed in Table 7. A suitable marine parcel was one that met the minimum water depth parameters and avoided specified marine spatial allocations.

An additional Stage 1b was added into the process for desalination only. As work was being undertaken on the stage 2a exercise and the ranking of the parcels, it was evident that the connectivity between the best performing terrestrial parcels and the best performing marine parcels would not be viable / feasible. This was due to the distance between the potential parcels as a result of the large search envelope. This led to the new Stage 1b being created as a precursor to the ranking of parcels at stage 2a.

The purpose of the new Stage 1b was to establish geographical clusters of desalination plant terrestrial parcels, marine intake parcels and marine outfall parcels, which when configured together have the potential to form a desalination solution. Clusters were created by drawing an 800 m buffer (based on the distance limitation identified in Stage 0 from each of the marine intake parcels from Stage 1 and then plotted on a Geographical Information System (GIS) map. This buffer identified each of the Stage 1 terrestrial parcels that are partly or wholly within 800 m of the marine intake parcels, which is the maximum distance the passive wedge wire screen intake can be located from the terrestrial parcel.

The creation of the clusters meant that those intake parcels that fell outside of the 800 m boundary were not progressed. This approach would also reduce future distances for installation of pipelines and associated pumping costs, minimise construction and operational costs, reduce carbon emissions (by reducing distances for installation of pipelines and pumping requirements) and minimising community and environmental impacts.

Stage 1b therefore established geographical clusters of desalination plant terrestrial parcels, marine intake parcels and marine outfall parcels, which when configured together have the potential to form a desalination solution. A total of 54 terrestrial parcels, 26 marine intake parcels and 14 marine outfall parcels were identified in Stage 1b and progressed to Stage 2a. These parcels are split across five broad geographical areas, the Western extent being Christchurch and the Eastern extent Hill Head. Figure 8 illustrates the output of Stage 1b and the development of Clusters A to E.

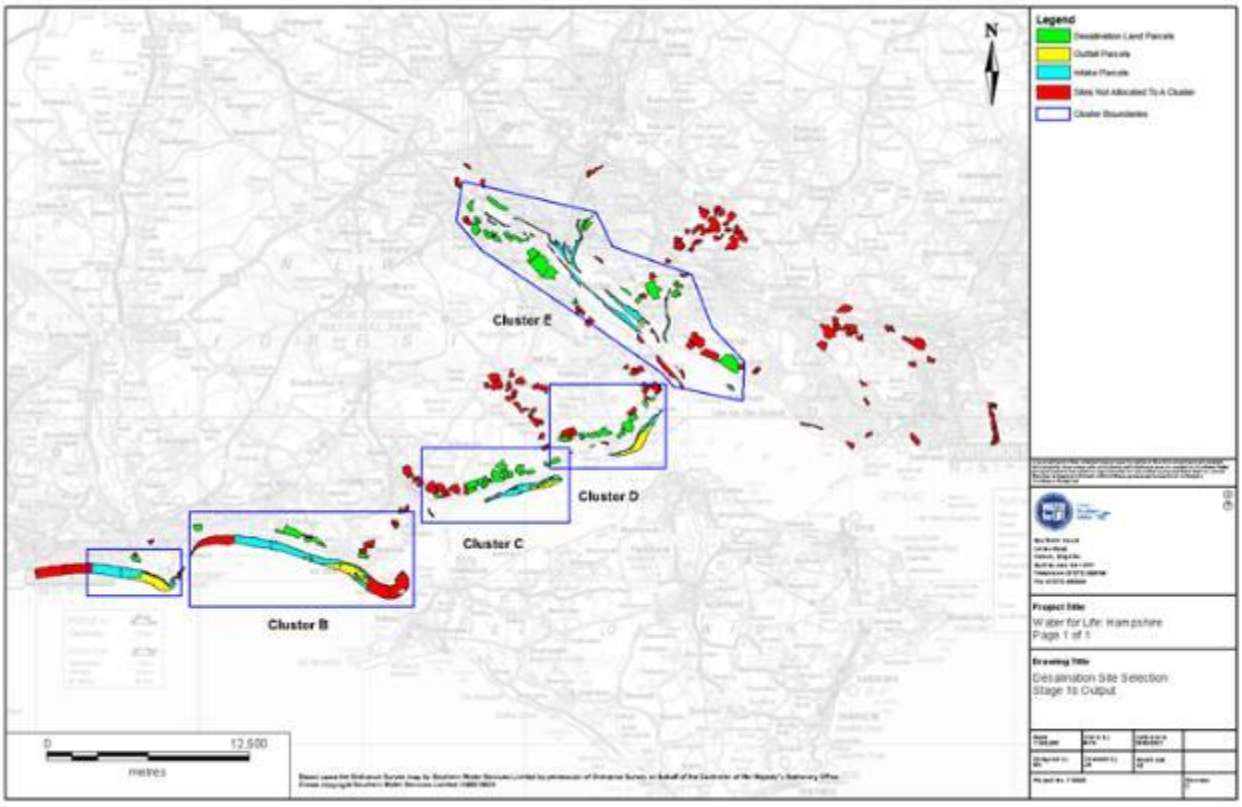

Figure 8 - Desalination Stage 1b Site Selection Output

3.1.4.3 Site Selection Stage 2a – Desalination

Stage 2a considered the proximity of the parcels to sensitive receptors to identify the best performing parcels. The performance of each parcel was determined by its proximity to specific receptors and the level of sensitivity of the receptor.

The criteria were:

- SAC / Ramsar / Special Protection Area (SPA) (including potential and candidate sites)
- Site of Special Scientific Interest (SSSI) / National Nature Reserve (NNR)
- Scheduled Monuments
- National Parks / Areas of Outstanding Natural Beauty (AONB) / Green Belt
- Ancient Woodland
- Grade 1 and 2* Registered Parks and Gardens and Listed Buildings and Battlefield Sites
- Residential (noise/vibration and air quality impact)
- Hospitals, Care Homes, Schools, and
- Amenity Spaces e.g., allotments, public parks, playgrounds, playing fields

The scores allocated for each criterion reflected the importance of statutory designations and alignment with descriptions of sensitive areas in Regulation 2 of the EIA Regulations 2017. The importance placed on a receptor was determined by the weight given to its sensitivity and protection within the law or planning policy documents (Draft National Policy Statement for Water Resources and the National Planning Policy Framework). For example, statutory designated sites of international importance are afforded the highest

levels of protection through law and planning policy and therefore, they were allocated an importance score of 3 (the highest importance score). Statutory Designated sites or non-statutory sites of national importance were allocated an importance score of 2, and other sensitive receptors were allocated an importance score of 1. The importance score assigned to each receptor is explained in further detail in Desalination Site Selection Framework, Desalination Site Selection Criteria Supporting Report (April 2021).

Specific distances from protected sites or features associated with each criterion were also considered in the process, with different distances being defined for each type of receptor. Details of the specific distances used in the assessment to determine the performance of each parcel is provided within Desalination Site Selection Framework, Desalination Site Selection Criteria Supporting Report (April 2021).

The scoring process was then applied to each terrestrial parcel.

The process for the marine parcels was similar although used some different receptors reflecting the marine environment and other relevant policy documents including the Marine Policy Statement (2011) and the South Inshore and South Offshore Marine Plan (Defra, 2018). The receptors considered were:

- SAC / Ramsar / SPA (including potential and candidate sites)
- SSSI
- Marine Conservation Zone (MCZ)
- Scheduled Monument
- Marine Scheduled Monument
- Protected wrecks site
- Residential (noise / vibration and air quality impact)
- Recreational Areas e.g., yachting, fishing and diving

A score was calculated for each parcel that progressed from Stage 1b, the higher the score, the better the parcel performed. A total of 54 parcels were scored, with the highest score attributed to a parcel being 32 points and the lowest being 17. To ensure a sufficient cohort of sites could be compared at later stages the five best performing parcels for each parcel type (if available) by cluster progressed to Stage 2b. Where more than 5 parcel types performed the same against the Stage 2a criteria, all the parcels progressed through to Stage 2b.

A total of 28 parcels progressed to Stage 2b. For these parcels the variance between the best performing parcels and the least well performing parcels was principally, proximity to the New Forest National Park, Grade 1 and 2* Registered Parks and Gardens, Listed Buildings, Battlefield Sites and Ancient Woodland.

A total of 26 marine intake parcels were scored, the highest score attributed to a parcel was 29 points with the lowest being 21.

A total of 14 marine outfall parcels were scored, the highest score attributed to a parcel was 29 points and the lowest being 15. For these parcels the variance between the best performing parcels and the least well performing parcels is principally, proximity to the SSSI, terrestrial scheduled monuments or residential areas. It is noted all the marine intake and outfall parcels are located within a SPA, the Solent and Dorset SPA stretches between Poole Harbour and up to the Western extents of the Sussex coast and is present throughout the entire search area. The results of Stage 2a are illustrated on Figure 9 and the complete set of scoring and results is available in the Desalination Site Selection Framework, Desalination Site Appraisal Tool, April 2021.

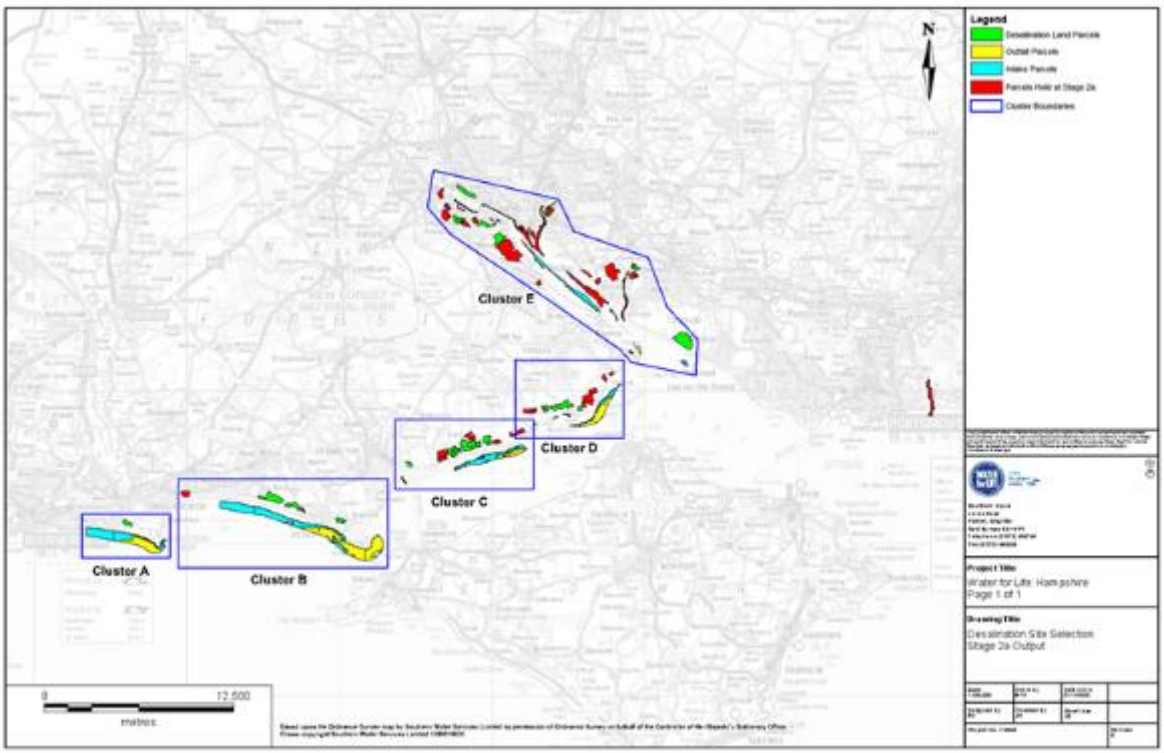

Figure 9 - Desalination Terrestrial and Marine Parcel Site Selection Stage 2a Output

3.1.4.4 Site Selection Stage 2b – Desalination

Stage 2b considered any conflict of the best performing parcels within each cluster from Stage 2a with terrestrial or marine areas that have been approved or validated for DCO developments (within the last five years) or development subject to Transport and Works Act Orders (TWAO) under the Transport and Works Act 1992 and screened / scoped or validated and approved within the last three years in accordance with the relevant EIA Regulations. Stage 2b also considered any conflict with Marine Licences approved within the last three years under the Marine and Coastal Access Act 2009 for the marine environment that have been screened / scoped or validated and approved in accordance with the relevant EIA Regulations.

A compatibility score was calculated for each parcel, the best performing terrestrial parcel, marine intake parcel and marine outfall parcel were taken forward to Stage 3. The compatibility scoring is detailed in Table 8.

Table 8 - Compatibility Scoring for Stage 2b – Desalination

Compatibility Scoring	Score
Low compatibility would be a parcel located in an approved order limits boundary (red line boundary) or in a boundary for significant development comprising major infrastructure with associated security and / or health and safety conflicts that affords little / no opportunity for co-development.	1
Medium compatibility would be a parcel located in an approved order limits boundary (red line boundary) or in a boundary for significant development comprising major infrastructure with associated security and / or health and safety conflicts that may offer opportunity for co-development.	3
High compatibility would be a parcel located in an approved order limits boundary (red line boundary) or in a boundary for significant development that is very likely to offer an opportunity for co-development, such as opportunity to utilise an area that is not part of permanent land take of the development e.g., temporary construction area / laydown area.	5

Where there was more than one best performing parcel within the respective cluster those that scored the joint highest progressed through to Stage 3. Those parcels that received lower scores were not excluded but held in the event that those taken forwards were unsuitable.

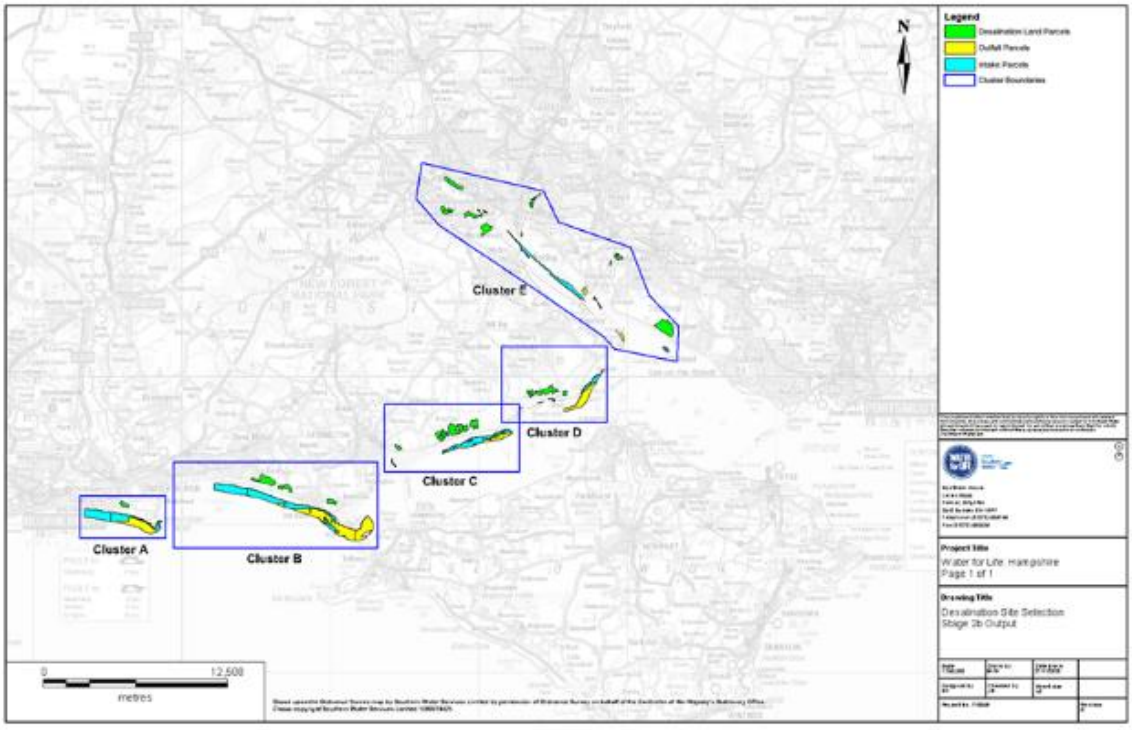

Figure 10 - Desalination Terrestrial and Marine Parcel Site Selection Stage 2b Output

None of the best performing parcels from Stage 2a had any conflict with developments defined by the criteria and as such all terrestrial and marine parcels progressed to Stage 3 (refer to Figure 10 for the Stage 2b results).

3.1.4.5 Site Selection Stage 3 – Desalination

Stage 3 introduced additional proximity criteria covering a number of environmental, geotechnical and constructability considerations as well as reconsidering the performance of those parcels against the Stage 2a criteria.

The additional criteria used in Stage 3 are fully detailed in the Desalination Site Selection Criteria Supporting Document and include but are not limited to the presence of floodplain, proximity to Source Protection Zone, rivers / drains (potential pollution pathways), schools, care homes, hospitals and residential and non-statutory designated sites for nature conservation and historic environment. Non environmental criteria included but were not limited to ease of access from major transport route, ground condition and current or previous potentially contaminating land uses. A score of 0 to 3 was assigned for each criterion with the points allocation being defined for each specific criterion e.g., for floodplain, a parcel scored 3 if it was located within Flood Zone 3. The full breakdown of points allocation to each criterion is presented in the supporting Desalination Site Selection Criteria Document.

A score was calculated for each parcel within each cluster that progressed from Stage 2b. A total of 28 parcels were scored, the highest score attributed to a parcel was 86 points with the lowest being 70. Given that the parcels were scored against 39 criteria with each criteria awarding a maximum of three and a minimum of zero points, a variance of 16 points between the 28 parcels across the clusters illustrated some differentiation could be made between the best performing and least well performing parcels through mapping and criteria application.

The 28 parcels were ranked and the top performing parcels within each cluster identified. A total of 16 terrestrial parcels across the 5 clusters progressed to the next stage of the site selection process.

Stage 3 of the marine intake parcels applied the same methodology as the terrestrial parcels but scored the parcels against 20 marine specific criteria such as proximity to military practice areas or proximity to an area of aquaculture production. The criteria used in Stage 3 are detailed in the Desalination Site Selection Criteria Supporting Document. A score was calculated for each parcel that progressed from Stage 2b within each cluster, the higher the score the better the parcel performed. A total of 19 marine intake parcels were scored, the highest score attributed to a parcel was 48 points with the lowest being 26. A total of 13 marine outfall parcels were scored, the highest score attributed to a parcel was 45 points with the lowest being 23.

The parcels were scored against 20 criteria with each criteria awarding a maximum of three and a minimum of zero points. A variance of 22 points between the 19 marine intake parcels and 22 points between the 13 marine outfall parcels, illustrated some differentiation could be made between the best performing and least well performing parcels through mapping and criteria application.

Whilst it was possible to make some differentiation between the best and least performing clusters at Stage 3 through mapping and scoring against criteria, further distinction was needed between the clusters and the parcels within them. A key component of this would be the pipeline connectivity and a more detailed consideration of the engineering constraints associated with each parcel as well as their performance against key legal and planning policy tests.

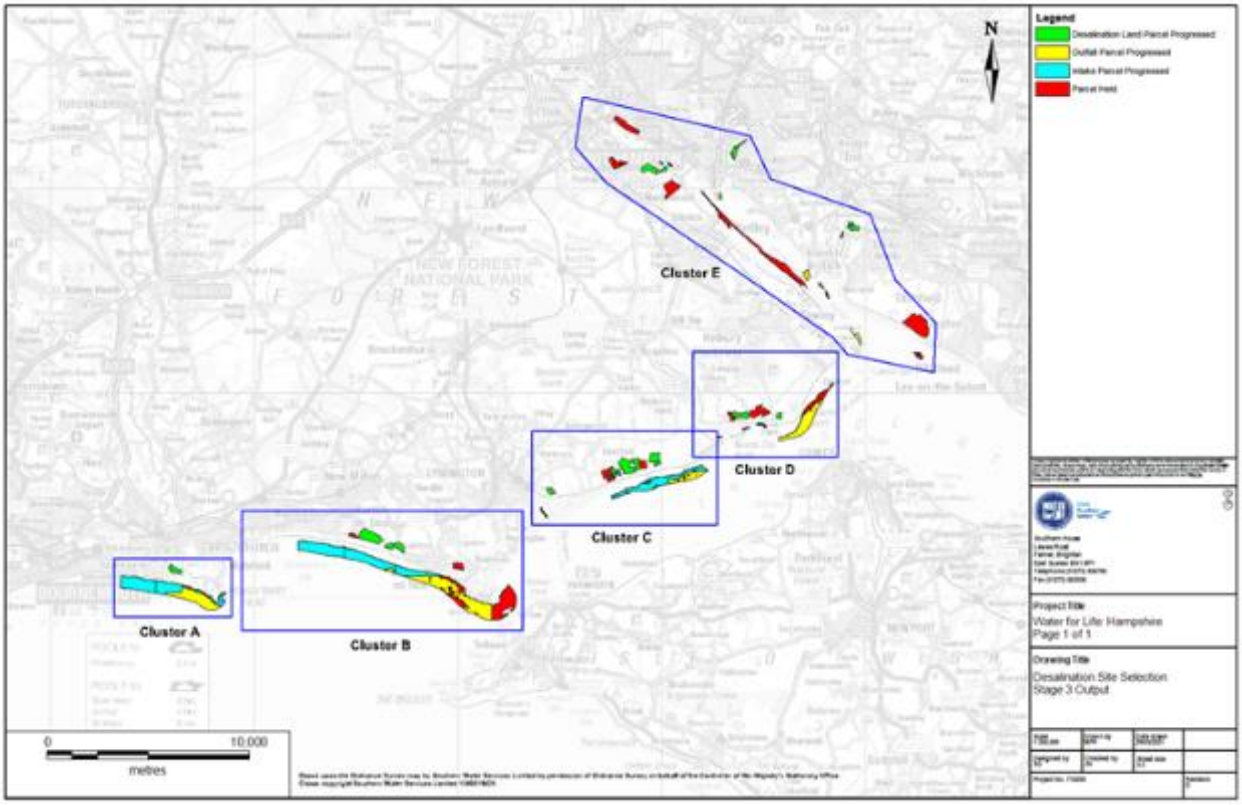

Figure 11 - Desalination Terrestrial and Marine Parcel Site Selection Stage 3 Output

Figure 11 illustrates the output of the Stage 3 site selection process for desalination.

3.1.4.6 Site Selection Stage 3b - Desalination

At the end of Stage 3, a total of 16 terrestrial parcels, 15 marine intake parcels and 11 marine outfall parcels were identified as the best performing within their respective clusters.

The intention of Stage 3b was to help differentiate between the clusters remaining at the end of Stage 3b in terms of the comparative risk to delivering the objectives of WfLH. On this basis, the purpose of Stage 3b was to recommend clusters to be held, and leading clusters to be taken forward for further, more detailed Consenting Evaluation.

The initial stage of the process reviewed the total scores allocated to each parcel within the clusters from Stage 3A and the pipeline scores. Based on quantitative review of the combined scores of pipelines and terrestrial / parcels, it was determined that Clusters A, B and C were poor performing compared to the parcels within Clusters D and E and therefore Clusters A, B and C were not to be progressed to the risk workshop.

A risk workshop was held that considered the engineering and feasibility constraints associated with the short-listed parcels (those within clusters D and E) and the potential connecting pipelines to Testwood or Otterbourne WSW. Risk workshop attendees were asked to score each criterion (set out below) against a number of objectives based on compliance, efficiency and resilience.

- Water Quality
- Traffic and Transport
- Security

- Public Safety
- Maintenance
- Navigation
- Tunnelling
- Defence
- Oil and Gas
- Port Development
- Dredging
- Marine Activity
- Contaminated Land
- Services (marine and land)
- Access
- Demolition
- Estimating
- Market appetite
- Procurement
- Outfall complexity
- Pipeline complexity
- Stakeholder complexity
- Sustainability
- Climate change
- Security
- Programme
- Environmental Compliance

The workshop was effective in exploring the engineering and environmental constraints associated to each cluster, but it was not possible to definitively define configurations based on the current level of site knowledge and 'ground-truthing', and understanding of the tunnelling requirements (design, environmental mitigation and construction) for the marine intakes and outfalls. It was possible however to develop sub-clusters within cluster E, based on the spatial relationship of individual land parcels, outfalls and intakes, and their relative engineering and environmental constraints, and pipeline routing. The sub-cluster exercise determined that Cluster E which extended along the length of Southampton Water did not differentiate between the level of risk of development within this water body from an environmental perspective and also meant that there may be significant lengths between the marine intakes / outfalls and the terrestrial parcels owing to the distances between them.

The outcome of the risk assessment workshop indicated that all the clusters were likely to carry significant risks to delivery and the satisfaction of the objectives of WfLH. The assessed risk profiles of clusters E1 and E2 (upper and middle Southampton water respectively) were deemed to be significantly higher than the other clusters (E3 (lower Southampton Water) and D. Following the risk workshop, it was therefore recommended that Clusters E3 (comprising terrestrial Parcel D55 and a marine intake and outfall in the lower Southampton Water), D and the Base Case were progressed to more detailed Consenting Evaluation.

Following further review of the approach for Stage 3b it was determined that a consenting lens needed to be applied to the parcels to understand the level of consenting risk when compared to national policy and also the likelihood of being able to mitigate impacts to achieve policy compliance. Therefore, a back-check of the outputs of this stage was conducted as part of Stage 4 (see below).

3.1.4.7 Pipeline Route Development and Evaluation

At Gate 1 three Network Technical Reports were produced that explained how pipeline routes were developed and evaluated:

- Annex 8.1 - Network Technical Report: Desalination (September 2020)
- Annex 8.2 - Network Technical Report: Water Recycling (September 2020)
- Annex 8.4 - Network Technical Report: Alternative Solution (September 2020)

These reports presented a series of Options for how the water for each solution could be transferred to the relevant WSW. The potential pipeline routes were identified as part of a desktop study using existing datasets and avoiding obvious engineering and environmental risks.

For each pipeline route identified, an appraisal log was created to assess the alternative route Options according to defined, measurable parameters. The appraisal logs addressed:

- Technical (engineering, health and safety, stakeholders, land and estates, operations)
- Enabling environment (statutory and non-statutory designations)
- Construction (pipeline constructability, ground condition risks, techniques required to mitigate environmentally sensitive areas, logistics)

The appraisal logs were designed to record potential risks to the delivery of a pipeline route in a consistent manner to facilitate comparison as well as providing a consistent record of decisions made. They were developed through a series of workshops with the Programme Risk Manager and discussions with subject specialists. The outcome of each log was a Red, Amber, Green (RAG) evaluation for each pipeline against each of the above three topics. This approach to pipeline identification was undertaken for Option A.1 (Base Case desalination solution) and all other Options.

Following Gate 1, further pipeline development work was undertaken. This comprised the application of the Stantec Insight Analytics (SIA) 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 (some of the pipeline Options developed for the alternative clusters for the desalination Base Case were developed using this tool). Three scenarios were used to generate the pipelines:

- Minimal environmental and ecological impact
- Best engineering solution
- Combined minimal environmental and ecological impact and best engineering solution

For the minimum environmental and ecological impact approach the SIA Route Planner Tool considered ecological and environmental constraints to plan pipeline route Options from the land parcels to the appropriate WSW. The environmental criteria considered were:

- SAC / Ramsar / SPA (3)
- SSSI / NNR (2)
- Scheduled Monuments (2)
- National Parks / AONB / Green Belt (2)
- Ancient Woodland (2)
- Grade 1 and II* Registered Parks and Gardens and Listed Buildings and Battlefield Sites (2)
- Residential (1)
- Hospitals, Care Homes, Schools (1)
- Amenity Spaces (1)

Each criterion was assigned an importance (refer to the number in brackets) to indicate its importance, with 3 being the highest importance.

The principles of the 'Best Engineering Solution approach are set out below:

- Topography: this is given as a factor of 1
- Length: each link of the grid accrues a score of 1 - this is to reflect cost and embodied carbon of a longer route
- Roads: each link within a road accrues a score of 1
- Waterbodies: each link within a waterbody accrues a score of 20
- Rail: each link within the extent of a rail accrues a score of 20
- Options are also restricted that are within 15m of a building

Waterbodies and rail were given a significantly higher weighting in order to "force" the route to cross at the shortest point, by comparison roads were scored 1 as it is feasible to run a pipe within a road.

The optimised route used a combination of the constraints and weightings for the minimal environmental and ecological impact with those for the best engineering solution.

The tool generated a 'SIA' route for each solution and that was produced by the tool generating multiple routes and selecting the lowest scoring Option. The SIA routes were assessed for engineering / constructability, and some were discounted on feasibility grounds. The remaining routes were then taken forward into Stage 4 of the site and route selection process and supplemented those routes that had already been developed at Gate 1.

During Stage 4, rather than linear routes being used for the evaluation, corridors of varying widths were developed. A corridor approach to pipeline definition was considered appropriate to reflect the fact that there are a number of constraints for example environmental designations, properties etc that would require localised routeing and mitigation once further site-based information is presented. Additionally, the routes had been generated based on an algorithm based on desktop data and therefore the routes would need to be informed by site visits and additional data collation post Gate 2. Therefore, a corridor approach was considered a more robust means of providing a basis for defining a consentable route corridor following Gate 2.

3.1.4.8 Stage 4 of the Site and Route Selection - Desalination

Following completion of Stages 0 to 3b for desalination and the development of pipeline route Options, refinements were made to the methodology for Stage 4 for site and route selection which included combining the previous Stages 4 and 5 identified at Gate 1 and developing a series of evaluation criteria. This was to ensure it fully integrated planning and consenting considerations and would ensure a robust selection process that could be relied upon in a future consenting process. The Consenting Evaluation criteria were developed drawing upon the following policy and regulations:

- Draft National Policy Statement for Water Resources (November 2018)
- National Planning Policy Framework (2021)
- Environmental Impact Assessment Regulations 2017
- Water Framework Directive 2000 / 60 / EC
- The Conservation of Habitats and Species Regulations 2017
- Marine Policy Statement (2011)
- Marine Plans (South Inshore and South Offshore) (2018)

These criteria were developed such that they could be applied to any of the solutions being developed recognising that some have both terrestrial and marine components. The criteria and their supporting sub criteria used for the site selection process are detailed in Table 9.

Table 9 - Stage 4 Consenting Evaluation Criteria

Criteria	Sub-Criteria	Source of the Criteria
Biodiversity and Nature Conservation Terrestrial – Habitats Regulations Assessment (HRA)	SACs, SPAs, Ramsar and all potential, possible and candidate sites Functionally linked habitat	dNPS Habitats Regulations EIA Regulations NPPF
Biodiversity and Nature Conservation Terrestrial	Nationally designated sites Priority habitats Ancient woodland and veteran trees	dNPS EIA Regulations NPPF
Biodiversity and Nature Conservation - HRA (Marine)	SACs, SPAs, Ramsar and all potential, possible and candidate sites Functionally linked habitat	dNPS Marine Plans Habitats Regulations EIA Regulations NPPF
Biodiversity and Nature Conservation – Marine	Nationally designated sites Impact on Priority Habitats	dNPS EIA Regulations Marine Plans
Historic Environment – Terrestrial	Nationally and regionally important assets Unknown archaeology (impact on areas of archaeological potential)	dNPS EIA Regulations NPPF
Historic Environment – Marine	Nationally and regionally important assets Unknown archaeology (impact on areas of archaeological potential)	dNPS EIA Regulations Marine Plans
Landscape / Seascape and Townscape and Visual Amenity	Nationally and regionally important sites Visual amenity	dNPS EIA Regulations Marine Plans NPPF
Water Quality and Resources	Impact on marine water quality Impact on terrestrial water quality Impact on watercourse geomorphology and hydrology Impact on groundwater resources	dNPS EIA Regulations Marine Plans Water Framework Directive (WFD) NPPF

Criteria	Sub-Criteria	Source of the Criteria
Flood Risk	Impact on flood risk Impact on flood defences	dNPS EIA Regulations NPPF
Interface with Future Development and Planning	Risks associated with existing/future Nationally Significant Infrastructure Project (NSIP) Risks associated with 'other' development Risks associated with compromising future marine development Development Plan risk	dNPS Planning Act EIA Regulations
Land Use	Impact on special categories of land Land Take Impact	Planning Act
Green Belt	Impact on Green Belt	dNPS NPPF

These criteria were selected for the site selection process as they are associated with very stringent tests that need to be met for a site to be considered consentable as defined in the relevant policy documents (the NNPF and the dNPS). For example, if a site is within a specific designation (for example a nationally designated asset) there is a clear policy direction to look for an alternative outside of this designation as there is a clear risk of consent not being granted.

Stage 4 comprised a site-based Consenting Evaluation of each of the parcels shortlisted at Stage 1 to 3b against the criteria and sub-criteria detailed in Table 9. Stage 4 of the process also included a back checking process to ensure that all relevant information and inputs were up to date, and to identify where there were any information gaps which would affect the following stages.

Stage 4 also considered the potential pipeline connections that would ultimately form part of a final configuration for each Option. The purpose of integrating the pipeline connections into the evaluation was to ensure that there was a complete evaluation of the potential consenting risks associated with the parcel and its associated infrastructure.

This evidence-based process used reports prepared at Gate 1 (HRA, SEA, WFD), supplemented by the following HRA technical notes to determine the levels of consenting risk:

- HRA Consenting Risks – Desalination Solution (Version 2, June 2021)
- Review of Pipeline Watercourse Crossings for Water Recycling and Bulk Supplies (Version 2, June 2021)

Each parcel and potential pipeline Option were assigned a RAG rating to record their performance against the criteria detailed in Table 10.

Table 10 - Definition of the 'RAG' Consenting Evaluation Criteria

Score	Definition
Substantial adverse	Potential for substantial consenting risks that are likely to be very challenging to overcome / mitigate. Impacts are likely to be unacceptable and will fail to meet required legal/policy tests based on current information.
Large adverse	Potential for major consenting risks. Impacts are likely to require significant mitigation but are potentially acceptable from legal / policy perspective. A case may need to be made e.g., balance of benefits against impacts but could be justified.
Moderate adverse	Potential for moderate consenting risks that will require the development of bespoke mitigation to address, but likely to be achievable and acceptable in policy terms i.e. policy compliance can be achieved.
Minor adverse	Potential for minor consenting risks that will require application of standard best practice.
Positive Impact	Potential for positive performance against policy.
No impact	Does not require appraisal and can be scoped out as not relevant to the Option e.g., no receptors within policy wording that could be affected.

Using the RAG scores assigned to each parcel and pipeline, the outcomes for each parcel and pipeline for each solution were reviewed and a potential configuration recommended to take forward to the Consenting Appraisal stage of the process.

3.1.4.8.1 Stage 4 Site Selection Results – Desalination

Stage 4 of the site and route selection process included a back-checking exercise to ensure that all relevant information and judgments were as robust as possible, and to identify where there were any information gaps which would affect Stage 4. To ensure that planning considerations were a key factor in the short-listing of sites, it also included a review of the terrestrial and marine parcels associated with clusters A, B, C, D and E to determine if there were potentially more consentable alternatives to the Base Case at Ashlett Creek. Figure 12 illustrates clusters considered.

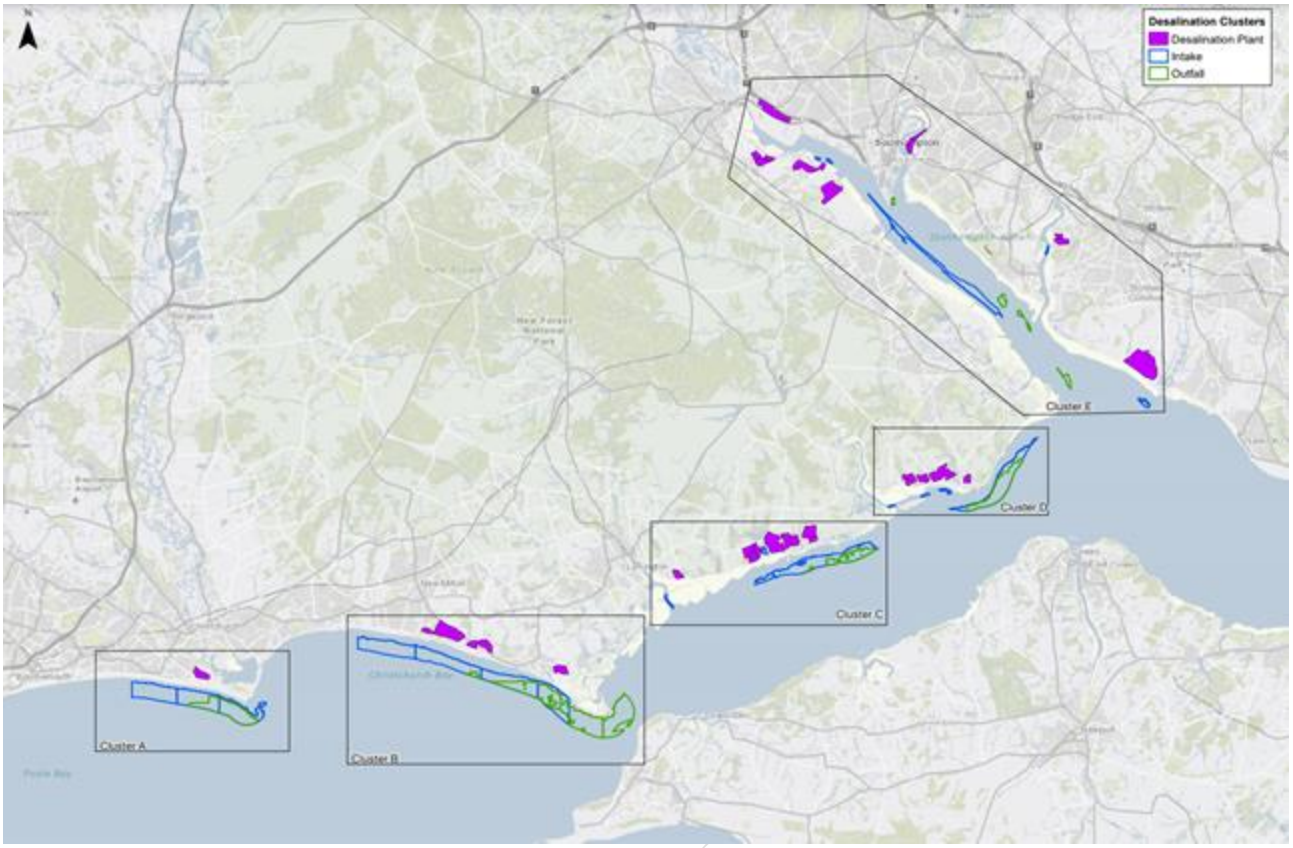

Figure 12 - Clusters and Corresponding Parcels considered in the back-check

A review was undertaken of the HRA risks associated with each of the marine intake/outfall locations as this is a key factor in the viability and consentability of any Desalination-based Option. On the basis of this review, it was determined that the marine components of clusters A, C, D and E were all very high risk owing to potential impacts on designated sites and therefore would not represent more consentable alternatives than the Base Case from this perspective.

The Eastern part of cluster B nearer to Hurst Castle was also identified as having a very high HRA consenting risk but the Western part of that parcel near to Barton on Sea was deemed to have a lower, albeit still high, HRA consenting risk. On this basis, a review of the terrestrial parcels that could connect to the marine intake / outfall in this location was undertaken. Whilst all the terrestrial parcels would be outside of the New Forest National Park the following consenting risks were identified:

- The extensive lengths of pipeline that would be required to connect to Testwood (and which would lie within the New Forest National Park)
- The proximity of the pipelines and their direct impact (intersection with) on a number of European Sites and nationally designated sites (SSSI)
- The geological SSSI designation (Milford Cliffs) along the coastline (in relation to the marine intake/outfall)

It was therefore confirmed that due to these factors, this cluster was not a viable alternative for a desalination solution from a consenting perspective.

A review was also completed of terrestrial parcel D55 (within Cluster E) and its associated marine intake / outfall into the southern part of Southampton Water. Parcel D55 was identified as a possible alternative desalination location at Stage 3b. The review sought to identify whether there was a potential consentable alternative site outside of the New Forest National Park to the Base Case. This review determined that this

Option would require completely new infrastructure within the Solent and Dorset Coast SPA and there would be potential consenting risks associated with impacts on mudflat and saltmarsh areas associated with the saline plume. The terrestrial parcel was also identified as having very high consenting risks owing to the designation of the site as a 'Core' area in the Solent Waders and Brent Geese Strategy [2] . This strategy identifies functional habitat linked to the Solent and Southampton Water SPA and Ramsar. It was therefore not considered a consentable alternative to the Base Case. On the basis of the Stage 4 site selection analysis, no alternative, viable and consentable parcels were identified within clusters A, B, C, D and E.

In addition, a review was undertaken of the discounted draft WRMP19 site at the Former Fawley Power Station to reconfirm that this was not a viable alternative to the Base Case site within the New Forest National Park. This concluded that:

- The terrestrial parcel, whilst not within the National Park, was still immediately adjacent to it and would likely incur significant landscape and visual impacts on the setting of the National Park. It was therefore deemed to have marginally lower, but still significant, consenting risk than the Base Case when assessed against key tests in the dNPS and the NPPF – National Park policy. Development proposals for Fawley Waterside are significantly more advanced than when this Option was removed from the WRMP19 (outline consent has now been granted and the site was also allocated in the Local Plan for this purpose). The size of the plant is likely to consume most of the masterplan area allocated for business and industrial space and it would be very challenging to reconfigure to allow the new masterplan and the desalination plant to operate concurrently on that site. This incompatibility was deemed a very significant feasibility constraint and acquisition risk. Furthermore, as noted above the Fawley Waterside site would still have potential for significant landscape and visual amenity effects and the delivery risks associated with the Fawley Waterside site in relation to the housing allocation and planning permission were not deemed sufficient to prefer this site to the Base Case location at Ashlett's Creek.

Taking the above factors together, it was reaffirmed that the former Fawley Power Station site was not a viable alternative to the Base Case. Table 11 details the configuration that was taken through into Stage 4 of the site selection process.

Table 11 - Parcels and Pipelines taken into Stage 4 of the Site Selection Process for the Base Case

Solution	Parcels	Intake and Outfall (Marine)	Pipelines
Desalination	Ashlett Creek	Fawley to Abstraction / Discharge Route 1 (intake from the existing Fawley Deep Dock and outfall most direct route to marine discharge parcel) Fawley to Abstraction Discharge Route 2 (Calshot Intake / Outfall) – note uses redundant Fawley Power Station water tunnels Fawley to Abstraction Discharge Route 3 (Lepe) Fawley to Abstraction Discharge Route 4 (Lepe)	Fawley to Testwood Route 1 Fawley to Testwood Route 2 Fawley to Testwood Route 4 Fawley to Testwood Route SIA Pipeline Route 3 was discounted prior to Stage 4 owing to significant engineering feasibility issues

[2] Whitfield, D (2020) Solent Waders and Brent Goose Strategy Hampshire and Isle of Wight Wildlife Trust. Curdridge.

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Solution	Parcels	Intake and Outfall (Marine)	Pipelines
			associated with the routeing along a live freight railway.

Table 12 details the results of the site selection process for the Base Case. For details of the components considered in the site selection process refer to Figure 13 (the Ashlett Creek site is shown by the redline site boundary).

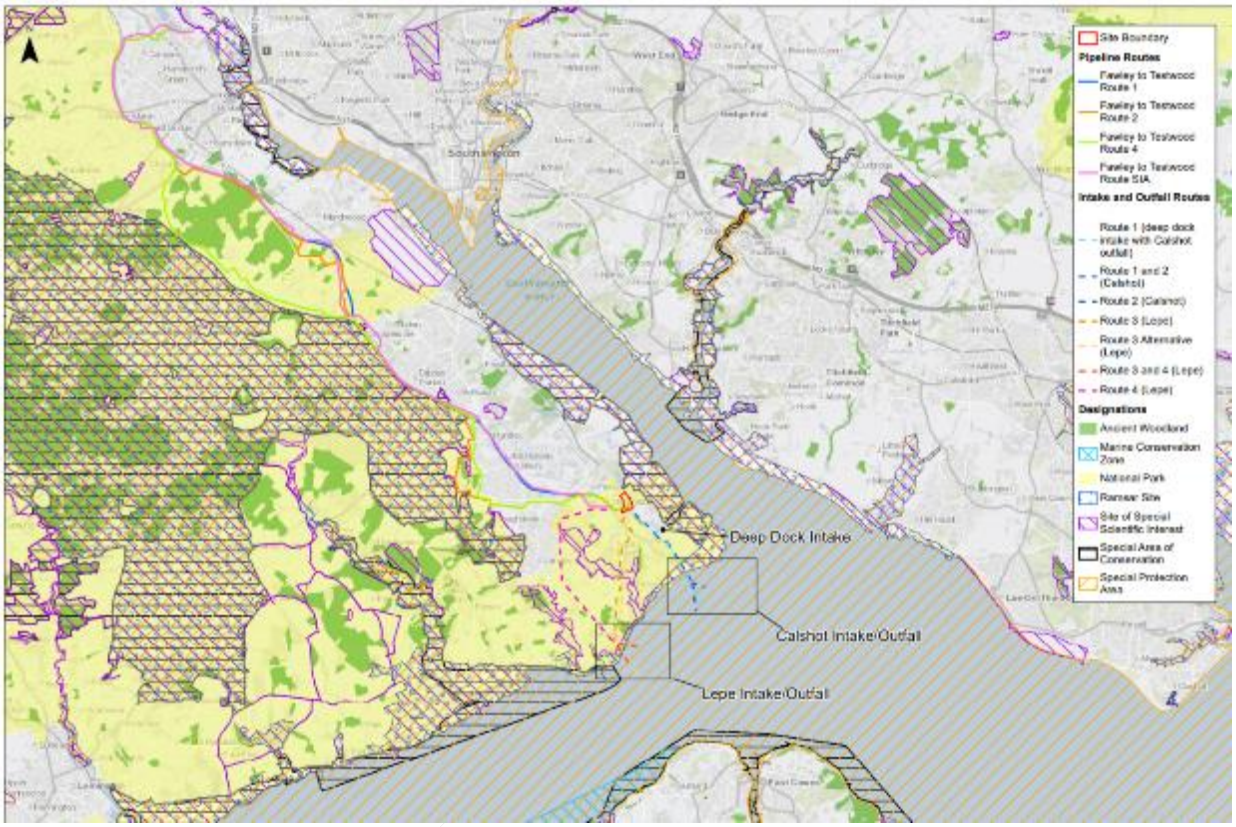

Figure 13 - Components of Site Selection Process for Base Case

Table 12 - Site and Route Selection Results for the Base Case

Option	Summary of Site Selection Outcomes	Consenting Risk
Terrestrial Parcel	This parcel lies within the New Forest National Park and therefore this represents a significant potential consenting risk. The dNPS states: *"Great weight should be given to conserving landscape and scenic beauty in nationally designated areas. National Parks, the Broads and Areas of Outstanding Natural Beauty have the highest status of protection in relation to landscape and scenic beauty. Each of these designated areas has specific statutory purposes which help ensure their continued protection and which the Secretary of State has a statutory duty to have regard to in decisions. The Secretary of State should refuse development consent in these areas except in exceptional circumstances and where it can be demonstrated that the development is in the public interest…. (Paras 4.9.9 and 4.9.10)".* The terrestrial parcel also lies in proximity to a number of internationally and nationally designated ecological sites and therefore there is the potential for indirect effects to affect the conservation objectives of these sites. This will require development of appropriate mitigation to ensure there is no adverse effect as the dNPS indicates that development consent should not normally be granted where there is likely to be an adverse effect.	There is no certainty that mitigation of National Park impacts could be provided. There would be a permanent impact on the National Park associated with the development of this parcel.

Option	Summary of Site Selection Outcomes	Consenting Risk
Marine Intake/ Outfall Lepe Option	The proximity of the Lepe site to the Beaulieu River (part of the Solent and Southampton Water SPA) means that use of this location for the intake / outfall would have a very high consenting risk from a HRA perspective. This risk relates to disturbance to important foraging / roosting areas within the Beaulieu Estuary during the construction works (a temporary impact). The Beaulieu River and Needs Ore Point area is known to support Annex I 'Salicornia and Other Annuals Colonising Mud and Sand' habitat (part of the Solent Maritime SAC), which is highly sensitive to changes in suspended solids (water clarity). A known area of seagrass is located close to the westernmost extent of the modelled dispersion plume for the Lepe site. Seagrass is also considered to be highly sensitive to changes in water clarity, smothering and salinity changes. Although the extent of any sediment plume is unknown, the proximity of the Lepe site to the Solent Maritime SAC and the recorded area of seagrass increases the risk of adverse effects that cannot be mitigated. This would be an ongoing operational impact. Therefore, there are significant consenting risks associated with this site.	Further environmental information especially in relation to HRA risks is required to establish consenting viability and ability to be able to mitigate potential effects. Significant risk would remain until this survey information is completed. This potential location for the marine intake / outfall is considered to have potentially greater consenting risks than the Calshot Option considered below.
Marine Intake / Outfall Calshot Option	The HRA consenting risks are considered to be potentially lower for the Calshot intake and outfall Options as there is potential to re-use some existing infrastructure associated with the Fawley Power Station that would further reduce impacts to the marine environment. Use of the redundant Fawley power station infrastructure at the deep dock for the intake would be offset from the main Southampton Water channel which could reduce risks associated with the intake. If a new intake needed to be constructed, then this would be within the Western Solent. Although mitigation is proposed with the type of intake screen and mesh size to be used, further evidence will be required to determine impingement / entrainment and entrapment issues will not result in adverse effects. If required, the new offshore intake infrastructure would be outside the estuaries feature of the Solent Maritime SAC, but construction would be required in intertidal areas which area designated as part of the SAC and Solent and Southampton Water SPA and Ramsar. There is potential for an adverse effect on site integrity. There would be the dispersion of the waste-stream across the entrance to Southampton Water which leads to the spawning watercourses designated for Atlantic salmon (River Itchen SAC, River Meon (compensatory habitat) and River Test SSSI). Further investigation is needed regarding how any waste stream impacts could be mitigated and this would be developed through further modelling and survey information.	Further environmental information especially in relation to HRA risks is required to establish consenting viability. Significant risk would remain until this survey information is completed. In view of the potential to re-use existing infrastructure this Option is considered preferable to the Lepe intake / outfall Option above.
Pipelines- Four Considered (1, 2, 4 and SIA)	Four pipelines were considered in the site selection process. Pipeline 3 was discounted prior to Stage 4 owing to significant engineering feasibility issues associated with the routeing along a live freight railway. Pipeline SIA was developed after Gate 1 during a refinement of the pipeline corridors. This comprised the application of the SIA 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. Pipelines 1 and 2 have a lower impact on the New Forest National Park than Pipelines 4 and SIA, however there are significant constructability constraints related to construction within the A326 Hythe bypass. There will be a need for further technical feasibility work and engagement with Hampshire County Council regarding the proposed pipeline construction.	The consenting risks are considered potentially lower for pipelines 1 and 2 as they have a reduced impact on the New Forest National Park and other national level designations although there remain significant challenges associated with the

Option	Summary of Site Selection Outcomes	Consenting Risk
	Pipeline SIA has potential significant ancient woodland impact. 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)* Pipeline 4 presents fewer engineering challenges but passes close to ancient woodland and is likely to require mitigation. All the pipelines have a potential intersection with Flood Zones 2 and 3 and therefore a Flood Risk Assessment will be required to ensure that all relevant tests within the dNPS are met.	deliverability of these pipeline routes.

3.1.4.9 Site and Route Selection Conclusions – Desalination

Based on the Stage 4 site and route selection process and the consideration of marine and terrestrial risks, it was determined that there was no consentable and viable alternative to the Base Case.

The Base Case therefore remained the preferred Desalination-based Option. The site selection process confirmed that for the Base Case, the Calshot marine intake / outfall Options should be taken forward and the Lepe Options discounted as the former were deemed to have lower consenting risk from an HRA perspective.

Regarding the pipeline route Options, pipeline corridors 1 and 2 were recommended to be included within the preferred configuration. Stage 4 concluded that there remained a number of consenting risks that needed to be considered further in the Consenting Evaluation that would form part of the Options Appraisal:

- There remain significant HRA risks. There was significant residual uncertainty about the ability to mitigate the potential impacts associated with the marine intake and outfall, and the impact of the timescales on the scheme delivery programme that would be required to establish data on which acceptable proposals could be developed.
- The impact of the terrestrial parcel on the New Forest National Park and the ability to mitigate the impacts
- The mitigation required to develop a deliverable pipeline connection to Testwood

Table 13 details the components that were taken forward into the Consenting Evaluation.

Table 13 - Recommended Desalination Configuration

Infrastructure Component	Site Selection Outcome
Marine Intake / Outfall	Calshot Intake and Outfall (including potential use of the deep dock)
Terrestrial Parcel	Ashlett Creek
Pipeline	Pipelines 1 and 2

3.1.5 Site and Route Selection – Water Recycling

The following sections present details of the site and route selection process and outcomes for water recycling. The site selection methodology and results for Stages 0 to 3 are supported by the following Reports:

- Option B Water Recycling Report, Water Recycling Plant Site Selection, Site Selection Stage 0 -3 Output Report, Text for Gate 2 Update, April 2021
- Water Recycling Site Selection Framework, Water Recycling Plant Site Selection Criteria Supporting Report, April 2021

There are three Options for water recycling that have been assessed: two using an EBL at Otterbourne WSW as an environmental buffer, namely Option B.2 and Option B.5. Option B.4 uses HTR as the environmental buffer for the treated recycled water.

The three Options are summarised in the Table 14.

Table 14 - Summary of Water Recycling Options

Option no.	Summary
B.2	61 Ml/d DO recycled water (indirect) sent to Environmental Buffer Lake (EBL) and treated at Otterbourne WSW (Water Recycling Plant (WRP) supplied by Budds Farm Wastewater Treatment Works (WTW));
B.5	75 Ml/d DO of recycled water (indirect) sent to EBL and treated at Otterbourne WSW (WRP supplied by Budds Farm and Peel Common WTW);
B.4	75 Ml/d DO transfer between HTR and Otterbourne WSW (augmented with a 15 Ml/d WRP to supplement HTR)

The key difference between B.2 and B.5 is that B.5 has the addition of a 25 km FE transfer from Peel Common WTW to enable the WRP to treat up to its full capacity of 75 Ml/d. Both B.2 and B.5 include:

- A FE transfer from Budds Farm WTW via a 0.8 km tunnel to a new WRP
- 35 km transfer pipeline from the WRP to a new 75 Ml Lake EBL adjacent to Otterbourne WSW

3.1.5.1 Site Selection Stage 0 – Water Recycling

Stage 0 comprised the identification of a terrestrial search envelope for the WRP plant. The search envelope was determined by two factors:

- At Gate 1 the initial envelope proposed was 500 m so the WRP could be located as close as possible to the final effluent end point for the waste stream. However, the search envelope was increased to 1.5 km around Budds Farm WTW owing to the level of development already around Budds Farm. A larger envelope provided greater flexibility whilst also maintaining a reasonable proximity to the WRP thereby reducing the likelihood of needing increased lengths of interconnecting pipelines and pumping requirements for increased distances.
- The application of the Water for Life Hampshire: Coastal Study for Site Selection Assessment (Report Ref: PB9638-RHD-ZZ-XX-RP-Z-0001, Dated 21 July 2020). The Coastal Resilience Line was formed through the assessment of coastal geomorphology and management policies, to identify projected future rates of coastal change and zones susceptible to sea flooding in order to identify areas along the coastline where major infrastructure development would not be suitable.

Figure 14 - Terrestrial Search Envelope for Water Recycling

3.1.5.2 Site Selection Stage One – Water Recycling

At Stage 1, parcels were identified and plotted on a GIS map. The suitability of a parcel was determined by considering the criteria detailed in Table 15 and fell within the 1.5 km search envelope of Budd's Farm WTW. The criteria considered were land use, avoidance of certain land conditions, as well as meeting the required minimum size requirement.

Table 15 - Stage 1 Land Parcel Requirements – Water Recycling

Element	Water Recycling
Land Use	Densely developed residential areas (towns/cities) - private residences, care homes, hospitals, schools, universities, places of worship, burial grounds, holiday parks, hotels, retail parks, leisure parks Key transport infrastructure - railways, airports, classified roads, ports Key utilities - power stations, gas and electricity substations
Land Conditions	Avoidance of the following: Marsh Mudflat Cliff face

Element	Water Recycling
	Open Water
Land Parcel Size	61 Ml/d - Minimum of 40,470m^2 + 4,047m^2 for construction 75 Ml/d - Minimum of 48,564m^2 + 4,047m^2 for construction

A total of 17 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 15.

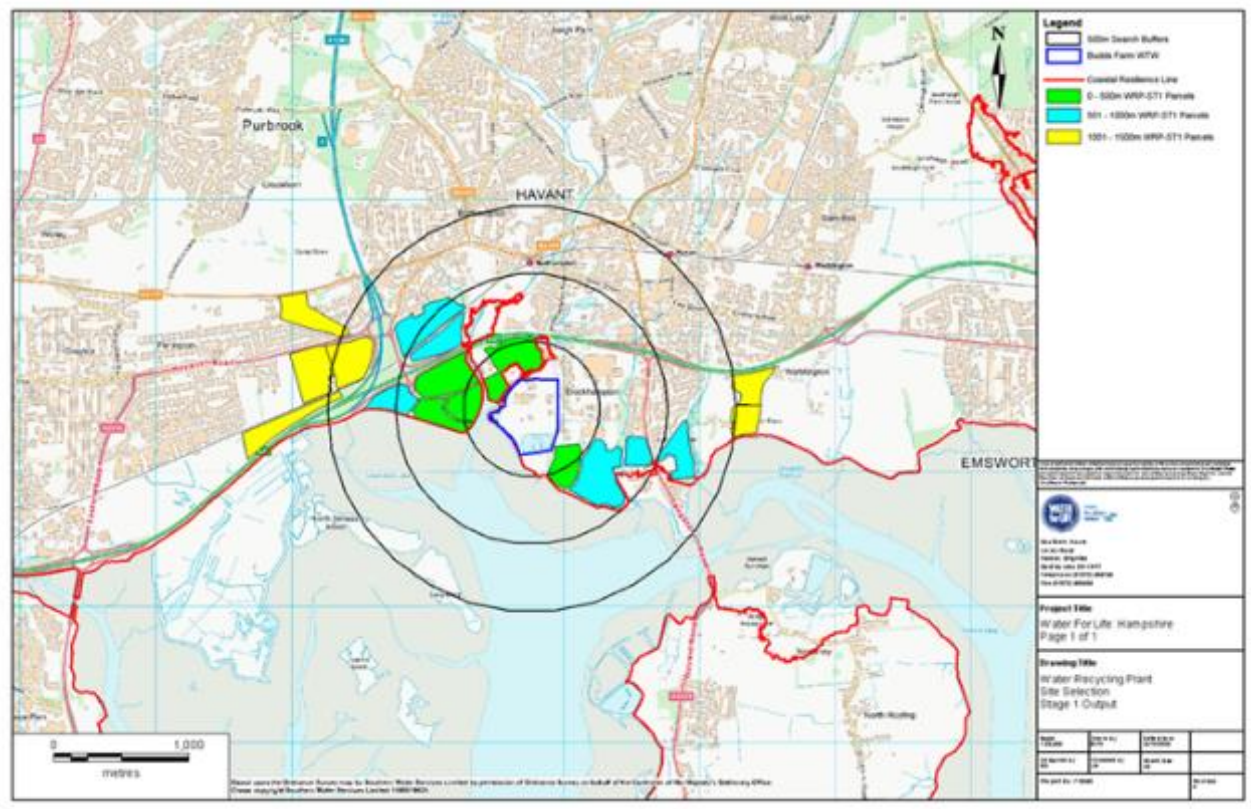

Figure 15 - Water Recycling Plant Site Selection Stage 1 Output

3.1.5.3 Site Selection Stage 2a – Water Recycling

Stage 2a considered the proximity of the parcels to sensitive receptors to identify the best performing parcels. The performance of each parcel was determined by its proximity to specific receptors and the level of sensitivity of the receptor.

The criteria were:

- SAC / Ramsar / SPA (including potential and candidate sites)
- SSSI / National Nature Reserve (NNR)
- Scheduled Monument
- National Park / AONB/ Green Belt
- Ancient Woodland
- Grade 1 and 2* Registered Parks and Gardens and Listed Buildings and Battlefield Sites
- Residential (Noise/vibration and air quality impact)
- Hospitals, Care Homes, Schools; and

- Amenity Spaces e.g., allotments, public parks, playgrounds, playing fields

A range of sensitive receptors related to statutory ecological, cultural heritage and landscape designations, human health and amenity have been identified for inclusion in this stage and which reflect importance in planning and environment policy, such as NPPF, Draft NPS 2018 and the EIA Regulations 2017. Within this stage, each of the identified sensitive receptors are assigned a criteria reference and importance (1-3, with 3 being the most important) and proximity/distance rating value. To calculate a final score for each land parcel and determine best performing (highest scoring) terrestrial parcels, the criteria importance value is multiplied by the proximity value. The final score then allows the parcels to be ranked to identify the best performing terrestrial parcel. The overall score for the parcel identifies those parcels that have the least potential to result in harm to the environment and other sensitive receptors.

The definitions used to allocate land parcel scoring are detailed in Table 16 distance banding scoring definitions are detailed in Table 17.

Table 16 - Importance scoring of receptors

Importance scoring	
3	Statutory Designated site of International importance afforded the highest levels of protection through the law and planning policy.
2	Statutory Designated sites or non-statutory sites of national importance.
1	Non-designated sensitive sites that are material planning policy considerations.

Table 17 - Distance band scoring for Stage 2a

Distance band scoring	
0	Parcel has been assessed as within a sensitive receptor, as such development of the parcel has higher potential for adverse environmental, quality, cost and programme impacts, though these could potentially be overcome through embedded mitigation, design optimisation/changes and/or compensation.
1	Parcel has been assessed as being near a sensitive receptor, as such development of the parcel has lower potential for adverse environmental, quality, cost and programme impacts than those parcels that score 0. Though these could potentially be overcome through embedded mitigation, design optimisation/changes and/or compensation.
3	Parcel has been assessed as not being in relevant proximity to a sensitive receptor, as such development of the parcel has lower potential for adverse environmental, quality, cost and programme impacts, than those parcels that score 1.

The criteria/receptors for inclusion in Stage 2a are detailed in Table 18 with importance scoring and distance band allocations. These rating and bandings reflect the importance of statutory designations, significance and alignment with descriptions of sensitive areas in Regulation 2 of the EIA Regulations 2017.
The importance placed on a criteria or receptor is determined by the weight given to its sensitivity and protection within the law or planning policy documents.
For example: for a criteria or receptor of international importance where 'development within it would be wholly exceptional', an importance score of 3 is allocated. A criteria or receptor of national importance would be allocated an importance score of 2. A criteria or receptor that is sensitive and important at the local scale is allocated a score of 1. The importance score assigned to each receptor is explained in further detail in Water Recycling Site Selection Framework, Water Recycling Plant Report, Site Selection Criteria Supporting Document (April 2021).

Table 18 - Stage 2a sensitive receptor criteria and scoring

Criteria Ref. No	Criteria/receptor	Importance	RAG - Red/Amber/Green

			0	1	3
			Distance bands (m)		
WRP_ST2_A_1	SAC/Ramsar/SPA (incl. potential and candidate sites)	3	Within	Within relevant SSSI IRZ	Outside relevant SSSI IRZ
WRP_ST2_A_2	SSSI/National Nature Reserves	2	Within	Within SSSI IRZ	Outside SSSI IRZ
WRP_ST2_A_3	Scheduled Monuments	2	Within	0m-499m	>500m
WRP_ST2_A_4	National Parks / AONB / Green Belt	2	Within	0m -3km	>3km
WRP_ST2_A_5	Ancient Woodland	2	Within	0m-499m	>500m
WRP_ST2_A_6	Grade 1 and 2* Registered Parks and Gardens and Listed Buildings and Battlefield Sites	2	Within	0m-499m	>500m
WRP_ST2_A_7	Residential (Noise/vibration and air quality impact)	1	N/A	0m-350m	>350m
WRP_ST2_A_8	Hospitals, Care Homes, Schools	1	N/A	0m-350m	>350m
WRP_ST2_A_9	Amenity Spaces e.g., Allotments, public parks, playgrounds, playing fields	1	Within	0m-350m	>350m

Each terrestrial parcel is scored against each criterion and a total score calculated. The higher the score the better the terrestrial parcel performs.

The 17 parcels were then scored against the Stage 2a criteria. The highest scoring parcel was awarded 31 points and the lowest 18. To ensure a sufficient cohort of sites could be compared at later stages the top 25% best performing parcels, progressed to Stage 2b. Two of the 17 parcels fall within a SAC/Ramsar/SPA (including. potential and candidate sites) and SSSI designation. Following Stage 2a, seven parcels progressed to Stage 2b which represented 41% of the 17 parcels. A higher percentage than 25% progressed

due to the number of parcels being assigned the same score and there being no quantitative and objective differentiation that could be made between them. The output of Stage 2a is illustrated on Figure 16.

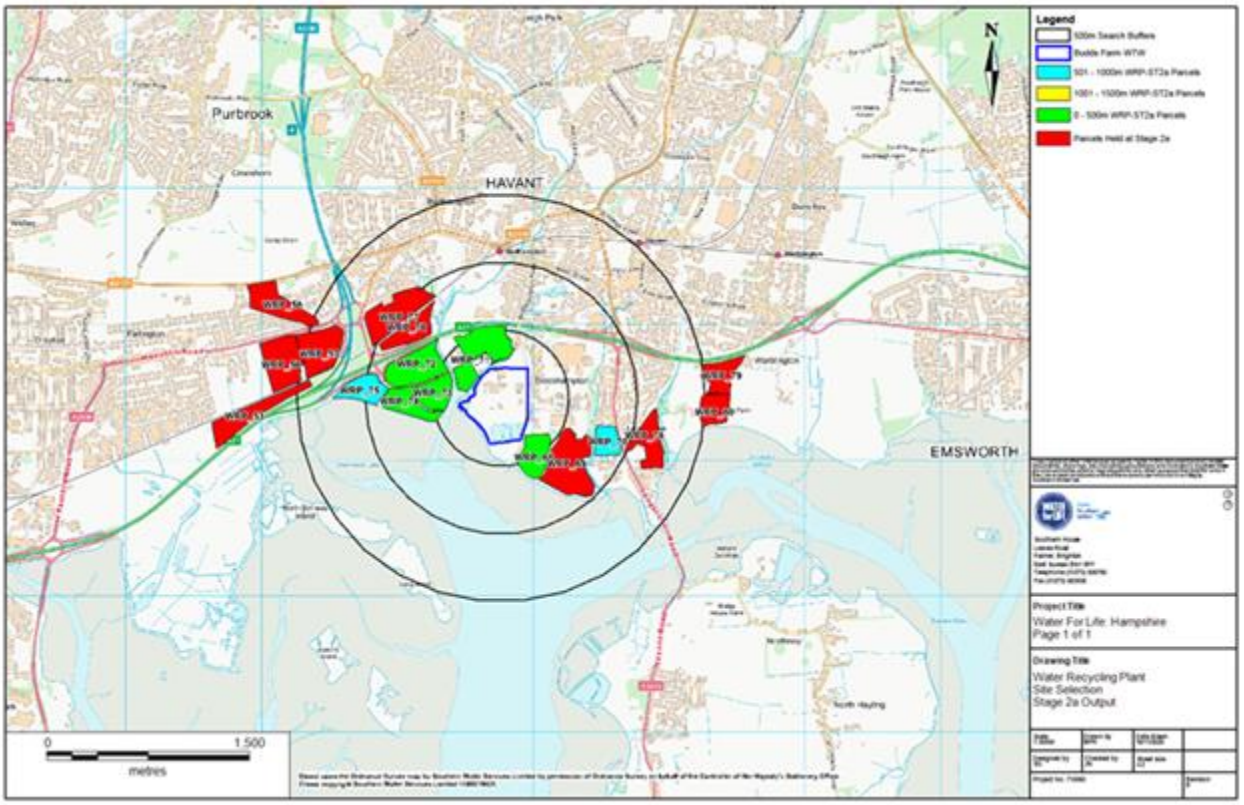

Figure 16 - WRP Parcel Site Selection Stage 2a Output

3.1.5.4 Site Selection Stage 2b – Water Recycling

Stage 2b considered any conflict of the best performing parcels from Stage 2a with areas that have been approved or validated for DCO developments (within last five years) or development subject to TWAO under the Transport and Works Act 1992 and screened / scoped or validated and approved within the last three years in accordance with the relevant EIA Regulations.

A compatibility score was calculated for each parcel, the higher the score the better the parcel performed. The criteria for attributing a score to each parcel for compatibility reflects that used for desalination is detailed in Table 8 **- Compatibility Scoring for Stage 2b – Desalination**Table 8.

None of the best performing parcels from Stage 2a had any conflict with any developments as defined above and as such all parcels proceeded to Stage 3. The outcome of Stage 2b is illustrated in Figure 17.

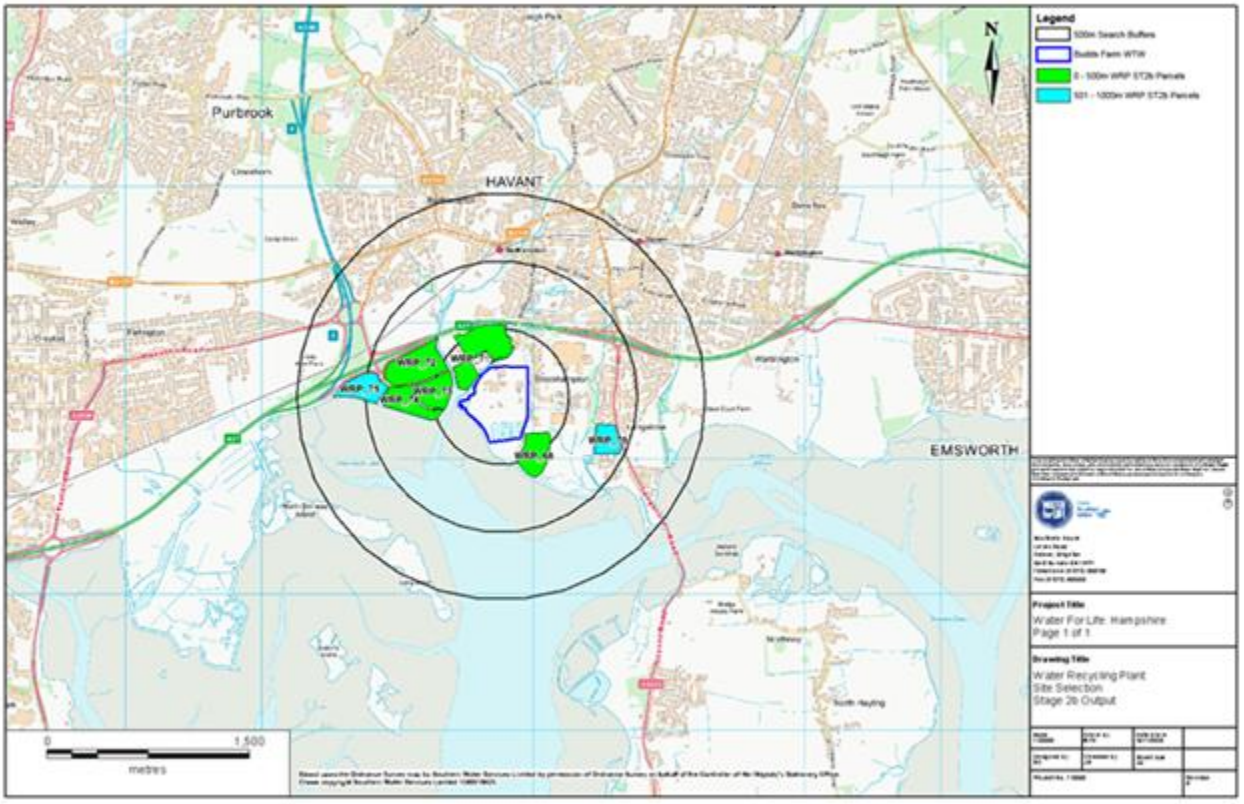

Figure 17 - Site Selection Stage 2b Output – Water Recycling

3.1.5.5 Site Selection Stage 3 – Water Recycling

Stage 3 introduced additional proximity criteria covering a number of environmental, geotechnical and constructability considerations as well as reconsidering the performance of those parcels against the Stage 2a criteria. The additional criteria included but were not limited to the presence of flood plain, proximity to Source Protection Zone, rivers / drains (potential pollution pathways), schools, care homes, hospitals and residential and non-statutory designated sites for nature conservation and historic environment. Examples of non-environment criteria included ease of access from major transport routes, ground conditions and current or previous potentially contaminating land uses. The performance of each parcel was determined by its proximity and the importance of the receptor (consistent with the approach used for Stage 2a).

The additional criteria used in Stage 3 are fully detailed in the Water Recycling Site Selection Criteria Supporting Document. A score of 0 to 3 was assigned for each criterion with the points allocation being defined for each specific criterion e.g., for floodplain a parcel scored 3 if it was located within Flood Zone 3. The full breakdown of points allocation to each criterion is presented in the supporting Water Recycling Site Selection Criteria Document.

Seven parcels proceed to Stage 3 with all being scored for their performance against the additional site selection criteria. The higher the score the better the parcel performed. The highest score attributed to a parcel was 80 points with the lowest being 75. As the parcels were scored against 39 criteria with each criteria awarding a maximum of three and a minimum of zero points, a variance of five points between the seven parcels illustrates little differentiation could be made between the best performing and least well performing parcels through mapping and criteria application alone. The outcome of Stage 3 of the process

was that five parcels (68, 70, 71, 72 and 75) proceeded to the next stage. Figure 18 illustrates the location of the parcels (those in green and blue).

None of the parcels were designated Grade 1 and 2* Registered Parks and Gardens, the curtilage of Listed Buildings or within Battlefield Sites, Ancient Woodland or SAC /Ramsar / SPA (including potential and candidate sites), SSSI or NNR designations.

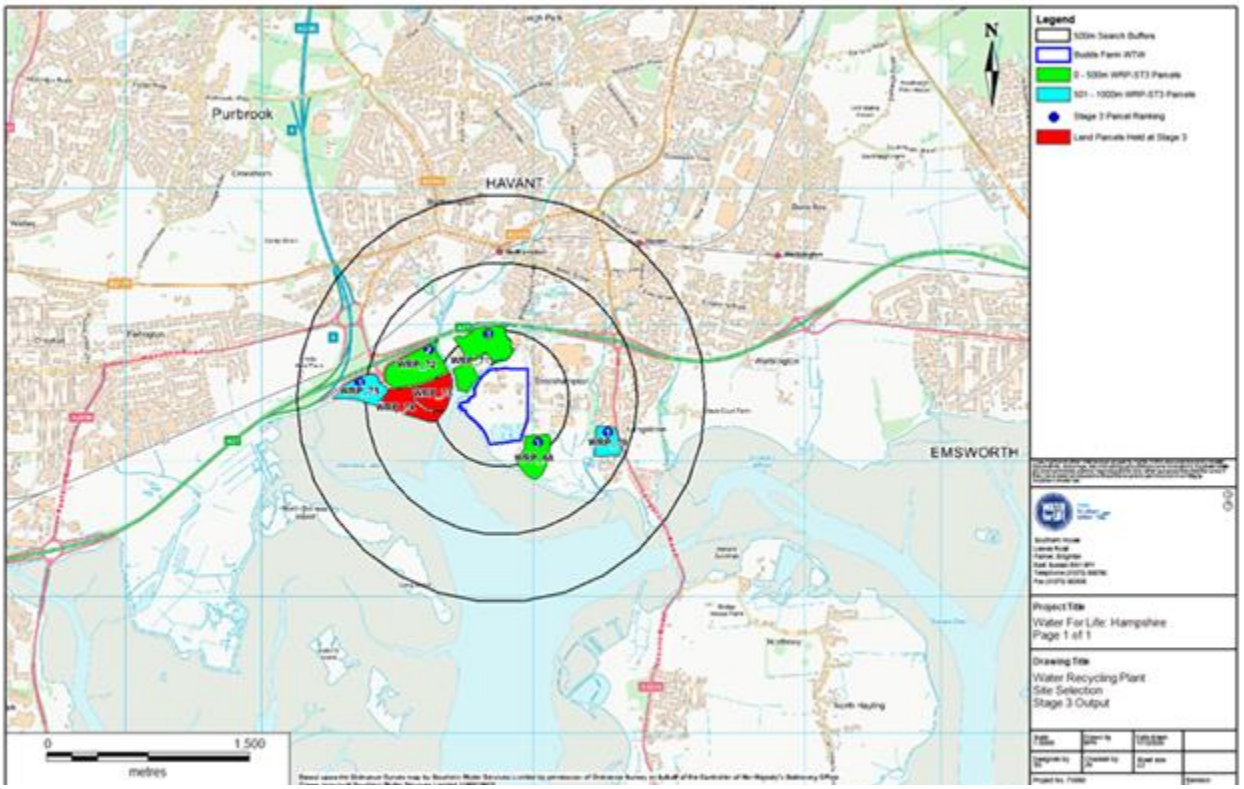

Figure 18 - Site Selection Stage 3 Output – Water Recycling

3.1.5.6 Stage 4 Site and Route Selection Results – Water Recycling

The development of connecting pipelines for the water recycling Options followed the same process as described for the Desalination-based Option. The Stage 4 site selection process for water recycling also used the same methodology as the Desalination-based Option.

The results for the site and route selection process for water recycling are presented as follows:

- The site selection results for the WRP parcel that is relevant to all Options
- The connecting pipelines between the WRP and Otterbourne for Options B.2 and B.5
- Site selection conclusions for Options B.2 and B.5
- Site selection conclusions for Option B.4 which also incorporates HTR

3.1.5.6.1 WRP Parcels – Site Selection Results

Following completion of stages 0 to 3 of the site selection process, five parcels (illustrated in Figure 18) (68, 70, 71, 72 and 75) proceeded to the Stage 4 site and route selection process.

The parcels for the location of the WRP (which is common to all three Options: B.2, B.4 and B.5) were evaluated for their consenting risk with the results of this process summarised in Table 19.

Table 19 - Summary of Site Selection Outcomes for WRP Parcels

Option	Summary of Site Selection Outcomes	Consenting Risk
Parcel WRP 68	This parcel lies adjacent to a Site of Importance for Nature Conservation (SINC). The dNPS states: *"Sites of regional and local biodiversity and geological interest (which include Local Geological Sites, Local Nature Reserves and Local Wildlife Sites and Nature Improvement Areas) have a fundamental role to play in meeting overall national biodiversity targets, in contributing to the quality of life and the well-being of the community, and in supporting research and education. The Secretary of State should give due consideration to such regional or local designations. However, given the need for new infrastructure, these designations should not be used in themselves to refuse development consent". (Para 4.3.13)* The parcel is also defined as a Secondary Support Area in the Solent and Waders Brent Goose Strategy[3] and therefore, would require appropriate mitigation. The strategy and the sites designated as part of it were developed to wherever possible conserve extant sites, and to create new sites, enhancing the quality and extent of the feeding and roosting resource for the internationally important brent goose and wading bird populations within and around the SPA and Ramsar wetlands of the Solent Coast. This site also partially lies within flood zones 2 and 3 and lies within a sand and gravel extraction area.	The SINC is not considered to be a reason to not take forward the parcel but the designation of the site as a Secondary Support Area is a potential consenting risk as there are other potential parcels available.
Parcel WRP70	This parcel is also defined as a Secondary Support Area in the Solent and Waders Brent Goose Strategy and would therefore require mitigation. The site also lies directly adjacent to the Chichester Harbour Area of Outstanding Natural Beauty although the parcel is separated from the AONB by a road (A27).	Whilst the parcel lies in proximity to the AONB this is not considered to be a consenting risk in view of the proximity of existing industrial land uses and the A27. However, the designation of the site as a Secondary Support Area is a potential consenting risk as there are other potential parcels available.
Parcel WRP71	This parcel is allocated within the Havant Borough Council adopted Core Strategy (2011) and Allocations (2014) as a site suitable for B2 / B8 uses in the heart of the Broadmarsh Industrial Area that could provide 16,300 square metres of new employment floorspace and between 233 and 452 jobs. The site is already developed and comprises existing / active warehousing and office uses.	This parcel is considered to be possible to consent although there are potentially greater challenges associated with the presence of existing infrastructure.
Parcel WRP72	The Western part of the site is identified as a low use site in the Solent and Waders Brent Goose Strategy and therefore would require appropriate mitigation. The parcel area is	Whilst part of the site is identified as a low use site in the Solent and Waders Brent Goose Strategy, it should be possible to

[3] Solent Waders and Brent Goose Steering Group (2020) Solent Waders and Brent Goose Strategy

Option	Summary of Site Selection Outcomes	Consenting Risk
	designated as a 'gateway' employment site and an outline application for employment uses (class E, B2, B8) was submitted in Feb 2021. The parcel is also a former landfill site.	implement appropriate mitigation and therefore this is not deemed a reason not to take this parcel forward to the next stage of the Consenting Evaluation. The use of the landfill site is not considered a consenting risk although as noted in the dNPS *"For developments on previously developed land, the applicant should ensure that they have considered the risk posed by land contamination and how it is proposed to address this*." (Extract of para 4.10.8)
Parcel WRP75	This is designated as a Core Area in the Solent and Waders Brent Goose Strategy. This is a significant constraint to future development on this site as this constitutes functional habitat associated with the SPA and Ramsar wetlands of the Solent Coast.	This parcel is not considered to be consentable owing to the Core designation of the site.

On the basis of the site selection and consenting risk review, it was considered that parcels WRP71 and WRP72 had the least consenting risks. WRP 71 is already developed and comprises existing / active warehousing and office uses and is considered potentially more difficult to consent than WRP72. WRP 72 experiences 'low' use as defined in the Solent Waders Strategy (Western side of site only); and there is a current outline application on the site for business and commercial use. It was therefore recommended that WRP 72 was taken forward to the Stage 5 evaluation of preferred configurations. It is also proposed to retain WRP71 as a back-up to WRP72, subject to completion of further work.

WRP75 is identified as a 'Core' Area in the Solent Waders and Brent Goose Strategy. Therefore, as there are other alternative parcels available for use it was not deemed preferable to use this parcel as it would pose a greater level of consenting risk. Parcels WRP68 and WRP70 were both identified in the strategy as Secondary Support Areas and would therefore require HRA mitigation.

3.1.5.6.2 Route Selection Outcomes for Options B.2 and B.4

Following Gate 1, further pipeline development work was undertaken, regarding the connecting pipelines. This comprised the application of the SIA 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 three potential pipeline corridors were identified between the WRP and Otterbourne WSW that were considered in the stage 4 site and route selection evaluation. The pipelines considered were (illustrated in Figure 19 for their location):

- WRP to Otterbourne Route 1
- WRP to Otterbourne Route 2
- WRP to Otterbourne SIA

The connecting pipelines to Otterbourne WSW (relevant to Options B.2 and B.5) were evaluated for their consenting risk with the results of this process summarised in Table 20.

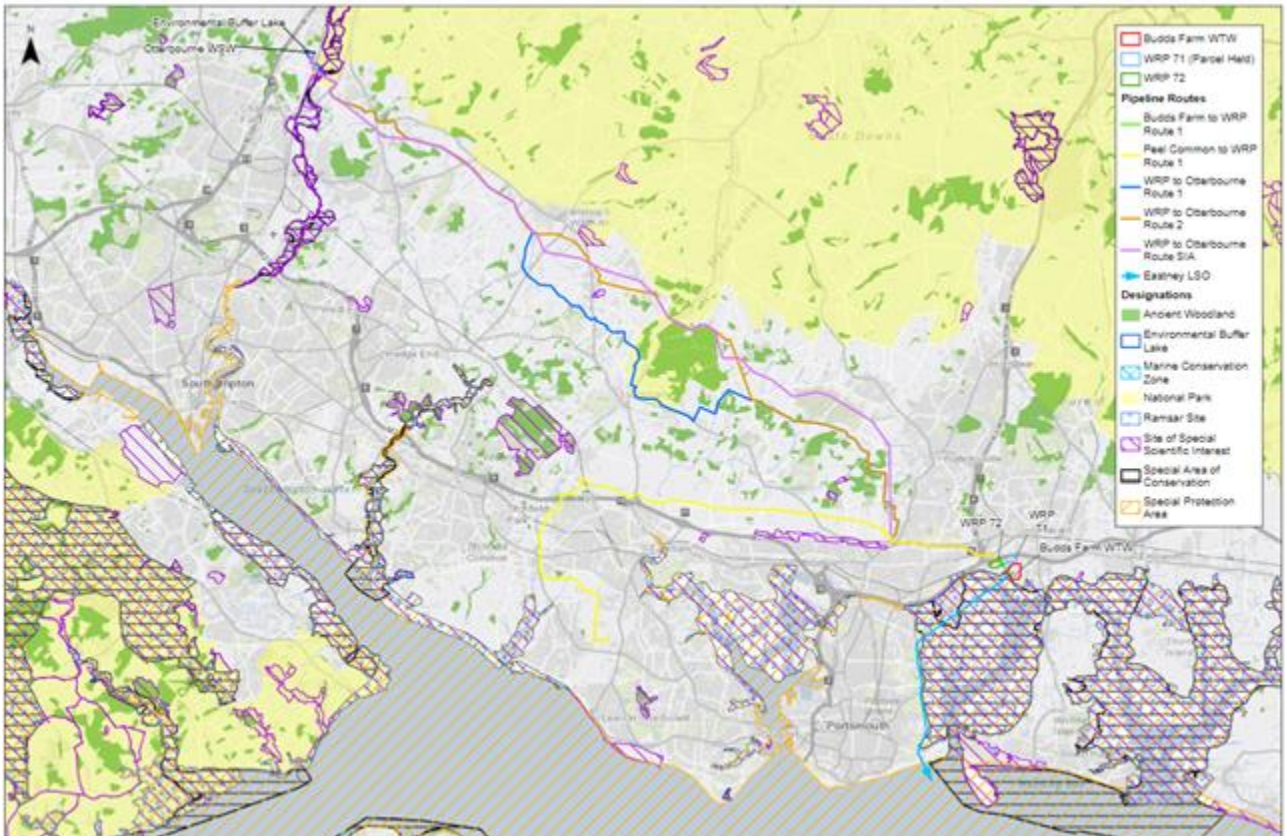

Figure 19 - Location of connecting pipelines between the WRP and Otterbourne

Table 20 - Summary of Route Selection Outcomes for the Pipelines between the WRP and Otterbourne

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 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 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 3.5 km of the South Downs National Park. There is an interface with the SLP Pipeline 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 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. Whilst this corridor would run within the National Park, the final pipeline would be buried although there will be a need to undertake future siting work in relation to the location of potential pumping stations at the next stage of scheme development after Gate 2.
Pipeline 2	This corridor would require a crossing of the River Itchen SAC which is a potential HRA risk that would	There would be a need for further engineering and environmental assessment work to ensure that there is appropriate

Option	Summary of Site Selection Outcomes	Consenting Risk
	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 appropriate mitigation / engineering solution. This corridor runs through approximately 2 km of the South Downs National Park. There is an interface with the SLP Pipeline Route and the AQUIND Interconnector both intersect with the pipeline corridor and there will be a requirement for appropriate re-routeing / construction techniques. There are two Scheduled Monuments within 100 m of the centre of the pipeline corridor and whilst they are unlikely to be directly affected there is risk of indirect effects and potential for there to be currently unknown archaeological features that could be impacted.	routeing and mitigation of the crossing of the River Itchen SAC. This is a potential consenting risk (that applies to all the pipeline Options). Effects on ancient woodland would also need to be further assessed and appropriate mitigation implemented to avoid both direct and indirect effects. Whilst this corridor would run within the National Park, the final pipeline would be buried although there will be a need to undertake future siting work in relation to the location of pumping stations at the next stage of scheme development after Gate 2. There will also be a requirement to ensure appropriate routeing of the corridor to reduce potential impacts on nationally designated cultural heritage features.
Pipeline SIA	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. There is potential for direct and indirect impact on ancient woodland, and this would require an appropriate mitigation / engineering solution. This corridor runs through approximately 2 km of the South Downs National Park. There is an interface with the SLP Pipeline 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 the pipeline Options). Effects on ancient woodland would also need to be further assessed and appropriate mitigation implemented to avoid both direct and indirect effects. Whilst this corridor would run within the National Park, the final pipeline would be buried although there will be a need to undertake future siting work in relation to the location of potential pumping stations at the next stage of scheme development after Gate 2.

All three alternative pipelines performed in a very similar way against the evaluation criteria with all requiring a crossing of the River Itchen SAC prior to connecting into Otterbourne WSW and so there would be a need for appropriate mitigation which is likely to comprise re-routeing of the pipeline corridor to ensure no adverse effects on integrity. All routes would run partially through the South Downs National Park and there would also be a need for appropriate design to avoid impacts on ancient woodland. Therefore, the site selection process recommended a combination of Route 1 through to the approximate location of the Forest of Bere and then the need for further feasibility to determine whether the corridor should run through the more Northerly corridor (Route 2), albeit through a shorter section of the National Park or retain Route 1 through a more Southerly extent of the National Park before all pipeline routes re-join to connect into Otterbourne WSW.

The pipelines would require a pumping station and break pressure tanks to be sited along the route. 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. This will mean that an area of search for this infrastructure will need to be established within the recommended pipeline corridors, and for further work to be undertaken to identify a preferred site.

Site and Route Selection Conclusions for Option B.2

The outcome of the site selection process recommended that the following components were taken forward into the Consenting Evaluation for Option B.2:

- Parcel WRP 72 (with Parcel WRP71 retained as a backup)
- Pipeline 1 and Pipeline 2 to connect to Otterbourne WSW

Notwithstanding that, at the conclusion of Stage 4 there were a number of consenting risks identified that needed to be considered further in the Consenting Evaluation:

- 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.

Site and Route Selection Conclusions for Option B.5

Option B.5 would use the same land parcels as Option B.2 and the same pipeline connections to Otterbourne and therefore the recommendations outlined above would apply.

Option B.5 would additionally require a new pipeline connection between Peel Common Water Treatment Works and the WRP. The areas to the northwest of Peel Common WTW and south of M27 / Portsdown Hill Road are heavily urbanised, in addition there are a number of designations in the area (illustrated in pink in Figure 20 below) which constrain potential route Options. This pipeline route would need to be routed through the urban areas and there are potentially challenging locations such as along Portsdown Hill Road where there are highway, community and cultural heritage constraints (Listed Buildings and Scheduled Monuments) that will need to be managed through the future scheme development stages. The corridor proposed navigates through the designations (Figure 20 below illustrates the route corridor). The (SIA) Route Planner Tool was used to back-check the route and derived substantially the same route and within the same corridor.

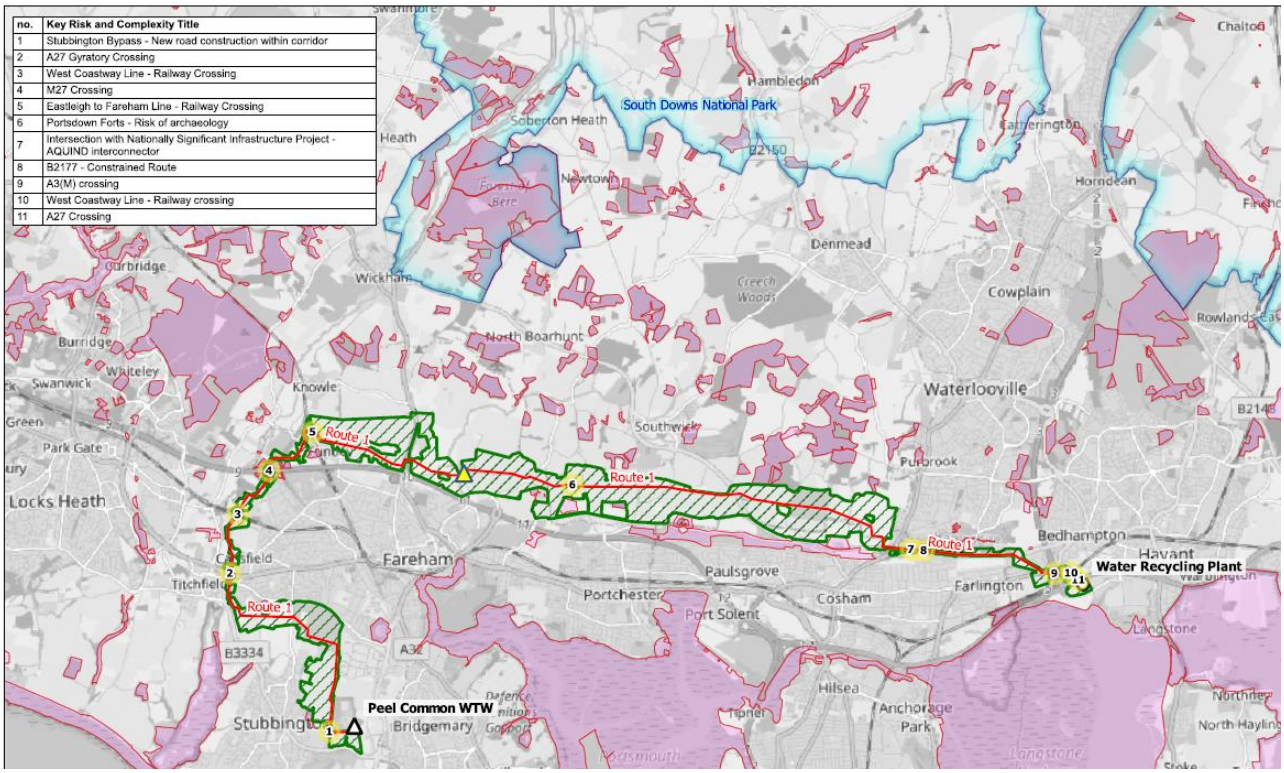

Figure 20 - Location of connecting pipeline corridor between Peel Common WTW and the WRP

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

- Parcel WRP 72 (with Parcel WRP71 retained as a backup)
- Pipeline 1 and Pipeline 2 to connect to Otterbourne WSW
- Pipeline connection between Peel Common Water Treatment Works and the WRP

As in B.2, at the conclusion of Stage 4 there were a number of consenting risks identified that needed to be considered further in the Consenting Evaluation:

- 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

Further work on the issues discussed above will be carried out prior to Gate 2 in accordance with the activities set out in the Interim Update Activity Plan.

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 Havant Thicket and the Otterbourne WSW and the proposed parcel for a High-Lift Pumping Station (HLPS) are reported for Option D.2 in the Gate 2 Annex 3 Havant Thicket Site Selection chapter and in the following sections of this annex.

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 preferred site was identified 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 Option 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 break pressure tank, secondary pumping stations and a possible booster station.

Should the Havant Thicket Option emerge as the Preferred Option, 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 Consenting 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 in the Consenting Evaluation.

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

- Parcel WRP 72 (with Parcel WRP71 retained as a backup)
- Pipeline 3 and Pipeline 4 to connect to Otterbourne WSW (refer to sections below)
- 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 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 the Consenting Evaluation:

- 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

3.1.5.7 Site and Route Selection – Water Transfer

The following sections present details of the site and route selection process and outcomes for water transfer. The site selection methodology and results for Stages 0 to 3 are supported by the following technical reports:

- Option D.2 Havant Thicket Pumping station, Site Selection Stage 0-3 Output Report, Text for Gate 2 Update, April 2021
- Havant thicket Pumping Station Site Selection Framework, Havant Thicket Pumping Station Site Selection Criteria Supporting Report, April 2021

This Option 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. The Option will also require a secondary pumping station, break pressure tank 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.

3.1.5.8 Site Selection Stage 0 – Water Transfer

Stage 0 comprised the identification of a search envelope for the HLPS which was driven by the proximity to PW's proposed reservoir at Havant Thicket. This resulted in the identification of parcels of potentially available land to the west of the proposed reservoir. Figure 21 illustrates the search area.

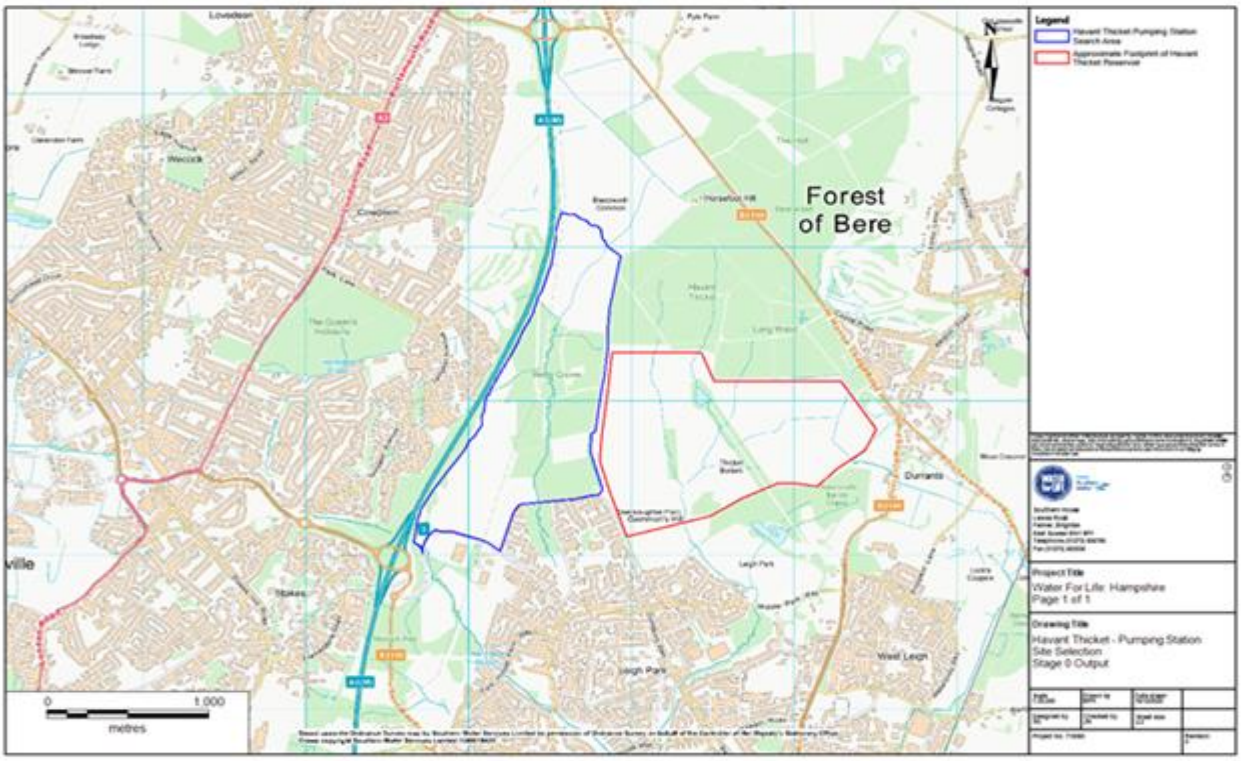

Figure 21 - Search Area for the HLPS for Havant Thicket Raw Water Transfer

3.1.5.9 Site Selection Stage 1 – Water Transfer

At Stage 1, parcels were identified and plotted on a GIS map. The suitability of a parcel was determined by considering the criteria detailed in Table 21 and the extent of the search envelop defined at Stage 0. The criteria considered were land use, avoidance of certain land conditions, as well as meeting the required minimum size requirement.

Table 21 - Stage 1 Land Parcel Requirements – Water Transfer

Element	Havant Thicket raw water transfer
Land Use	Densely developed residential areas (towns/cities) - private residences, care homes, hospitals, schools, universities, places of worship, burial grounds, holiday parks, hotels, retail parks, leisure parks Key transport infrastructure - railways, airports, classified roads, ports Key utilities - power stations, gas and electricity substations
Land Conditions	Avoidance of the following: Marsh Mudflat Cliff face Open Water
Land Parcel Size	Temporary construction compound – 4046m^2 Pumping station land take – 77m x 82m = 6341m^2

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 22.

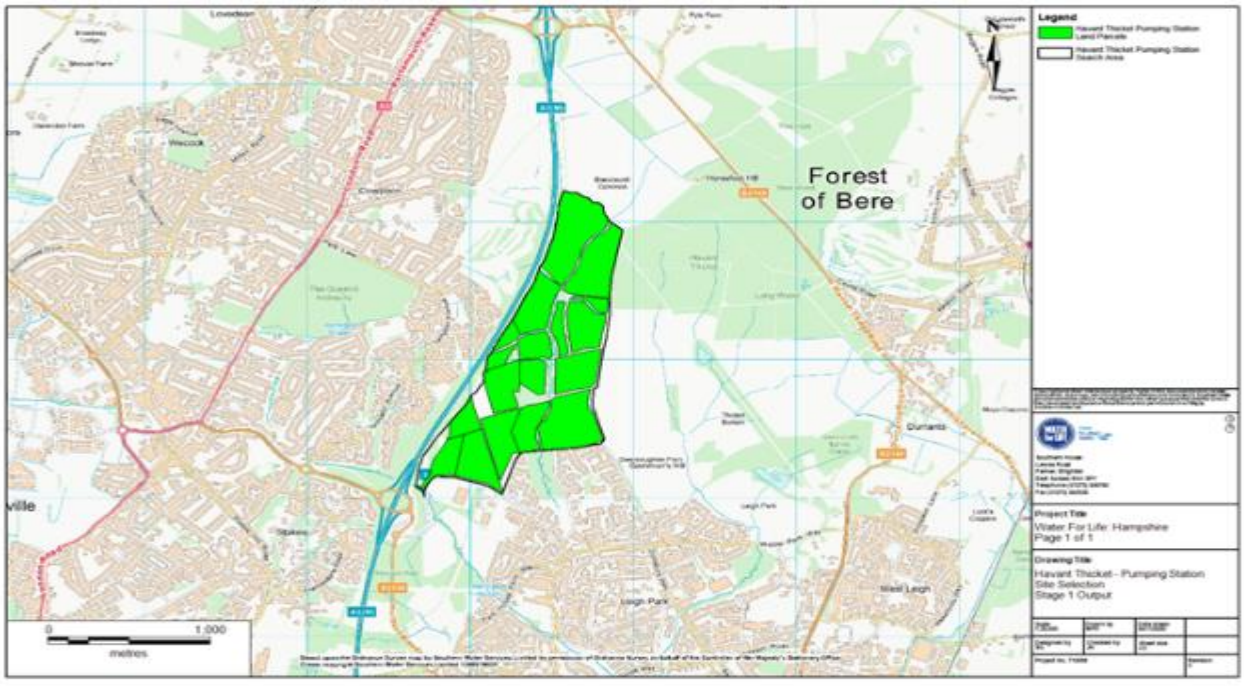

Figure 22 - Water Transfer Site Selection Stage 1 Output

3.1.5.10 Site Selection Stage 2a – Water Transfer

Stage 2a considered the proximity of the parcels to sensitive receptors to identify the best performing parcels. The performance of each parcel was determined by its proximity to specific receptors and the level of sensitivity of the receptor.

The criteria were:

- SAC / Ramsar / SPA (including potential and candidate sites)
- SSSI / NNR
- Scheduled Monuments
- National Parks / AONB / Green Belt
- Ancient Woodland
- Grade 1 and 2* Registered Parks and Gardens and Listed Buildings and Battlefield Sites
- Residential (Noise/vibration and air quality impact)
- Hospitals, Care Homes, Schools; and
- Amenity Spaces e.g., allotments, public parks, playgrounds, playing fields

The scores allocated for each criterion reflected the importance of statutory designations and alignment with descriptions of sensitive areas in Regulation 2 of the EIA Regulations 2017. The importance placed on a receptor was determined by the weight given to its sensitivity and protection within the law or planning policy documents (Draft National Policy Statement for Water Resources and the National Planning Policy Framework). For example, statutory designated sites of international importance are afforded the highest levels of protection through law and planning policy and therefore, they were allocated an importance score of 3 (the highest importance score). Statutory Designated sites or non-statutory sites of national importance were allocated an importance score of 2, and other sensitive receptors were allocated an importance score of 1. The importance score assigned to each receptor is explained in further detail in Havant Thicket Pumping Station Site Selection Framework, Havant Thicket Pumping Station Site Selection Criteria Supporting Report, April 2021.

Specific distances from protected sites or features associated with each criterion were also considered in the process, with difference distances being defined for each type of receptor. Details of the specific distances used in the assessment to determine the performance of each parcel is provided within Havant Thicket Pumping Station Site Selection Framework, Havant Thicket Pumping Station Site Selection Criteria Supporting Document, April 2021.

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 23 illustrates the output of Stage 2a.

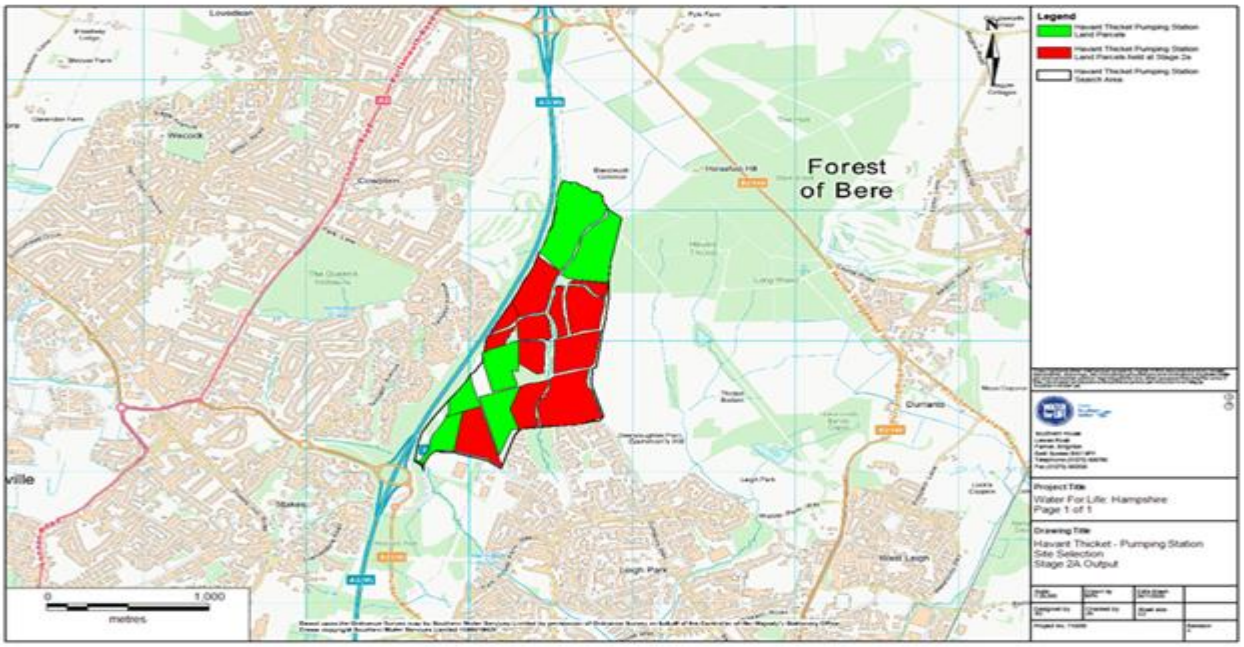

Figure 23 - Water Transfer Site Selection Output Stage 2a

3.1.5.11 Site Selection Stage 2b – Water Transfer

Stage 2b considered any conflict of the best performing parcels from Stage 2a with areas that have been approved or validated for DCO developments (within last five years) or development subject to TWAO under the Transport and Works Act 1992 and screened / scoped or validated and approved within the last three years in accordance with the relevant EIA Regulations.

A compatibility score was calculated for each parcel, the higher the score the better the parcel performed. The criteria for attributing a score to each parcel for compatibility reflects that used for desalination detailed in Table 8.

In this instance two of the six best performing parcels from Stage 2a conflicted with a development in line with the scoring criteria and these parcels were therefore excluded at Stage 2b. Four parcels then progressed from Stage 2b to Stage 3. The output from Stage 2b is illustrated in Figure 24.

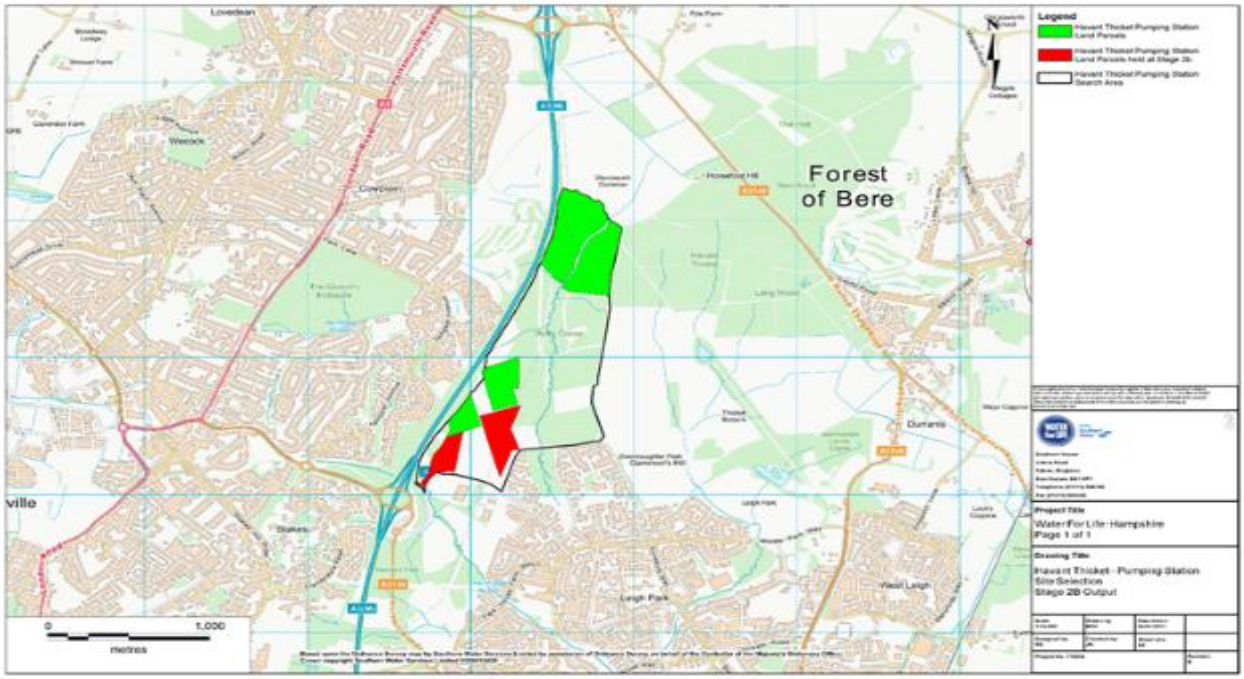

Figure 24 - Water Transfer Site Selection Stage 2b Output

3.1.5.12 Site Selection Stage 3 – Water Transfer

Stage 3 introduced additional proximity criteria covering a number of environmental, geotechnical and constructability considerations as well as reconsidering the performance of those parcels against the Stage 2a criteria. The additional criteria included but were not limited to the presence of flood plain, proximity to Source Protection Zone, rivers / drains (potential pollution pathways), schools, care homes, hospitals and residential and non-statutory designated sites for nature conservation and historic environment. Examples of known environment criteria included ease of access from major transport routes, ground conditions and current or previous potentially contaminating land uses. The performance of each parcel was determined by its proximity and the importance of the receptor (consistent with the approach used for Stage 2a).

The additional criteria used in Stage 3 are fully detailed in the Havant Thicket Pumping Station Site Selection Criteria Supporting Document. A score of 0 to 3 was assigned for each criterion with the points allocation being defined for each specific criterion - e.g., for floodplain a parcel scored 3 if it was located within Flood Zone 3. The full breakdown of points allocation to each criterion is presented in the supporting Havant Thicket Pumping Station Site Selection Criteria Document.

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 the site selection process is illustrated in Figure 25, namely parcels HTPS3, 5 and 8.

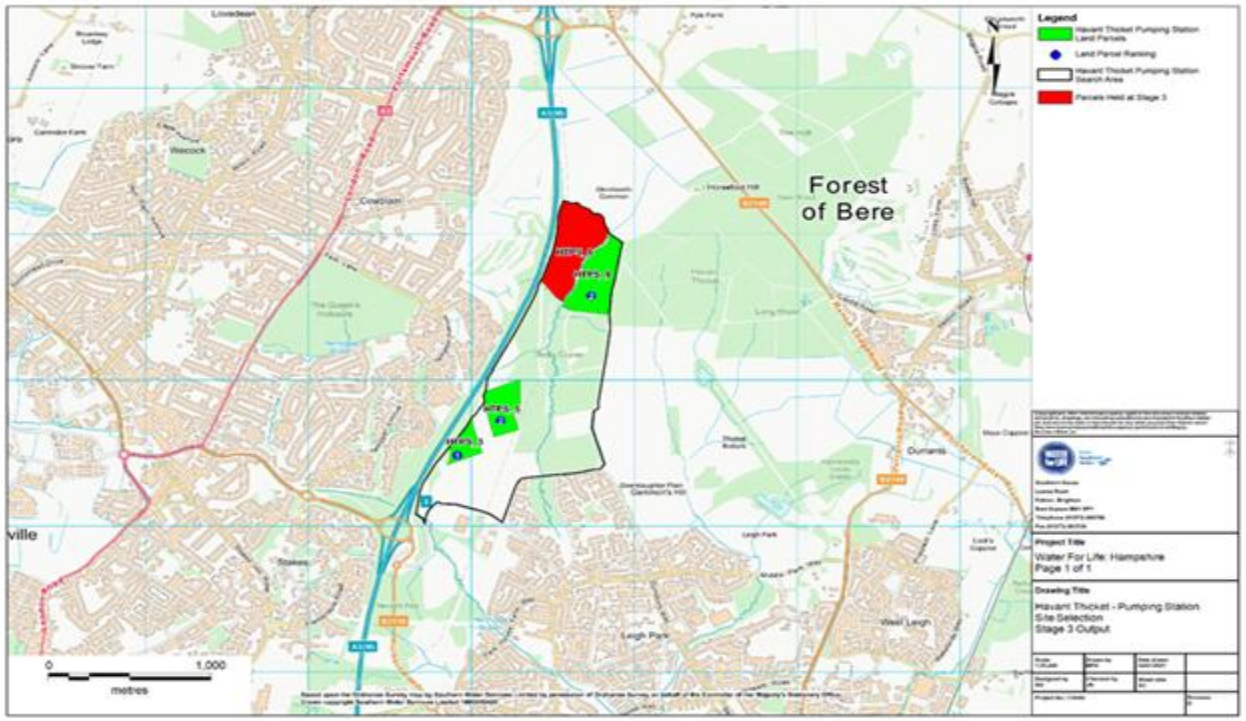

Figure 25 - Water Transfer Site Selection Stage 3 Output

3.1.5.13 Stage 4 Site and Route Selection Results

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

3.1.5.13.1 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 summarised in Table 13.

Table 13 - 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 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 mitigation site for the adjacent Dunsbury Park development.	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 Dunsbury Park mitigation site.
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

Option	Summary of Site Selection Outcomes	Consenting Risk
		the least consenting risk as it has no specific designations associated with it and it is not designated as mitigation habitat for the Dunsbury Park development.
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) (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 Dunsbury Park development.

3.1.5.13.2 Pipeline Selection Results

Following Gate 1, further pipeline development work was undertaken. This comprised the application of the SIA 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 and route selection. Details about the development of these pipeline corridors is provided in section 3.3.4.7 above and their location is illustrated in Figure 26.

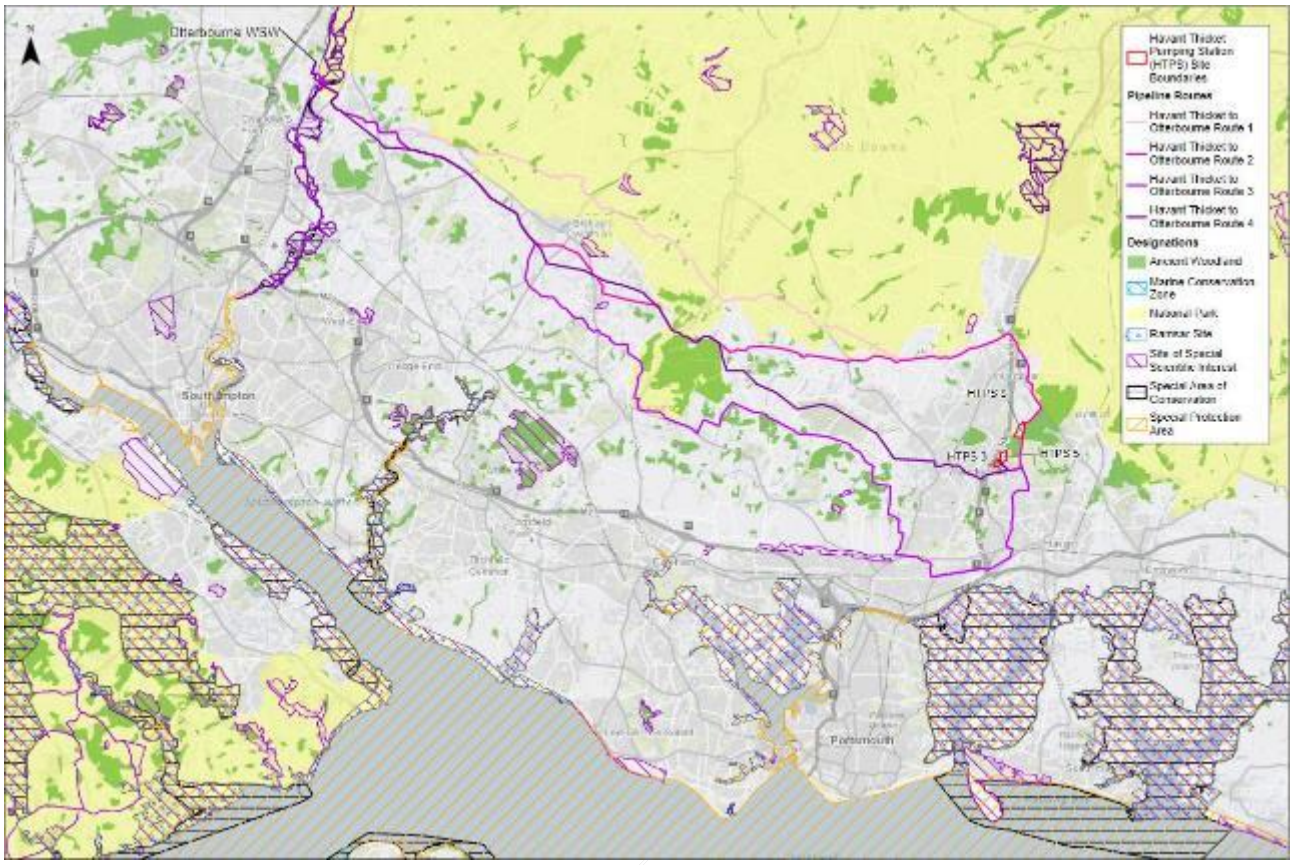

Figure 26 - Pipeline Routes between the HTPS and Otterbourne

The pipelines were evaluated with the results of this process summarised in Table 22.

Table 22 - 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 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 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 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. 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 Pipeline 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. 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 Pipeline 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 Pipeline 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 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 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 the Options have the potential to directly and indirectly affect areas of ancient woodland that would again require appropriate mitigation with routes 1 and 2 potentially having a greater impact on ancient woodland where they lie in cross 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 forward 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 considered to present a greater consenting risk compared to the other shorter pipelines, 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.

3.1.5.13.3 Refined Approach to the Siting of the HLPS

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 preferred site was identified 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 Option 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 break pressure tank, secondary pumping stations and a possible booster station.

Should the Havant Thicket Option emerge as the Preferred Option, 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 Consenting Evaluation to provide a baseline against which future alternative locations, if different, can be compared against and original assumptions and judgements reviewed accordingly.

3.1.5.13.4 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 the Consenting Evaluation:

- 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 the Consenting Evaluation:

- 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

3.1.5.14 Summary of Site and Route Selection Outcomes

The results of the Stages 1 to 4 of the updated site and route selection process have been described and the output from this process was a recommendation of the preferred configuration for each Option.

The overall results of the best configurations for each Option, taken into the next stages of Options Appraisal are detailed in Table 23.

Table 23 - Best configurations for each of the Options

Scheme Component	Options					
	A.1	A.2	B.2	B.4	B.5	D.2
Marine intake / outfall	Intake Option 1 (Fawley Deep Dock) Outfall Option 1 (Calshot) Intake Option 2 (Calshot) Outfall Option 2 (Calshot)	Intake Option 1 (Fawley Deep Dock) Outfall Option 1 (Calshot) Intake Option 2 (Calshot) Outfall Option 2 (Calshot)	Not applicable	Not applicable	Not applicable	Not applicable
Site	Ashlett Creek	Ashlett Creek	WRP 72 (parcel 71 held at Stage 4)	WRP 72 (parcel 71 held at Stage 4)	WRP 72 (parcel 71 held at Stage 4)	HTPS5
Pipeline Route	Route 1 Route 2	Route 1 Route 2	Route 1 Route 2 Budds Farm to WRP Pipeline	Route 3 to Otterbourne Route 4 to Otterbourne Budds Farm to WRP Pipeline Budds Farm to Havant thicket – route 1 and route 2	Route 1 Route 2 Budds Farm to WRP Pipeline Pipeline from Peel Common to Budds Farm	Route 3 to Otterbourne Route 4 to Otterbourne
Other Infrastructure / Components			EBL at Otterbourne Eastney LSO (Long Sea Outfall) (no new infrastructure)	Eastney LSO (no new infrastructure)	EBL at Otterbourne Eastney LSO (no new infrastructure)	

4 Consenting Evaluation

4.1 Approach

Following confirmation of the configuration for each Option, the Consenting Evaluation was undertaken. This evaluation comprised a RAG based evaluation against the planning criteria and sub-criteria detailed in Table 24 for each of the Option configurations. These criteria were developed using the Government policy and regulations below:

- Draft National Policy Statement for Water Resources (November 2018)
- National Planning Policy Framework (2021)
- Environmental Impact Assessment Regulations 2017
- Water Framework Directive 2000 / 60 / EC
- The Conservation of Habitats and Species Regulations 2017 (as amended)
- Marine Policy Statement (2011)
- Marine Plans (South Inshore and South Offshore) (2018)

Table 24 - Consenting Evaluation Criteria

Criterion	Sub-Criteria	Source of the Criteria
Air Quality and Emissions	Dust Vehicular emissions Odour	dNPS EIA Regulations NPPF
Biodiversity and Nature Conservation Terrestrial –	SAC, SPA, Ramsar sites and all potential, possible and candidate sites Functionally linked habitat	dNPS Habitat Regulations EIA Regulations NPPF
Biodiversity and Nature Conservation Terrestrial –	Nationally designated sites Priority habitats Ancient woodland and veteran trees	dNPS EIA Regulations NPPF
Biodiversity and Nature Conservation Marine - HRA	SACs, SPAs, Ramsar and all potential, possible and candidate sites Functionally linked habitat	dNPS Marine Plans Habitat Regulations EIA Regulations NPPF
Biodiversity and Nature Conservation Marine	Nationally designated sites Impact on priority habitats	dNPS EIA Regulations Marine Plans
Carbon	Embodied carbon Carbon emissions	dNPS EIA Regulations

Criterion	Sub-Criteria	Source of the Criteria
		NPPF
Coastal Change / processes	Impact on coastal processes (coastal erosion / deposition)	dNPS EIA Regulations Marine Plans
Geology and Soils	Designated sites Soil resource Risk of mobilisation of contaminants	dNPS EIA Regulations NPPF
Historic Environment – Terrestrial	Nationally and regionally important assets Unknown archaeology (impact on areas of archaeological potential)	dNPS EIA Regulations NPPF
Historic Environment – Marine	Nationally and regionally important assets Unknown archaeology (impact on areas of archaeological potential)	dNPS EIA Regulations Marine Plans
Landscape / Seascape and Townscape and Visual Amenity	Nationally and regionally important sites Visual amenity	dNPS EIA Regulations Marine Plans NPPF
Major accidents and disasters	Risks associated with existing facilities Risks associated with the operation of the plant itself	dNPS EIA Regulations
Resource and waste management	Waste generation Waste facilities / infrastructure Impact on Mineral Safeguarding Areas Proximity to licensed dredging, disposal and extraction areas	dNPS EIA Regulations Marine Plans NPPF
Socio-economic impact	Impacts on Public Rights of Way and recreational facilities Impact on community facilities Impact on marine recreation Impact on commercial fisheries Impact on licensing areas	dNPS EIA Regulations Marine Plans NPPF
Traffic and Transport	Impact on shipping and navigation Impact on marine vessel users Impact on road and rail network	dNPS EIA Regulations Marine Plans

Criterion	Sub-Criteria	Source of the Criteria
	Impact on road users	NPPF
Water Quality and Resources	Impact on marine water quality Impact on terrestrial water quality Impact on watercourse geomorphology and hydrology Impact on groundwater resources	dNPS EIA Regulations Marine Plans WFD NPPF
Flood Risk	Impact on flood risk Impact on flood defences	dNPS EIA Regulations NPPF
Interface with Future Development and Planning	Risks associated with existing/future NSIPs Risks associated with 'other' development Risks associated with compromising future marine development Development Plan risk	dNPS Planning Act EIA Regulations
Land Use (Special Category Land)	Impact on Special Categories of Land	Planning Act
Green Belt	Impact on Green Belt	dNPS NPPF
Technology and compliance with regulatory approvals	Technological viability Ability to secure necessary regulatory permits and licences	dNPS
Constructability	Construction risks Construction timescales Interfaces with utilities Topography challenges	dNPS EIA Regulations
Resilience	Likely resilience of the solution Self-sufficiency of the solution	dNPS
Cost	Capital cost Operational cost	Overarching factor in the consenting balance.

The criteria above were selected as they would allow a robust Consenting Evaluation to be completed against core legislative and policy requirements that would be factors in the future consenting and decision-making processes for the EPO.

It is important to note that the requirements of the WFD and the Conservation of Habitats and Species Regulations have specific legal tests that have to be met and are therefore more stringent than the other

policy tests. These legislative requirements were tested through the Biodiversity and Nature Conservation - HRA and Water Quality and Resources criteria.

The Consenting Evaluation identified the potential consenting risks when tested against the criteria during both construction and operation. It also identified the potential mitigation requirements that would need to be considered post Gate 2, as well as further engagement requirements that would be needed both to develop mitigation and to ensure all appropriate legislative and policy tests could be achieved. The RAG evaluation used the scoring is detailed in Table 25.

Table 25 - Definition of the 'RAG' Consenting Evaluation Criteria

Score	Definition
Substantial adverse	Potential for substantial consenting risks that are likely to be very challenging to overcome / mitigate. Impacts are likely to be unacceptable and will fail to meet required legal/policy tests based on current information.
Large adverse	Potential for major consenting risks. Impacts are likely to require significant mitigation but are potentially acceptable from legal / policy perspective. A case may need to be made e.g., balance of benefits against impacts but could be justified.
Moderate adverse	Potential for moderate consenting risks that will require the development of bespoke mitigation to address, but likely to be achievable and acceptable in policy terms i.e. policy compliance can be achieved.
Minor adverse	Potential for minor consenting risks that will require application of standard best practice.
Positive Impact	Potential for positive performance against policy.
No impact	Does not require appraisal and can be scoped out as not relevant to the Option e.g., no receptors within policy wording that could be affected.

As this is a Consenting Evaluation at the Options stage where there is a degree of uncertainty and the level of modelling and scheme detail available is more limited, a precautionary approach was adopted. This approach reflected the fact that, for example there may be uncertainty about baseline conditions or the likely effectiveness or deliverability of mitigation and therefore subsequently the confidence in the ability to meet specific policy compliance tests and or legal requirements.

The evidence bases for the Consenting Evaluation comprised a number of other documents.

- Technical Report 1: Review of Pipeline Watercourse Crossings for Water Recycling and Bulk Supplies
- HRA Technical Note 2: Biodiversity Net Gain (BNG) / NC Report
- Technical Note 3: HRA Consenting Risks – Desalination Solution Report
- Technical Note 4: HRA Consenting Risks: Marine Environment – Water Recycling Solution Report
- WfLH – High Level Landscape Appraisal Report
- Technical Report 5: High level air quality assessment to inform site selection and mitigation requirements
- Technical Report 6: HRA Consenting Risks Report: Ornithology and Airborne Noise Disturbance – Desalination and Water Recycling SROs
- WfLH Gate 2 Report – Marine Conservation Zone Assessment (MCZA) – Desalination (A.1 / .2) and Water Recycling (B.2, B.4 and B.5) Options

- Gate 2 Report HRA
- Gate 2 Report WFDA
- Gate 2 Report SEA
- Gate 2 Report Invasive Non-Native Species (INNS) Raw Water Risk Assessment

The Consenting Evaluation against the design and cost criteria were informed by a series of meetings with key stakeholders within SW.

The planning criteria relating to interfaces with allocated and future development used the following data sources:

- Site allocation searches in relevant adopted Local Plans
- A review of policy constraints as identified in the relevant Local and Marine Plans
- A review of the Planning Inspectorate (PINS) website to determine potential interfaces with NSIPs.

In relation to the Special Category Land criterion, searches were undertaken for the following using the open data provided by Defra:

- Common Land
- Country Parks
- Countryside Rights of Way Act Open Access Land

Regarding statutory undertakers' rights in land, no searches have been undertaken to identify the extent of any rights of protected undertakers / interests in land. For example, no utility searches have been undertaken to identify any protected assets within the pipeline corridors.

At this stage a complete land referencing exercise has not been completed for all Options and therefore there are some data gaps that will require completion prior to and post Gate 2. For example, Ministry of Defence (MOD) land is an interest that can only be identified through land registry searches and a complete Crown Land search also needs to be completed. The land registry searches can be more effectively targeted post Gate 2 once the pipeline corridor Options in particular are further refined. The level of information provided to date is considered sufficient to determine the potential level of consenting risk at this stage.

The responses to the 2021 non-statutory consultation made by key stakeholders such as Historic England, the EA etc were also taken into consideration when making judgements about the level of potential consenting risk.

The outcome of the Stage 5 Consenting Evaluation was a series of RAG ratings for each Option against each of the Consenting Evaluation topics and a recommendation about the likely ability to be able to obtain consent for each Option and their associated risks. Where there was a degree of Optionality remaining within the short-listed configurations e.g., multiple pipeline routes, any differences in consenting risks associated with these Options were identified.

4.2 Outcomes

4.2.1 Option A.1

The outcomes of the Consenting Evaluation for Option A.1 are presented below against each of the Consenting Evaluation criteria. Details are provided of the level of consenting risk for the construction and operation of the Option with supporting justification for the consenting risk identified. There is a degree of Optionality for Option A.1, with there being two connecting pipeline Options (routes 1 and 2) between the Ashlett Creek site and Testwood and also two marine intake Options and two marine outfall Options. Where

the Optionality within the configuration changes the level of consenting risk this is reported, and an explanation provided. For each topic, details are also provided of further work that should be undertaken post Gate 2 to manage the level of consenting risk identified.

4.2.1.1 Air Quality and Emissions

Table 26 - Air Quality Emissions

Topic	Consenting Evaluation RAG	Impact of Optionality
Air Quality and Emissions	Construction – Minor	No change in level of consenting risk
	Operation – No impact	As above

During construction there is the potential for emissions to air (including dust) from vehicle movements and use of plant. There are no Air Quality Management Areas (AQMAs) immediately adjacent to the Ashlett Creek parcel or along the length of the pipeline routes although there are some on the wider Strategic Road Network. The proposed routes that would be used by construction vehicles to access the construction works are not yet known. As noted in paragraph 4.2.8 of the dNPS, the Secretary of State should take into account the presence of AQMAs and any development should be consistent with local air quality action plans.

The Technical Report 5 concluded, based on initial, conservative modelling that the risk to human health receptors in the locations modelled is not significant. Therefore, on the basis of current information there is unlikely to be a breach of air quality thresholds during construction although there is a need for more detailed and comprehensive traffic and air quality modelling post Gate 2.

During construction there would be potential dust generation, and this would be managed through application of standard construction mitigation measures. This would be informed through the application of best practice guidance and documented in a Construction Environmental Management Plan.

For operation, no consenting risks are identified as there would be limited vehicle movements associated with operation of the site.

Post Gate 2, traffic and air quality modelling will be required to ensure appropriate mitigation is developed and the relevant assessments are available to meet policy tests.

4.2.1.2 Biodiversity – Terrestrial HRA

Table 27 - Biodiversity – Terrestrial HRA

Topic	Consenting Evaluation RAG	Impact of Optionality
Biodiversity – Terrestrial HRA	Construction – Major	No change in level of consenting risk
	Operation – Moderate	If pipeline 2 were adopted, then the level of consenting risk would increase to Major

During construction the consenting risk for terrestrial HRA is deemed to be major owing to the potential for there to be significant effects on the integrity of Habitats Sites.

The construction of both pipeline Options has the potential to affect the New Forest SAC, SPA and Ramsar site. Whilst the pipeline routes for some of their length follow the alignment of the A326 Hythe Bypass there is uncertainty about the extent to which it may be possible to lay the pipeline in the highway itself or the adjoining verge. There is potential therefore that there may be a need to install the pipeline within the verges

which are part of the New Forest SSSI and the underpinning SAC designation. There is therefore the potential for direct habitat loss. Further survey information is required to determine whether there are any designated features of the sites within the verges and therefore an adverse effect on integrity cannot be ruled out at this stage.

The following designated features of the New Forest SAC could also be disturbed by the pipeline construction works: Great crested newt, Southern Damselfly and stag beetle. The pipelines run adjacent to the New Forest SAC. 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. There are also risks to the New Forest SAC as a result of dust and air quality impacts during construction e.g., nitrogen dioxide emissions which may affect the integrity of the designated features of the SAC. Air quality modelling based on highly conservative assumptions shows there is potential for significant air quality impacts upon ecological receptors at the New Forest SAC. As a result, it is not possible to rule out an adverse effect on integrity at this stage. The crossing of small watercourses that flow in the SAC may also be required as a result of the pipeline construction works. These could mobilise sediments and alter surface water drainage pathways that could affect riparian habitats. The NE (2014) New Forest SSSI Ecohydrological Survey Overview shows the presence of Valley Mire systems to the West of the Hythe Bypass, near Dibden Purlieu. These systems are in close proximity to the pipeline routes and an adverse effect on integrity cannot be ruled out at this stage.

Potential loss of habitat on the verges of the Hythe Bypass could affect the availability of prey species for raptor species of the SPA. Whilst effects are likely to be localised in the context of the wider prey resource, an effect on integrity cannot be ruled out and further field survey is required. Technical Report 6 considers the effects on the SPA, in particular the raptor and passerines species which are qualifying species of the New Forest SPA. The technical report concludes that construction traffic is unlikely to cause a significant shift away from the baseline noise conditions in this area and thus a persistent increase in ambient noise is unlikely to be generated. Significant temporary and sporadic increases in noise associated with specific construction activities such as piling may cause temporary disturbance however, the literature indicates that impacts from such noise may only cause temporary disturbance, and in some cases no disturbance. However, at this stage effects on integrity cannot be ruled out. As the pipeline installation would be immediately adjacent to and potentially overlapping the SPA, an adverse effect on integrity cannot be ruled out.

During operation it is not considered that there would be any new impacts as a result of the desalination plant. However, there would be a need for ongoing reinstatement and establishment of mitigation related to the pipeline construction corridors and there would be a need to demonstrate the ongoing success and monitor the implementation of these measures. For this reason, the level of consenting risk is assessed as moderate. It is considered that the level of consenting risk would increase to major if pipeline route 2 were selected. Whilst this route is similar to route 1 in certain locations it would have a potentially greater effect on the New Forest SAC, Ramsar and SPA.

Post Gate 2, further survey work is required to understand the level of potential impact to qualifying features and also to inform the development of mitigation that would ensure no adverse effects on the integrity of the Habitats Sites. At this stage and based on current levels of information there is a significant consenting risk and the potential for a need to consider alternative solutions in the event that effects on integrity cannot be avoided. There will also be a need for continued engagement with NE as part of the HRA process.

4.2.1.3 Biodiversity – Terrestrial

Table 28 - Biodiversity – Terrestrial

Topic	Consenting Evaluation RAG	Impact of Optionality
Biodiversity – Terrestrial	Construction – Major	No change in level of consenting risk
	Operation – Moderate	If pipeline 2 were adopted, then the level of consenting risk would increase to Major

The major consenting risks during construction are very similar to those reported for Terrestrial HRA above with the construction of the pipelines in particular posing risks to the New Forest SSSI. These risks are considered potentially greater for pipeline route 2.

There is also the potential for direct impacts on ancient woodland associated with the construction of the pipeline routes. Sections of both pipeline routes lie immediately adjacent to ancient woodland and whilst it may be possible for the pipelines to be constructed in the road it is uncertain whether this would be viable and therefore whether there would be a direct impact on ancient woodland. There is also potential for indirect impacts on ancient woodland associated with changes in hydrology during construction. The risks to ancient woodland both direct and indirect are potentially greater with pipeline route 2. The dNPS is very clear in the level of protection afforded to ancient woodland stating:

"Ancient woodland is a valuable biodiversity resource both for its diversity of species and for its longevity as woodland. Once lost it cannot be recreated. 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 and the loss of ancient or veteran trees found outside ancient woodland unless there are wholly exceptional reasons, for example where the need for and other public benefits of the development, in that location, would clearly outweigh the loss or deterioration of the habitat, and a suitable compensation strategy exists". (Para 4.3.14)

During operation it is not considered that there would be any new impacts as a result of the desalination plant and the associated pipelines. However, there would be a need for ongoing reinstatement and establishment of mitigation related to the pipeline construction corridors and there would be a need to demonstrate the ongoing success and monitor the implementation of these measures. For this reason, the level of consenting risk is assessed as moderate. It is considered that the level of consenting risk would increase to major if pipeline route 2 were selected. Whilst this route is similar to route 1 in certain locations it would have a potentially greater effect on the New Forest SSSI and ancient woodland.

Post Gate 2 impacts on ancient woodland need to be avoided and minimised through further evolution of the design process. Constructability constraints associated with the pipelines need to be understood including the likelihood of being able to construct the pipelines in the Hythe bypass and this should drive the further refinement of the route corridors. This route corridor refinement should be undertaken in collaboration with NE.

4.2.1.4 Marine HRA

Table 29 - Marine HRA

Topic	Consenting Evaluation RAG	Impact of Optionality
Biodiversity – Marine HRA	Construction – Substantial	No change in level of consenting risk although intake Option 1 that would use the Fawley Waterside Marina could possibly reduce effects although the level of consenting risk would not change. Outfall Option 2 may also reduce the consenting risk as it would also re-use more existing infrastructure.
	Operation – Substantial	As above

There are substantial consenting risks as a result of potential direct and indirect impacts on Habitats Sites associated with this Option. There are potential significant effects on the Solent and Southampton Waters SPA, Solent and Dorset Coast SPA and Ramsar and the Solent Maritime SAC.

There are risks to the Solent Maritime SAC associated with the construction of the desalination plant at Ashlett Creek (within 120 m at its closest point) owing to its proximity to the SAC and the risk of run-off adversely affecting integrity. The Estuaries, Mudflats and Sandflats features of the SAC are currently deemed to be in unfavourable condition. There is also the potential for underwater noise during construction to impact the mobile fauna associated with the sandbank feature although underwater noise modelling is needed to understand the potential extent of noise impacts.

The construction process has the potential to disturb the designated features of the Solent and Dorset Coast SPA and Ramsar, in particular nesting tern if using adjacent habitat. NE has advised (July 2020) that the tern species nest on habitat at the edge of the designated site and are extremely vulnerable to disturbance. In the Ashlett Creek area a number of waterfowl species have been recorded including dark-bellied brent goose, ringed plover, sandwich tern and teal which are features of the SPA. Within the wider area, common tern and little tern have also been recorded. There would also be the loss of benthic habitat within the site, and this requires further site-specific survey work to determine its importance and structural and functional role in supporting the tern populations. It is likely that the loss of habitat will be a small-scale effect in the context of the wider SPA, however an adverse effect on integrity cannot be ruled out at this stage.

There would also be direct and permanent loss of subtidal habitat under the footprint of the marine intake (if a new intake were required off the coast of Calshot) and new outfall arrangement. Whilst the habitat that would be lost is not a qualifying feature of the Solent Maritime SAC, Solent and Southampton Water SPA, or Solent and Dorset Coast SPA, it provides a structural and functional role in supporting the prey of the tern species, and therefore the breeding success of the populations. The significance of the loss in terms of the effect on site integrity will be linked to the provision the habitats make in supporting the prey species that the tern forage upon.

The Fawley Waterside Marine intake (Intake Option 1) is outside the boundary of the Solent and Southampton Water SPA however is in direct proximity (c.250 m). It also lies outside the boundary of the Solent Maritime SAC and the Solent and Dorset Coast SPA. Therefore, this Option is preferable to Intake Option 2 as it would not result in direct habitat loss from within a designated site boundary. Although there is connectivity with Southampton Water, the level of functional role the marina plays in supporting any of the qualifying features is considered to be low (uncertain) based on the number of vessels using the site.

During operation the abstraction of the water for the desalination plant has the potential to impact the Solent and Dorset Coast SPA and Ramsar as there is the potential to impinge, entrain and entrap fish and invertebrates, resulting in a reduction in prey for tern and gull species. Additionally, the construction of the outfall within the Solent and Dorset Coast SPA, as well as the hypersaline plume will potentially alter prey availability and foraging areas for the qualifying tern species.

There are also risks to the River Avon, River Itchen, River Meon and River Test. Whilst the sites are sufficiently remote from the desalination onshore works to have no direct or indirect effects on the rivers themselves, the marine intake and outfall Options are within the potential migratory route for Atlantic salmon using these rivers. There are risks associated with entrainment and impingement. Technical Report 3: HRA Desalination Consenting Risks considers the effects of water abstraction on Atlantic salmon. The report concludes that, while mitigation is proposed with regards to the type of intake screen and mesh size to be used, further evidence is required to determine whether impingement and entrainment issues will result in an adverse effect to the population at the Calshot intake Option. The intake Option using the Fawley Waterside Marina (Intake Option 1) could possibly reduce the likelihood of intake issues for Atlantic salmon, however an adverse effect on integrity cannot be ruled out at this stage.

The Solent and Southampton Water SPA and Ramsar could be affected by the operation of the desalination plant as a result of effects on coastal processes and there is also the potential for Reject Water to interact with the saltmarsh and mudflat habitats at Calshot Marshes and affect offshore feeding areas.

Modelling of the hypersaline plume has been conducted. The key issues are the salinity and the other contaminants released in the discharge; concentrated residuals from feedwater, chemicals inputs from the RO process, antiscalants and antifoulants, chlorine and disinfection products, suspended solids. The modelling was initially conducted for the full 75 Ml/d scenario which will only be required to supply potable water in a 1-in-200-year drought event, and therefore the output at this level is periodic and very much the worst-case scenario. The more realistic scenario is running with a sweetening flow of 15 Ml/d to main operational processes, ready for output to be increased when required. This would therefore be the likely, and more frequent, mode of operation and modelling was also completed for this more likely operating scenario.

The Reject Water from the desalination solution could have implications for Annex I habitats within the Solent Maritime SAC, barrier effects to fish migration (River Itchen SAC, Rivers Meon and Test compensatory habitat) and loss of foraging grounds / prey for tern species (Solent and Dorset Coast SPA, Solent and Southampton Water SPA and Ramsar). The near field CORMIX modelling and Mike21 mid and far field modelling has predicted small changes in salinity and concentrations of the various parameters assessed (note the Mike21 modelling was only conducted for the 75 Ml/d scenario). These are normally highly localised to the vicinity of the outfall. Under the 15 Ml/d scenario Total Suspended Solids (TSS) concentrations fall to approximately 20 mg/l within 30 m, and salinity reaches the 5% threshold within 150 m, meeting a 1% threshold at 300 m.

Using modelling for the worst-case 75 Ml/d 1-in-200-year drought scenario, TSS concentrations fall to approximately 20 mg/l within 300 m of the discharge and are only detectable in the mid and far-field under maximum input conditions. Even under this scenario the changes are small (1-2 mg/l, 2-5 mg/l around the outfall). Salinity reaches the 5% threshold at 250 m for the 75 Ml/d average input, although again small changes are detectable further afield under the maximum input scenario (0.05-0.10 psu excess salinity). Around the outfall, salinity under the maximum input scenario has a change of above 0.40 psu excess salinity.

The modelling has been completed using a single port diffuser, and therefore the use of a multiport diffuser may provide increased dispersion. Changes across the European designated sites, once out of the main mixing zone (c.250 m) are small, although the plume does extend for a distance up Southampton Water with the 75 Ml/d operation and could interact with the saltmarsh and mudflat habitats behind Calshot Spit,

although unlikely to be for a considerable period of time. Literature and data are limited for the marine life stages of Atlantic salmon, with most reports evaluating responses to thermal plumes rather than salinity changes. Further work is therefore required to understand existing permit limits of comparable discharges (e.g., Beckton desalination) and to provide an indication of the parameters within which the desalination permit would need to comply to achieve consent and ensure no adverse effect on site integrity. The ability to find consents with a comparable set of circumstances (tidal regime, designated sites and their conservation status), such that parameters and thresholds can be easily identified may be limited. For example, on initial review, there were no comparable Ramsar sites with desalination discharges in similar proximity, to understand and obtain information on the scale of impacts, possible mitigation methods, and discharge consent limits.

Further work is also required to understand whether the discharge is within natural baseline water quality variations, for relevant compound parameters, taking account of seasonal variations. Further investigation is also required into the outstanding issues such as diffuser turbulence issues, scour and changes in localised velocity patterns and turbidity. These can all affect the use of the area by benthic fauna and fish, and therefore indirectly affect the foraging success of the tern species.

As such, at Gate 2, there are still uncertainties, gaps in the available evidence base and potential limitations to the scope of mitigation, to be able to determine, beyond reasonable scientific doubt, for multiple European designated sites, that the desalination solution would not have an adverse effect on site integrity, and therefore meet the Stage 2 Appropriate Assessment integrity test. Therefore, there are substantial consenting risks during both construction and operation and Post Gate 2 there is a need for a significant level of survey, design and assessment work to determine whether the potential impacts on integrity can be avoided or mitigated.

4.2.1.5 Marine Biodiversity

Table 30 - Marine Biodiversity

Topic	Consenting Evaluation RAG	Impact of Optionality
Biodiversity – Marine HRA	Construction – Major	No change in level of consenting risk although intake Option 1 that would use the Fawley Waterside Marina could possibly reduce effects although the level of consenting risk would not change. Outfall Option 2 may also reduce the consenting risk as it would also re-use more existing infrastructure
	Operation – Major	As above

There are SSSI sites associated with each of the Habitats Sites discussed in the section above and the risks identified for those sites would also apply to the associated SSSIs.

4.2.1.6 Carbon

Table 31 - Carbon

Topic	Consenting Evaluation RAG	Impact of Optionality
Carbon	Whole Life	Not applicable

The average (more realistic 15.6 Ml/d) operating scenario whole life carbon of the Option will be 746,364 tCO2e. Using the maximum operating scenario (75 Ml/d), whole life carbon would be 2,115,305 tCO2e. This

is the most significant of all the Options under consideration. For the operational carbon there is potential for offsetting through the use of a Power Purchase Agreement that would ensure the use of renewable energy sources. This has not been considered to date but should be progressed after Gate 2 to ensure that SW's wider commitments in its Net Zero Plan are met and any potential risks associated with an increasingly stringent future policy context in relation to carbon are also managed. Paragraph 4.4.7 of the dNPS states:

"The applicant should demonstrate that it has investigated feasible Options in terms of using energy efficient technology or processes, or using renewable energy sources, produced either on site or linked to any local renewable energy initiatives. The Secretary of State will consider the effectiveness of such mitigation measures in order to ensure that the carbon footprint is not unnecessarily high. The Secretary of State's view of the adequacy of the mitigation measures will be a material factor in the decision-making process".

The policy requirement to consider the effectiveness of mitigation suggests that effectiveness of offsetting of both the operational carbon, as well as the carbon effects of additional generation, will need to be considered. Without further detail at this stage, this remains a significant project risk for this Option.

4.2.1.7 Coastal Change

Table 32 - Coastal Change

Topic	Consenting Evaluation RAG	Impact of Optionality
Coastal Change	Construction – Minor	No change in level of consenting risk although intake Option 1 that would use the redundant Fawley Waterside Marina could possibly reduce effects although the level of consenting risk would not change.
	Operation – Minor	No change in level of consenting risk although intake Option 1 that would use the redundant Fawley power station infrastructure could possibly reduce effects although the level of consenting risk would not change.

Construction of the marine components of the desalination plant has the potential to impact coastal erosion. The draft NPS (paragraph 4.5.8) states that the decision maker should refuse development if proposals would impact on a Coastal Change Management Area (CCMA) without mitigation measures. The A.1 Option configuration falls outside of CCMA. However, there remain risks associated with potential changes to coastal processes and hydrodynamics and so these will require further assessment post Gate 2 to ensure policy compliance. During operation there are unlikely to be any significant impacts once the marine components are constructed and any required mitigation is in place. Engagement should also continue with the MMO, and future assessment ensures that the requirements of the South Marine Plan policies are fully considered.

4.2.1.8 Geology and Soils

Table 33 - Geology and Soils

Topic	Consenting Evaluation RAG	Impact of Optionality
Geology and Soils	Construction – Moderate	No change in the level of consenting risk
	Operation – None	No change in level of consenting risk

During construction the consenting risk is assessed as moderate as there will be a requirement for bespoke mitigation and further assessment work to ensure policy compliance. The desalination land parcel is located on land previously used as a MOD oil storage facility which represents a contaminant mobilisation risk.

Whilst there is potential for the pipeline routes to directly impact the New Forest SSSI as outlined above, it is considered unlikely that the pipeline routes would impact on the geological interest features owing to their location in relation to the pipeline routes. The pipelines would run through areas of Grade 1 and 2 agricultural lands (based on provisional Defra mapping (this is considered best and most versatile agricultural land). Where possible impacts on this land should be minimised and appropriate mitigation measures such as adherence to best practice guidance e.g., the Code of Practice for Sustainable Use of Soils on Construction Sites. Paragraph 4.10.12 of the dNPS states that *'applicants should seek to minimise impacts on the best and most versatile agricultural land…Applicants should also identify any effects on soil quality and show how they would minimise those effects, including by proposing appropriate mitigation measures."*

There would be no ongoing operational consenting risks as land would have been restored associated with pipeline construction.

4.2.1.9 Historic Environment – Terrestrial

Table 34 - Historic Environment – Terrestrial

Topic	Consenting Evaluation RAG	Impact of Optionality
Historic Environment – Terrestrial	Construction – Moderate	No change in the level of consenting risk
	Operation – None	No change in level of consenting risk

There is potential for the construction of both pipeline routes to have a direct impact on a bowl barrow scheduled monument alongside the Hythe Bypass. Paragraph 4.7.17 of the dNPS states *"Substantial harm or loss of designated sites of the highest significance, including.....Scheduled Monuments..... should be wholly exceptional and given great weight in the decision-making process".*

Based upon the current alignment of the pipeline route it is not clear if this Scheduled Monument could be fully avoided and this will depend upon further assessment of constructability constraints in the Hythe Bypass. There are also a number of Listed Buildings along the line of the pipeline routes that would potentially experience effects on setting during construction of the pipelines. Beaulieu Heath is also an archaeologically rich landscape that has largely escaped the intensive agricultural cultivation of later periods and, because of this, and its protection as a heath and royal forest, the potential for archaeology will be extremely high. Therefore, post Gate 2 there will need to be further desk-based archaeological assessment completed to ensure that the level of risk is understood and appropriately mitigated. Engagement should occur with Historic England and the County Archaeologist as part of this process. Further work should also be undertaken to further refine the pipeline corridors and to minimise the impacts on historic assets particularly those of national and regional importance in line with policy requirements, recognising that substantial harm to or loss of assets should be wholly exceptional.

Once operational there are no specific consenting risks as appropriate mitigation would have been implemented during construction and a significant part of the infrastructure (the pipelines) buried and land restored.

4.2.1.10 Historic Environment – Marine

Table 35 - Historic Environment - Marine

Topic	Consenting Evaluation RAG	Impact of Optionality
Historic Environment – Marine	Construction – Minor	No change in the level of consenting risk although use of intake Option 1 and outfall Option 2 would both re-use existing infrastructure and therefore may reduce some potential for impacts.

Topic	Consenting Evaluation RAG	Impact of Optionality
	Operation – None	No change in level of consenting risk.

Based on current information there are no significant consenting risks associated with impacts on nationally designated features (protected wreck sites). The dNPS policy affords the highest levels of protection to Protected Wreck Sites. However, at the next stage of scheme development there will be a need for marine archaeological surveys and further desk studies to ensure full evaluation of potential impacts on marine heritage resources. There remains potential for non-designated heritage assets to be identified through further evaluation at the next stage of scheme development.

4.2.1.11 Landscape, Seascape, Townscape and Visual Amenity

Table 36 - Landscape, Seascape, Townscape and Visual Amenity

Topic	Consenting Evaluation RAG	Impact of Optionality
Landscape, Seascape, Townscape and Visual Amenity	Construction – Substantial	No change in the level of consenting risk although pipeline route 2 would potentially run for a longer length through the National Park.
	Operation – Substantial	No change in level of consenting risk although pipeline route 2 would potentially run for a longer length through the National Park.

The desalination plant, and parts of the pipeline routes to Testwood as well as the pipeline Options connecting the marine intake and outfall Options to the desalination plant lie within the New Forest National Park. The permanent, above ground desalination plant would therefore affect a nationally designated landscape and there would be a short-term impact associated with the construction of the pipeline and the subsequent time taken for reinstatement planting to mature.

The dNPS in paragraph 4.9.9 states: *"Great weight should be given to conserving landscape and scenic beauty in nationally designated areas. National Parks, the Broads and Areas of Outstanding Natural Beauty have the highest status of protection in relation to landscape and scenic beauty. Each of these designated areas has specific statutory purposes which help ensure their continued protection and which the Secretary of State has a statutory duty to have regard to in decisions".* Paragraph 4.9.10 also states that:

"Consideration of such applications should include an assessment of:

- *The need for the development, including in terms of any national considerations, and the impact of permitting it, or refusing it, upon the local economy*
- *The cost of, and scope for, developing outside the designated area, or meeting the need for it in some other way; and*
- *Any detrimental effect on the environment, the landscape and recreational opportunities, and the extent to which that could be moderated"*

Similar policy is reflected in the NPPF with paragraph 177 identifying that major development should be refused in the National Park and the need within paragraph 176 to ensure that development within the setting of these landscapes should be sensitively located and designed to avoid or minimise adverse impacts on the designated areas.

There are significant policy compliance risks associated with Option A.1 and in line with paragraph 4.9.10 there is the potential to meet the need in another way, for example one of the other Options (B.2, B.5, B.4 and D.2) although recognising that they also require some works within the South Downs National Park albeit this would be likely temporary effects associated with pipeline construction. However, the desalination

plant is sited in an already industrial landscape context and there is potential for sensitive design to minimise the impacts on the nationally designated landscape and adjacent sensitive receptors.

There are also potential seascape effects associated with the construction of the marine infrastructure on the New Forest National Park that would need to be assessed and mitigated.

Once operational there would remain major consenting risks as there would be the permanent siting of the desalination plant within the National Park and it would take time for mitigation to mature and re-establish and therefore some impacts would lessen over time. The major adverse consenting risks during operation could be effectively managed and reduced through the sensitive sitting of the pipeline as far as possible and development of a comprehensive mitigation package and potentially wider enhancements.

Post Gate 2 there needs to be further work undertaken to refine the pipeline route corridors and this should be undertaken in conjunction with the National Park Authority and NE. This exercise should seek to minimise the impact as far as possible on the Special Qualities of the National Park.

4.2.1.12 Major Accidents and Disasters

Table 37 - Major Accidents and Disasters

Topic	Consenting Evaluation RAG	Impact of Optionality
Major Accidents and Disasters	Construction – Minor	No change in the level of consenting risk.
	Operation – Minor	No change in level of consenting risk.

There are a number of COMAH sites in close proximity to the terrestrial parcel and the associated pipelines. Further analysis of this risk would be required and engagement with the Hampshire Southampton East (HSE). It is uncertain the number, type and volume of chemicals that would be stored on the site and therefore whether the site itself would qualify as a COMAH site. Major accident and disaster risks would need to be considered as part of the EIA although this is not considered to be a significant consenting risk for either construction or operation.

4.2.1.13 Noise and Vibration

Table 38 - Noise and Vibration

Topic	Consenting Evaluation RAG	Impact of Optionality
Noise and Vibration	Construction – Minor	No change in the level of consenting risk.
	Operation – Minor	No change in level of consenting risk.

Noise and vibration generated by construction activities are likely to have temporary minor adverse impacts and they would need to be controlled through the implementation of best practice mitigation. The proposed routes that would be used by construction vehicles to access the construction works and construction plant information is not yet known.

During operation there will be no additional impacts on receptors. It is assumed that the relevant pollution control or other noise consenting regimes will be properly applied and enforced. As part of the future assessments there would need to be consideration of future receptors that may be located in the vicinity

such as those at the recently consented Fawley Waterside scheme. Paragraph of 4.11.10 of the dNPS states:

"In determining an application, the Secretary of State should consider whether mitigation measures are needed both for construction noise and operational noise. The Secretary of State may wish to impose requirements to ensure delivery of all mitigation measures. This is to ensure that the noise levels from the proposed development do not exceed those described in the assessment or any other estimates on which the decision was based".

Post Gate 2 traffic and noise modelling will be required to ensure appropriate mitigation is developed and the relevant assessments are available to meet policy tests.

4.2.1.14 Resource and Waste Management

Table 39 - Resource and Waste Management

Topic	Consenting Evaluation RAG	Impact of Optionality
Resource and Waste Management	Construction – Minor	No change in the level of consenting risk.
	Operation – Moderate / Major	No change in level of consenting risk.

There is interface between pipeline intake / outfall connections and the Badminston Farm safeguarded site for minerals processing and maintaining a landbank of sand and gravel reserves under Policy 20 of the Hampshire Minerals and Waste Local Plan (HMWLP) 2013. As noted in paragraph 4.10.14 of the dNPS this would need to be assessed in conjunction with the Mineral Planning Authority.

During operation, the desalinisation process would generate approximately 9.4 m^3 of solid waste per week at 15 Ml/d (the most realistic operating scenario) and approximately 45.8 m^3 per day at 75 Ml/d. It is not yet known how this solid waste will be disposed of as the total salt content is not yet known, this means that a waste classification cannot be assigned yet. It is anticipated that the solid waste would be sent to landfill due to the high salt content, subject to further investigation. National and local policy is clear on the position regarding diverting waste away from landfill (100%) and waste being managed at highest achievable level within the waste hierarchy.

Although there are a small number of dredge licenses and applications on Southampton Water it is considered that the dredge sites and marine components are considered to be far enough apart that they would not have any impacts on each other, and this risk could be effectively managed post Gate 2.

Post Gate 2 there needs to be ongoing monitoring of planning applications and the evolution of current local plans to ensure that all relevant resource and waste management applications and allocations are taken account of.

4.2.1.15 Socio-Economic

Table 40 - Socio-Economic

Topic	Consenting Evaluation RAG	Impact of Optionality
Resource and Waste Management	Construction – Minor	No change in the level of consenting risk.

Topic	Consenting Evaluation RAG	Impact of Optionality
	Operation – Minor	No change in level of consenting risk.

The construction of the site and the pipeline have the potential to impact on Public Rights of Way (PRoW) permanently and temporarily and therefore appropriate diversions will be required. Users of the New Forest National Park would also be impacted during construction particularly associated with the pipeline routes. There is also the potential for amenity impacts on users of Calshot Beach associated with intake / outfall construction and for similar construction related disturbance to occur for marine recreation as well. However, all these impacts can be controlled and managed through effective mitigation and adherence to a Construction Environmental Management Plan. There would also be beneficial effects during construction associated with employment creation.

Once operational there are unlikely to be ongoing impacts to socio-economic receptors as pipeline routes would be restored and nuisance would reduce. The desalination plant would also be appropriately screened and operated in line with relevant permits although mitigation screening would take time to mature. There would also be positive socio-economic impacts as a result of the provision of water supply in drought scenario.

4.2.1.16 Traffic and Transport

Table 41 - Traffic and Transport

Topic	Consenting Evaluation RAG	Impact of Optionality
Traffic and Transport	Construction – Moderate / Major	No change in the level of consenting risk.
	Operation – Minor	No change in level of consenting risk.

During construction there is the potential for the construction of the pipeline to have a significant impact on the local highway network as there would need to be extensive works in the A326. There are potentially limited diversion routes available and therefore extensive traffic management may be required (potentially further complicated by associated construction of the Fawley Waterside development as the construction phasing of aspects of that scheme may overlap with this Option). There are also a number of other developments identified by Hampshire County Council in previous consultation responses that would need to be considered in developing the pipeline corridors and the construction works for the desalination plant.

The construction of the intake and outfall infrastructure has the potential to have an interface with shipping, navigation and marine vessel users during construction. This would require further assessment and appropriate mitigation at the next stage of the assessment.

Once operational there would be limited ongoing traffic and transport impacts and so consenting risks are deemed to be minor.

Post Gate 2 there would need to be engagement with Hampshire County Council regarding the development of the pipeline routes and to clarify the viability of construction within the A326 particularly as this has implications for the risks associated for other policy areas e.g., biodiversity and cultural heritage as noted above.

4.2.1.17 Water Quality and Resources

Table 42 - Water Quality and Resources

Topic	Consenting Evaluation RAG	Impact of Optionality
Water Quality and Resources	Construction – Moderate	No change in the level of consenting risk.
	Operation – Moderate	No change in level of consenting risk.

During both construction and operation 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 any mitigation measures identified in the River Basin Management Plan (RBMP) or adversely affect water-related Protected Areas. This means that these activities are unlikely to result in deterioration in the status of water body status or prevent WFD objectives being achieved in relevant water body in the future. This is a critical factor owing to the legislative requirements of the WFD.

Given the requirement to discharge Reject Water from the desalination plant, modelling was undertaken to assess the magnitude and extent of effect within the WFD water body in which the discharge would occur but also to assess whether the plume would extend into adjoining water bodies. The assessment was based on the use of two models; CORMIX to understand the near-field behaviour of the discharge such as the dilution and geometry of the near-field plume and mid / far-field modelling using MIKE21 to indicate the potential dispersion outside of the initial mixing calculated by CORMIX. Two scenarios were modelled, the likely maximum flow for A.1 at 75 Ml/d representing a 1-in-200-year drought flow and the Business as Usual (BAU) flow of 15 Ml/d. Results of the CORMIX modelling showed that, as expected, the discharge plume is heavier than the ambient water and even with a strong discharge velocity, it does not reach the water surface. Results for suspended solids, indicate concentrations fall to approximately 20 mg/l within 300 m of the discharge for 75 Ml/d and within 50 m for 15 Ml/d. For iron, compliance is achieved prior to discharge. For pH, ambient values are reached within 200 m of the discharge location for both flow scenarios. With respect to salinity, modelled output indicates that the plume would be at 5% of ambient salinity within 250 m from the outfall for 75 Ml/d and within 150m for 15 Ml/d. Note that the plume would extend with the prevailing currents rather than spread laterally.

Given that the 75 Ml/d would only be required in very dry prolonged weather, the results of the 15 Ml/d are considered to best represent the day-to-day operational effects. Overall, therefore, a deterioration in water quality of the Solent WFD water body on a water body scale is not predicted. Only under certain conditions is the plume likely to extend into the Southampton Water WFD water body and therefore, again a deterioration in this water body on a water body scale is also not predicted. As a result of the limited effects on water quality and natural baseline conditions within the Solent WFD water body which give rise to varying baseline salinities and suspended solids concentrations, effects on fish and offshore habitats are not predicted.

Post Gate 2 further modelling, and assessment work will be required to ensure that the WFD Assessment for the future consent application meets all regulatory requirements and engagement should also be undertaken with the EA, NE and MMO on an ongoing basis.

4.2.1.18 Flood Risk

Table 43 - Flood Risk

Topic	Consenting Evaluation RAG	Impact of Optionality
Flood Risk	Construction – Moderate	No change in the level of consenting risk.
	Operation – No impact	No change in level of consenting risk.

The terrestrial parcel does not lie in a flood zone, however an area of flood zone 2 and 3 lies approximately 130 m North of the site. Construction of the pipelines would cross areas of flood zones 2 and 3 in multiple locations. The dNPS states in paragraph 4.8.10 states:

"Where flood risk is a factor in determining an application for development consent, the Secretary of State will need to be satisfied that, where relevant:

1. *The application is supported by an appropriate flood risk assessment; and*
2. *The Sequential Test has been applied as part of site selection and, if required, the Exception Test".*

Post Gate 2 the pipeline corridors should be subject to further refinement to seek to avoid as much of flood zones 2 and 3 as possible in line with the principles of the sequential test. A Flood Risk Assessment will also need to be undertaken which should include engagement with the EA and the Lead Local Flood Authority (Hampshire County Council). Adopting this process should ensure compliance with the relevant policy tests.

During operation there would be no ongoing consenting risk as it is assumed that all required drainage would be incorporated into the desalination plant design to ensure no increase in flood risk offsite and the pipeline works would have been completed and the land restored.

4.2.1.19 Interface with Future Development and Planning

Table 44 - Interface with Future Development and Planning

Topic	Consenting Evaluation RAG	Impact of Optionality
Interface with Future Development and Planning	Construction – Moderate	No change in the level of consenting risk.
	Operation – No impact	No change in level of consenting risk.

There is a major planning application pending for a residential development at Fawley Waterside comprising 1500 homes with a resolution to permit planning permission subject to the completion of a S106 agreement. According to the Fawley Waterside application, construction is planned to be phased over 10-15 years. Therefore, construction of the desalination plant and the pipeline would likely coincide with Fawley Waterside posing a risk of cumulative risks during construction as acknowledged above.

Both pipeline routes also run in proximity to the Marchwood and Dibden areas where there are large strategic land holdings for expansion of the Port of Southampton and the existing Marchwood Military Port. However, as of July 2021, there are no live proposals for either of these ports. This will need to be actively monitored going forwards and interfaces with the projects sought to be avoided where possible.

Sections of the A326 and B3053, east of Holbury, fall within a special policy area of the New Forest District Local Plan for upgrades to create safe vehicular, cycle and public transport links to access the former Fawley

Power station to serve possible new development at the site. The pipeline route along the A326 to the South of Marchwood also passes adjacent to New Forest District Housing site allocation MAR3. To the East of Totton, the pipeline routes pass adjacent to housing site allocations TOT1 and TOT3.

Post Gate 2 there will be a requirement for ongoing monitoring of planning applications to ensure that interfaces with future development are appropriately monitored and managed.

4.2.1.20 Land Use – Open Space, Green Infrastructure and Special Category Land

Table 45 - Land Use

Topic	Consenting Evaluation RAG	Impact of Optionality
Land Use – Open space, green infrastructure and special category land	Construction – Moderate	No change in the level of consenting risk.
	Operation – No impact	No change in level of consenting risk.

The desalination parcel does not affect land designated as open space or Special Category Land based on searches completed to date (refer to the methodology section 3.1). The pipeline routes would intersect with the New Forest National Park which is designated as Common Land and also sections of Countryside and Rights of Way Act land. All these factors will need to be considered post Gate 2.

The compulsory acquisition of certain types of land (land held inalienably by the National Trust, land forming part of a common (including a town or village green), open space, or fuel or field garden allotment and statutory undertakers' land) is subject to additional restrictions. Crown Land and Utilities owned land has additional requirements that will need to be factored into the next stage of the consenting process and additional land referencing activities are required post Gate 2 to complete a comprehensive understanding of special land interests.

4.2.1.21 Green Belt

Table 46 - Green Belt

Topic	Consenting Evaluation RAG	Impact of Optionality
Green Belt	Construction – No impact	No change in the level of consenting risk.
	Operation – No impact	No change in level of consenting risk.

There would be no impact on green belt and therefore no consenting risk.

4.2.1.22 Technology and Regulatory Approvals

Table 47 - Green Belt

Topic	Consenting Evaluation RAG	Impact of Optionality
Green Belt		**NA**

Whilst the technology is not itself a factor to consider against specific policy requirements, the deliverability of the technology and the ability to be able to secure regulatory approvals are all factors that need to be considered in the decision-making process. Seawater desalination is practiced internationally as a necessary

means of drinking water production where freshwater resources are scarce. Reverse Osmosis (RO) is the predominant technology globally and is considered the more feasible technology Option in the UK, recognising the energy scarcity and high energy costs of the UK relative to other regions where desalination is used. The UK market for desalination products used in drinking water supply is small, meaning the Regulation 31 approval process represents a more significant commercial risk to the product suppliers, becoming a barrier to market entry and a potential risk to this programme. However, there are two RO suppliers seeking Regulation 31 approval of their membranes and therefore this is not considered to be a significant risk for this specific Option although it is potentially more challenging than some of the other Options being considered.

4.2.1.23 Constructability

Table 48 - Constructability

Topic	Consenting Evaluation RAG	Impact of Optionality
Constructability		**NA**

As noted in sections above (Traffic and Transport) there are potential significant constructability risks associated with the construction of the pipeline connection to Testwood. This would require further design development and engagement with Hampshire County Council to understand to what extent the construction constraints could impact the wider programme and the ability to meet S20 requirements. Alternative pipeline routes that are not within the Hythe bypass could increase the risk of further policy risks for these topics.

4.2.1.24 Resilience

Table 49 - Resilience

Topic	Consenting Evaluation RAG	Impact of Optionality
Resilience		**NA**

Testwood and Otterbourne WSWs account for half of the total zonal risk in the Hampshire region and both sites have very poor redundancy. There is presently insufficient spare capacity in the network to make up the loss of either of these sites in the event of a full outage. Two scenarios were assessed in the resilience assessment: the non-drought resilience benefit provided by each Option to Otterbourne and Testwood WSW in a BAU scenario and the resilience benefit provided by each Option to Otterbourne and Testwood WSW in the event of a 1-in-200-year stressed drought. The results demonstrated that the Desalination scenario is more resilient that the Otterbourne dependent Options. There is also greater resilience with the 75 Ml/d Option than the 61 Ml/d Desalination-based Option.

4.2.1.25 Cost

Table 50 - Cost

Topic	Consenting Evaluation RAG	Impact of Optionality
Cost		**No change in the level of consenting risk.**

The Capital Expenditure (CAPEX) and the Operational Expenditure (OPEX) for Option A.1 are significantly higher than the other Options under consideration. Whilst this is not a consenting risk it is acknowledged within the dNPS in paragraph 2.3.12 that states:

"Desalination plants currently require high operational energy and face constraints such as managing the impact of discharges from the treatment process which can increase the costs and impact of this type of water resource".

This is a further important factor in the planning balance that needs to be weighed against the other consenting risks identified for this Option.

4.2.1.26 Conclusions for Option A.1

Based on the above Consenting Evaluation results A.1 is not considered to be consentable in this location (and the Stage 4 site selection process identified that there were no other more consentable sites) at this time. The main reason for this relates to the failure to meet the legislative tests within the Habitats Directive as there likely to be significant effects on the integrity of multiple Habitats Sites that cannot be mitigated. This would therefore trigger the process of considering whether there are other alternatives in line with the regulations. Other key risks are:

- The location of the terrestrial parcel for desalination within the New Forest National Park and the likely significant landscape and visual impacts
- Impacts on nationally important biodiversity resources including the New Forest SSSI and ancient woodland
- Significant constructability and traffic and transport risks related to construction in the Hythe Bypass
- Potential for direct impacts on nationally designated heritage assets
- Production of solid waste as a result of the desalination process that would presently need to be landfilled and therefore make achieving waste hierarchy requirements and non-compliance with zero to waste landfill policies difficult
- There is a significant whole life carbon impact although there is potential for renewable sources to be used through a Power Purchase Agreement

4.2.2 Option A.2

The infrastructure required for Option A.2 would be the same as for Option A.1 and therefore the results identified above would also be applicable to Option A.2. Whilst the DO of A.2 at 61 Ml/d is lower than A.1, there are not considered to be significant differences in the level of planning risk reported and therefore section 3.1.1 should be referred to for the Consenting Evaluation results.

4.2.2.1 Conclusions for Option A.2

Refer to the conclusions for Option A.1 above.

4.2.3 Option B.2

The outcomes of the Consenting Evaluation for Option B.2 are presented below against each of the Consenting Evaluation criteria. Details are provided of the level of consenting risk for the construction and operation of the Option with supporting justification for the consenting risk identified. There is a degree of Optionality for Option B.2, with there being two connecting pipeline Options (routes 1 and 2). The configuration also incorporates an EBL on land adjacent to the Otterbourne WSW. The waste stream would outfall via the existing Eastney Long Sea Outfall with there being no physical modifications to this structure.

4.2.3.1 Air Quality and Emissions

Table 51 - Air Quality and Emissions

Topic	Consenting Evaluation RAG	Impact of Optionality
Air Quality and Emissions	Construction – Minor	No change in level of consenting risk.
	Operation – No impact	As above

During construction there is the potential for emissions to air (including dust) from vehicle movements and use of plant. There are no AQMAs immediately adjacent to the proposed infrastructure although there are some on the wider Strategic Road Network. The proposed routes that would be used by construction vehicles to access the construction works are not yet known. As noted in paragraph 4.2.8 of the dNPS, the Secretary of State should take into account the presence of AQMAs, and any development should be consistent with local air quality action plans. On the basis of information presently available it will be possible for the relevant traffic and air quality assessments to be undertaken post Gate 2 and there is unlikely to be a breach of air quality thresholds during construction.

During construction there would be potential dust generation, and this would be managed through application of standard construction mitigation measures. This would be informed through the application of best practice guidance and documented in a Construction Environmental Management Plan.

For operation no consenting risks are identified as there would be limited vehicle movements associated with operation of the site.

Post Gate 2 traffic and air quality modelling will be required to ensure appropriate mitigation is developed and the relevant assessments are available to meet policy tests.

4.2.3.2 Biodiversity – Terrestrial HRA

Table 52 - Biodiversity – Terrestrial HRA

Topic	Consenting Evaluation RAG	Impact of Optionality
Biodiversity – Terrestrial HRA	Construction – Major	No change in level of consenting risk.
	Operation – Moderate	As above

During construction there are potentially a number of risks to Habitats Sites. Both the Buster Hill SAC and the Woolmer Forest SAC have the potential to be affected by construction vehicle movements resulting in nitrogen deposition risks. Whilst it is considered that relevant thresholds are unlikely to be exceeded this will need to be verified after Gate 2 once construction routes and vehicle movements are known and modelling can be carried out. Therefore, on a precautionary basis it is not possible to rule out effects on integrity.

Watercourse crossings are required associated with the pipeline routes to connect to Otterbourne and they have the potential to affect priority chalk stream habitat and SACs. The proposed pipeline connections extend from the Havant area to Otterbourne WSW, requiring the crossing of four main rivers (tributaries may also need to be crossed depending on final route selection). These watercourses are the River Wallington, River Meon, River Hamble and River Itchen. Two of these watercourses are, or will be, designated as SACs for their chalk stream habitat and species which they support; River Meon (compensatory habitat for SW Drought Plan) and River Itchen. All four watercourses discharge into the Solent European Marine Site and a number of estuaries for which an attribute to support favourable conservation status is to maintain freshwater input ("Structure: freshwater sources – maintain the natural freshwater flow / volume into the estuary").

The pipeline crossings as documented in Technical Report 1: Review of Pipeline Watercourse Crossings for Water Recycling and Bulk Supplies have the potential to have high impacts and there will be a need to identify potential alternative crossing locations. On the basis of the work completed to date and adopting a precautionary approach in line with the methodology, there is a major consenting risk in line with the tests in the Habitats Regulations as effects on integrity cannot be ruled out at this stage. Following Gate 2 it is recommended that further work is completed to understand whether the potential alternatives are feasible. Site specific survey work will be required to further understand local groundwater levels, surface flows, geology and watercourse characteristics will be required to further understand the level of impact and where route crossings can be altered.

The construction of the Otterbourne EBL has the potential to result in the mobilisation of sediment and contaminants that could have an adverse impact on the River Itchen as the EBL is sited within approximately 100 m of the Otter Bourne and this flows directly into the Itchen. Changes to physico-chemistry could also lead to loss or modification of in-channel and riparian habitats and as a result an adverse effect on integrity 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. However, on a precautionary basis the consenting risk is assessed major. There is also the potential for any changes to river water quality to deter the 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. The salmon spawning risk also applies to the Meon compensatory habitat.

During operation there will be a requirement to allow emergency discharge (overflow or drawdown) from the EBL under the Reservoirs Act 1975, although this is highly unlikely to be required. There are two potential discharge routes for this operational activity. Option 1 involves overflow and drawdown discharge to the Otter Bourne and under Option 2 overflow and drawdown to ground via a discharge to priority floodplain and coastal grazing marsh to the south of the proposed EBL. Option 1 has potential to impact upon the water quality of the River Itchen SAC, however due to the control measures proposed, discharge is unlikely to cause an adverse effect on integrity. It is considered that the concentration of contaminants (nutrients, heavy metals, or other anthropogenic compounds) would be at the same or at lower levels than are currently measured in the River Itchen. A proposed pumping station as part of the Lake Otterbourne infrastructure will monitor water quality and ensure raw water from the lake is suitable for discharge into the SAC.

During emergency overflow, there is potential for impact on hydromorphology of the River Itchen because of increased flow rate and volume to the Otter Bourne. This has potential to alter the quantity and dynamics of flow, the structure and substrate of the riverbed and width and depth of the channel. To prevent such adverse impacts, the proposed energy dissipation structure would reduce the rate of flow to the river during emergency discharge. The discharge structure on the Otter Bourne will be designed to reduce rates of scour. With appropriate designs, any impacts from increased flow are likely to be localised and temporary in nature.

Furthermore, the installation of channel erosion protection will reduce potential for any significant changes in reach scale erosion and deposition processes of the Otter Bourne and the Itchen. Erosion protection will be tied into the existing bank to prevent any morphological instability upstream and downstream. Further details and modelling will be required to assess potential impacts of the discharge.

If Option 2, with the presence of the proposed energy dissipation structure and discharge to floodplain and coastal grazing marsh, would significantly reduce any input of raw water to the River Itchen SAC. As there remains further mitigation work to be developed on a precautionary basis an adverse effect on integrity cannot be ruled again which again has driven the major consenting risk. However, it is considered likely that effective mitigation supported by further design / modelling evidence will ultimately allow significant adverse effects to the River Itchen be avoided. The Otterbourne EBL has not been subject to a site selection process and therefore depending upon the outcomes of further HRA work and if the risk of an adverse impact on the

River Itchen SAC remains then further site selection work will be needed post Gate 2 in line with HRA alternatives tests. This risk is reflected in the consenting RAG for this topic.

After Gate 2 further engagement is required with NE and the EA regarding the optimisation of the watercourse crossings as well as the development of appropriate mitigation for the Otterbourne EBL to ensure that there are no significant effects on the integrity of Habitats Sites.

4.2.3.3 Biodiversity – Terrestrial

Table 53 - Biodiversity – Terrestrial HRA

Topic	Consenting Evaluation RAG	Impact of Optionality
Biodiversity – Terrestrial HRA	Construction – Major	No change in level of consenting risk.
	Operation – Major	No change in level of consenting risk.

The major consenting risks during construction are very similar to those reported for Terrestrial HRA with the construction of the pipelines in particular posing risks to the SSSI designated rivers.

There is also the potential for direct impacts on ancient woodland associated with the construction of the pipeline. Sections of both pipeline routes lie immediately adjacent to ancient woodland and whilst it may be possible for the pipelines to be constructed in the road it is uncertain whether this would be viable and therefore whether there would be a direct impact on ancient woodland. There is also potential for indirect impacts on ancient woodland associated with changes in hydrology during construction. The dNPS is very clear in the level of protection afforded to ancient woodland stating:

"Ancient woodland is a valuable biodiversity resource both for its diversity of species and for its longevity as woodland. Once lost it cannot be recreated. 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 and the loss of ancient or veteran trees found outside ancient woodland unless there are wholly exceptional reasons, for example where the need for and other public benefits of the development, in that location, would clearly outweigh the loss or deterioration of the habitat, and a suitable compensation strategy exists". (para 4.3.14)

During operation there would be a need for ongoing reinstatement and establishment of mitigation related to the pipeline construction corridors and there would be a need to demonstrate the ongoing success and monitor the implementation of these measures. There would also be risks to the River Itchen SSSI as a result of the Otterbourne EBL that will require development of mitigation as noted in the terrestrial HRA section. For this reason, the level of consenting risk is assessed as major.

Post Gate 2 impacts on ancient woodland need to be avoided and minimised through further evolution of the design process. This route corridor refinement should be undertaken in collaboration with NE.

4.2.3.4 Biodiversity – Marine HRA

Table 54 - Biodiversity – Marine HRA

Topic	Consenting Evaluation RAG	Impact of Optionality
Biodiversity – Marine HRA	Construction – Moderate	No change in level of consenting risk.
	Operation – Moderate	No change in level of consenting risk.

The construction of the WRP and the pipeline connecting Budds Farm with the WRP have the potential to affect the Storehouse Lake / Brockhampton Mill Lake part of Langstone Harbour. These works have the potential to cause changes in suspended solids - water clarity and turbidity issues; smothering and siltation rate changes impacting subtidal and intertidal habitats and disturbance of breeding and non-breeding birds within intertidal and terrestrial zones – noise, visual (personnel presence), lighting. It should be possible to develop appropriate mitigation to manage these risks such that there are no adverse effects on the integrity of Habitats Sites.

The Eastney LSO already discharges the wastewater from the Budds Farm WTW and is subject to a discharge permit with a set of conditions that must be met with regards water quality. When incorporating the additional waste-stream from the water recycling RO process, the only two water quality parameters that will change are salinity and nitrogen levels.

No construction works are required offshore, and therefore the impacts to the marine environment, and European designated sites (Solent and Dorset Coast SPA, Chichester and Langstone Harbours SPA, Solent Maritime SAC) relate to the waste-stream only.

SW completed modelling of the changes in these salinity and nitrogen levels to investigate the impact of the discharge of Reject Water and brine, in the mid and far-field using a calibrated and validated hydrodynamic and water quality model to understand the potential for impacts from these discharges4. The modelling was completed for the Option B.5 solution (75 Ml/d) i.e., using final effluent from both Peel Common WTW and Budds Farm WTW as the supply to the water recycling plant. Note that for B.5, less flow would be discharged via the Peel Common WTW and this is reflected in the modelling for this scenario. Modelling was also completed for the 15 Ml/d sweetening flow, which utilises FE from Budds Farm WTW only, and is the likely operational scenario for Options B.2 and B.5 and the maximum flow for Option B.4. 5 Ml/d represents the likely operational scenario for Option B.4, but this was not modelled as the output would likely fall between the existing situation and the 15 Ml/d output. The modelling work considered the dry weather flow with predicted population growth within the catchments, and the headroom available within the existing permits.

The modelling demonstrates that there is a betterment in the salinity changes at the outfall, in that there is less of a difference between the ambient and waste-stream when the water recycling process is operating. This is because the water recycling process adds brine to the otherwise ‘freshwater’ waste-stream, thereby reducing the difference. Due to the reduction in flow when the water recycling process is added, the area over which the plume disperses interacts with the offshore sandbank (associated with the Solent Maritime SAC) slightly more than the current waste-stream. Based on available evidence, it is anticipated that the biotopes of the sandbank are not sensitive to these minor changes in salinity. However, survey work will be required to verify the biotopes present and confirm this conclusion.

The results for mean excess total nitrogen concentrations into clean water (i.e., no baseline included in the runs) show that there is some improvement in the Solent, Portsmouth Harbour and Langstone Harbour WFD water bodies in total nitrogen concentrations over the existing situation for the 75 Ml/d (B.5) scenario (reduces from widespread 10-15 µg/l to between 5-10 µg/l). This is because wastewater is being transferred away from the Peel Common WTW LSO and treated, with a lower flow being discharged via the Eastney LSO. This outfall offers increased dilution and dispersion. For the 15 Ml/d (B.2 and B.5 at BAU flow and B.4 at maximum flow) there is very little difference from the existing situation with the exception of a small

[4] Southern Water (June 2021) Water for Life Hampshire Coastal Modelling - Reuse Option Total Nitrogen and Salinity Assessment.

improvement in Portsmouth Harbour WFD water body. This is considered to be because the process removing nitrogen from the wastewater is not 100% effective and therefore not all total nitrogen is discharged back into the marine environment. If the 5 Ml/d had been modelled (B.4 at BAU), it is likely that the output would have indicated minimal change from the existing situation.

Overall therefore, for Option B.5 working at the maximium flow of 75 Ml/d, an improvement is predicted in total nitrogen concentrations and a reduced effect is noted on salinity within a number of the WFD water bodies. This improvement significantly reduces with the reduction in flow to 15 Ml/d (B.2 and B.5 functioning at BAU flow and B.4 at maximum flows) and would have reduced further had 5 Ml/d been modelled (B.4 BAU flow). The proposed 61 Ml/d (B.2) was not modelled but it is anticipated that the effect would fall somewhere in between the modelled scenarios but produce results closer to the those presented for 15 Ml/d, given that no flow would be transferred away from Peel Common WTW.

Under the 15 Ml/d sweetening flow for Option B.2 there is little change in the concentrations in the wider Solent, although a higher concentration in immediate proximity to the outfall. However, as with the changes in salinity, the reduced flow changes the dispersion pattern slightly, with a greater overlap of the plume with the offshore sandbank and Hayling Island coastline. When operating at 75 Ml/d this is less apparent. Further assessment will be required to understand the nutrient budgets of the final solution selected; however additional nitrogen stripping technologies could be incorporated at Budds Farm WTW to provide additional mitigation. Therefore, on the basis of this assessment the consenting risk is considered to be moderate as further modelling and baseline survey work needs to be conducted to verify the current results.

After Gate 2 further survey work should be conducted to determine the biotopes associated with the Solent Maritime SAC combined with further modelling and investigation of the need for additional mitigation.

With regards to potential impacts to Langstone Harbour as a result of discharges from the Short Sea Outfall (SSO), all water recycling Options will take final effluent from the WTW outlet channel (prior to discharge into the Budds Farm-Eastney transfer tunnel) and then transfer it offsite for further treatment. Waste discharges from the water recycling plant will be transferred back to the Budds Farm-Eastney system and will be discharged downstream of the Budds Farm WTW FE outlet channel and directly into the Budds Farm-Eastney transfer tunnel. From this location, WRP wastewater is unable to backflow to the Langstone Harbour SSO as the tunnel is approximately 20 m below the Budds Farm WTW SSO Langstone Harbour diversion point.

All waste discharges from the water recycling plant will enter the transfer tunnel and will be discharged to the Eastney LSO. The transfer tunnel is approximately 20 m below the ground level at Budds Farm WTW and the hydraulics of the system mean that wastewater cannot flow back up to ground level and be discharged to the SSO without first overflowing in an uncontrolled manner at shafts along the tunnel route (shafts are located at Eastney WTW, Kendalls Wharf and Budds Farm WTW). Therefore, no water recycling waste discharges will enter Langstone Harbour via the Langstone Harbour SSO.

4.2.3.5 Biodiversity – Marine

Table 55 - Biodiversity – Marine

Topic	Consenting Evaluation RAG	Impact of Optionality
Biodiversity – Marine	Construction – Moderate	No change in level of consenting risk.
	Operation – Moderate	No change in level of consenting risk.

As noted above for Marine HRA there are potential pollution risks associated with the construction of the WRP and the pipeline connecting Budds Farm with the WRP to affect the Storehouse Lake / Brockhampton Mill Lake part of Langstone Harbour. These works have the potential to cause changes in suspended solids -

water clarity and turbidity issues; smothering and siltation rate changes impacting subtidal and intertidal habitats and disturbance of breeding and non-breeding birds within intertidal and terrestrial zones resulting from noise, visual (personnel presence) and lighting. It should be possible to develop appropriate mitigation to manage these risks and as such the level of consenting risk is considered to be moderate. During operation the level of consenting risk reflects that for Marine HRA as there would be similar risks to national level designations.

4.2.3.6 Carbon

Table 56 - Carbon

Topic	Consenting Evaluation RAG	Impact of Optionality
Carbon	Whole Life	NA

The average (15.46 Ml/d) (more realistic) operating scenario whole life carbon of the Option will be 362,448 tCO2e. Assuming the maximum operating scenario (61 Ml/d), whole life carbon would be 872,257 tCO2e. For the operational carbon there is potential for offsetting through the use of a Power Purchase Agreement that would ensure the use of renewable energy sources. This has not been considered to date but should be after Gate 2 to ensure that SW's wider commitments in its Net Zero Plan are met and any potential risks associated with a more stringent future policy context in relation to carbon are also managed. Paragraph 4.4.7 of the dNPS states:

"The applicant should demonstrate that it has investigated feasible Options in terms of using energy efficient technology or processes, or using renewable energy sources, produced either on site or linked to any local renewable energy initiatives. The Secretary of State will consider the effectiveness of such mitigation measures in order to ensure that the carbon footprint is not unnecessarily high. The Secretary of State's view of the adequacy of the mitigation measures will be a material factor in the decision-making process".

The siting of the EBL would also result in the loss of existing solar panels and the associated renewable energy benefits that they provide. Therefore, there will be a need to ensure that this lost provision can be replaced to again reflect SW renewable energy targets and to meet wider net zero goals. This issue should be addressed in the event of a formal site selection exercise being undertaken for the Otterbourne EBL as noted in the HRA recommendations above.

4.2.3.7 Coastal Change

Table 57 - Coastal Change

Topic	Consenting Evaluation RAG	Impact of Optionality
Coastal Change	Construction – No impact	No change in level of consenting risk.
	Operation – No impact	No change in level of consenting risk.

The dNPS (paragraph 4.5.8) states that the decision maker should refuse development if proposals would impact on a CCMA without mitigation measures. The B.2 Option configuration falls outside of CCMA. There would be no changes to the Eastney outfall (with the exception of the contents of the plume as reported above) and the new connection between Budds Farm and the WRP has the potential to be tunneled and therefore there are no significant consenting risks identified for Option B.2.

4.2.3.8 Geology and Soils

Table 58 - Coastal Change

Topic	Consenting Evaluation RAG	Impact of Optionality
Coastal Change	Construction – Moderate	No change in the level of consenting risk
	Operation – None	No change in level of consenting risk.

During construction the consenting risk is assessed as moderate as there will be a requirement for bespoke mitigation and further assessment work to ensure policy compliance. The WRP72 sites lie within an area defined on the Provisional ALC Map produced by Defra as being Grade 1 agricultural land. However, it is also noted that this site is also a historic landfill and therefore there needs to be further investigation to determine the value of the land at the next stage of the scheme development. The use of the site as a previous landfill represents a contaminant risk that would require appropriate mitigation. The pipeline Options would run through areas of Grade 1 and 2 agricultural land (based on provisional Defra mapping and this is considered best and most versatile agricultural land. Where possible impacts on this land should be minimised and appropriate mitigation measures such as adherence to best practice guidance e.g., the Code of Practice for Sustainable Use of Soils on Construction Sites. Paragraph 4.10.12 of the dNPS states that *'applicants should seek to minimise impacts on the best and most versatile agricultural land…Applicants should also identify any effects on soil quality and show how they would minimise those effects, including by proposing appropriate mitigation measures."*

There would be no ongoing operational consenting risks.

4.2.3.9 Historic Environment – Terrestrial

Table 59 - Historic Environment – Terrestrial

Topic	Consenting Evaluation RAG	Impact of Optionality
Historic Environment – Terrestrial	Construction – Moderate	No change in the level of consenting risk
	Operation – Minor	No change in level of consenting risk.

There are a number of heritage assets where the pipelines are in close proximity and where best practice mitigation will be required to avoid construction activities leading to a temporary adverse impact. This includes nationally and regionally important assets including Listed Buildings and Scheduled Monuments. There is potential for indirect effects on the setting of the assets during construction of the pipeline and potentially direct effects depending upon the final routing of the pipeline although it should be possible to avoid direct effects through effective design. This, however, may be more challenging along the Portsdown Hill Road. Paragraph 4.7.19 of the dNPS states *"Substantial harm to or loss of designated sites of the highest significance, including.....Scheduled Monuments..... should be wholly exceptional" and given great weight in the decision-making process.*

The pumping stations required for the pipelines will need to be subject to further assessment and mitigation at the next stage of scheme development as they comprise large infrastructure that may have an impact on the setting of heritage assets depending on their location.

Post Gate 2 there will need to be further desk-based archaeological assessment completed to ensure that the level of archaeological risk is understood and appropriately mitigated. Engagement should occur with Historic England and the County Archaeologist as part of this process. Further work should also be undertaken to further refine the pipeline corridors and to minimise the impacts on historic assets particularly

those of national and regional importance in line with policy requirements recognising that substantial harm to or loss of assets should be wholly exceptional.

Once operational there is the potential for ongoing effects on the setting of heritage assets dependent on the location of pumping stations and break pressure tanks. Therefore, once detailed hydraulic analysis has been carried out to determine where pumping stations / break pressure tanks are required, a detailed location risk analysis can be carried out to determine the optimum location for these features that balances the various environmental and constructability constraints within the pipeline corridors.

4.2.3.10 Historic Environment – Marine

Table 60 - Historic Environment – Marine

Topic	Consenting Evaluation RAG	Impact of Optionality
Historic Environment – Marine	Construction – No impact	No change in the level of consenting risk.
	Operation – No impact	No change in level of consenting risk.

On the basis of current information there are no significant consenting risks associated with impacts on nationally designated features (protected wreck sites) as there would be no new marine infrastructure works. This conclusion should be re-visited after Gate 2 to confirm if the connecting pipeline between Budds Farm and the WRP will be tunneled.

4.2.3.11 Landscape and Visual Amenity

Table 61 - Landscape and Visual Amenity

Topic	Consenting Evaluation RAG	Impact of Optionality
Landscape and Visual Amenity	Construction – Major	No change in the level of consenting risk.
	Operation – Moderate	No change in level of consenting risk.

The pipeline routes to Otterbourne would run for a short section of their length through the South Downs National Park. The construction of the pipelines would therefore affect a nationally designated landscape and there would be a short-term impact associated with the construction of the pipeline and the subsequent time taken for reinstatement planting to mature.

The dNPS in paragraph 4.9.9 states: *"Great weight should be given to conserving landscape and scenic beauty in nationally designated areas. National Parks, the Broads and Areas of Outstanding Natural Beauty have the highest status of protection in relation to landscape and scenic beauty. Each of these designated areas has specific statutory purposes which help ensure their continued protection and which the Secretary of State has a statutory duty to have regard to in decisions".* Paragraph 4.9.10 also states that:

"Consideration of such applications should include an assessment of:

- *The need for the development, including in terms of any national considerations, and the impact of permitting it, or refusing it, upon the local economy*
- *The cost of, and scope for, developing outside the designated area, or meeting the need for it in some other way; and*
- *Any detrimental effect on the environment, the landscape and recreational opportunities, and the extent to which that could be moderated"*

Similar policy is reflected in the NPPF with paragraph 177 identifying that major development should be refused in the National Park and the need within paragraph 176 to ensure that development within the setting of these landscapes should be sensitively located and designed to avoid or minimise adverse impacts on the designated areas.

All the pipelines would have to run through the South Downs National Park to connect into Otterbourne and the site selection process previously ruled out other pipeline Options owing to their far greater length through the National Park. Post Gate 2 further work needs to be undertaken to refine the pipeline corridors to seek to minimise the impact on the National Park. This work should include engagement with the SDNPA. Once detailed hydraulic analysis has been carried out to determine where pumping stations / break pressure tanks are required, a detailed location risk analysis can be carried out to determine which routes pose the highest risk to landscape and visual amenity receptors and again appropriate siting can be undertaken.

Once operational there would remain potential consenting risks associated with the permanent impact of the break pressure tanks and pumping stations and it would take time for mitigation to mature and re-establish associated with any required screening and linked to pipeline reinstatement although these impacts would lessen over time. The consenting risks during operation could be effectively managed and reduced through the sensitive sitting of the pipeline as far as possible and development of a comprehensive mitigation package and potentially wider enhancements.

The WRP parcel is located in a largely industrial area immediately adjacent to the A27 and therefore construction impacts would have a limited impact on adjacent visual receptors and such risks could be managed through the implementation of appropriate construction mitigation. Once operation, owing to the industrial nature of the immediate environment it is not considered there would be a significant consenting risk although further LVIA work would be required post Gate 2 including site visits to ensure appropriate design and assessment of effects on sensitive receptors.

4.2.3.12 Major Accidents and Disasters

Table 62 - Major Accidents and Disasters

Topic	Consenting Evaluation RAG	Impact of Optionality
Major Accidents and Disasters	Construction – Moderate	No change in the level of consenting risk.
	Operation – Moderate	No change in level of consenting risk.

Major accident and disaster risks would need to be considered as part of the EIA and this assessment may need to consider risks associated with certain infrastructure components of the configuration itself. For example, the operation of the Otterbourne EBL and potential emergency situations that could arise would need to be considered as part of a screening exercise. However, it is expected that this issue would be able to be effectively managed (as per the Havant Thicket Environmental Statement (ES) – Vulnerability to Major Accidents and Disasters) through the adOption of similar risk mitigation measures associated with the lake's operation.

4.2.3.13 Noise and Vibration

Table 63 - Noise and Vibration

Topic	Consenting Evaluation RAG	Impact of Optionality
Noise and Vibration	Construction – Minor	No change in the level of consenting risk.

Topic	Consenting Evaluation RAG	Impact of Optionality
	Operation – Minor	No change in level of consenting risk.

Noise and vibration generated by construction activities is likely to have temporary minor adverse impacts and they would need to be controlled through the implementation of best practice mitigation. The proposed routes that would be used by construction vehicles to access the construction works and construction plant information is not yet known. At the WRP parcel, the adjacent land uses are primarily industrial, or transport related with limited adjacent residential receptors. Construction mitigation would need to be implemented accordingly based on future modelling work.

During operation there will be no additional impacts on receptors. It is assumed that the relevant pollution control or other noise consenting regimes will be properly applied and enforced. As part of the future assessments there would need to be consideration of future receptors that may be located in the vicinity of the infrastructure works. Paragraph of 4.11.10 of the dNPS states:

"In determining an application, the Secretary of State should consider whether mitigation measures are needed both for construction noise and operational noise. The Secretary of State may wish to impose requirements to ensure delivery of all mitigation measures. This is to ensure that the noise levels from the proposed development do not exceed those described in the assessment or any other estimates on which the decision was based".

Post Gate 2 traffic and noise modelling will be required to ensure appropriate mitigation is developed and the relevant assessments are available to meet policy tests.

4.2.3.14 Resource and Waste Management

Table 64 - Resource and Waste Management

Topic	Consenting Evaluation RAG	Impact of Optionality
Resource and Waste Management	Construction – Minor	No change in the level of consenting risk.
	Operation – No impact	No change in level of consenting risk.

There are potential land contamination issues associated with the WRP parcel's previous use a landfill that would require further assessment and mitigation as noted above. There are interfaces with areas that are designated Safeguarded sites within the HMWLP (2013) for uses including minerals and waste processing and transfer:

- The Budds Farm WTW is a Safeguarded Site for waste processing and waste transfer
- Part of the WRP parcel site falls within the Bedhampton Aggregates Wharf Safeguarded Site for minerals processing, and
- Both pipeline Options intersect the Farlington Redoubt site at Portsdown Hill, Safeguarded for aggregate recycling

As noted in paragraph 4.10.14 of the dNPS these interfaces would need to be assessed in conjunction with the Mineral Planning Authority.

Post Gate 2 there needs to be ongoing monitoring of planning applications and the evolution of current local plans to ensure that all relevant resource and waste management applications and allocations are taken account of.

4.2.3.15 Socio-Economic

Table 65 - Socio-Economic

Topic	Consenting Evaluation RAG	Impact of Optionality
Socio-Economic	Construction – Moderate	No change in the level of consenting risk.
	Operation – Minor	No change in level of consenting risk.

The construction of the site and the pipelines have the potential to impact on PRoW permanently and temporarily and therefore appropriate diversions will be required. Construction of the WRP site will impact a footpath running along the eastern edge of the site that may require appropriate screening from the works and the Broadmarsh Coastal Park lies to the south of the site and construction activities may have temporary adverse noise, vibration and visual amenity impacts on users of this area. There would be employment creation during the construction works that may provide short-term benefits.

Tarmac Limited hold a licence for berth maintenance dredging in Bedhampton approach channel until 2027 and this potentially overlaps with the Budds Farm to WRP pipeline connection although this may not be affected depending upon the type of construction used (currently understood to be tunnelled).

There are multiple crossings of PRoW along the lengths of the pipelines which would require appropriate diversions during construction. It is assumed once reinstatement has occurred there would be no ongoing operational impact.

The WRP parcel is currently the subject of a planning application that is seeking outline planning permission for flexible uses across Class E (Light industrial), Class B2 (General industrial) and Class B8 (Storage or distribution) – with ancillary office, car parking, service yard, drainage, landscaping and enabling works. At the time of drafting the application had not been consented. If the WRP is sited on this proposed application site, then there would potentially be a loss of employment opportunity associated as the site proposed circa 300 jobs compared to circa only 10 Full Time Equivalent (FTEs) on site during operation of the WRP.

There would be positive socio-economic impacts once the Option is operational associated with the provision of water supply in drought scenario.

4.2.3.16 Traffic and Transport

Table 66 - Traffic and Transport

Topic	Consenting Evaluation RAG	Impact of Optionality
Traffic and Transport	Construction – Moderate	No change in the level of consenting risk.
	Operation – Minor	No change in level of consenting risk.

During construction there is the potential for the construction of the pipeline to have a significant impact on the local highway network particularly the B2177 that is a key constraint for both pipeline Options. This could

be effectively mitigated however depending upon the final alignment of the pipeline in this location there could be potential wider impacts on heritage assets and open space designations in this area.

Post Gate 2 there would need to be engagement with the highways authority regarding the development of the pipeline routes and to clarify the viability of construction within the B2177 particularly as this has implications for the risks associated for other policy areas.

4.2.3.17 Water Quality and Resources

Table 67 - Water Quality and Resources

Topic	Consenting Evaluation RAG	Impact of Optionality
Water Quality and Resources	Construction – Moderate	No change in the level of consenting risk.
	Operation – Moderate	No change in level of consenting risk.

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.

Post Gate 2 further modelling, and assessment work will be required to ensure that the WFD Assessment for the future consent application meets all regulatory requirements and engagement should also be undertaken with the EA, NE and MMO on an ongoing basis.

4.2.3.18 Flood Risk

Table 68 - Flood Risk

Topic	Consenting Evaluation RAG	Impact of Optionality
Flood Risk	Construction – Moderate	No change in the level of consenting risk.
	Operation – No impact	No change in level of consenting risk.

The pipeline routes and the Otterbourne EBL would intersect areas of flood zones 2 and 3 in multiple locations. The dNPS states in paragraph 4.8.10 states:

"Where flood risk is a factor in determining an application for development consent, the Secretary of State will need to be satisfied that, where relevant:

- *The application is supported by an appropriate flood risk assessment, and*
- *The Sequential Test has been applied as part of site selection and, if required, the Exception Test"*

Post Gate 2 the pipeline corridors should be subject to further refinement to seek to avoid as much of flood zones 2 and 3 as possible in line with the principles of the sequential test. A Flood Risk Assessment will also need to be undertaken which should include engagement with the EA and the Lead Local Flood Authority (Hampshire County Council). Adopting this process should ensure compliance with the relevant policy tests.

During operation there would be no ongoing consenting risk as it is assumed that all required drainage would be incorporated into the desalination plant design to ensure no increase in flood risk offsite and the pipeline works would have been completed and the land restored.

4.2.3.19 Interface with Future Development and Planning

Table 69 - Interface with Future Development Planning

Topic	Consenting Evaluation RAG	Impact of Optionality
Interface with Future Development Planning	Construction – Moderate	No change in the level of consenting risk.
	Operation – No impact	No change in level of consenting risk.

The key planning risks for the pipeline route Options are the interfaces with the Southampton to London (SLP) Pipeline and AQUIND DCOs (affects both pipeline Options) which would require appropriate design mitigation. As discussed above there is also the pending outline planning application on the site of the WRP parcel. Both pipeline routes would also lie in close proximity to other developments including a proposed solar farm (Winchester County Council - 21/01391/FUL - Land at Locks Farm Botley Road) which is not yet consented as well as running through the site of an application (Winchester County Council ref 20/01483/HCS) for the proposed winning and working of up to 230,000 tonnes of soft sand with phased working and restoration through backfilling with up to 450,000 tonnes of clean inert waste/materials

Post Gate 2 there will be a requirement for ongoing monitoring of planning applications to ensure that interfaces with future development are appropriately monitored and managed.

4.2.3.20 Land Use – Open Space, Green Infrastructure and Special Category Land

Table 70 - Land Use

Topic	Consenting Evaluation RAG	Impact of Optionality
Land Use – Open space, green infrastructure and special category land	Construction – Moderate	No change in the level of consenting risk.
	Operation – No impact	No change in level of consenting risk.

The pipeline routes potentially intersect with areas of Special Category Land including Common Land and Countryside and Rights of Way land. This would need further consideration at Gate 2 and if possible, the optimisation of the pipeline routes to avoid these areas of land.

The compulsory acquisition of certain types of land (land held inalienably by the National Trust, land forming part of a common (including a town or village green), open space, or fuel or field garden allotment and statutory undertakers' land) is subject to additional restrictions, Crown Land and Utilities owned land has additional requirements that will need to be factored into the next stage of the consenting process and additional land referencing activities are required post Gate 2 to complete a comprehensive understanding of special land interests.

4.2.3.21 Green Belt

Table 71 - Green Belt

Topic	Consenting Evaluation RAG	Impact of Optionality
Green Belt	Construction – No impact	No change in the level of consenting risk.
	Operation – No impact	No change in level of consenting risk.

There would be no impact on green belt and therefore no consenting risk.

4.2.3.22 Technology and Regulatory Approvals

Table 72 - Technology and Regulatory Approvals

Topic	Consenting Evaluation RAG	Impact of Optionality
Technology and Regulatory Approvals		**NA**

Whilst the technology is not itself a factor to consider against specific policy requirements, the deliverability of the technology and the ability to be able to secure regulatory approvals are all factors that need to be considered in the decision-making process. The technology proposed is not considered to be a specific constraint. Water quality and pilot trial data has been gathered and will continue to be gathered to meet the level of confidence needed to develop a Water Safety Plan (WSP) to secure Drinking Water Inspectorate (DWI) approval.

4.2.3.23 Constructability

Table 73 - Constructability

Topic	Consenting Evaluation RAG	Impact of Optionality
Constructability		NA

As noted above (traffic and transport) there are potential constructability risks associated with the construction of the pipeline in certain roads. This would require further engagement with the Highways authority. There are also crossings of the South West mainline and West Coast railways that would be required. It is considered that all these constraints could be overcome with further design, mitigation and engagement work with stakeholders.

4.2.3.24 Resilience

Table 74 - Resilience

Topic	Consenting Evaluation RAG	Impact of Optionality
Resilience		NA

Testwood and Otterbourne WSWs account for half of the total zonal risk in the Hampshire region and both sites have very poor redundancy. There is presently insufficient spare capacity in the network to make up the loss of either of these sites in the event of a full outage. Two scenarios were assessed in the resilience assessment: the non-drought resilience benefit provided by each Option to Otterbourne and Testwood WSW

in a BAU scenario and the resilience benefit provided by each Option to Otterbourne and Testwood WSW in the event of a 1-in-200-year stressed drought. The results demonstrated that the Desalination scenario is more resilient that the Otterbourne dependent Options i.e., Options B.2, B.5, B.4 and D.2). However, the Otterbourne Options also improve resilience in the BAU Scenario.

4.2.3.25 Cost

Table 75 - Cost

Topic	Consenting Evaluation RAG	Impact of Optionality
Cost		No change in the level of consenting risk.

The CAPEX and the OPEX for Option B.2 are lower than Options A.1, A.2 and B.5 but higher than B.4 and D.2.

This is a further important factor in the planning balance that needs to be weighed against the other consenting risks identified for this Option.

4.2.3.26 Conclusions for Option B.2

The Consenting Evaluation determined that Option B.2 would have less consenting risk that Options A.1 and A.2. This Option has less impact on the highly designated marine environment which is the key determinant in the level of consenting risk for Options A.1 and A.2. The key consenting risks for Option B.2 are:

- Potential HRA challenges associated with the pipeline watercourse crossings. Whilst a significant effect on integrity has not been ruled out at this stage it is considered likely that it should be possible to mitigate this impact through a design and engineering solution.
- The pipeline routes would run partly through the South Downs National Park and there is a need for further engagement with the SDNPA and further route development to minimise impact
- There is potential for direct and indirect effects on ancient woodland that need to be further considered and avoided where possible
- The Otterbourne EBL has the potential to affect the integrity of the River Itchen SAC during construction and as a result of the emergency discharge. As the level of design development is at an early stage, on a precautionary basis an adverse effect on integrity cannot be ruled out. However, it is likely that mitigation measures, supported by further design / modelling evidence will allow significant adverse effects to be avoided.
- The Otterbourne EBL has not been subject to a site selection process and this exercise should be undertaken post Gate 2 in parallel to further work in relation to the risks to the River Itchen SAC

There remain uncertainties with this Option about the location of break pressure tanks and pumping station locations that would require effective siting post Gate 2.

4.2.3.27 Option B.5

Option B.5 comprises the same infrastructure as Option B.2 but with an additional pipeline from Peel Common to the WRP. Therefore, the consenting risks identified for Option B.2 would also apply for Option B.5. Option B.5 would introduce additional receptors that could be affected, for example properties and their residents that could be affected by changes in air quality or noise and vibration and additional river crossings during construction. However, the level of consenting risk would not change as reported for B.2 and the same mitigation would be required to ensure legislative and policy compliance. The same consenting risks as identified for Option B.2 would remain and would need to be managed for Option B.5.

SW completed modelling of the changes in the salinity and nitrogen levels to investigate the impact of the discharge of Reject Water and brine, in the mid and far-field using a calibrated and validated hydrodynamic and water quality model to understand the potential for impacts from these discharges[5]. The modelling was completed for the Option B.5 solution (75 Ml/d) i.e. using final effluent from both Peel Common WTW and Budds Farm WTW as the supply to the water recycling plant.

The modelling identified that for B.5, a portion of the final effluent is redistributed from Peel Common WTW to Budds Farm WTW which will reduce the flows through the Peel Common WTW LSO, which is a less well mixed environment than the Eastney LSO. In addition, under the 75 Ml/d scenario there is less overlap of the plume with the offshore sandbank features and the Hayling coastline. However, as for Option B.2, there would need to be further modelling done and ongoing engagement with the EA, NE and MMO regarding the salinity and nitrogen levels to determine if any additional mitigation such as nitrogen stripping technologies would be required.

Both the whole life carbon and the CAPEX and OPEX costs are slightly higher for Option B.5 compared to B.2 but are not sufficiently different to change any of the results and analysis reported for Option B.2.

The construction of B.5 would also potentially add additional complexity to the works along the Portsdown Hill Road that are already identified for B.2 as there would be a need to site two pipelines along this road: the pipeline between Peel Common and the WRP and the pipeline from the WRP to Otterbourne.

4.2.3.28 Conclusions for Option B.5

The infrastructure required for Option B.5 would be the same as for Option B.2 with the exception of the additional connecting pipeline between Peel Common and the WRP. The level of planning risk for each of the topics considered would be the same as reported for Option B.2 and the conclusions for B.2 should be referred to although there would be a potential benefit associated with B.5 and effects on the water environment as some flows would be diverted from the Peel Common WTW LSO which is a less well mixed environment than the Eastney LSO. Furthermore, under the 75 Ml/d scenario for Option B.5 there would be less overlap of the waste plume with the offshore sandbank features and the Hayling coastline.

4.2.4 Option B.4

The outcomes of the Consenting Evaluation for Option B.4 are presented below against each of the Consenting Evaluation criteria. Details are provided of the level of consenting risk for the construction and operation of the Option with supporting justification for the consenting risk identified. There is a degree of Optionality for Option B.4, with there being two connecting pipeline Options (routes 3 and 4) between Havant Thicket and Otterbourne as well as two potential connecting pipeline routes between the WRP and Havant Thicket.

The Stage 4 site selection process identified the preferred location for the HLPS (parcel HTPS5) close to the proposed HTR. However, it became apparent through scheme development that, in addition to consenting factors, the siting of the HLPS will be partly dictated by the hydraulic modelling associated with the actual pipeline routing. It was therefore decided that post Gate 2 it will be necessary to review the area of search and consider the potential for alternative sites for the HLPS along the proposed pipeline corridors.

[5] Southern Water (June 2021) Water for Life Hampshire Coastal Modelling - Reuse Option Total Nitrogen and Salinity Assessment.

Assumptions made regarding early site selection work for the HLPS were therefore carried through into the Consenting Evaluation and the parcel HTPS5 is considered below for completeness.

Post Gate 2, more detailed site and pipeline route planning will take place as part of further scheme development for the Preferred Option to determine land requirements and ultimately inform any application boundary for the project. Should the Havant Thicket Option emerge as the Preferred Option, 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.

Where the Optionality within the configuration changes the level of consenting risk this is reported, and an explanation provided. For each topic, details are also provided of further work that should be undertaken post Gate 2 to manage the level of consenting risk identified.

4.2.4.1 Air Quality and Emissions

Table 76 - Air Quality and Emissions

Topic	Consenting Evaluation RAG	Impact of Optionality
Air Quality and Emissions	Construction – Minor	No change in level of consenting risk.
	Operation – No impact	As above

During construction there is the potential for emissions to air (including dust) from vehicle movements and use of plant. There are no AQMAs immediately adjacent to the proposed infrastructure although there are some on the wider Strategic Road Network. The proposed routes that would be used by construction vehicles to access the construction works are not yet known. As noted in paragraph 4.2.8 of the dNPS, the Secretary of State should take into account the presence of AQMAs and any development should be consistent with local air quality action plans. On the basis of information presently available it will be possible for the relevant traffic and air quality assessments to be undertaken post Gate 2 and there is unlikely to be a breach of air quality thresholds during construction.

During construction there would be potential dust generation, and this would be managed through application of standard construction mitigation measures. This would be informed through the application of best practice guidance and documented in a Construction Environmental Management Plan.

For operation no consenting risks are identified as there would be limited vehicle movements associated with operation of the site.

Post Gate 2 traffic and air quality modelling will be required to ensure appropriate mitigation is developed and the relevant assessments are available to meet policy tests.

4.2.4.2 Biodiversity – Terrestrial HRA

Table 77 - Biodiversity – Terrestrial HRA

Topic	Consenting Evaluation RAG	Impact of Optionality
Biodiversity – Terrestrial HRA	Construction – Major	No change in level of consenting risk
	Operation – Moderate	As above

During construction there are potentially a number of risks to Habitats Sites. Both the Buster Hill SAC and the Woolmer Forest SAC have the potential to be affected by construction vehicle movements resulting in nitrogen deposition risks. Whilst it is considered that relevant thresholds are unlikely to be exceeded this will

need to be verified after Gate 2 once construction routes and vehicle movements are known and modelling can be carried out. Therefore, on a precautionary basis it is not possible to rule out effects on integrity.

Watercourse crossings are required associated with the pipelines to connect to Otterbourne and they have the potential to affect priority chalk stream habitat and SACs. The proposed pipeline connections extend from the Havant area to Otterbourne WSW, requiring the crossing of four main rivers (tributaries may also need to be crossed depending on final route selection). These watercourses are the River Wallington, River Meon, River Hamble and River Itchen. Two of these watercourses are, or will be, designated as SAC for their chalk stream habitat and species which they support; River Meon (compensatory habitat for SW Drought Plan) and River Itchen. All four watercourses discharge into the Solent European Marine Site and a number of estuaries for which an attribute to support favourable conservation status is to maintain freshwater input ("Structure: freshwater sources – maintain the natural freshwater flow / volume into the estuary").

These pipeline crossings as documented in the Technical Report 1: Review of Pipeline Watercourse Crossings for Water Recycling and Bulk Supplies have the potential to high impacts on the watercourses and therefore alternative crossing locations should be considered. On the basis of the work completed to date and adopting a precautionary approach in line with the methodology, there is a major consenting risk in line with the tests in the Habitats Regulations as effects on integrity cannot be ruled out at this stage. Following Gate 2 further pipeline route development work is required to optimise these crossing locations and minimise their impacts. Some initial feasibility work has been undertaken which suggests that it should be possible to mitigate any possible impacts on the watercourses. Site specific survey work will also be required to further understand local groundwater levels, surface flows, geology and watercourse characteristics. This will inform assessments about the level of likely impact and where route crossings can be altered. Further engagement is required with NE and the EA regarding the optimisation of the watercourse crossings.

4.2.4.3 Biodiversity – Terrestrial

Table 78 - Biodiversity – Terrestrial

Topic	Consenting Evaluation RAG	Impact of Optionality
Biodiversity – Terrestrial	Construction – Major	No change in level of consenting risk although pipeline route 4 potentially has a greater impact on ancient woodland
	Operation – Minor	No change in level of consenting risk.

The major consenting risks during construction are very similar to those reported for Terrestrial HRA with the construction of the pipelines in particular posing risks to the SSSI designated rivers.

There is also the potential for direct impacts on ancient woodland associated with the construction of the pipeline routes. Sections of both pipeline routes lie immediately adjacent to ancient woodland and whilst it may be possible to route the pipeline to avoid these areas it is uncertain whether this would be viable and therefore whether there would be a direct impact on ancient woodland. There is also potential for indirect impacts on ancient woodland associated with changes in hydrology during construction. The dNPS is very clear in the level of protection afforded to ancient woodland stating:

"Ancient woodland is a valuable biodiversity resource both for its diversity of species and for its longevity as woodland. Once lost it cannot be recreated. 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 and the loss of ancient or veteran trees found outside ancient woodland unless there are wholly exceptional reasons, for example where the need for and other public benefits of the development, in that location, would clearly outweigh the loss or deterioration of the habitat, and a suitable compensation strategy exists". (para 4.3.14)

During operation there would be a need for ongoing reinstatement and establishment of mitigation as a result of the pipeline construction and there would be a need to demonstrate the ongoing success and monitor the implementation of these measures.

Post Gate 2 impacts on ancient woodland need to be avoided and minimised through further evolution of the design process. This route corridor refinement should be undertaken in collaboration with NE.

4.2.4.4 Biodiversity – Marine HRA

Table 79 - Biodiversity – Marine HRA

Topic	Consenting Evaluation RAG	Impact of Optionality
Biodiversity – Marine HRA	Construction – Moderate	No change in level of consenting risk.
	Operation – Moderate	No change in level of consenting risk.

The construction of the WRP and the pipeline connecting Budds Farm with the WRP have the potential to affect the Storehouse Lake / Brookhampton Mill Lake part of Langstone Harbour. These works have the potential to cause changes in suspended solids - water clarity and turbidity issues; smothering and siltation rate changes impacting subtidal and intertidal habitats and disturbance of breeding and non-breeding birds within intertidal and terrestrial zones as a result of noise, visual (personnel presence) and lighting. It should be possible to develop appropriate mitigation to manage these risks such that there are no adverse effects on the integrity of Habitats Sites.

The Eastney LSO already discharges the wastewater from the Budds Farm WTW and is subject to a discharge permit with a set of conditions that must be met with regards water quality. When incorporating the additional waste-stream from the water recycling reverse osmosis process, the only two water quality parameters that will change are salinity and nitrogen levels.

No construction works are required offshore, and therefore the impacts to the marine environment, and European designated sites (Solent and Dorset Coast SPA, Chichester and Langstone Harbours SPA, Solent Maritime SAC) relate to the waste-stream only.

SW completed modelling of the changes in these salinity and nitrogen levels to investigate the impact of the discharge of Reject Water and brine, in the mid and far-field using a calibrated and validated hydrodynamic and water quality model to understand the potential for impacts from these discharges[6]. The modelling was completed for the Option B.5 solution (75 Ml/d) i.e., using final effluent from both Peel Common WTW and Budds Farm WTW as the supply to the water recycling plant. Note that for B.5, less flow would be discharged via the Peel Common WTW and this is reflected in the modelling for this scenario. Modelling was also completed for the 15 Ml/d sweetening flow, which utilises FE from Budds Farm WTW only, and is the maximum flow for Option B.4 and the likely operational scenario for Options B.2 and B.5). 5 Ml/d represents the likely operational scenario for Option B.4 but this was not modelled as the output would likely fall between the existing situation and the 15 Ml/d output. The modelling work considered the dry weather flow with predicted population growth within the catchments, and the headroom available within the existing permits.

[6] Southern Water (June 2021) Water for Life Hampshire Coastal Modelling - Reuse Option Total Nitrogen and Salinity Assessment.

The modelling demonstrates that there is a betterment in the salinity changes at the outfall, in that there is less of a difference between the ambient and waste-stream when the water recycling process is operating. This is because the water recycling process adds brine to the otherwise 'freshwater' waste-stream, thereby reducing the difference. Due to the reduction in flow when the water recycling process is added, the area over which the plume disperses interacts with the offshore sandbank (associated with the Solent Maritime SAC) slightly more than the current waste-stream. Based on available evidence, it is anticipated that the biotopes of the sandbank are not sensitive to these minor changes in salinity. However, survey work will be required to verify the biotopes present and confirm this conclusion.

The results for mean excess total nitrogen concentrations into clean water (i.e., no baseline included in the runs) for the 15 Ml/d (B.4 at maximum flow and B.2 and B.5 at BAU flow) there is very little difference from the existing situation with the exception of a small improvement in Portsmouth Harbour WFD water body. This is considered to be because the process removing nitrogen from the wastewater is not 100% effective and therefore not all total nitrogen is discharged back into the marine environment. If the 5 Ml/d had been modelled (B.4 at BAU), it is likely that the output would have indicated minimal change from the existing situation.

Overall therefore, for Option B.5 working at the maximium flow of 75 Ml/d, an improvement is predicted in total nitrogen concentrations and a reduced effect is noted on salinity within a number of the WFD water bodies. This improvement significantly reduces with the reduction in flow to 15 Ml/d (B.4 at maximum flows) and would have reduced further had 5 Ml/d been modelled (B.4 BAU flow).

Under the 15 Ml/d flow there is little change in the concentrations in the wider Solent, although a higher concentration in immediate proximity to the outfall. However, as with the changes in salinity, the reduced flow changes the dispersion pattern slightly, with a greater overlap of the plume with the offshore sandbank and Hayling Island coastline. Further assessment will be required to understand the nutrient budgets of the final solution selected; however additional nitrogen stripping technologies could be incorporated at Budds Farm WTW to provide additional mitigation. Therefore, on the basis of this assessment the consenting risk is considered to be moderate as further modelling and baseline survey work needs to be conducted to verify the current results.

After Gate 2 further survey work should be conducted to determine the biotopes associated with the Solent Maritime SAC combined with further modelling and investigation of the need for additional mitigation.

As explained for Option B.2 above, there would be no discharge from the WRP into Langstone Harbour.

4.2.4.5 Biodiversity – Marine

Table 80 - Biodiversity – Marine

Topic	Consenting Evaluation RAG	Impact of Optionality
Biodiversity – Marine	Construction – Moderate	No change in level of consenting risk.
	Operation – Moderate	No change in level of consenting risk.

As noted above for Marine HRA there are potential pollution risks associated with the construction of the WRP and the pipeline connecting Budds Farm with the WRP to affect the Storehouse Lake / Brockhampton Mill Lake part of Langstone Harbour. These works have the potential to cause changes in suspended solids - water clarity and turbidity issues; smothering and siltation rate changes impacting subtidal and intertidal habitats and disturbance of breeding and non-breeding birds within intertidal and terrestrial zones as a result of noise, visual impacts (personnel presence), lighting. It should be possible to develop appropriate

mitigation to manage these risks and as such the level of consenting risk is considered to be moderate. During operation the level of consenting risk reflects that for Marine HRA as there would be similar risks to national level designations.

4.2.4.6 Carbon

Table 81 - Carbon

Topic	Consenting Evaluation RAG	Impact of Optionality
Carbon	Whole Life	NA

The average (6.69 Ml/d) (realistic operating scenario) whole life carbon of the Option will be 194,835 tCO2e. Assuming the maximum operating scenario (75 Ml/d), whole life carbon would be 363,231 tCO2e. For the operational carbon there is potential for offsetting through the use of a Power Purchase Agreement that would ensure the use of renewable energy sources. This has not been considered to date but should be after Gate 2 to ensure that SW's wider commitments in its Net Zero Plan are met and any potential risks associated with a more stringent future policy context in relation to carbon are also managed. Paragraph 4.4.7 of the dNPS states:

"The applicant should demonstrate that it has investigated feasible Options in terms of using energy efficient technology or processes, or using renewable energy sources, produced either on site or linked to any local renewable energy initiatives. The Secretary of State will consider the effectiveness of such mitigation measures in order to ensure that the carbon footprint is not unnecessarily high. The Secretary of State's view of the adequacy of the mitigation measures will be a material factor in the decision-making process".

4.2.4.7 Coastal Change

Table 82 - Coastal Change

Topic	Consenting Evaluation RAG	Impact of Optionality
Coastal Change	Construction – No impact	No change in level of consenting risk.
	Operation – No impact	No change in level of consenting risk.

The draft NPS (paragraph 4.5.8) states that the decision maker should refuse development if proposals would impact on a CCMA without mitigation measures. The B.4 Option configuration falls outside of CCMA. There would be no changes to the Eastney outfall (with the exception of the contents of the plume as reported above) and the new connection between Budds Farm and the WRP has the potential to be tunneled and therefore there are no significant consenting risks identified for Option B.4.

4.2.4.8 Geology and Soils

Table 83 - Geology and Soils

Topic	Consenting Evaluation RAG	Impact of Optionality
Geology and Soils	Construction – Moderate	No change in the level of consenting risk although pipeline route 3 runs potentially higher

Topic	Consenting Evaluation RAG	Impact of Optionality
		quality agricultural land (based on provisional Defra mapping).
	Operation – None	No change in level of consenting risk.

During construction the consenting risk is assessed as moderate as there will be a requirement for bespoke mitigation and further assessment work to ensure policy compliance. The WRP72 sites lie within an area defined on the Provisional ALC Map produced by Defra as being Grade 1 agricultural land. However, it is also noted that this site is also a historic landfill and therefore there needs to be further investigation to determine the value of the land at the next stage of the scheme development. The use of the site as a previous landfill represents a contaminant risk that would require appropriate mitigation. The pipelines would run through areas of Grade 1 and 2 agricultural land (based on provisional Defra mapping (this is considered best and most versatile agricultural land). Where possible impacts on this land should be minimised and appropriate mitigation measures such as adherence to best practice guidance e.g., the Code of Practice for sustainable use of soils on construction sites. Paragraph 4.10.12 of the dNPs states that *'applicants should seek to minimise impacts on the best and most versatile agricultural land…Applicants should also identify any effects on soil quality and show how they would minimise those effects, including by proposing appropriate mitigation measures.'*

There would be no ongoing operational consenting risks.

Post Gate 2 there will need to be further development of the pipeline corridors to seek to re-route them to avoid the best and most versatile agricultural land where possible and areas of potential land contamination.

4.2.4.9 Historic Environment – Terrestrial

Table 84 - Historic Environment – Terrestrial

Topic	Consenting Evaluation RAG	Impact of Optionality
Historic Environment – Terrestrial	Construction – Moderate	No change in the level of consenting risk
	Operation – Minor	No change in level of consenting risk.

There are a number of heritage assets where the pipelines are in close proximity and where best practice mitigation will be required to avoid construction activities leading to a temporary adverse impact. This includes nationally and regionally important assets including Listed Buildings and Scheduled Monuments. There is potential for indirect effects on the setting of the assets during construction of the pipeline and potentially direct effects depending upon the final routing of the pipeline although it should be possible to avoid direct effects through effective design. This, however, may be more challenging for pipeline route 3 that potentially lies in closer proximity to more Listed Buildings along the A2030 as these properties are likely to experience effects on their setting during construction. The connecting pipelines between the WRP and HTR would have a potential interface with the Staunton Country Park that is also a Registered Park and Garden although these effects would be temporary during construction.

Paragraph 4.7.19 of the dNPS states *"Substantial harm to or loss of designated sites of the highest significance, including.....Scheduled Monuments..... should be wholly exceptional" and given great weight in the decision-making process.*

Post Gate 2 there will need to be further desk-based archaeological assessment completed to ensure that the level of archaeological risk is understood and appropriately mitigated. Engagement should occur with Historic England and the County Archaeologist as part of this process. Further work should also be undertaken to further refine the pipeline corridors and to minimise the impacts on historic assets particularly those of national and regional importance in line with policy requirements recognising that substantial harm to or loss of assets should be wholly exceptional.

Once operational there is the potential for ongoing effects on the setting of heritage assets dependent on the location of pumping stations and break pressure tanks. Therefore, once detailed hydraulic analysis has been carried out to determine where pumping stations / break pressure tanks are required, a detailed location risk analysis can be carried out to determine the optimum location for these features that balances the various constraints within the pipeline corridors.

4.2.4.10 Historic Environment – Marine

Table 85 - Historic Environment – Marine

Topic	Consenting Evaluation RAG	Impact of Optionality
Historic Environment – Marine	Construction – No impact	No change in the level of consenting risk.
	Operation – No impact	No change in level of consenting risk.

Based on current information there are no significant consenting risks associated with impacts on nationally designated features (protected wreck sites) as there would be no new marine infrastructure works. This conclusion should be re-visited after Gate 2 to confirm if the connecting pipeline between Budds Farm and the WRP will be tunneled.

4.2.4.11 Landscape and Visual Amenity

Table 86 - Landscape and Visual Amenity

Topic	Consenting Evaluation RAG	Impact of Optionality
Landscape and Visual Amenity	Construction – Major	No change in the level of consenting risk. Whilst pipeline route 3 may run through the National Park boundary for a marginally longer length than pipeline route 4, there is no site-based detail about the sensitivities of each route that would need to form further routing development.
	Operation – Moderate	No change in level of consenting risk.

The pipeline routes to Otterbourne would run for a short section of their length through the South Downs National Park. The construction of the pipeline would therefore affect a nationally designated landscape and there would be a short-term impact associated with the construction of the pipelines and the subsequent time taken for reinstatement planting to mature.

The dNPS in paragraph 4.9.9 states: *"Great weight should be given to conserving landscape and scenic beauty in nationally designated areas. National Parks, the Broads and Areas of Outstanding Natural Beauty*

have the highest status of protection in relation to landscape and scenic beauty. Each of these designated areas has specific statutory purposes which help ensure their continued protection and which the Secretary of State has a statutory duty to have regard to in decisions". Paragraph 4.9.10 also states that:

"Consideration of such applications should include an assessment of:

- *The need for the development, including in terms of any national considerations, and the impact of permitting it, or refusing it, upon the local economy;*
- *The cost of, and scope for, developing outside the designated area, or meeting the need for it in some other way; and*
- *Any detrimental effect on the environment, the landscape and recreational opportunities, and the extent to which that could be moderated".*

Similar policy is reflected in the NPPF with paragraph 177 identifying that major development should be refused in the National Park and the need within paragraph 176 to ensure that development within the setting of these landscapes should be sensitively located and designed to avoid or minimise adverse impacts on the designated areas.

All of the pipelines would have to run through the South Downs National Park to connect into Otterbourne and the site selection process previously ruled out other pipeline Options owing to their far greater length through the National Park. Post Gate 2 further work needs to be undertaken to refine the pipeline corridors to seek to minimise the impact on the National Park. This work should include engagement with the SDNPA. Once detailed hydraulic analysis has been carried out to determine where pumping stations / break pressure tanks are required, a detailed location risk analysis can be carried out to determine which routes pose the highest risk to landscape and visual amenity receptors and again appropriate siting can be undertaken.

Once operational there would remain potential consenting risks associated with the permanent impact of the break pressure tanks and pumping stations and it would take time for mitigation to mature and re-establish associated with any required screening and linked to pipeline reinstatement although these impacts would lessen over time. The consenting risks during operation could be effectively managed and reduced through the sensitive sitting of the pipeline as far as possible and development of a comprehensive mitigation package and potentially wider enhancements.

The WRP parcel is located in a largely industrial area immediately adjacent to the A27 and therefore construction impacts would have a limited impact on adjacent visual receptors and such risks could be managed through the implementation of appropriate construction mitigation. Once operation, owing to the industrial nature of the immediate environment it is not considered there would be a significant consenting risk.

The HTPS5 parcel for the high lift pumping station would be a new permanent landscape feature. However, the site is screened by vegetation from any potential receptors and is bordered by the A3(M), and therefore will have minimal impact on the landscape. Any impact during construction, such as vegetation loss will have impacts continuing into operation. This will require mitigation to reduce landscape impacts. These impacts will reduce over time as mitigation matures. The location of the site does not pose a risk to nationally important landscapes.

4.2.4.12 Major Accidents and Disasters

Table 87 - Major Accidents and Disasters

Topic	Consenting Evaluation RAG	Impact of Optionality
Major Accidents and Disasters	Construction – Minor	No change in the level of consenting risk.

Topic	Consenting Evaluation RAG	Impact of Optionality
	Operation – Minor	No change in level of consenting risk.

Major accident and disaster risks would need to be considered as part of the EIA and on the basis of the information regarding the configuration presently available there aren't considered to be any significant consenting risks for this policy area.

4.2.4.13 Noise and Vibration

Table 88 - Noise and Vibration

Topic	Consenting Evaluation RAG	Impact of Optionality
Noise and Vibration	Construction – Minor	No change in the level of consenting risk.
	Operation – Minor	No change in level of consenting risk.

Noise and vibration generated by construction activities will have temporary minor adverse impacts and they would need to be controlled through the implementation of best practice mitigation. The proposed routes that would be used by construction vehicles to access the construction works and construction plant information is not yet known.

The construction works associated with site HTPS5 will have negligible noise and vibration impacts due to the distance from receptors. At the WRP parcel, the adjacent land uses are primarily industrial or transport related with limited adjacent residential receptors. Construction mitigation would need to be implemented accordingly based on modelling work.

During operation there will be no additional impacts on receptors. It is assumed that the relevant pollution control or other noise consenting regimes will be properly applied and enforced. Paragraph of 4.11.10 of the dNPS states:

"In determining an application, the Secretary of State should consider whether mitigation measures are needed both for construction noise and operational noise. The Secretary of State may wish to impose requirements to ensure delivery of all mitigation measures. This is to ensure that the noise levels from the proposed development do not exceed those described in the assessment or any other estimates on which the decision was based".

Post Gate 2 traffic and noise modelling will be required to ensure appropriate mitigation is developed and the relevant assessments are available to meet and demonstrate policy compliance.

4.2.4.14 Resource and Waste Management

Table 89 - Noise and Vibration

Topic	Consenting Evaluation RAG	Impact of Optionality
Noise and Vibration	Construction – Minor	No change in the level of consenting risk.
	Operation – No impact	No change in level of consenting risk.

There are potential land contamination issues associated with the WRP parcel's previous use a landfill that would require further assessment and mitigation as noted above. There are interfaces with areas that are designated Safeguarded sites within the HMWLP (2013) for uses including minerals and waste processing and transfer:

- The Budds Farm WTW is a Safeguarded Site for waste processing and waste transfer;
- Part of the WRP parcel site falls within the Bedhampton Aggregates Wharf Safeguarded Site for minerals processing; and
- The Southern section of the Safeguarded site area for the Waterlooville Household Waste Recycling Centre (pipeline route 4); and
- Pipeline route 4 intersects a small section of the Bishop's Waltham Depot Safeguarded site area, designated for aggregate recycling.

As noted in paragraph 4.10.14 of the dNPS these interfaces would need to be assessed in conjunction with the Mineral Planning Authority.

Post Gate 2 there needs to be ongoing monitoring of planning applications and the evolution of current local plans to ensure that all relevant resource and waste management applications and allocations are taken account of.

4.2.4.15 Socio-Economic

Table 90 - Socio-Economic

Topic	Consenting Evaluation RAG	Impact of Optionality
Socio-Economic	Construction – Moderate	No change in the level of consenting risk.
	Operation – Minor	No change in level of consenting risk.

The construction of the site and the pipelines have the potential to impact on PRoW permanently and temporarily and therefore appropriate diversions will be required. Construction of the WRP site will impact a footpath running along the Eastern edge of the site that may require appropriate screening from the works and the Broadmarsh Coastal Park lies to the South of the site and construction activities may have temporary adverse noise, vibration and visual amenity impacts on users of this area.

East of the HTPS5 parcel there is a bridleway, and its users may experience temporary adverse effects on amenity during construction.

Tarmac Limited hold a licence for berth maintenance dredging in Bedhampton approach channel until 2027 and this potentially overlaps with the Budds Farm to WRP pipeline connection although this may not be affected depending upon the type of construction used (currently understood to be tunnelled).

There are multiple crossings of PRoW along the lengths of the pipelines which would require appropriate diversions during construction. It is assumed once reinstatement has occurred there would be no ongoing operational impact.

The pipeline between the WRP and Havant Thicket (route 2) would appear to intersect with areas of public open space, but this Option may be tunnelled beneath Havant which would reduce impacts.

The WRP parcel is currently the subject of a planning application that is seeking outline planning permission for flexible uses across Class E (Light industrial), Class B2 (General industrial) and Class B8 (Storage or distribution) – with ancillary office, car parking, service yard, drainage, landscaping and enabling works. At the time of drafting the application had not been consented. If the WRP is sited on this proposed application

site, then there would potentially be a loss of employment opportunity associated as the site proposed circa 300 jobs compared to circa only 10 FTEs on site during operation of the WRP.

There would be positive socio-economic impacts once the Option is operational associated with the provision of water supply in drought scenario. There may be visual amenity impacts on users of a bridleway running directly along the east side of site HTPS5 during operation. However, it is assumed that the plant would be appropriately screened although mitigation screening would take time to mature.

Post Gate 2 there will need to be further development of pipeline corridors to seek to minimise crossings and proximity to PRoW.

4.2.4.16 Traffic and Transport

Table 91 - Traffic and Transport

Topic	Consenting Evaluation RAG	Impact of Optionality
Traffic and Transport	Construction – Moderate	No change in the level of consenting risk.
	Operation – Minor	No change in level of consenting risk.

During construction there is the potential for the construction of the pipeline to impact on the local highway network particularly the Portsdown Hill Road (B2177) or Hulbert Road (B2150) and Maurepas Way (A3) depending on the route. Both connecting pipelines between the WRP and Havant Thicket would also run through very urban areas with route Option 1 comprising road works that would create disturbance for local road users. It is presently understood that Option 2 would be tunneled.

Post Gate 2 there would need to be engagement with the highways authority regarding the development of the pipeline routes and to clarify the viability of construction within the B2177 particularly as this has implications for the risks associated for other policy areas.

There would also need to be a crossing of the Southwest Mainline Railway that would require an appropriate engineering solution.

4.2.4.17 Water Quality and Resources

Table 92 - Water Quality and Resources

Topic	Consenting Evaluation RAG	Impact of Optionality
Water Quality and Resources	Construction – Moderate	No change in the level of consenting risk.
	Operation – Moderate	No change in level of consenting risk.

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.

Post Gate 2 further modelling and assessment work will be required to ensure that the WFD Assessment for the future consent application meets all regulatory requirements and engagement should also be undertaken with the EA, NE and MMO on an ongoing basis.

4.2.4.18 Flood Risk

Table 93 - Flood Risk

Topic	Consenting Evaluation RAG	Impact of Optionality
Flood Risk	Construction – Moderate	No change in the level of consenting risk.
	Operation – No impact	No change in level of consenting risk.

The pipeline route Options would intersect areas of flood zones 2 and 3 in multiple locations. In paragraph 4.8.10 the dNPS states:

"Where flood risk is a factor in determining an application for development consent, the Secretary of State will need to be satisfied that, where relevant:

- *The application is supported by an appropriate flood risk assessment; and*
- *The Sequential Test has been applied as part of site selection and, if required, the Exception Test"*

Post Gate 2 the pipeline corridors should be subject to further refinement to seek to avoid as much of flood zones 2 and 3 as possible in line with the principles of the sequential test. A Flood Risk Assessment will also need to be undertaken which should include engagement with the EA and the Lead Local Flood Authority (Hampshire County Council). Adopting this process should ensure compliance with the relevant policy tests.

During operation there would be no ongoing consenting risk as it is assumed that all required drainage would be incorporated into the desalination plant design to ensure no increase in flood risk offsite and the pipeline works would have been completed and the land restored.

4.2.4.19 Interface with Future Development and Planning

Table 94 - Interface with Future Development Planning

Topic	Consenting Evaluation RAG	Impact of Optionality
Interface with Future Development Planning	Construction – Moderate	No change in the level of consenting risk.
	Operation – No impact	No change in level of consenting risk.

The key planning risks for the pipeline route Options are the interfaces with the SLP Pipeline and AQUIND DCOs (affects both pipeline Options) which would require appropriate design mitigation.

Pipeline route 3 runs through a minerals application site (20 / 01483 / HCS) for the winning and working of soft sand. Pipeline route 4 runs through a residential site, currently under construction (10 / 02862 / OUT) for 2,550 dwellings west of Waterlooville and there are a number of associated applications for reserved matters and discharge of conditions being determined for future phases of the development. Pipeline route 4 runs through application 17 / 01300 / FUL for the proposed upgrading of the recreation ground in Swanmore that was permitted in 2017 and West of Waltham Chase as well as running through the site of an application for a Solar Farm 21 / 01391 / FUL that is yet to be determined.

Post Gate 2 there will be a requirement for ongoing monitoring of planning applications to ensure that interfaces with future development are appropriately monitored and managed.

4.2.4.20 Land Use – Open space, Green Infrastructure and Special Category Land

Table 95 - Land Use

Topic	Consenting Evaluation RAG	Impact of Optionality
Land Use – Open space, green infrastructure and special category land	Construction – Moderate	No change in the level of consenting risk although pipeline route 4 would appear to impact a greater area of Special Category Land.
	Operation – No impact	No change in level of consenting risk.

The pipeline route Options would potentially intersect with areas of Special Category Land including Common Land and Countryside and Rights of Way land. Pipeline route 4 would run through a significant area of Countryside and Rights of Way land north of Southwick and runs around a further area at the Forest of Bere whilst pipeline route 3 could potentially affect Common Land at Wickham Common. This would need further consideration at Gate 2 and if possible, the optimisation of the pipeline routes to avoid these areas of land.

The compulsory acquisition of certain types of land (land held inalienably by the National Trust, land forming part of a common (including a town or village green), open space, or fuel or field garden allotment and statutory undertakers' land) is subject to additional restrictions, Crown Land and Utilities owned land has additional requirements that will need to be factored into the next stage of the consenting process and additional land referencing activities are required post Gate 2 to complete a comprehensive understanding of special land interests.

4.2.4.21 Green Belt

Table 96 - Green Belt

Topic	Consenting Evaluation RAG	Impact of Optionality
Green Belt	Construction – No impact	No change in the level of consenting risk.
	Operation – No impact	No change in level of consenting risk.

There would be no impact on green belt and therefore no consenting risk.

4.2.4.22 Technology and Regulatory Approvals

Table 97 - Technology and Regulatory Approvals

Topic	Consenting Evaluation RAG	Impact of Optionality
Technology and Regulatory Approvals		NA

Whilst the technology is not itself a factor to consider against specific policy requirements, the deliverability of the technology and the ability to be able to secure regulatory approvals are all factors that need to be considered in the decision-making process. The technology proposed is not considered to be a specific

constraint. Water quality and pilot trial data has been gathered and will continue to be gathered to meet the level of confidence needed to develop a WSP to secure DWI approval. However, at the time of drafting, the planning permission for the HTR had not been granted and this therefore poses a consenting risk in relation to this Option.

4.2.4.23 Constructability

Table 98 - Constructability

Topic	Consenting Evaluation RAG	Impact of Optionality
Constructability		NA

As noted above (traffic and transport) there are potential constructability risks associated with the construction of the pipeline in certain roads. This would require further engagement with the highway's authority. There are also railway crossings that would be required. It is considered that all these constraints could be overcome with further design, mitigation and engagement work with stakeholders. The WRP to Havant Thicket Route 1 pipeline would also follow the local road network through Havant and this presents significant challenges relating to buildability and impact on the local community.

4.2.4.24 Resilience

Table 99 - Resilience

Topic	Consenting Evaluation RAG	Impact of Optionality
Resilience		NA

Testwood and Otterbourne WSWs account for half of the total zonal risk in the Hampshire region and both sites have very poor redundancy. There is presently insufficient spare capacity in the network to make up the loss of either of these sites in the event of a full outage. Two scenarios were assessed in the resilience assessment: the non-drought resilience benefit provided by each Option to Otterbourne and Testwood WSW in a BAU scenario and the resilience benefit provided by each Option to Otterbourne and Testwood WSW in the event of a 1-in-200-year stressed drought. The results demonstrated that the Desalination scenario is more resilient that the Otterbourne dependent Options i.e. Options B.2, B.5, B.4 and D.2). However, the Otterbourne Options also improve resilience in the BAU Scenario.

4.2.4.25 Cost

Table 100 - Cost

Topic	Consenting Evaluation RAG	Impact of Optionality
Cost		No change in the level of consenting risk.

The CAPEX and the OPEX for Option B.4 are lower than Options A.1, A.2, B.2 and B.5 but higher than D.2.

This is a further important factor in the planning balance that needs to be weighed against the other consenting risks identified for this Option.

4.2.4.26 Conclusions for B.4

The Consenting Evaluation determined that Option B.4 would have less consenting risk that Options A.1 and A.2. This Option has less impact on the highly designated marine environment which is the key determinant

in the level of consenting risk for Options A.1 and A.2. It is also assessed as having less consenting risk than Options B.2 and B.5 as it does not require the Otterbourne EBL, and this removes a further HRA risk from the configuration. The key consenting risks for Option B.2 are:

- Potential HRA challenges associated with the pipeline watercourse crossings. Whilst a significant effect on integrity has not been ruled out at this stage it is considered likely that it should be possible to mitigate this impact through a design and engineering solution.
- The pipeline routes would run partly through the South Downs National Park and there is a need for further engagement with the SDNPA and further route development to minimise impact
- There is potential for direct and indirect effects on ancient woodland that need to be further considered and avoided where possible

There remain uncertainties with this Option about the location of break pressure tanks and pumping station locations that would require effective sitting post Gate 2.

4.2.5 Option D.2

The outcomes of the Consenting Evaluation for Option D.2 are presented below against each of the Consenting Evaluation criteria. Details are provided of the level of consenting risk for the construction and operation of the Option with supporting justification for the consenting risk identified. There is a degree of Optionality for Option D.2, with there being two connecting pipeline Options (routes 3 and 4). As described for Option B.4 a change in approach was taken regarding the siting of the HLPS but consistent with the approach for Option B.4, parcel HTPS5 was carried through into the Consenting Evaluation and is considered below for completeness.

Post Gate 2, more detailed site and pipeline route planning will take place as part of further scheme development for the Preferred Option to determine land requirements and ultimately inform any application boundary for the project. Should the Havant Thicket Option emerge as the Preferred Option, 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.

Where the Optionality within the configuration changes the level of consenting risk this is reported, and an explanation provided. For each topic, details are also provided of further work that should be undertaken post Gate 2 to manage the level of consenting risk identified.

4.2.5.1 Air Quality and Emissions

Table 101 - Air Quality and Emissions

Topic	Consenting Evaluation RAG	Impact of Optionality
Air Quality and Emissions	Construction – Minor	No change in level of consenting risk
	Operation – No impact	As above

During construction there is the potential for emissions to air (including dust) from vehicle movements and use of plant. There are no AQMAs immediately adjacent to the pipeline routes proposed although there are some on the wider Strategic Road Network. The proposed routes that would be used by construction vehicles to access the construction works are not yet known. As noted in paragraph 4.2.8 of the dNPS, the Secretary of State should take into account the presence of AQMAs, and any development should be consistent with local air quality action plans. On the basis of information presently available it will be possible for the relevant traffic and air quality assessments to be undertaken post Gate 2 and there is unlikely to be a breach of air quality thresholds during construction (note this is in relation to air quality impacts on human receptors).

During construction there would be potential dust generation, and this would be managed through application of standard construction mitigation measures. This would be informed through the application of best practice guidance and documented in a Construction Environmental Management Plan.

For operation no consenting risks are identified as there would be limited vehicle movements associated with operation of the site.

Post Gate 2 traffic and air quality modelling will be required to ensure appropriate mitigation is developed and the relevant assessments are available to meet policy tests.

4.2.5.2 Biodiversity – Terrestrial HRA

Table 102 - Biodiversity – Terrestrial HRA

Topic	Consenting Evaluation RAG	Impact of Optionality
Biodiversity – Terrestrial HRA	Construction – Major	No change in level of consenting risk
	Operation – Moderate	As above

During construction there are potentially a number of risks to Habitats Sites. Both the Buster Hill SAC and the Woolmer Forest SAC have the potential to be affected by construction vehicle movements resulting in nitrogen deposition risks. Whilst it is considered that relevant thresholds are unlikely to be exceeded this will need to be verified after Gate 2 once construction routes and vehicle movements are known and modelling can be carried out. Therefore, on a precautionary basis it is not possible to rule out effects on integrity.

Watercourse crossings are required associated with the pipelines to connect to Otterbourne and they have the potential to affect priority chalk stream habitat and SACs. The proposed pipeline connections extend from the Havant area to Otterbourne WSW, requiring the crossing of four main rivers (tributaries may also need to be crossed depending on final route selection). These watercourses are the River Wallington, River Meon, River Hamble and River Itchen. Two of these watercourses are, or will be, designated as SAC for their chalk stream habitat and species which they support; River Meon (compensatory habitat for SW Drought Plan) and River Itchen. All four watercourses discharge into the Solent European Marine Site and a number of estuaries for which an attribute to support favourable conservation status is to maintain freshwater input ("Structure: freshwater sources – maintain the natural freshwater flow / volume into the estuary").

These pipeline crossings as documented in the Technical Report 1: Review of Pipeline Watercourse Crossings for Water Recycling and Bulk Supplies have the potential to high impacts on the watercourses and therefore alternative crossing locations should be considered. On the basis of the work completed to date and adopting a precautionary approach in line with the methodology, there is a major consenting risk in line with the tests in the Habitats Regulations as effects on integrity cannot be ruled out at this stage. Following Gate 2 further pipeline route development work is required to optimise these crossing locations and minimise their impacts, some initial feasibility work has been undertaken which suggests that it should be possible to mitigate any possible impacts on the watercourses. Site specific survey work will also be required to further understand local groundwater levels, surface flows, geology and watercourse characteristics. This will inform assessments about the level of likely impact and where route crossings can be altered. Further engagement is required with NE and the EA regarding the optimisation of the watercourse crossings.

4.2.5.3 Biodiversity – Terrestrial

Table 103 - Biodiversity – Terrestrial

Topic	Consenting Evaluation RAG	Impact of Optionality
Biodiversity – Terrestrial	Construction – Major	No change in level of consenting risk although pipeline route 4 potentially has a greater impact on ancient woodland.
	Operation – Minor	No change in level of consenting risk.

The major consenting risks during construction are very similar to those reported for Terrestrial HRA above with the construction of the pipelines in particular posing risks to the SSSI designated rivers.

There is also the potential for direct impacts on ancient woodland associated with the construction of the pipeline route Options. Sections of both pipeline routes lie immediately adjacent to ancient woodland and whilst it may be possible to route the pipeline to avoid these areas it is uncertain whether this would be viable and therefore whether there would be a direct impact on ancient woodland. There is also potential for indirect impacts on ancient woodland associated with changes in hydrology during construction. The dNPS is very clear in the level of protection afforded to ancient woodland stating:

"Ancient woodland is a valuable biodiversity resource both for its diversity of species and for its longevity as woodland. Once lost it cannot be recreated. 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 and the loss of ancient or veteran trees found outside ancient woodland unless there are wholly exceptional reasons, for example where the need for and other public benefits of the development, in that location, would clearly outweigh the loss or deterioration of the habitat, and a suitable compensation strategy exists". (para 4.3.14)

During operation there would be a need for ongoing reinstatement and establishment of mitigation as a result of the pipeline construction and there would be a need to demonstrate the ongoing success and monitor the implementation of these measures.

Post Gate 2 impacts on ancient woodland need to be avoided and minimised through further evolution of the design process. This route corridor refinement should be undertaken in collaboration with NE.

4.2.5.4 Biodiversity – Marine HRA

Table 104 - Biodiversity – Marine HRA

Topic	Consenting Evaluation RAG	Impact of Optionality
Biodiversity – Marine HRA	Construction – No impact	Not applicable
	Operation – No impact	Not applicable

There are no marine consenting risks associated with this Option.

4.2.5.5 Biodiversity – Marine

Table 105 - Biodiversity – Marine

Topic	Consenting Evaluation RAG	Impact of Optionality
Biodiversity – Marine	Construction – No impact	No change in level of consenting risk.
	Operation – No impact	No change in level of consenting risk.

There are no marine consenting risks associated with this Option.

4.2.5.6 Carbon

Table 106 - Carbon

Topic	Consenting Evaluation RAG	Impact of Optionality
Carbon	Whole life	N/A

The average (6.69 Ml/d) (realistic operating scenario) whole life carbon of the Option will be 55,271 tCO2e. Assuming the maximum operating scenario (75 Ml/d), whole life carbon would be 98,291 tCO2e. This is the least significant of all the Options under consideration. For the operational carbon there is potential for offsetting through the use of a Power Purchase Agreement that would ensure the use of renewable energy sources. This has not been considered to date but should be after Gate 2 to ensure that SW's wider commitments in its Net Zero Plan are met and any potential risks associated with a more stringent future policy context in relation to carbon are also managed. Paragraph 4.4.7 of the dNPS states:

"The applicant should demonstrate that it has investigated feasible Options in terms of using energy efficient technology or processes, or using renewable energy sources, produced either on site or linked to any local renewable energy initiatives. The Secretary of State will consider the effectiveness of such mitigation measures in order to ensure that the carbon footprint is not unnecessarily high. The Secretary of State's view of the adequacy of the mitigation measures will be a material factor in the decision-making process".

4.2.5.7 Coastal Change

Table 107 - Coastal Change

Topic	Consenting Evaluation RAG	Impact of Optionality
Coastal Change	Construction – No impact	
	Operation – No impact	

There is no impact on coastal change as Option D.2 is a purely terrestrial Option, therefore there is no consenting risk.

4.2.5.8 Geology and Soils

Table 108 - Geology and Soil

Topic	Consenting Evaluation RAG	Impact of Optionality
Geology and Soil	Construction – Minor	No change in the level of consenting risk although pipeline route 3 runs through higher quality agricultural land for a longer distance than pipeline route 4 (based on provisional Defra mapping).
	Operation – No impact	

During construction the consenting risk is assessed as minor, the pipeline routes would run through areas of Grades 1 and 2 agricultural land (based on provisional Defra mapping) this is considered best and most versatile agricultural land which could be temporarily impacted by the construction works. Where possible impacts on this land should be minimised and appropriate mitigation measures such as adherence to best practice guidance e.g., the Code of Practice for sustainable use of soils on construction sites. Paragraph 4.10.12 of the dNPs states that *'applicants should seek to minimise impacts on the best and most versatile agricultural land…Applicants should also identify any effects on soil quality and show how they would minimise those effects, including by proposing appropriate mitigation measures.'*

There would be no ongoing operational consenting risks.

Post Gate 2 there will need to be further development of the pipeline corridors to seek to re-route them where possible to avoid the best and most versatile agricultural land and the contaminated land.

4.2.5.9 Historic Environment – Terrestrial

Table 109 - Historic Environment – Terrestrial

Topic	Consenting Evaluation RAG	Impact of Optionality
Historic Environment – Terrestrial	Construction – Minor	No change in level of consenting risk.
	Operation – Minor	No change in level of consenting risk.

There are a number of heritage assets where the pipelines are in close proximity and where best practice mitigation will be required to avoid construction activities leading to a temporary adverse impact. This includes nationally and regionally important assets including Listed Buildings and Scheduled Monuments. There is potential for indirect effects on the setting of the assets during construction of the pipeline and potentially direct effects depending upon the final routing of the pipeline although it should be possible to avoid direct effects through effective design. This, however, may be more challenging for pipeline route 3 that potentially lies in closer proximity to more Listed Buildings along the A2030 and where indirect setting effects are more likely.

Paragraph 4.7.17 of the dNPS states *"Substantial harm to or loss of designated sites of the highest significance, including.....Scheduled Monuments.. and Grade I and II* Listed Buildings... should be wholly exceptional"* and given great weight in the decision-making process.

The pumping stations required for the pipelines will need to be subject to further assessment and mitigation at the next stage of scheme development as they comprise large infrastructure that may have an impact on the setting of heritage assets depending on their location.

Post Gate 2 there will need to be further desk-based archaeological assessment completed to ensure that the level of archaeological risk is understood and appropriately mitigated. Engagement should occur with Historic England and the County Archaeologist as part of this process. Further work should also be undertaken to further refine the pipeline corridors and to minimise the impacts on historic assets particularly those of national and regional importance in line with policy requirements recognising that substantial harm to or loss of assets should be wholly exceptional.

Once operational there is the potential for ongoing effects on the setting of heritage assets dependent on the location of pumping stations and break pressure tanks. Therefore, once detailed hydraulic analysis has been carried out to determine where pumping stations / break pressure tanks are required, a detailed location risk analysis can be carried out to determine the optimum location for these features that balances the various constraints within the pipeline corridors.

4.2.5.10 Historic Environment – Marine

Table 110 - Historic Environment - Marine

Topic	Consenting Evaluation RAG	Impact of Optionality
Historic Environment - Marine	Construction – No impact	Not applicable
	Operation – No impact	Not applicable

There is no impact on the marine historic environment and therefore no consenting risks associated with this Option.

4.2.5.11 Landscape, Townscape and Visual Amenity

Table 111 - Landscape, Townscape and Visual Amenity

Topic	Consenting Evaluation RAG	Impact of Optionality
Landscape, Townscape and Visual Amenity	Construction – Minor	No change in the level of consenting risk. Whilst pipeline route 3 may run through the National Park boundary for a marginally longer length than pipeline route 4, there is no site-based detail about the sensitivities of each route that would need to inform further routing development.
	Operation – Moderate	No change in the level of consenting risk.

The pipeline routes to Otterbourne would run for a short section of their length through the South Downs National Park. The construction of the pipelines would therefore affect a nationally designated landscape and there would be a short-term impact associated with the construction of the pipelines and the subsequent time taken for reinstatement planting to mature.

The dNPS in paragraph 4.9.9 states: *"Great weight should be given to conserving landscape and scenic beauty in nationally designated areas. National Parks, the Broads and Areas of Outstanding Natural Beauty*

have the highest status of protection in relation to landscape and scenic beauty. Each of these designated areas has specific statutory purposes which help ensure their continued protection and which the Secretary of State has a statutory duty to have regard to in decisions". Paragraph 4.9.10 also states that:

"Consideration of such applications should include an assessment of:

- *The need for the development, including in terms of any national considerations, and the impact of permitting it, or refusing it, upon the local economy*
- *The cost of, and scope for, developing outside the designated area, or meeting the need for it in some other way; and*
- *Any detrimental effect on the environment, the landscape and recreational opportunities, and the extent to which that could be moderated"*

Similar policy is reflected in the NPPF with paragraph 177 identifying that major development should be refused in the National Park and the need within paragraph 176 to ensure that development within the setting of these landscapes should be sensitively located and designed to avoid or minimise adverse impacts on the designated areas.

All of the pipelines would have to run through the South Downs National Park to connect into Otterbourne and the site selection process previously ruled out other pipeline Options owing to their far greater length through the National Park. Post Gate 2 further work needs to be undertaken to refine the pipeline corridors to seek to minimise the impact on the National Park. This work should include engagement with the SDNPA. Once detailed hydraulic analysis has been carried out to determine where pumping stations / break pressure tanks are required, a detailed location risk analysis can be carried out to determine which routes pose the highest risk to landscape and visual amenity receptors and again appropriate siting can be undertaken.

Once operational there would remain potential consenting risks associated with the permanent impact of the break pressure tanks and pumping stations and it would take time for mitigation to mature and re-establish associated with any required screening and linked to pipeline reinstatement although these impacts would lessen over time. The consenting risks during operation could be effectively managed and reduced through the sensitive sitting of the pipeline as far as possible and development of a comprehensive mitigation package and potentially wider enhancements.

The HTPS5 parcel for the high lift pumping station would be a new permanent landscape feature. However, the site is screened by vegetation from any potential receptors and is bordered by the A3(M), and therefore will have minimal impact on the landscape. Any impact during construction, such as vegetation loss will have impacts continuing into operation. This will require mitigation to reduce landscape impacts. These impacts will reduce over time as mitigation matures. The location of the site does not pose a risk to nationally important landscapes.

4.2.5.12 Major Accidents and Disasters

Table 112 - Major Accidents and Disasters

Topic	Consenting Evaluation RAG	Impact of Optionality
Major Accidents and Disasters	Construction – Minor	No change in the level of consenting risk.
	Operation – Minor	No change in the level of consenting risk.

Major accident and disaster risks would need to be considered as part of the EIA and on the basis of the information regarding the configuration presently available there aren't considered to be any significant consenting risks for this policy area.

4.2.5.13 Noise and Vibration

Table 113 - Noise and Vibration

Topic	Consenting Evaluation RAG	Impact of Optionality
Noise and Vibration	Construction – Minor	No significant differences between pipeline routes, however each pipeline route will have noise and vibration impacts in different areas.
	Operation – No impact	No change in the level of consenting risk.

Noise and vibration generated by construction activities associated with the pipeline routes will have temporary adverse impacts and they would need to be controlled through the implementation of best practice mitigation. The proposed routes that would be used by construction vehicles to access the construction works and construction plant information is not yet known.

The construction works associated with Site HTPS5 will have negligible noise and vibration impacts due to the distance from receptors.

During operation there will be no additional impacts on receptors. It is assumed that the relevant pollution control or other noise consenting regimes will be properly applied and enforced. Paragraph of 4.11.10 of the dNPS states:

"*In determining an application, the Secretary of State should consider whether mitigation measures are needed both for construction noise and operational noise. The Secretary of State may wish to impose requirements to ensure delivery of all mitigation measures. This is to ensure that the noise levels from the proposed development do not exceed those described in the assessment or any other estimates on which the decision was based*".

Post Gate 2 further development of pipeline corridors will be required. Optimisation of pipeline route could reduce proximity to receptors.

4.2.5.14 Resource and Waste Management

Table 114 - Resource and Waste Management

Topic	Consenting Evaluation RAG	Impact of Optionality
Resource and Waste Management	Construction – Minor	
	Operation – No impact	

There are interfaces with areas that are designated as safeguarded sites within the HMWLP (2013) for uses including minerals and waste processing, including:

- The Southern section of the Safeguarded site area for the Waterlooville Household Waste Recycling Centre
- Pipeline route 4 intersects a small section of the Bishop's Waltham Depot Safeguarded site area, designated for aggregate recycling

These areas would require further investigation at the next stage of the scheme development. As noted in paragraph 4.10.14 of the dNPS these interfaces would need to be assessed in conjunction with the Mineral Planning Authority.

Post Gate 2 further work would be required to optimise the use of waste hierarchy and seek to avoid historic contaminated land sites in pipeline route siting.

4.2.5.15 Socio-Economic Impact

Table 115 - Socio-economic Impact

Topic	Consenting Evaluation RAG	Impact of Optionality
Socio-economic Impact	Construction – Minor	No change in level of consenting risk
	Operation – Minor	No change in level of consenting risk.

In addition, east of the HTPS5 parcel there is a bridleway, and its users may experience temporary adverse effects on amenity during construction.

There are multiple crossings of PRoW along the lengths of the pipelines which would require appropriate diversions during construction. It is assumed once reinstatement has occurred there would be no ongoing operational impact.

There would be positive socio-economic impacts once the Option is operational associated with the provision of water supply in drought scenario. There may be visual amenity impacts on users of a bridleway running directly along the east side of site HTPS5 during operation. However, it is assumed that the plant would be appropriately screened although mitigation screening would take time to mature.

Post Gate 2 there will need to be further development of pipeline corridors to seek to minimise crossings and proximity to rights of way.

4.2.5.16 Traffic and Transport

Table 116 - Traffic and Transport

Topic	Consenting Evaluation RAG	Impact of Optionality
Traffic and Transport	Construction – Minor	No change in level of consenting risk
	Operation – No impact	No change in level of consenting risk

During construction there is the potential for the construction of the pipeline to have an impact on the local highway network particularly the Portsdown Hill Road (B2177) or Hulbert Road (B2150) and Maurepas Way (A3) depending on the route. Construction on the Portsdown Hill Road (B2177) (part of pipeline route 3) will especially produce risks as this will involve interacting with other services within the carriageway and an interface with the AQUIND interconnector. There is little scope for rerouting due to the environmental, public access, open space, and heritage designations and assets in the area. In addition, pipeline routes cross the SLP Pipeline route to the west of Bishops Waltham. This is a consented pipeline route and an engineering constraint that will need to be addressed through the design process. The route at the West end of the pipeline will require crossing the Southwest Mainline Railway. Mitigation through the design of the pipeline and construction methods used will reduce impacts. Pipeline route 3 runs through residential areas of Havant which will likely have temporary adverse impacts on road users in the local community. Also construction on Hulbert Road (B2150) and Maurepas Way (A3) poses a risk to pipeline route 4.

Once operational there would be limited ongoing traffic and transport impacts and so consenting risks are deemed to be minor.

The potential impacts can be reduced and mitigated through the Construction Traffic Management Plan. Post Gate 2 there would need to be engagement with Hampshire County Council to review the construction Options.

4.2.5.17 Water Quality and Resources

Table 117 - Water Quality and Resources

Topic	Consenting Evaluation RAG	Impact of Optionality
Water Quality and Resources	Construction – Minor	No change in level of consenting risk
	Operation – No impact	No change in level of consenting risk

During both construction and operation, 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. This is a critical factor owing to the legislative requirements of the WFD.

4.2.5.18 Flood Risk

Table 118 - Flood Risk

Topic	Consenting Evaluation RAG	Impact of Optionality
Flood Risk	Construction – Moderate	No change in the level of consenting risk.
	Operation – No impact	No change in level of consenting risk.

The pipeline routes would intersect areas of flood zones 2 and 3 in multiple locations. The dNPS states in paragraph 4.8.10 states:

"Where flood risk is a factor in determining an application for development consent, the Secretary of State will need to be satisfied that, where relevant:

- *The application is supported by an appropriate flood risk assessment; and*
- *The Sequential Test has been applied as part of site selection and, if required, the Exception Test"*

Post Gate 2 the pipeline corridors should be subject to further refinement to seek to avoid as much of flood zones 2 and 3 as possible in line with the principles of the sequential test. A Flood Risk Assessment will also need to be undertaken which should include engagement with the EA and the Lead Local Flood Authority (Hampshire County Council). Adopting this process should ensure compliance with the relevant policy tests.

During operation there would be no ongoing consenting risk as it is assumed that all required drainage would be incorporated into the desalination plant design to ensure no increase in flood risk offsite and the pipeline works would have been completed and the land restored.

4.2.5.19 Interface with Future Development and Planning

Table 119 - Interface with Future Development and Planning

Topic	Consenting Evaluation RAG	Impact of Optionality
Interface with Future Development and Planning	Construction – Minor	No change in the level of consenting risk.
	Operation – No impact	No change in the level of consenting risk.

The key planning risks for the pipeline route Options are the interfaces with the SLP Pipeline and AQUIND DCOs (affects both pipeline Options) which would require appropriate design mitigation.

Pipeline route 3 runs through a minerals application site (20/01483/HCS) for the winning and working of soft sand. Pipeline route 4 runs through a residential site, currently under construction (10/02862/OUT) for 2,550 dwellings west of Waterlooville and there are a number of associated applications for reserved matters and discharge of conditions being determined for future phases of the development. Pipeline route 4 runs through application 17/01300/FUL for the proposed upgrading of the recreation ground in Swanmore that was permitted in 2017 and west of Waltham Chase as well as running through the site of an application for a Solar Farm 21/01391/FUL that is yet to be determined.

Post Gate 2 there will be a requirement for ongoing monitoring of planning applications to ensure that interfaces with future development are appropriately monitored and managed.

4.2.5.20 Land Use– Open Space, Green Infrastructure and Special Category Land

Table 120 - Land Use

Topic	Consenting Evaluation RAG	Impact of Optionality
Land Use – Open space, green infrastructure and special category land	Construction – Moderate	No change in the level of consenting risk although pipeline route 4 would appear to impact a greater area of Special Category Land.
	Operation – No impact	No change in level of consenting risk

The pipeline routes would potentially intersect with areas of Special Category Land including Common Land and Countryside and Rights of Way land. Pipeline route 4 would run through a significant area of CRoW land north of Southwick and runs around a further area at the Forest of Bere whilst pipeline route 3 could potentially affect Common Land at Wickham Common. This would need further consideration at Gate 2 and if possible, the optimisation of the pipeline routes to avoid these areas of land.

The compulsory acquisition of certain types of land (land held inalienably by the National Trust, land forming part of a common (including a town or village green), open space, or fuel or field garden allotment and statutory undertakers' land) is subject to additional restrictions, Crown Land and Utilities owned land has additional requirements that will need to be factored into the next stage of the consenting process and additional land referencing activities are required post Gate 2 to complete a comprehensive understanding of special land interests.

4.2.5.21 Green Belt

Table 121 - Green Belt

Topic	Consenting Evaluation RAG	Impact of Optionality
Green Belt	Construction – No impact	No change in level of consenting risk
	Operation – No impact	No change in level of consenting risk

There is no impact on the green belt and therefore no consenting risk.

4.2.5.22 Technology and Regulatory Approvals

Table 122 - Technology and Regulatory Approvals

Topic	Consenting Evaluation RAG	Impact of Optionality
Technology and Regulatory Approvals		N/A

The source water for this Option is Bedhampton and Havant Thicket Springs. There are no technological viability or market constraints that would pose a risk to this Option. However, at the time of drafting, the planning permission for the HTR had not been granted and this therefore poses a consenting risk in relation to this Option.

4.2.5.23 Constructability

Table 123 - Constructability

Topic	Consenting Evaluation RAG	Impact of Optionality
Constructability		N/A

As noted in sections above (traffic and transport) there are potential constructability risks associated with the construction of the pipeline in certain roads. This would require further engagement with the highways authority. There are also crossings of the South West mainline and River Itchen that would be required. Also, the pipeline route runs along the same route as a National Grid Overhead Extra High Voltage (EHV) line through Creech Woods. Further development of pipeline corridors would be required to overcome these constraints.

4.2.5.24 Resilience

Table 124 - Resilience

Topic	Consenting Evaluation RAG	Impact of Optionality
Resilience		N/A

This Option would improve resilience in the BAU Scenario of the Otterbourne Options as demonstrated through the resilience assessment. However, all Otterbourne dependent Options are not as resilient as the Desalination-based Options (A.1 / A.2). However, this Option is considered more resilient potentially in combination with B.4 compared to B.2 / B.5 as the complexity of the technology is greater for B.2 / B.5.

Further work also needs to be undertaken about the ability of D.2 to meet the long-term supply duty during drought conditions and to provide sufficient levels of long-term resilience.

4.2.5.25 Costs

Table 125 - Costs

Topic	Consenting Evaluation RAG	Impact of Optionality
Costs		

The CAPEX and the OPEX for Option D.2 are significantly lower than all the other Options.

This is a further important factor in the planning balance that needs to be weighed against the other consenting risks identified for this Option.

4.2.5.26 Conclusions for D.2

The Consenting Evaluation determined that Option D.2 would have the least consenting risk of all the Options. This Option would not impact the marine environment which is a key determinant in the level of consenting risk for Options A.1 and A.2. It is also assessed as having less consenting risk than Options B.2 and B.5 as it does not require the Otterbourne EBL, and this removes a further HRA risk from the configuration. The key consenting risks for Option D.2 are:

- Potential HRA challenges associated with the pipeline watercourse crossings. Whilst a significant effect on integrity has not been ruled out at this stage it is considered likely that it should be possible to mitigate this impact through a design and engineering solution.
- The pipeline routes would run partly through the South Downs National Park and there is a need for further engagement with the SDNPA and further route development to minimise impact
- There is potential for direct and indirect effects on ancient woodland that need to be further considered and avoided where possible
- Further analysis is needed about the ability to meet the long-term supply duty during drought conditions and to provide sufficient long-term resilience

There remain uncertainties with this Option about the location of break pressure tanks and pumping station locations that would require effective siting post Gate 2.

4.2.6 Consenting Evaluation Conclusions

Based on the reported Consenting Evaluation discussion above, and assuming that the HTR and pipeline is granted the appropriate planning permissions, the following are the main conclusions of the evaluation:

- Options A.1 and A.2 are not considered to be consentable in this location and at this time. They should therefore not be progressed as there are likely to be significant effects on the integrity of multiple Habitats Sites. In line with the legislative tests this would trigger the need to consider alternative solutions.
- Options B.2 and B.5 are assessed to have fewer consenting risks than Options A.1 and A.2, but risks remain in relation to Otterbourne EBL that need to be worked through. Whilst it should be possible through further assessment and mitigation to avoid adverse effects on integrity of the River Itchen.
- The Otterbourne EBL has not been subject to a site selection process and this exercise should be undertaken post Gate 2 in parallel to further work in relation to the risks to the River Itchen SAC
- Option B.4 which does not require the EBL has fewer consenting risks than B.2 / B.5 and has the potential to supplement the operation of D.2

- Option D.2 is assessed to perform best under the Consenting Evaluation and should be taken forwards beyond Gate 2. Further analysis is needed about the ability of D.2 to meet the long-term supply duty during drought conditions and to provide sufficient level of long-term resilience, including whether B.4 should also be taken forwards to provide additional resilience and support a long-term strategy.
- Further work is needed for D.2 / B.4 post Gate 2 as part of scheme development associated with pipeline routing to resolve:
    1. Designated watercourse crossings
    2. Route of the pipeline partially through the South Downs National Park which should be informed by site surveys and engagement with the SDNPA
    3. Avoiding and minimising potential loss and deterioration by direct and indirect impact on ancient woodland
    4. Avoiding and reducing impacts on heritage assets
- There are risks associated with D.2 relating to siting of pumping stations and break pressure tanks, but these are capable of being managed through progressing this design development and siting work, as well as engaging with statutory bodies on this process post Gate 2

4.2.6.1 Consenting Evaluation Ranking

Table 126 – Consenting Evaluation Ranking[7]

Consenting Evaluation Ranking	Option	Consenting Evaluation Justification
1	D.2	• Has least consenting risk. • Potential HRA challenges associated with the pipeline watercourse crossings. Whilst a significant effect on integrity has not been ruled out at this stage it is considered likely that it should be possible to mitigate this impact through a design and engineering solution. • The pipeline routes would run partly through the South Downs National Park and there is a need for further engagement with the SDNPA and further route development to minimise impact. • There is potential for direct and indirect effects on ancient woodland that need to be further considered and avoided where possible. • Uncertainty about the break pressure tank and pumping station locations that would require effective siting post Gate 2 • Technical evidence to be provided about the ability of this Option to provide against the S20 requirements under all drought conditions and whether it provides a sufficient level of long-term resilience
2	B.4	• This has less consenting risk than A.1 / A.2 and it does not have the same level of marine HRA impact which is a significant determinant of consentability for Option A.1 / A.2. It has less risk than Options B.2 / B.5 as it does not require Otterbourne EBL which removes a further HRA risk. • Potential HRA challenges associated with the pipeline watercourse crossings. Whilst a significant effect on integrity has not been ruled out at this stage it is considered likely that it should be possible to mitigate this impact through a design and engineering solution. • The pipeline routes would run partly through the South Downs National Park and there is a need for further engagement with the SDNPA and further route development to minimise impact. • There is potential for direct and indirect effects on ancient woodland that need to be further considered and avoided where possible. • Uncertainty about the break pressure tank and pumping station locations that would require effective siting post Gate 2. • Modelling indicates that there would be no risk or pathway to Langstone Harbour designations.
3	B.2	• This has less consenting risk than A.1 / A.2 and it does not have the same level of marine HRA impact which is a significant determinant of consentability for A.1 / A.2. • Potential HRA challenges associated with the pipeline watercourse crossings. Whilst a significant effect on integrity has not been ruled out at this stage it is considered likely that it should be possible to mitigate this impact through a design and engineering solution. • The pipeline routes would run partly through the South Downs National Park and there is a need for further engagement with the SDNPA and further route development to minimise impact. • There is potential for direct and indirect effects on ancient woodland that need to be further considered and avoided where possible. • The Otterbourne EBL has the potential to affect the integrity of the River Itchen SAC during construction and as a result of the emergency discharge. As the level of design development is at an early stage, on a precautionary basis an adverse effect on integrity cannot be ruled

[7] Please note, the colours used on this table are not a RAG rating but indicate the ranking order of each of the Options comparatively.

Consenting Evaluation Ranking	Option	Consenting Evaluation Justification
		out. However, it is likely that mitigation measures, supported by further design / modelling evidence will allow significant adverse effects to be avoided. • The Otterbourne EBL has not been subject to a site selection process and this exercise should be undertaken post Gate 2 in parallel to further work in relation to the risks to the River Itchen SAC. • There remain uncertainties with this Option about the location of break pressure tanks and pumping station locations that would require effective siting post Gate 2. • Modelling indicates that there would be no risk or pathway to Langstone Harbour designations.
3	B.5	• The infrastructure required for Option B.5 would be the same as for Option B.2 with the exception of the additional connecting pipeline between Peel Common and the WRP. • Whilst the construction of the additional length of pipeline would increase the number of potentially affected receptors for certain planning topics, the level of planning risk for each of the topics would be the same as reported for Option B.2. • There remain uncertainties with this Option about the location of break pressure tanks and pumping station locations that would require effective siting post Gate 2. • There are potential benefits on the water environment associated with B.5 as some flows would be diverted from the Peel Common WTW LSO which is a less well mixed environment than the Eastney LSO.
5	A.1	• A.1 is not considered to be consentable in this location (and the Stage 4 site selection process identified that there were no other more consentable sites) at this time. The main reason for this relates to the failure to meet the legislative tests within the Habitats Directive as there likely to be significant effects on the integrity of multiple Habitats Sites that cannot be mitigated. This would therefore trigger the process of considering whether there are other alternatives in line with the regulations. • The location of the terrestrial parcel for desalination within the New Forest National Park and the likely significant landscape and visual impacts creates a further consenting risk. • There is potential for direct and indirect effects on ancient woodland and the New Forest SSSI that need to be further considered and avoided. • Significant constructability and traffic and transport risks related to construction in the Hythe Bypass. • Potential for direct impacts on nationally designated heritage assets. • Production of solid waste as a result of the desalination process that would presently need to be landfilled and therefore make achieving waste hierarchy requirements and non-compliance with zero to waste landfill policies difficult.
5	A.2	• Refer to the summary for A.1

5 Best Value Appraisal (MCDA)

5.1 Approach for the Multi-Criteria-Decision Analysis (MCDA)

5.1.1 An overview of the Scope and Purpose of the MCDA

Economic appraisal helps decision-makers to consider how well an investment or intervention performs when considering its impacts on 'economic wellbeing' or 'public value' from the perspective of customers, the wider UK population (individuals, households, businesses) and the environment[8] (collectively referred to as 'economic benefits'), relative to the costs of delivering that intervention. These impacts can be measured in either monetary or non-monetary terms, in line with best practice guidance from our regulators and from the UK Government.

In the water sector, economic appraisal is a well-established method for weighing up the costs and benefits of intervention in public value terms; it is used in the development of water companies' WRMPs and regional resilience planning (e.g., by WRSE) against the objective of achieving "Best Value", as well as used extensively by the UK Government for public spending decisions against the objective of maximising "Value for Money (VfM)".

The WRPG[9] defines a Best Value Plan as one that:

- Considers factors alongside economic cost and seeks to achieve an outcome that increases the overall **benefit to customers, the wider environment and overall society**
- Is **efficient and affordable to deliver, legally compliant** and accounts for the range of legislation that applies to it
- And **where the outcome of increased benefits will be typically measured relative to the 'least cost' programme** that delivers the minimum requirements to meet supply duties

At this stage of the WfLH programme's development, there is a long-list of potential Options for addressing SW's supply duties in a 1-in-200-year drought event which involve the deployment of different technologies in different locations. The assessment of which Option might represent a Best Value approach requires a number of complex, and in some cases competing trade-offs to be considered. At this stage some of these factors are possible to quantify and even monetise from a public value perspective (such as the costs of the project). However, there are also many factors which are important for decision-making but cannot be monetised given the relatively early stage of the programme's development, and as such are assessed qualitatively.

Therefore, using the principles of economic appraisal and with reference to HM Treasury Green Book Guidance[10], SW have used a MCDA to inform a robust assessment of the relative performance of the Options against Best Value as part of the overall OAP. The aim of an MCDA is to provide an overall ranking of Options from highest to lowest performing (of those under consideration for Gate 2), considering a range

[8] Economic wellbeing concerns overall social welfare efficiency, not simply economic market efficiency. Hence public value (or as referred to by HM Treasury Green Book 'social value') includes all significant costs and benefits that affect the welfare and wellbeing of the population, not just market effects.
[9] Environment Agency, Natural England and Ofwat, Water Resources Planning Guideline, July 2021, Section 9.1
[10] The Green Book and accompanying guidance and documents - GOV.UK (www.gov.uk)

of both non-monetisable and monetisable factors which constitute Best Value. For those factors which have been possible to monetise, the analysis resembles a social Cost-Benefit Analysis[11] (CBA), wherein the impacts of the Option (its costs and benefits) are valued in social welfare terms. Impacts have been monetised where (i) there is established guidance from UK Government on the valuation of impacts; and (ii) quantitative data on the expected impacts of the Options was available. Further explanation of which impacts have either been monetised, quantified or qualitatively assessed is set out later in Sections 5.1.2.1 and 5.1.3.4. Note that qualitative assessments have been undertaken using SME expertise and incorporated into the framework to provide a combined Best Value Ranking for the wider considerations.

MCDA is a well-established methodology used by various organisations in the water sector to formulate Best Value Plans, such as the work underway by WRSE, as well as by the UK Government in the earlier stages of developing a project or programme.

As explained later in this section, SW developed its MCDA approach for the WfLH OAP over a six-month period in consultation with its regulators and WRSE and tested aspects of the approach and its results with a group of SW customers. The evidence and impact assessments which form the inputs to the MCDA have been drawn widely from work undertaken to support Gate 2, which as SW explains later, includes assessments of whole life costs, carbon, natural capital, biodiversity and wider environmental and social impacts identified. This section describes the methodology and results of SW's MCDA approach, which in summary comprised three key strands of activity:

- Consideration of best practice guidance on the economic appraisal of resilience plans and infrastructure investments against Best Value, and specifically the appraisal of different types of customer, environmental, social and cost impacts associated with major infrastructure projects. See Section 5.1.2 for a summary of the guidance which has informed SW's approach, which SW cross-refers to throughout the remainder of this section.
- Development of a comprehensive Best Value appraisal (MCDA) framework which, using 23 Best Value criteria, enables a consistent assessment of the relative performance of the Options in terms of their Net Social Impact, their cost to deliver (as a proxy for the economic cost to customers and overall affordability of the scheme), and the balance between these two factors. The details of SW's MCDA approach are explained in Section 5.1.3, whilst Sections 5.1.3.3 and 5.1.3.4 specifically set out the criteria used to assess the Options performance.
- Extensive scenario analysis to consider the sensitivity of the results to different views on the relative importance (weighting) of the different criteria within SW's Best Value appraisal (MCDA) framework, based on HM Treasury Green Book guidance on switching values, considering the different factors within Net Social Impact, cost, and again the balance between the two. See Section 5.1.3.6 for an explanation of the scenarios analysed, Section 5.2 for a summary of the results and their implications for the detailed results for each scenario.

5.1.2 Best practice guidance which has informed SW's approach

The development of MCDA framework has been informed by an extensive review of relevant best practice economic appraisal guidance via the lens of Best Value. This guidance broadly falls into four categories:

[11] Social Cost Benefit Analysis (CBA) assesses the impact of different Options on social welfare. All relevant costs and benefits are valued in monetary terms unless it is not proportionate or possible to do so. The appraisal of social value via CBA involves the calculation of Net Present Social Value (NPSV) and Benefits Cost Ratios (BCRs) the ratio of benefits to costs.

- **The HM Treasury Green Book**[12], which provides guidance from UK Government on the key principles for appraising and evaluating policies, programmes and projects in 'social value' or 'public value' terms (considering the costs, benefits and trade-offs between different Options for intervention), including publicly-funded major infrastructure investments – see Section 5.1.2.1
- **UK Government Departmental Appraisal Guidance,** which are produced by Government departments (e.g., Defra and Department for Business, Energy and Industrial Strategy (BEIS)) and arms-length agencies and bodies (e.g., the EA) as supplementary, sector-specific guidance to the Green Book and providing more detailed guidance on the appraisal of different types of infrastructure investments and their specific types of impacts
- **The WRPG**[13], which is produced by the EA, NE and Ofwat as guidance for water companies in England and Wales to use in the development of a WRMP, with the aim of achieving both a secure supply of water for customers and a protected and enhanced environment for the public. The WRPG outlines the principles of 'Best Value', alongside factors that should be considered in compiling a Best Value Plan – see Section 5.1.2.2.
- **Ofwat Public Value principles**[14]**,** which provide Ofwat's proposed guidelines for water companies when considering public value in their decision-making and support for sector-wide efforts to deliver further social and environmental value in future plans – see Section 5.1.2.3.

Alongside drawing on this guidance, SW also considered evidence from:

- **WRSE's emerging approach to the development of its Best Value resilience plan** (which is being developed in line with the WRPG); ensuring alignment wherever appropriate in terms of the objectives, criteria and metrics used to represent Best Value and the relative importance and trade-offs between them. This was achieved through both detailed consideration of their strategy and technical documents[15] and direct engagement with WRSE.
- **SW's collated customer preferences evidence** [16], which included willingness to pay research from PR19, WRSEs single view of customer preferences and research on impacts of bill changes on customers. This work was done to better understand the preferences of customers and allowed SW to consider evidence from those who will be affected most by the SROs.

The remainder of this section explains the key elements of the best practice appraisal guidance which has informed SW's approach. Later in Section 5.1.3.4 SW also shows how best practice appraisal guidance maps to the individual assessment criteria used in the MCDA framework to assess the relative performance of Options against Best Value.

5.1.2.1 HM Treasury Green Book and Departmental Appraisal Guidance

In order to develop the framework for the MCDA SW used the principles outlined in HMT Green Book and relevant supplementary technical guidance for conducting economic appraisal. This included, for example, guidance relating to discounting of costs and benefits over a common appraisal period for the assessment of

[12] The Green Book and accompanying guidance and documents - GOV.UK (www.gov.uk)
[13] Water resources planning guideline - GOV.UK (www.gov.uk)
[14] Ofwat-Response-to-Public-value-discussion-document.pdf
[15] Library | WRSE - Water Resource South East
[16] This includes SW's Gate 1 customer feedback on supply Option preferences, SW's PR19 Household Willingness to Pay report and Customer Preferences to Inform Long-term Water Resource Planning: Part B Deliberative Research (WRSE)

monetisable impacts, and specific guidance on the development and application of MCDA as a technique for appraising Options against both monetisable and non-monetisable criteria.

When conducting the assessment of impacts on customers, the environment and wider society (either as a monetisable or qualitative assessment), SW referred to the relevant economic appraisal guidance outlined by various Government departments, including:

- BEIS guidance for the appraisal and valuation of carbon impacts[17]
- Defra's Enhancing a Natural Capital Approach (ENCA) guidance for the appraisal of biodiversity and natural capital impacts
- Defra and EA guidance for the appraisal of other environmental impacts, such as noise, air quality flooding and the value of water resources
- Various other departmental guidance, such as that provided by Cabinet Office on resilience and DfT on environmental landscape and habitat impacts, where they were transferable to the assessment of the impacts of the WfLH scheme Options

In Section 5.1.3.4 SW shows how this specific departmental appraisal guidance relates to the individual assessment criteria used in the MCDA framework.

5.1.2.2 Water Resources Planning Guideline (WRPG)

SW drew upon the main WRPG from the EA, NE and Ofwat for its definition of the factors which constitute Best Value when developing the MCDA. This included the Guideline's supplementary guidance in relation to specific Best Value factors, comprising:

- **'Best Value planning' supplementary guidance document**, which informed how SW structured its overall approach and specifically how the factors which constitute Best Value (considering impacts for customers, the environment and overall society alongside cost/ affordability) should be weighted up against one another. This led to the definition of five alternative approaches or 'lenses' for defining Best Value, under which the relative performance of the Options is ranked (see Section 5.1.3.6 for details).
- **'Environment and Society in decision making' supplementary guidance document**, which informed SW's consideration of impacts on biodiversity, natural capital ecosystem services and environmental gain, and ensured SW took a proportionate approach to the analysis of these effects at this stage of the WfLH programme's development (Section 5.1.3.3 and 5.1.3.4 describe the specific type of impacts SW considered through the MCDA in line with this guidance).

5.1.2.3 Ofwat Public Value Principles

The MCDA has been developed to understand the relative performance of the Options in public value terms, and therefore aligns with the core premise of Ofwat's proposed seven principles (published in July 2021), which aim to increase public value in the water sector by embedding the consideration of impacts on the environment and wider society alongside impacts on customers. Hence these seven principles are reflected in the five 'cluster criteria' for decision-making that SW developed for the MCDA (described in Section

[17] BEIS updated its estimates of carbon value (traded and un-traded) on 2 September 2021 however given all analysis for this submission was finalised by the 31 August 2021 these latest values have not been incorporated.

5.1.3.3), as well as in SW's approach to ranking the overall performance of Options against different 'lenses' of Best Value. These lenses (detailed in Section 5.1.3.5) determine how Options are ranked to identify relative performance against Best Value; considering the trade-off between the financial costs of delivery (which ultimately pose an economic cost to customers) and Net Social Impacts (which can provide an economic cost or benefit to customers, wider society and the environment), and how SW balances the two.

5.1.3 The MCDA framework employed for the economic appraisal of Options against Best Value

5.1.3.1 Overview of SW's approach to designing and implementing the MCDA

The MCDA was developed as an appraisal tool for SW to help identify which of the Options under consideration might represent a Best Value Option for addressing SW's supply duties in a 1-in-200-year drought event.

It is important to note that any Option which is eventually taken forward is part of a wider SW programme. The focus of the MCDA is on which Option (of those under consideration at this stage) represents the Best Value Option for providing 61-75 Ml/d of capacity, all else being equal. Therefore, the MCDA implicitly assumes that the other schemes / interventions within SW's programme go ahead and contribute to overall supply requirements as envisaged in WRMP19.

As illustrated in Figure 27 below, the ultimate outcome of the MCDA is a ranking of the Options based on an overall assessment of their relative performance, which is achieved by combining the results of different impact assessments against individual criteria which constitute Best Value. Some of these assessments are monetised or quantified, but some are assessed used a robust qualitative approach based on SMEs due to lack of monetisable information at this stage.

As explained later in this section, the Options have been assessed against 23 criteria (see Sections 5.1.3.4 and 5.1.3.5) and the results of these assessments combined under five different Best Value ranking approaches. Each ranking approach involves combining an increasing number of criteria; first considering cost / affordability and Net Social Impact in isolation and then in combination (see Section 5.1.3.6 for more details). The impact assessment for each criterion has been based on either a monetised, quantitative or qualitative analysis of the consequences of each Option and how these consequences compare to one another, in line with the relevant best practice guidance on the appraisal of specific impacts (summarised previously in Section 5.1.2 and detailed against each criterion in Section 5.1.3.4). This analysis was undertaken by SW and its advisors drawing upon new technical evidence developed over the last year as part of the Gate 2 process, as well as evidence from Gate 1 (see Section 5.1.3.5 for more details on the range of technical work that informed the MCDA).

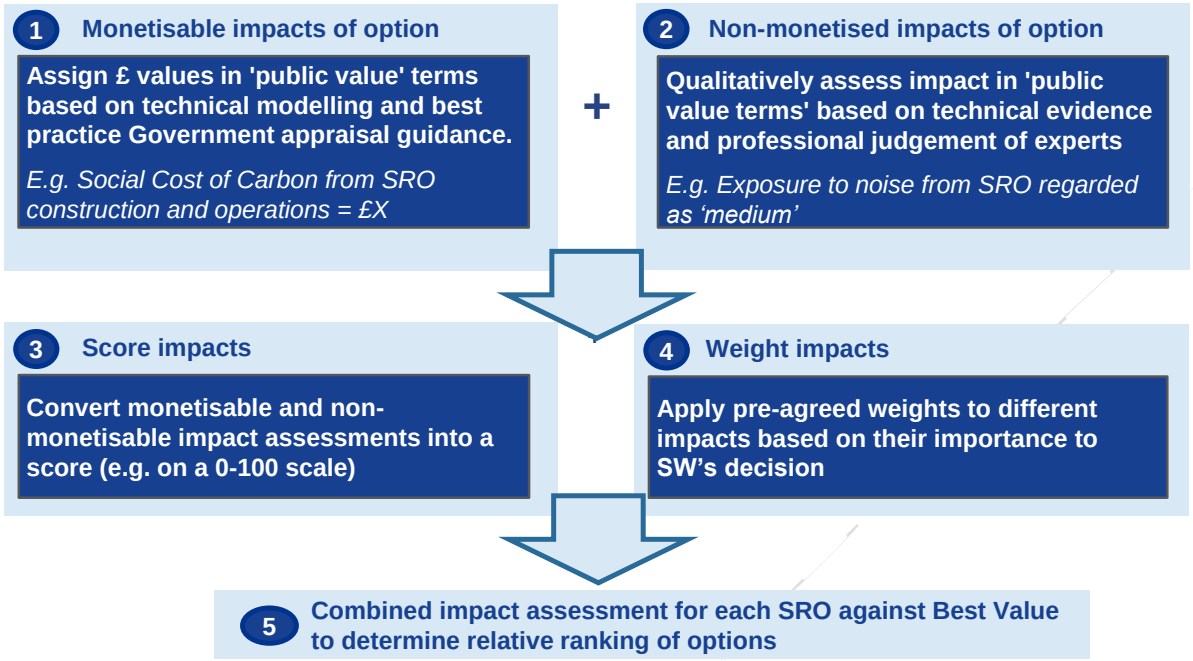

Figure 27 - Process of combining impacts within an MCDA

SW developed the MCDA framework through eight key steps, in line with best practice MCDA guidance from HM Treasury's Green Book, which are summarised in Table 127[18]. The remainder of this section describes Steps 1-5 in more detail, whilst Section 5.2, which summarises the results of the MCDA, describes the outcome of Steps 6-8.

Table 127 – MCDA framework

MCDA Key steps	Key activities
Step 1: Establishing the decision context	• Established aims of the MCDA, identified key decision-makers and stakeholders to the decision (including customers and regulators) • Considered the decision context and objective of the appraisal • Designed the framework for conducting the MCDA for different infrastructure scheme Options under different operating scenarios
Step 2: Identifying MCDA Best Value themes / clusters	• Used best practice guidance and considered available evidence to determine key themes for appraisal or 'cluster criteria' against which to appraise the Options' performance
Step 3: Defining Best Value sub-criteria	• Identified measurable sub-criteria under each theme for assessing the impacts, or consequences, of each Option, with reference to best practice appraisal approaches and information available at Gate 2

[18] HM Treasury, Green Book Supplementary Guidance: Multi-criteria decision analysis – a manual, 2013

	• Engaged regulators and WRSE to iterate and finalise the criteria
Step 4: Assessment of impacts against each criterion and scoring performance levels	• Conducted Gate 2 technical analysis / modelling and evaluation workshops to assess the impacts / consequences of each Option and identify relative performance at the sub-criteria level • Scored the raw results of the impact assessments to derive a common assessment of performance across the sub-criteria • Checked the consistency of the scores for each criterion
Step 5: Defining how to combine the sub-criteria into an overall assessment of Best Value	• Identified a range of alternative approaches for combining the assessment of the Options' performance at the sub-criteria level into an overall assessment and ranking against Best Value, considering (i) different definitions of Best Value which involve combining an increasing number of different sub-criteria; and (ii) weighting the relative importance of the different sub-criteria under each of these definitions/rankings of Best Value • Engaged regulators, WRSE and SW customers to develop and finalise the weighting scenarios for analysis
Step 6: Combining the impact scores and weights to derive an overall value assessment of performance	• Calculated overall weighted scores at cluster level using sub-criteria scores and pre-agreed weighting scenarios • Combined scores under a number of Best Value Rankings using unweighted and weighted results
Step 7: Quality assurance and examination of results	• Conducted quality assurance on both the impact assessments forming inputs to the MCDA and the MCDA calculations • Presented draft and final results on relative performance of the Options to SW decision-makers and regulators
Step 8: Sensitivity analysis	• Conducted switching value analysis to understand what alternative assumptions would need to be made in relation to Option costs and criteria weightings in order to alter the ranking of Options

5.1.3.2 Step 1 – Establishing the decision context of the MCDA

The aims of the MCDA were established within the context of the Strategic Objectives for the WfLH programme and the overall OAP to support decision-making at Gate 2 and through detailed consideration of the policy and appraisal context and engagement with SW's regulators. A summary of the main guidance and policy documents SW considered in establishing the decision-context is illustrated in Figure 28. This led to the specific focus on identifying the Best Value Option for addressing SW's supply duties in a 1-in-200-year drought event from the perspective of SW customers, wider society and the environment.

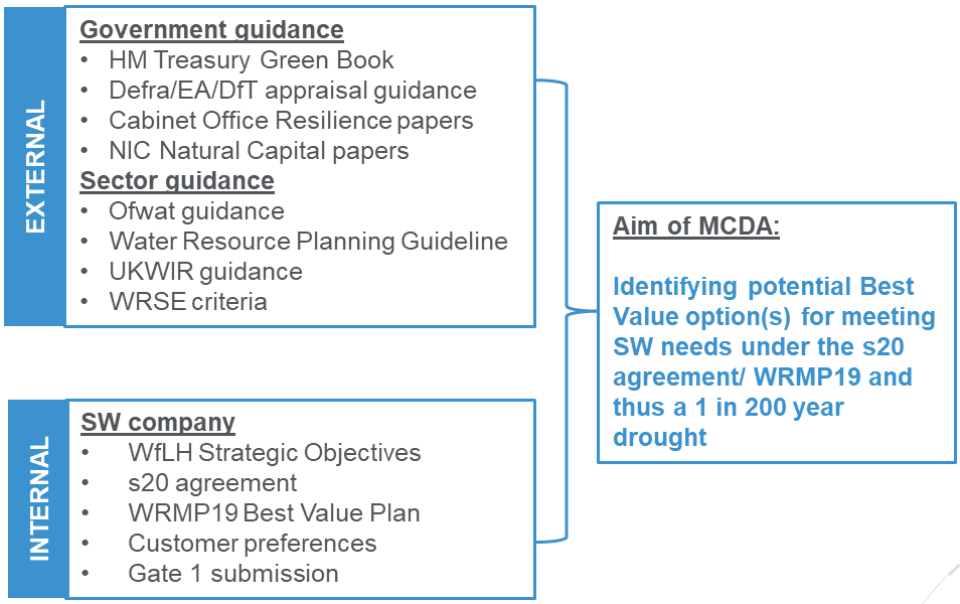

Figure 28 - A summary of the key guidance and policy documents which informed the aims of the MCDA

5.1.3.2.1 The Assumed Options that have been Assessed through the MCDA

The aim of the MCDA is to provide an assessment of the potential relative performance of the Options under consideration at Gate 2 against Best Value, all else being equal (rather than an assessment of each Options' Best Value performance in absolute terms, which will be the focus of future scheme development and appraisal work beyond Gate 2). For the purposes of the MCDA, the following consentable configurations (arrived at through the Stage 4 Site Selection process) were taken to be representative of each Option and were used to assess their relative performance against Best Value. The assumed configuration for each Option is detailed in Table 128. and a full technical description of each scheme is set out in Gate 2 Annex 1 Desalination, Annex 2 Water Recycling, Annex 3 Havant Thicket Alternatives within Section 2.2 of each. These were assumed to take a prudent approach and use a consentable configuration which has the 'reasonable worst case' environmental impacts as being the representative Option for assessing against Best Value – although not the Preferred Option to take forward.

Table 128 - Option configurations assumed for the purposes of the MCDA

Option Preferences	A.1 and A.2 (75 / 61 Ml/d)	A.3	B.2	B.4	B.5	D.2
Marine intake and outfall	Calshot intake / outfall Deep Dock - intake; Calshot - outfall	D55 not a viable alternative and no other alternative identified following the site evaluation / selection process	N/A		N/A	N/A
Parcel	Ashlett's Creek		WRP72	WRP72	WRP72	HTPS 5

Pipeline route	Combination of pipeline route 1 or 2.		**Pipeline to Otterbourne WTW –** Route 1 to Southern section of Forest of Bere, further feasibility work needed on routes 1 and 2 through this section before all pipelines join together to the south of Bishops Waltham. Therefore, pipeline routes 1 and 2 recommended to go forward. **Budds Farm to the WRP Parcel** – only one Option.	**Pipeline to Otterbourne WTW –** Route 1 to Southern section of Forest of Bere, further feasibility work needed on routes 1 and 2 through this section before all pipelines join together to the south of Bishops Waltham. Therefore, pipeline routes 1 and 2 recommended to go forward. **Budds Farm to Havant Thicket pipeline** - no consenting differentiators – engineering decision. **Budds Farm to the WRP Parcel** – only one Option.	**Pipeline to Otterbourne WTW –** Route 1 to Southern section of Forest of Bere, further feasibility work needed on routes 1 and 2 through this section before all pipelines join together to the south of Bishops Waltham. Therefore, pipeline routes 1 and 2 recommended to go forward. **Pipeline from Peel Common to Budd's Farm** – no Optionality. **Budds Farm to the WRP Parcel** – only one Option.	Combination of pipelines 3 and 4. Need further feasibility work to determine optimum route so both should go forward.
Notes	Engineering preference is Route 4 for the pipeline.		Suggest holding parcel WRP 71 – could be used if issues arise on WRP72.	Suggest holding parcel WRP 71 – could be used if issues arise on WRP72.	Suggest holding parcel WRP 71 – could be used if issues arise on WRP72.	

5.1.3.2.2 The Assessment of Options under Two Assumed Operating Scenarios

The nature of the infrastructure Options in question is that they are resilience assets; this means that they are not intended to be used regularly for standard water supply, but rather in the event of a 1-in-200-year drought. Therefore, the relative performance of the Options against Best Value was assessed under two

assumed operating regimes (which are described in more detail in Gate 2 Annex 1 Desalination, Annex 2 Water Recycling, Annex 3 Havant Thicket Alternatives within Section 2.10 Cost Modelling[19]):

- **BAU non-drought scenario** – based on a 'sweetening flow' assumption for the Options where they are running at a nominal level of capacity (15 Ml/d for desal Options compared to their 61-75 Ml/d full capacity, and 5 Ml/d for raw water transfer Options B.4/D.2)
- **Severe drought scenario (1-in-200-year event) –** requires the Option to operate at full capacity, and for non-drought years assuming the same 'sweetening flow' assumption as the BAU scenario

5.1.3.3 Step 2 – Identifying Best Value themes/clusters

Through consideration of the decision-making context in Step 1, which included SW's Strategic Objectives for the WfLH Programme, SW evidence on customer preferences and best practice appraisal guidance (as detailed previously in Section 5.1.2), SW identified five high level themes or (as typically defined within an MCDA) "cluster criteria" for framing the assessment of the Options against Best Value, which are illustrated in Figure 29.

The purpose of having cluster criteria was to frame the identification of more detailed sub-criteria which relate to separate and distinguishable components of the overall aims of the MCDA, which in this case related to the identification of a Best Value Option (of those Options under consideration at Gate 2). Grouping the MCDA criteria in this way helped the process of checking that the set of chosen sub-criteria were appropriate for informing decision-making given the aims of the appraisal, improved the ease of which SW could apply weights later in the process and facilitated the emergence of higher level views of the most pertinent issues, and in particular key trade-offs, for decision-making[20].

The five cluster criteria were developed by considering the internal and external influences on the decision required by this process – comprising the perspectives of SW and its customers, its regulators and UK Government. The various policy, sector, and company guidance documents established the key areas of influence when deciding how to assess Options under Best Value. The final themes used were a summary of the different categories of impacts which a Best Value Plan should consider, alongside the consideration of SW's S20 obligation (highlighting the importance of deliverability in particular) and were tested extensively with SW decision makers and its regulators in the early development of the MCDA approach. Section 5.1.1 outlines in more detail the requirements of the WRPG.

[19] These scenarios are categorised as simply either the minimum operating scenario (the lowest flow the Option can operate at) or the maximum operating scenario (the flow the Option can deliver in a drought event - DO)

[20] HM Treasury, Green Book Supplementary Guidance: Multi-criteria decision analysis – a manual, 2013

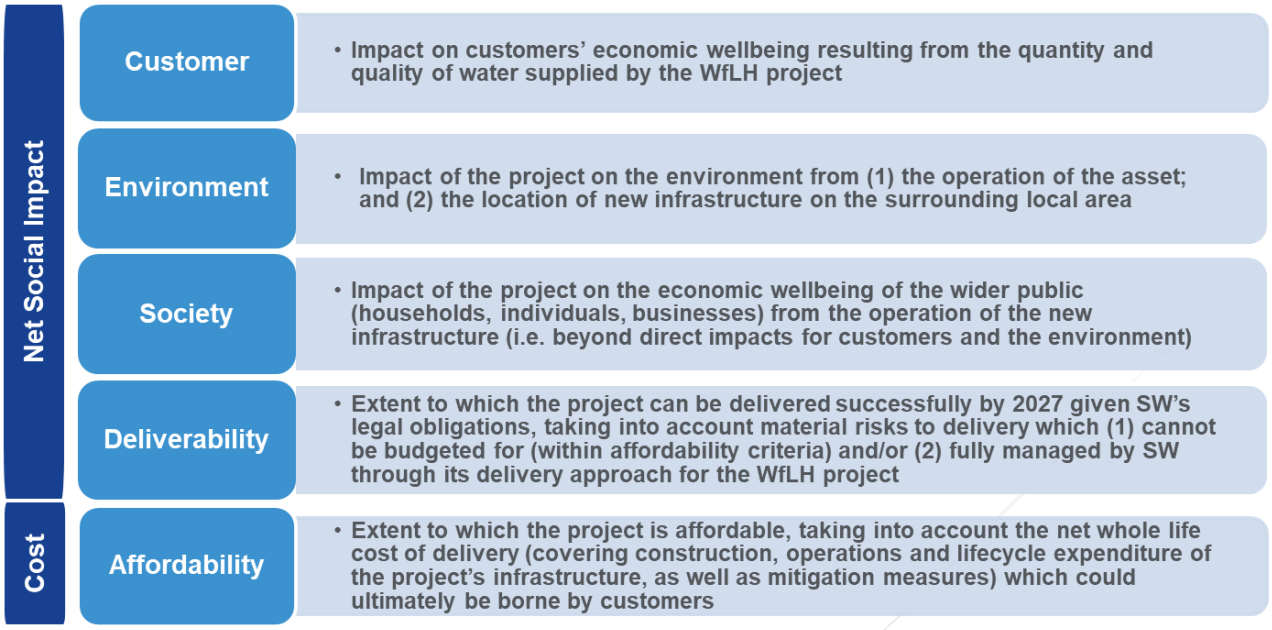

Figure 29 - MCDA Cluster criteria description

It is important to note that 'Deliverability' is largely covered through other parts of the OAP and Gate 2 work. This includes the Consenting Evaluation pillar of the OAP, which considers material planning-related risks in detail (see Section 5.1.3.5.4), as well as the development of an optimised infrastructure delivery schedule for each Option (see Gate 2 Annex 1 Desalination, Annex 2 Water Recycling, Annex 3 Havant Thicket Alternatives within Section 2.9 for project schedules). The deliverability theme within the MCDA framework is therefore relatively narrowly defined and is intended to cover only deliverability-related factors which are not explicitly covered in this wider work.

5.1.3.4 Step 3 – Defining Best Value sub-criteria

Within each of the five cluster criteria, SW developed detailed sub-criteria against which the impacts, or consequences, of the Options could be identified and compared to in turn enable an assessment of the relative performance of the Options. When developing the sub-criteria, SW sought to ensure the criteria struck a suitable balance between being:

- Comprehensive enough to capture all factors which distinguish the Options' performance against Best Value; and
- A manageable number to support transparent decision-making

The sub-criteria were developed through a two-stage approach, which comprised:

- Considering best practice guidance on the economic appraisal of Best Value (described previously in Section 4.1.2) to identify the full range of potential impacts of a major infrastructure project such as WfLH under the five themes established in Step 2. This established a long list of possible sub-criteria for the MCDA framework.
- Considering which of these impacts were most relevant to the WfLH programme and, importantly in the context of an OAP, might be expected to differ between the Options and hence help to distinguish the relative performance of the Options against Best Value at Gate 2. This established a final short-list of relevant sub-criteria to be included in the MCDA framework.

In refining the sub-criteria from a long list21 to a final short-list for assessment, SW worked with SW's technical SMEs and external advisors to consider the relevance of each potential criterion to the WfLH programme and the specific Options under consideration. Through this exercise SW also identified criteria at the long-list stage which were ultimately sifted out at the short-listing phase, as they were not deemed to materially differ between the Options, or in some cases or would not be expected to result in a net additional change in economic wellbeing or 'public value'. This includes, for example, factors such as jobs and regeneration impacts and construction-related traffic impacts22. This is not to say that in absolute terms the Options are not expected to have such impacts, nor that these impacts are unimportant from a Best Value perspective, but that the nature and magnitude of these impacts are not expected to differ between the Options, which is the primary focus for the MCDA pillar of the OAP at Gate 2.

As part of this iterative exercise, in some areas (such as natural capital) SW identified certain impacts which go beyond the minimum requirements of the WRPG where they were deemed to be potentially significant to the WfLH programme and hence particularly relevant to decision-making at Gate 2.

SW also engaged with its regulators to explore the range of impacts deemed most relevant to decision-making and provide an opportunity to expand and refine the various criteria identified. SW expects an assessment of the Best Value performance of an EPO (or Options) in absolute terms to be a focus for future scheme development and appraisal work beyond Gate 2.

When defining the details of each sub-criteria, SW used the following design principles, with reference to HMT Green Book best practice guidance on MCDA:

1. **Outcome-focused** – Ensuring the criteria captured the end-impact resulting from the Option, rather than the inputs or outputs which are a means to getting to that outcome e.g. 'Impact on carbon sequestration from changes in natural capital' (referred to by Defra as the climate regulation services provided by natural capital) rather than 'Changes in hectares of woodland', though clearly there is a relationship between the two (with changes in certain land uses affecting the level of climate regulation services provided)
2. **Mutual independence** – Ensuring that the consequences of the Option against one criterion could be assessed without knowing the Option's consequences for any other criteria within the MCDA framework
3. **Operationality** – Ensuring the criteria are specific and measurable (in either quantitative or qualitative terms), such that each Option's performance could be transparently and consistently judged against them e.g., 'Impact on carbon sequestration from changes in the quantum and type of land (which provides climate regulation services) over time resulting from the Option's construction', rather than 'Impact on the environment')
4. **Avoidance of double counting** – Ensuring the same type of impact is not considered more than once within the MCDA framework, in order to avoid implicitly biasing / weighting towards certain criteria over others (e.g., customers' preferences for protecting the environment typically overlap with the range of individual environmental impacts set out by best practice appraisal guidance)

[21] Multiple impacts -some with more, and some with less- relevance to the solutions in question based on the available information and guidance

[22] For example, job impacts associated with the construction and operation of an infrastructure scheme are not typically valued in an HMT Green Book economic appraisal due to additionality questions (i.e. the jobs are likely to be discipled from other UK locations and/or other sectors of the economy).

This led to the identification of a total 23 sub-criteria for SW's MCDA framework to support a combined assessment of Best Value (as defined by the WRPG and explained previously in Section 5.1.1). These sub-criteria are illustrated in Table 129 to

Table 132 - **Description of criteria under the cluster themes of Deliverability for MCDA**. Table 130 contains a description of each of the criteria, how they relate to the best practice appraisal guidance previously listed in Section 5.1.2, and indicate whether the assessment of the Options' impact against the criterion was undertaken using qualitative, quantitative or monetised analysis. As outlined in the aforementioned tables, across SW's MCDA framework some 16 criteria involved a qualitative assessment, 1 involved a quantitative assessment and 6 involved a monetised assessment. The scope of the impact assessments undertaken for each of the 23 criteria (Step 4 of the MCDA approach) are further discussed in Section 5.1.3.5.

It is important to note that customer preferences relate to many of the impacts within SW's MCDA framework that sit outside of the Customer theme – spanning the Environment, Society and Affordability clusters. The specific criteria under the Customer cluster are focused on the direct effects on customers in terms of the quality and quantity of water they receive with the introduction of the Option. As such, the consideration of customer preferences is reflected across multiple sub-criteria in the MCDA framework.

In addition, it is worth noting that around two-thirds of SW's sub-criteria (15 out of 23) sit within the Environment theme. This is due to:

- The main benefit of the Options being to provide system resilience within the context of providing an environmental asset (water)
- Apart from differences in cost, quality of water for consumption by customers and the level of system resilience, how the performance of Options differ from a Best Value perspective concerns the anticipated wider effects on environment and society
- Evidence generally shows that environment is important:
  - For example, SW customer research (see section 5.1.3.6) shows that customers are most concerned with environmental impacts
  - Best practice guidance such as the HM Treasury Green Book outlines the importance of valuing water resources, noting that the quality of water in the environment has an effect on biodiversity, amenity and recreation
  - Finally, WRSE and the WRPGs place significant focus on the environment, as well as the regulators (Defra remit, EA remit, Ofwat public value principles)

Table 129 below details the different sub-criteria identified within the MCDA according to their cluster. SW also outlines how the values are defined within the framework, a description of the sub-criterion and its precedent in guidance. It is important to note that where possible, SW monetised the criteria in question, however this is not always possible due to constraints on evidence.

Table 129 - Description of sub-criteria under the cluster theme of Customer in the MCDA framework

Theme	Criteria No.	Criterion	Value	Description	Precedent in appraisal guidance
Customer	**C.01**	**Tap water quality**	Qualitative	The taste, smell and appearance of tap water provided by the Option relative to current quality levels received by customers, taking into account the treatment process of each Option and the expected effects this will have on water quality.	• Water Resource Planning Guideline • WRSE Value Criteria • Deriving a Best Value Water

	C.02	**Resilience of supply**	Qualitative	Effectiveness of the Option in improving system resilience during short-term capacity issues, with system resilience defined as the ability of the system to cope with, and recover from, disruption, and anticipate trends and variability in order to maintain services for people and protect the natural environment.	Resources Management Plan (UKWIR) guidance • SW customer preferences research

Table 130 - Description of sub-criteria under the cluster themes of Environment in the MCDA framework

Theme	Criteria No.	Criterion	Value	Description	Precedent
Environment	**E.01**	**BNG**	Quantitative	The potential for net gain in biodiversity alongside the Option's construction, given the Environment Bill requirement to achieve a 10% BNG. Raw scores reflect 'habitat' units from Defra's biodiversity metric tool 3.0.	• Water Resource Planning Guideline • WRSE Value Criteria • Defra ENCA • Deriving a Best Value Water Resources Management Plan (UKWIR) guidance
	E.02	**Habitats and Biodiversity (HRA)**	Qualitative	Effects on marine and terrestrial habitats according to the outputs of Habitat Regulation Assessment.	• Water Resource Planning Guideline • Defra ENCA
	E.03	**Climate regulation (NC)**	Monetised	Overall change in natural carbon sequestration (capture and storage of carbon) due to changes in habitat ha, types and condition from the Option's construction, followed by 10% BNG (onsite and offsite impacts).	• Water Resource Planning Guideline • Defra ENCA
	E.04	**Natural Hazard Regulation (NC)**	Monetised	Overall change in natural flood risk management due to changes in habitat ha, types and condition from the Option's construction, followed by 10% BNG (onsite and offsite impacts).	Water Resource Planning Guideline Defra ENCA
	E.05	**Air quality - natural pollutant removal (NC)**	Qualitative	Permanent change in local air quality due to changes in habitat types from the Option's construction.	Water Resource Planning Guideline Defra ENCA
	E.06	**Water purification (NC)**	Qualitative	Permanent change in natural water purification services provided by the natural habitat, due to changes in habitat ha, types and condition from the Option's construction.	Water Resource Planning Guideline Defra ENCA

Theme	Criteria No.	Criterion	Value	Description	Precedent
	E.07	**Food production / agriculture services (NC)**	Monetised	Overall change in the area of land used for food production/agriculture services from the Option's construction, assuming a 10% BNG (onsite and offsite impacts).	Water Resource Planning Guideline Defra ENCA
Environment	**E.08**	**Embodied and operational carbon**	Monetised	Overall change in carbon emissions from both the embodied carbon associated with construction of the Option infrastructure and operational carbon emissions associated the OPTION's operating regime.	• HM Treasury Green Book • WRSE Value Criteria • Water Resource Planning Guideline • Deriving a Best Value Water Resources Management Plan (UKWIR) guidance • Defra ENCA • BEIS carbon valuation
	E.09	**Exposure to noise**	Qualitative	Permanent change in local exposure to noise levels from the operation of the Option infrastructure (after all design work to mitigate effects of the scheme).	• HM Treasury Green Book • Defra noise guidance
	E.10	**Air quality from infrastructure operations**	Qualitative	Permanent changes in local air quality due (including odour) to operation of Option infrastructure (after all design work to mitigate effects of the scheme).	• HMT Green Book • Defra ENCA • Defra air quality guidance
	E.11	**Environmental water quality**	Qualitative	Permanent change in the quality of the water environment due the operation of the Option, affecting recreation, amenity and non-use benefits of water resources.	• HM Treasury Green Book • Water Resource Planning Guideline • WRSE Value Criteria
	E.12	**Water abstraction**	Qualitative	Removal of water resources (ground or surface water) at identified sites as a result of the Option, considering both the direct abstraction required by the Option's operation and the effects on baseline abstraction required by the existing network.	• WRSE Value Criteria • Water Resource Planning Guideline • Defra ENCA

Theme	Criteria No.	Criterion	Value	Description	Precedent
Environment	E.13	**Landscape and townscape impacts**	Qualitative	Permanent change in the character and visual amenity of local landscapes (including urban) from operation of the Option (after all design work to mitigate / improve the effects of the scheme).	• HM Treasury Green Book • Defra ENCA • Defra Environment Values Look-up (EVL) tool • DfT appraisal guidance
	E.14	**Flood risk**	Qualitative	Permanent change in local flood risk due to construction of Option impacting floodplain or other areas, which could pose social costs via harm to people, damage to property and / or harm to the environment.	• HM Treasury Green Book • UK Water Industry Research (UKWIR) guidance • EA FCERM guidance
	E.15	**Coastal process impacts**	Qualitative	Permanent change in coastal processes and longer-term coastal change, which could pose social costs via harm to people, damage to property and/or harm to the environment.	

Table 131 - Description of criteria under the cluster themes of Society for MCDA

Theme	Criteria No.	Criterion	Value	Description	Precedent
Society	S.01	**Recreation and amenity (NC)**	Monetised	Overall change in recreation and amenity services due to changes in land area from the Option's construction.	• HM Treasury Green Book • Water Resource Planning Guideline • Defra ENCA
	S.02	**Historic environment (terrestrial)**	Qualitative	Permanent change in the character of local terrestrial heritage assets (buildings, public spaces, sites) from operation of the Option (after all design work to improve / mitigate the effects of the scheme).	Planning guidelines DfT appraisal guidance
	S.03	**Historic environment (marine)**	Qualitative	Permanent change in the character of local marine heritage assets (scheduled monuments, wrecks, areas of high archaeological potential) from operation of the Option (after all design work to improve / mitigate the effects of the scheme).	Planning guidelines DfT appraisal guidance

Table 132 - Description of criteria under the cluster themes of Deliverability for MCDA

Theme	Criteria no.	Criterion	Value	Description	Precedent
Deliver-ability	**D.01**	**Supply chain capacity**	Qualitative	The extent to which the capacity and skills available in the market to construct the Option infrastructure (considering the technology solution and scale of the project) poses a risk to delivery by in 2027 in line with legal obligations.	• HM Treasury Green Book • S20 Agreement

Table 133 - Description of criteria under the cluster themes of Affordability for MCDA

Theme	Criteria No.	Criterion	Value	Description	Precedent
Afford-ability	**A.01**	**Whole Life Cost of Option**	Monetised	Financial cost of the Option infrastructure incremental of a 'do-nothing' baseline (CAPEX, OPEX and lifecycle costs) over the life of the project (assumed to be 100 years), which ultimately poses an affordability issue / cost to customers.	• HM Treasury Green Book • Water Resource Planning Guideline • WRSE Value Criteria
	A.03	**Cost of interim measures to meet required supply in 2027**	Qualitative	Qualitative assessment as a proxy of financial cost associated with Option if project does not deliver in 2027 and requires interim measures to deliver capacity in line with legal obligations, which poses an affordability issue / cost to customers. This criterion uses time between s20 deadline and expected delivery of Option to assess impacts.	

5.1.3.5 Step 4 – Assessment of Impacts against Each Criterion and Scoring Performance Levels

The assessment of the impact / consequences of each Option against each of the MCDA sub-criteria was based on the technical information available at Gate 2 and involved either monetised, quantitative or qualitative analysis (as detailed previously in Section 5.1.3.4 in Table 29 to Table 133). The decision on how to analyse the impact of the Option for each sub-criterion was based on:

- The availability of an established methodology within the best practice appraisal guidance previously described in Section 5.1.2 for quantifying and valuing / monetising impacts
- The extent of data and information available on the Options' specific impacts at this stage of the programme's development

There are some criteria where it is possible to value in monetary terms their impact, for example whole life costs. For other criteria there are some examples where SW is technically able to value impacts but due to data limitations are unable to do so e.g., noise and air quality. In these cases, SW uses a qualitative approach to assess the anticipated impacts, either via advice from technical advisers e.g., natural capital assessment / Consenting Evaluation, or from an SW qualitative assessment.

Figure 30 illustrates the main workstreams from SW's Gate 2 work programme which provided the impact assessments for each of the MCDA sub-criteria, which SW then summarises in the remainder of this section. Further information on the scope of the impact assessment for each sub-criteria is also provided in Figure 30.

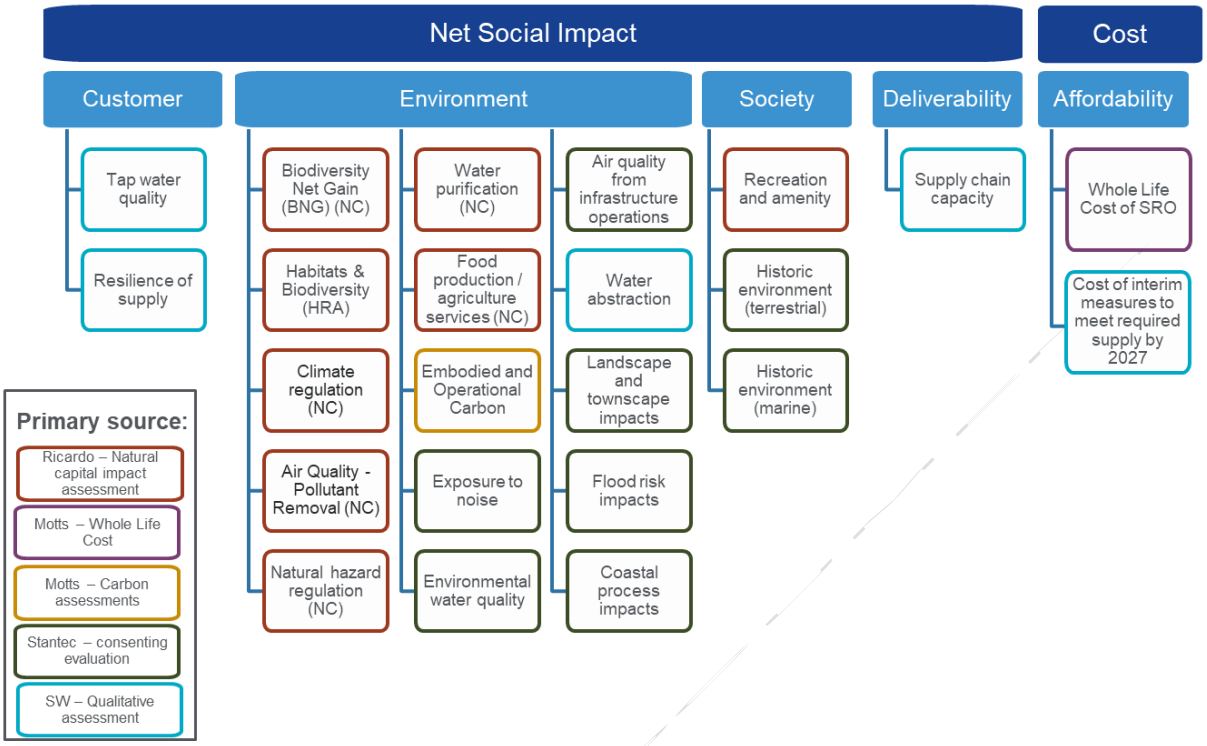

Figure 30 - Summary of the Gate 2 workstreams which provided the impact assessments for the MCDA sub-criteria

As illustrated in Figure 30, there were five main workstreams which provided the assessments of impacts:

- Monetised assessment of whole life costs
- Monetised assessment of carbon costs
- Monetised, quantified and qualitative assessments of impacts on biodiversity and habitats, natural capital ecosystem services and BNG
- Qualitative assessment of environmental and social impacts from the Consenting Evaluation
- Qualitative assessments for remaining sub-criteria in the MCDA framework by SW technical teams

Below in sections 5.1.3.5.1 to 5.1.3.5.5 SW explains the assessments.

5.1.3.5.1 Monetised assessment of whole life costs

The estimated costs to deliver the Option detailed in within Gate 2 Annex 1 Desalination, Annex 2 Water Recycling, Annex 3 Havant Thicket Alternatives within Section 2.10 Cost Modelling - provided the monetised assessment of the Options' Whole Life Cost (WLC) (in present value terms) for criterion A.01 in our MCDA framework. This is one of two criteria under the Affordability cluster criteria which considers the overall cost of delivery for achieving SW's 2027 supply obligations (the other criterion being A.02 – the cost of interim measures to meet required supply by 2027 which was based on a qualitative assessment as discussed later).

The monetised WLC estimates include CAPEX (including renewals and major maintenance), OPEX, and provisions for the potential cost of accompanying environmental measures (covering mitigations, compensation and BNG measures). The estimates are based on a 100-year appraisal period from Solution

opening (in line with the WRPG) and follow HMT Green Book guidance on discounting and Optimism Bias (OB) assumptions.

5.1.3.5.2 Monetised assessment of carbon costs

The estimated carbon impacts of the Option associated with embodied and operational emissions were analysed through quantitative analysis undertaken by as part of Gate 2 (detailed within Gate 2 Annex 1 Desalination, Annex 2 Water Recycling, Annex 3 Havant Thicket Alternatives within Section 2.10 Cost Modelling) and valued in line with BEIS appraisal guidance to provide the monetised assessment against sub-criteria E.08 – Embodied and Operational Carbon under the Environment cluster of the MCDA framework. The impact assessment is based on the estimated volume of carbon emissions associated with Option CAPEX and operations. The estimates are based on a 100-year appraisal period from scheme opening (in line with the WRPG) and follow HMT Green Book guidance on discounting assumptions.

5.1.3.5.3 Monetised, quantified and qualitative assessments of impacts on biodiversity and habitats, natural capital ecosystem services and Biodiversity Net Gain (BNG)

A Natural Capital Assessment (NCA), BNG assessment and HRA was conducted (see Section 2.5 in the Gate 2 submission, as well as Technical Report 2: BNG and NCAs, and Technical Report 3: HRA Consenting Risk for more details) in line with the WRPG and Defra economic appraisal guidance.

This was to identify the potential environmental impacts of the Options in terms of the following (representing 8 of the total 18 MCDA sub-criteria under the Environment and Society clusters)[23]:

Monetised

- Climate regulation (E.03)
- Natural hazard regulation (E.04)
- Food production / agricultural services (E.07)
- Recreation and amenity (S.01)

Quantitative

- Biodiversity (E.01 Biodiversity Net Gain)

Qualitative

- Habitats & Biodiversity (HRA) (E.02)
- Air quality pollutant removal (E.05)
- Water purification (E.06)

The BNG assessment was conducted using Defra / NE's Biodiversity 3.0 Metric Tool (as recommended by WRPG) and assumed a 10% uplift on the baseline level of biodiversity (i.e., the level prior to the introduction of the Option). The impacts on natural capital services are based on the estimated change in land use (i.e.,

[23] Note this assessment has gone further than the minimum five natural capital services recommended by WRPG supplementary guidance 'Environment and society in decision-making' by considering impacts on air quality pollutant removal services, food production /agricultural services; and recreation and amenity which arise from changes in land use resulting from the construction of the Option and an assumption of BNG +10%.

hectarage), by habitat type (e.g., woodland, grassland, etc), resulting from the construction of the Option and the assumption of BNG +10% and valued (where recommended by appraisal guidance and practical based on data availability), using Defra's ENCA and in line with the WRPG. For monetised impacts, the estimates are based on a 100-year appraisal period from scheme opening (in line with the WRPG) and follow HMT Green Book guidance on discounting assumptions.

5.1.3.5.4 Qualitative assessment of environmental and social impacts from the Consenting Evaluation

For eight of the MCDA sub-criteria under the Environment and Society clusters, the outputs of the Consenting Evaluation pillar of the OAP, which was undertaken, were used to qualitatively assess the relative performance of the Options:

- Exposure to noise (E.09)
- Air quality from infrastructure operations (E.10)
- Environmental water quality (E.11)
- Landscape and townscape (E.13)
- Flood risk (E.14)
- Coastal processes (E.15)
- Historic environment (S.02)
- Historic environment (S.03)

As outlined in the Consenting Evaluation section of this Annex, this evaluation was based on a broad range of site, technical and environmental information established for each Option as part of Gate 2, as well as prior established evidence through Gate 1.

5.1.3.5.5 Qualitative assessments for remaining sub-criteria in the MCDA framework by SW technical teams

For the five remaining sub-criteria in the MCDA framework listed below, a robust qualitative assessment of the Options' impacts was undertaken by SMEs from SW's technical teams within workshops, in line with MCDA best practice guidance from HM Treasury. This was based on a process to ensure consistency of scoring and using expert judgement to arrive at an agreed score for the following criteria:

- Customer cluster: tap water quality (C.01) and resilience of supply (C.02)
- Environment cluster: water abstraction (E.12)
- Deliverability cluster: supply chain capacity risk (D.01)
- Affordability cluster: cost of interim measures to meet required supply by 2027 (A.03)

These qualitative assessments were completed using a three-stage process:

- **Selection of SMEs**

SMEs from across the business were identified and nominated to be criteria evaluators based on their specialist technical area with their experience and expertise being ratified by provision of Curriculum Vitaes to ensure sufficient competence.

- **Provision of technical evidence and scoring guidance**

SMEs undertook the qualitative assessment of the Options' impacts drawing upon the technical evidence available from Gate 2 and independently prepared scoring guidance. This scoring approach used a RAG rating to directly score Options' relative performance based a linear five-point scale and was based upon a 'local' scoring approach (in line with HM Treasury MCDA guidance) which focuses on the relative impacts of the Options under consideration (rather than scoring performance based on impacts in absolute terms).

For each sub-criteria, SW SMEs in the relevant technical area were provided with technical summaries of the Options and the two operating scenarios described previously in section 5.1.3.2 alongside additional

technical evidence specific to the given sub-criterion. For example, in the case of the resilience of supply criterion, quantitative analysis of the Options' potential resilience benefit was available using SW's Resilience Assessment Procedure Tool, and in the case of the supply chain capacity risk criterion, evidence from informal market engagement with the supply chain was available.

- **Assessment of the Options' relative performance based on independent and consensus scoring**

Using the technical evidence available and pre-defined scoring guidance, SMEs individually assessed the performance of Options and then were challenged at workshops by independent facilitators to arrive at a consensus scoring of the relative performance of the Options for the given criterion. As the previously mentioned HM Treasury Green Book guidance on MCDA states, research suggests that group challenge can produce results that are better than could have been achieved if individuals worked separately. In this regard, the independent challenge this approach provided tested the assumptions used by evaluators, ensuring consistency in the judgements being made. Evaluators were also challenged on why particular results were chosen, and in some cases, revised their decisions once challenged; for example, in some cases evaluators had to be reminded to score impacts on a localised scale, rather than absolute.

Regarding governance of this scoring process, these assessments were underpinned by an MCDA Senior Evaluation Official whose role was to ensure a robust assessment of Options against criteria based on available technical information and act as the point of escalation on final decision-making. An MCDA Governance Official aimed to ensure a robust end-to-end process, resulting in outcomes which satisfied SW's regulatory requirements and would withstand future scrutiny in the consenting process

5.1.3.5.6 Raw results from the impact assessments for each sub-criterion

Through the impact assessments conducted against the 23 sub-criteria, it was identified that for five of the criteria, there are not expected to be discernible differences in the impacts / performance of the Options[24]. This applied to impacts on air quality pollutant removal (E.05 - natural capital assessment); noise impacts (E.09); environmental water quality impacts (E.11); air quality impacts from infrastructure operations (E.10); and impacts on the historic marine environment (S.03). Therefore, the results for these sub-criteria were not carried through into the overall assessment of Options' relative performance, meaning the MCDA findings are based on the impact assessments for a total 18 sub-criteria (16 under the clusters comprising Net Social Impact and 2 sub-criteria under the Affordability cluster). Note that if these impacts had been included it would not change the overall assessment of the relative performance of the Options and thus the findings from the MCDA, because the impact for all Options would be the same across these criteria.

In the tables below, SW details the 'raw value' results[25][26] from the impact assessments for the BAU Scenario (Table 134) and Drought Scenario (Table 135) for each of the Options for these 18 MCDA sub-criteria, which are based on either a monetised assessment (£ value impact based on established appraisal guidance),

[24] Note this does not mean that in absolute terms, the Options are not expected to lead to any impact in these particular areas, but that there are not expected to be any material differences in the nature/scale of these impacts when comparing the Options. Hence, they were excluded from the MCDA results, where the focus is to compare Options and identify a most preferable Option against Best Value to help inform SW's decision on an EPO as part of the Gate 2 OAP. In future scheme development and appraisal work beyond Gate 2, these impacts would be part of an absolute assessment of the nature/scale of impacts of the EPO.
[25] Note that the values underwent quality assurance by technical advisers who provided them, before the values were incorporated into the MCDA
[26] All analysis reflects the latest up-to-date information as of 31 August 2021.

quantitative assessment (using a defined metric from the relevant appraisal guidance) or qualitative assessment (using a scored assessment based on a relative, 5-point scale).

In Table 134 SW details where there are estimated to be differences in the impacts of the Options between the two operating scenarios that have guided the analysis – the BAU and Drought scenarios (as described previously in section 5.1.3.2). As detailed in the Table 135 this applies to only four sub-criteria (tap water quality, embodied and operational carbon, water abstraction and WLC of the Option). Given these differences are relatively marginal, they do not have a bearing on the overall MCDA assessment and subsequent ranking of Options in terms of their relative performance against Best Value. Therefore, the results of the overall MCDA assessment which are presented focus on the Drought Scenario only.

Table 134 - Raw value results for the impact assessments for each MCDA sub-criteria in the BAU Scenario

Raw Value				Options					
Criteria No.	Metric	Cluster	Unit	A.1	A.2	B.2	B.4	B.5	D.2
C.01	**Tap water quality**	Customer	Qualitative RAG	0	0	50	100	50	100
C.02	**Resilience of supply**	Customer	Qualitative RAG	100	75	0	50	25	50
E.01	**Biodiversity Net Gain (BNG)**	Environment	Quantitative Metric	37	37	29	41	48	29
E.02	**Habitats & Biodiversity (HRA)**	Environment	Qualitative RAG	0	0	50	75	25	100
E.03	**Climate regulation (NC)**	Environment	PV £, 2021	777,148	777,148	104,297	300,635	185,583	126,379
E.04	**Natural Hazard Regulation (NC)**	Environment	PV £, 2021	27,947	27,947	49,738	23,166	46,725	9,404
E.06	**Water purification (NC)**	Environment	Qualitative RAG	0.3	0.3	-1.3	-1.4	-1.2	-1.6
E.07	**Food production / agriculture services (NC)**	Environment	PV £, 2021	-96,303	-96,303	-328,359	-337,824	-470,716	-280,480
E.08	**Embodied and operational carbon**	Environment	PV £m, 2021	-42.5	-42.5	-24.6	-15.5	-26.7	-7.5
E.12	**Water abstraction**	Environment	Qualitative RAG	100	100	100	50	100	0
E.13	**Landscape and townscape**	Environment	Qualitative RAG	0	0	75	75	75	100
E.14	**Flood risk**	Environment	Qualitative RAG	50	50	25	0	100	75
E.15	**Coastal processes**	Environment	Qualitative RAG	0	0	100	100	100	100
S.01	**Recreation & amenity**	Society	PV £m, 2021	-3.3	-3.3	-2.0	-3.0	-2.0	-1.4
S.02	**Historic environment (terrestrial)**	Society	Qualitative RAG	0	0	0	0	0	100
D.01	**Supply chain capacity risks**	Deliverability	Qualitative RAG	0	0	50	50	50	100
A.01	**WLC of Option infrastructure**	Affordability	PV £m, 2021	1,119	1,119	829	684	927	394
A.03	**Cost of interim measures to meet required supply by 2027**	Affordability	Qualitative RAG	0	0	0	100	0	100

Table 135 - Raw value results for the impact assessments for each MCDA sub-criteria in the Drought Scenario

Raw Value				Options					
Criteria No.	Metric	Cluster	Unit	A.1	A.2	B.2	B.4	B.5	D.2
C.01	**Tap water quality**	Customer	Qualitative RAG	0	0	50	100	25	100
C.02	**Resilience of supply**	Customer	Qualitative RAG	100	75	0	50	25	50
E.01	**Biodiversity Net Gain (BNG)**	Environment	Quantitative Metric	37	37	29	41	48	29
E.02	**Habitats & Biodiversity (HRA)**	Environment	Qualitative RAG	0	0	50	75	25	100
E.03	**Climate regulation (NC)**	Environment	PV £, 2021	777,148	777,148	104,297	300,635	185,583	126,379
E.04	**Natural Hazard Regulation (NC)**	Environment	PV £, 2021	27,947	27,947	49,738	23,166	46,725	9,404
E.06	**Water purification (NC)**	Environment	Qualitative RAG	0.3	0.3	-1.3	-1.4	-1.2	-1.6
E.07	**Food production / agriculture services (NC)**	Environment	PV £, 2021	-96,303	-96,303	-328,359	-337,824	-470,716	-280,480
E.08	**Embodied and operational carbon**	Environment	PV £m, 2021	-43.2	-43.0	-24.9	-15.6	-27.0	-7.5
E.12	**Water abstraction**	Environment	Qualitative RAG	100	75	75	25	100	0
E.13	**Landscape and townscape**	Environment	Qualitative RAG	0	0	75	75	75	100
E.14	**Flood risk**	Environment	Qualitative RAG	50	50	25	0	100	75
E.15	**Coastal processes**	Environment	Qualitative RAG	0	0	100	100	100	100
S.01	**Recreation & amenity**	Society	PV £m, 2021	-3.3	-3.3	-2.0	-3.0	-2.0	-1.4
S.02	**Historic environment (terrestrial)**	Society	Qualitative RAG	0	0	0	0	0	100
D.01	**Supply chain capacity risks**	Deliverability	Qualitative RAG	0	0	50	50	50	100
A.01	**WLC of Option infrastructure**	Affordability	PV £m, 2021	1,123	1,122	831	687	930	394
A.03	**Cost of interim measures to meet required supply by 2027**	Affordability	Qualitative RAG	0	0	0	100	0	100

5.1.3.5.7 Scoring the impacts to derive a common assessment across the sub-criteria

Once the raw values for all the sub-criteria for all Options were established, these values were 'normalised' using a 'localised' scoring approach[27], in line with best practice MCDA guidance from HM Treasury Green Book, in order to be able to consistently compare and combine the results at the sub-criteria level into an overall score across the MCDA framework. Raw values were normalised by converting them into scores on a 0-100 scale; where 0 represents the lowest performing Option(s) and 100 represents the best performing Option(s).

In the tables below, SW details the normalised score results from the impact assessments for the BAU Scenario (Table 136) and Drought Scenario (Table 137) for each of the Options for the 18 MCDA sub-criteria.

In the remaining Steps 6-8 of SW's MCDA methodology (summarised previously in Table 127), these normalised scores were then combined under the five alternative definitions of Best Value using the unweighted and weighted scenarios defined under Step 5 – Defining How to Combine the Sub-criteria into an Overall Assessment of Best Value (within MCDA), to arrive at an overall assessment of the Options' relative performance.

Table 136 - Normalised scoring results for the impact assessments for each MCDA sub-criteria in the BAU scenario

MCDA Normalised Scores			Options					
Criteria No.	Metric	Cluster	A.1	A.2	B.2	B.4	B.5	D.2
C.01	Tap water quality	Customer	0	0	50	100	50	100
C.02	Resilience of supply	Customer	100	75	0	50	25	50
E.01	Biodiversity Net Gain (BNG)	Environment	44	44	0	62	100	4
E.02	Habitats & Biodiversity (HRA)	Environment	0	0	50	75	25	100
E.03	Climate regulation (NC)	Environment	100	100	0	29	12	3
E.04	Natural Hazard Regulation (NC)	Environment	46	46	100	34	93	0
E.06	Water purification (NC)	Environment	100	100	16	11	20	0
E.07	Food production / agriculture services (NC)	Environment	100	100	38	35	0	51
E.08	Embodied and operational carbon	Environment	0	0	51	77	45	100
E.12	Water abstraction	Environment	100	100	100	50	100	0

[27] As defined in guidance as associating 0 with the performance level of the Option in the currently considered set of Options which performs least well and 100 with that which performs best. Rather than assigning a score of 0 to represent the lowest level of performance that is likely to be encountered in absolute terms and 100 to represent the best level (global scaling).

E.13	Landscape and townscape	Environment	0	0	75	75	75	100
E.14	Flood risk	Environment	50	50	25	0	100	75
E.15	Coastal processes	Environment	0	0	100	100	100	100
S.01	Recreation and amenity	Society	0	0	73	18	70	100
S.02	Historic environment (terrestrial)	Society	0	0	0	0	0	100
D.01	Supply chain capacity risks	Deliverability	0	0	50	50	50	100
Net Social Impact: Average score (unweighted)			**40**	**38**	**45**	**48**	**54**	**61**
Net Social Impact: Implied ranking			**5**	**6**	**4**	**3**	**2**	**1**
A.01	WLC of Option infrastructure	Affordability	0	0	40	60	26	100
A.03	Cost of interim measures to meet required supply by 2027	Affordability	0	0	0	100	0	100
Affordability: Average score (unweighted)			0	0	20	80	13	100
Affordability: Implied ranking			**5**	**5**	**3**	**2**	**4**	**1**

Table 137 - Normalised scoring results for the impact assessments for each MCDA sub-criteria in the Drought scenario

MCDA Normalised Scores			Options					
Criteria No.	**Metric**	**Cluster**	**A.1**	**A.2**	**B.2**	**B.4**	**B.5**	**D.2**
C.01	Tap water quality	Customer	0	0	50	100	25	100
C.02	Resilience of supply	Customer	100	75	0	50	25	50
E.01	Biodiversity Net Gain (BNG)	Environment	44	44	0	62	100	4
E.02	Habitats & Biodiversity (HRA)	Environment	0	0	50	75	25	100
E.03	Climate regulation (NC)	Environment	100	100	0	29	12	3
E.04	Natural Hazard Regulation (NC)	Environment	46	46	100	34	93	0
E.06	Water purification (NC)	Environment	100	100	16	11	20	0
E.07	Food production / agriculture services (NC)	Environment	100	100	38	35	0	51
E.08	Embodied and operational carbon	Environment	0	0	51	77	45	100
E.12	Water abstraction	Environment	100	75	75	25	100	0
E.13	Landscape and townscape	Environment	0	0	75	75	75	100
E.14	Flood risk	Environment	50	50	25	0	100	75
E.15	Coastal processes	Environment	0	0	100	100	100	100
S.01	Recreation and amenity	Society	0	0	73	18	70	100

S.02	Historic environment (terrestrial)	Society	0	0	0	0	0	100
D.01	Supply chain capacity risks	Deliverability	0	0	50	50	50	100
Net Social Impact: Average score (unweighted)			**40**	**37**	**44**	**46**	**53**	**61**
Net Social Impact: Implied ranking			**5**	**6**	**4**	**3**	**2**	**1**
A.01	WLC of Option infrastructure	Affordability	0	0	40	60	26	100
A.03	Cost of interim measures to meet required supply by 2027	Affordability	0	0	0	100	0	100
Affordability: Average score (unweighted)			**0**	**0**	**20**	**80**	**13**	**100**
Affordability: Implied ranking			**5**	**5**	**3**	**2**	**4**	**1**

5.1.3.6 Step 5 – Defining How to Combine the Sub-criteria into an Overall Assessment of Best Value (within MCDA)

Having identified the sub-criteria for assessment within SW's MCDA framework in Step 3 – Defining Best Value sub-criteria, and conducting the impact assessments of those criteria in Step 4 – Assessment of Impacts against Each Criterion and , SW then developed an approach for combining the individual results for each sub-criteria into an overall assessment of each Option's performance against Best Value, and tested this with our regulators. This approach involved:

1. **Ranking the Options' overall performance against Best Value using five different 'lenses' or definitions of Best Value which incorporate different combinations of the 18 sub-criteria within our MCDA framework**. These five different ranking approaches are based on first considering the cost / affordability of the Option in isolation and its net social impact in isolation, and then bringing the two dimensions together. This aligns with the WRPG which suggests comparing a 'least cost' plan with a plan which maximises net social impact[28]. This approach selects different combinations sub-criteria to rank Option performance against, as such the next stage (weighting scenarios) is interlinked with this as performance will also be determined by weightings.
2. **Within each of these five Best Value ranking approaches, selecting weights for the relevant sub-criteria when combining the individual assessment results into an overall performance score.** These weights are intended to reflect the relative importance of each criterion in the assessment of Best Value (although the guidelines are not prescriptive on how to weigh these up against each other), considering the preferences of SW customers as well as the perspectives of

[28] Section 10 of the July 20201 WRPG states: *"You should produce a least cost programme as a benchmark to appraise your other programmes against... The outcome of increased benefits will be typically measured relative to the 'least cost' programme that delivers the minimum requirements to meet supply duties…The costs and benefits of your best value plan, least-cost programme and the other programmes you appraise, should be clearly identified and comparable."* Section 6 of the WRPG's supplementary guidance 'Environment and society in decision making' also states: *"You should present in your WRMP a programme that represents a 'Best Environment and society' programme in your programme appraisal…You should clearly demonstrate and quantify to your customers and regulators the benefits that can be delivered beyond those achieved through a least cost approach. This should also include presentation of the incremental cost difference between alternative programmes and the least cost programme."*

SW's regulators and Government policy objectives for the water sector. Given the broad range of perspectives this involves, SW established a range of different weighting scenarios for the analysis, which enabled it to consider the sensitivity of the conclusions of the MCDA to different views on the relative importance (weighting) of the different sub-criteria which constitute Best Value.

This process is illustrated in Figure 31 and the rest of this section details the ranking approaches and weighting scenarios used in the analysis. The sub-criteria-level results are based on the impact assessments described in Step 4 (see Section 5.1.3.5), the output of which provided raw values. These raw values are converted into normalised scores to enable like for like comparison. Armed with these outputs, the weighting scenarios were developed in consideration with the different lenses of Best Value in mind (the Best Value Rankings). This enabled the analysis to be presented at an individual Best Value Ranking level, with the highest scoring Options around each of the five identified themes being discussed and identified. The Option that most frequently appears as the highest scoring Option within each of these themes could be considered the Best Value Option.

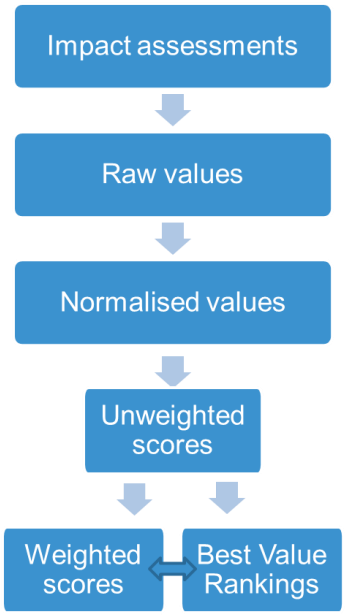

Figure 31 - MCDA assessment process flowchart

SW's approach to ranking and weighting the results of the MCDA was developed and discussed with SW decision-makers and its regulators prior to conducting the analysis of the Options' impacts against the criteria. The rankings and weighting scenarios used in SW's analysis are further explained below.

5.1.3.6.1 Ranking the relative performance of Options according to five alternative definitions of Best Value

SW has considered the overall performance of the Options by combining the individual assessment results at the sub-criteria level under five alternative Best Value ranking approaches (due to there being multiple requirements of Best Value in WRPG), in which SW has different weighting scenarios[29]:

- **Best Value Ranking 1 – Least cost**: Affects only one criterion (A.01 – WLC), allows decision makers to assess each Option based on WLC only i.e., the cheapest way (in terms of the core Option only) to deliver capacity as per WRPG requirements, but does not take into account qualitative cost / affordability factors or Net Social Impact factors (customers, environment, society, deliverability)
- **Best Value Ranking 2 – Affordability**: Combines the two affordability criteria (A.01 and A.02), allows decision makers to assess each Option based on a broader definition of cost i.e., cheapest way overall (including the cost of interim measures to ensure supply in 2027 if the Option cannot be delivered within that timescale) to deliver capacity, but does not take into account Net Social Impact factors (customers, environment, society, deliverability)
- **Best Value Ranking 3 – Net Social Impact**: Combines the 16 criteria under Net Social Impact (customer, environment, society and deliverability clusters), allows decision makers to assess performance of each Option against Net Social Impact but does not consider any cost / affordability factors
- **Best Value Ranking 4 – Net Social Impact per £100m of WLC**: Combines the 16 criteria under Net Social Impact and compares them to the WLC criterion, allows decision makers to assess performance of each Option by comparing its Net Social Impact to the cost of delivery – identifying which Option is providing the best impact "pound for pound". This is closest to a typical Benefit-Cost-Ratio used in economic appraisal / HMT Green Book and could potentially be considered the closest reflection of Best Value against WRMP guidelines.
- **Best Value Ranking 5 – Blended Net Social Impact and Affordability**: Combines the 16 criteria under Net Social Impact and the two criteria under the affordability cluster. Similar to ranking approach 4, allows decision makers to assess the performance of each Option by comparing its Net Social Impact to the cost of delivery, but using a wider definition of cost of cost / affordability which considers non-monetisable costs at this stage (i.e., measures to achieve required delivery of supply in 2027 if the Option cannot be delivered within that timescale).

5.1.3.6.2 Weighting the sub-criteria that are combined under each of the five Best Value ranking approaches

Best Value Ranking 1 (least cost), which simply ranks the Options based on their relative WLC (in Net Present Value (NPV) terms) does not require any weighting of sub-criteria. However, as soon as SW combines the impact assessment results for multiple criteria, SW must define weightings for each criterion based on their potential relative importance to the assessment of Best Value.

[29] Note that the Best Value Rankings focus on different criteria based on the element of the analysis they are trying to isolate e.g. ranking on cost alone includes only the criteria which contain cost figures. Whereas ranking on Net Social Impact requires we include all the criteria likely to exhibit those impacts. This is because there are multiple definitions of Best Value, so we cannot provide just one Best Value Ranking.

MCDA best practice guidance from HMT Green Book[30] recommends commencing the analysis of overall performance with unweighted scores and then applying weights to determine their influence on the results. SW therefore developed a range of weighting scenarios to understand whether placing different weights, or emphasis, on the different criteria within its framework leads to different conclusions on the overall relative performance of the Options under these Best Value rankings. These scenarios are explained below.

Affordability weighting scenarios – affects Best Value Ranking approach 2

When combining the assessments for SW's Affordability criteria, this involves weighting only two sub-criteria – the WLC of the Option (a monetised impact assessment) and the potential financial cost of interim measures to meet SW's supply duties in 2027 (a qualitative impact assessment). The relative importance / weight placed on these two sub-criteria therefore aims to reflect the relative dominance of each cost item to the total costs of delivering the Option. Given the uncertainties around this at this stage of the programme's development, SW analysed four different weighting scenarios.

Across the four scenarios, SW moves from a Core Scenario which is based on unweighted scores (Scenario 1) to testing the impact of more extreme scenarios of placing more or less importance on the cost of the core Option and the cost of interim measures (Scenarios 2-4):

- **Scenario 1 (Core Scenario) – unweighted scores (equal weighting given to each sub-criteria):** Assumes the WLC of Option infrastructure and cost of interim measures have equal importance at 50% each
- **Scenario 2 – significantly more weight to Option WLC**: Assumes WLC of the Option infrastructure is likely to make up a substantial proportion of the total cost of delivering the scheme, and therefore gives this criterion (80% weighting) four times more importance than the cost of interim measures (20%)
- **Scenario 3 – slightly more weight to Option WLC**: Assumes WLC of the Option infrastructure (60% weighting) is 1.5 times more important than the cost of interim measures (40%)
- **Scenario 4 – significantly more weight to the cost of interim measures alongside the Option:** As the converse to Scenario 2, assumes the cost of interim measures (80%) is four times more important than the WLC of the Option infrastructure (20% weighting)

Table 138 - Weighting scenario across cluster criteria – Affordability – affects Best Value Ranking 2

	Weighting scenario for affordability			
Sub-criteria within Affordability cluster	**1. Core Scenario: unweighted / equal weight**	**2. Significant emphasis on Whole Life Cost of Option**	**3. Most emphasis on Whole Life Cost of Option**	**4. Significant emphasis on cost of interim measures**
WLC of infrastructure	50%	80%	60%	20%
Cost of interim measures to achieve 2027	50%	20%	40%	80%

[30] HM Treasury, Green Book Supplementary Guidance: Multi-criteria decision analysis – a manual, 2013

Total	100%	100%	100%	100%

Net Social Impact weighting scenarios – affects Best Value Ranking approaches 3 and 4

When combining the assessments for the 16 sub-criteria which represent the Options' Net Social Impact within the MCDA, SW analysed five different weighting scenarios which reflect alternative views on the relative importance of the different sub-criteria across the clusters of customer, environment, society, and deliverability[31].

Across the five scenarios, SW moves from a Core Scenario which is based on unweighted scores (Scenario 1), to testing the impact of placing less weight on the criteria within SW environment and society clusters (Scenarios 2 and 3), to applying equal weight at the cluster level (Scenario 4), through to applying weightings according to customer preferences which have been elicited from bespoke engagement with SW customers (Scenario 5):

- **Scenario 1 (Core Scenario) – unweighted scores (equal weighting given to each sub-criteria)**: implicitly implies that impacts on the environment and society (a weighting of 82%) are around six times more important than direct impacts on customers (13%). However, it is again important to note that many impacts within environment/society are those valued by customers.
- **Scenario 2 – Less weight given to environment and society relative to Core Scenario:** impacts on the environment and society (70%) are scaled down in importance (relative to the Core Scenario of unweighted scores) and direct impacts on customers slightly increase in importance (23%), such that at the cluster level, they are three times more important than direct impacts on customers
- **Scenario 3 – Equal weighting for customer, environment and society clusters:** relative to the Core Scenario of unweighted scores, impacts on the environment and society (47%) are scaled down in importance and direct impacts on customers significantly increase in importance (47%), such that at the cluster level, they are equally as important as each other
- **Scenario 4 – Equal weighting across clusters:** impacts on the environment, society and deliverability at the cluster level are weighted equally meaning that, relative to the Core Scenario of unweighted scores, impacts on the environment are scaled down in importance (25%) and impacts on customers, society and deliverability increase in importance (25% each)
- **Scenario 5 – Weighting at the cluster level according to SW customers' preferences** – the relative weight placed on the sub-criteria are based on the outcomes of engagement with SW's customers (which is further explained below), meaning that, relative to the Core Scenario of unweighted scores, impacts on the environment and society are scaled down in importance (41%) and impacts on customers and deliverability increase in importance (39% and 20% respectively). WRSE are undertaking a similar approach to weighting within their Best Value Plan[32]; they propose testing the criteria with a representative sample of customers to understand views on the principle of weighting, and to ascertain if they have preferences for specific criteria.

[31] Note scenarios 1 to 4 represent arbitrary weighting values which have been developed to illustrate different scenarios where alternative weightings are altered to impact results.
[32] https://www.wrse.org.uk/media/pm1lf04t/wrse-response-to-the-consultation-on-best-value-planning-april-2021.pdf

Table 139 - Weighting scenarios across cluster criteria – Net Social Impact – affects Best Value Rankings 3 and 4

	Weighting scenarios for Net Social Impact (rounded)				
Cluster	1. Core Scenario: unweighted / equal weight to sub criteria[33]	2. Env / Soc weighted less than Core Scenario	3. Customer and Env / Soc given equal weight	4. Equal weighting at cluster level	5. Weights at cluster level based on SW Customer Action Group engagement
Customer	**13%**	**23%**	**47%**	**25%**	**39%**
Environment	**69%**	**59%**	**40%**	**25%**	**30%**
Society	**13%**	**11%**	**7%**	**25%**	**11%**
Deliverability	**6%**	**6%**	**6%**	**25%**	**20%**
Total	100%	100%	100%	100%	100%

The weightings for Scenario 5 were established through engagement with SW's Customer Action Group (CAG); a deliberative customer panel which has run monthly since November 2019 and involved 120 members from across the region with c35 members active at any one time.

As an informed customer focus group, the CAG has been engaged across many aspects of SW's Gate 1 and Gate 2 work programme, including reviewing environmental impacts, delivery constraints, local challenges, cost windows, bill impacts, water quality and many other areas. This has provided a robust and consistent approach to engagement and in turn helping to ensure customer preferences have informed the development of the WfLH programme and SW's decision-making. The CAG is run by an accredited MRS research agency to maintain independence and secure customer input through an engagement approach which aligns with industry best practice. Membership of the CAG is refreshed periodically to bring in new respondents to achieve a balance of both a highly informed customer group and a current view of perceptions.

For the MCDA, SW engaged the CAG to explain the criteria being used to assess the relative performance of the Options and to seek customers' views on their relative importance. Each member of the CAG put forward their preferred weighting of the criteria – considering those under Net Social Impact and the Affordability cluster – and using these individual responses an overall average by cluster criterion was established.

This provided the weightings for Scenario 5 detailed above in Table 1399, and also established that customers would weight the criteria comprising Net Social Impact at 80% relative to the criteria comprising Affordability at 20% (which affects Best Value Ranking 5, as explained later in this section). This suggests that, whilst intuitively, one would expect customers to always prefer to minimise cost, in this instance customers would rather a solution that protects or enhances the environment and the impacts on wider

[33] This weighting scenario is based upon an unweighted scenario (effectively applying equal weights to each criterion, which is based on the number of criteria being assessed). These values are the final weightings which were applied after some criteria were removed from the MCDA after initial impact assessments showed that there was no differentiation possible or not enough information to properly assess at this stage (refer to section 5.1.3.5 for more information).

society, rather than the simply the cheapest solution. Analysis of the customer panel responses showed that there were no statistical outliers associated with the allocation of weighting to affordability. However, it is important to note that customer preferences are typically influenced by thresholds of acceptability. Previous engagement with the CAG has included the presentation of illustrative projects which could equate to an indicative increase in customer bills of around £10-50 per annum, or £1-4 per month. As such, when proposing weightings for the MCDA, customers may have anchored their responses around these figures. Therefore, it may be the case that if the Options under consideration were to result in more significant increases to customer bills, and the panel was engaged to re-assess their weightings on this basis, the relative weighting of Net Social Impact criteria to Affordability criteria could differ. This uncertainty is in part why SW tested the sensitivity of the results to a range of alternative weighting scenarios (rather than relying on the results of customer engagement alone).

The same CAG members were engaged on the draft results of the MCDA that used these weightings (see Section 5.1.3.6.2). In reviewing the results, the CAG supported the findings on the relative performance of Options, as they matched the overall customer preferred solutions.

Net Social Impact and Affordability combined weighting scenarios – affects Best Value Ranking approach 5

Best Value Ranking Approach 5 brings together the combined Net Social Impact performance score of the Option (which is influenced by the chosen Net Social Impact weighting scenario, as described above) and the combined Affordability performance score of the Option (again influenced by the chosen weighting scenario for the Affordability cluster).

For this final ranking, SW analysed two weighting scenarios:

1. **Core Scenario (unweighted):** A simple average across the two combined scores, which implicitly assumes an equal weighting across Net Social Impact and Affordability – i.e., an additional point score of NSI is worth the same as an additional point score of Affordability (this is a similar principle to a typical 'Benefit-Cost Ratio' in CBA, where £1 of benefit is compared to £1 of cost).
2. **Customer Preferences Scenario (weighted):** A weighted average across the two combined scores using the results of SW's engagement with SW's CAG (described above), which implies that the combined Net Social Impact performance of the Option (weighted 80%) is four times more important to customers than its Affordability score (20%). See above for more information on SW customer panel.

Table 140 - Weighting scenario across cluster criteria – Net Social Impact and Affordability combined – affects Best Value Ranking 5

	Weighting Scenarios for Best Value Ranking Approach 5 (NSI / affordability blend)	
Cluster	**1. Core Scenario: equal weight to Net Social Impact and Affordability**	**2. Customer preferences: Significantly more emphasis on Net Social Impact than affordability**
Net Social Impact (Customer, Environment, Society, Deliverability)	50%	80%
Affordability	50%	20%
Total	100%	100%

5.2 Outcomes from the Multi-Criteria-Decision Analysis (MCDA)

5.2.1 An overview of the MCDA results and their implications

As discussed previously in Section 5.1.3 and summarised in Table 127, there were eight steps involved in developing the MCDA results. This section summarises the outcomes of the remaining steps of the process (Steps 6-8) where SW conducted an overall assessment of the Options' relative performance against Best Value by combining the 'normalised' impact assessment scores at the sub-criteria level (derived in Step 4 – see Section 5.1.3.5) and the pre-agreed Best Value ranking approaches and criteria weighting scenarios (developed in Step 5 – Defining How to Combine the Sub-criteria into an Overall Assessment of Best Value (within MCDA)) into an overall performance score. To recap, this analysis comprised:

- A single scenario for Best Value Ranking 1 where SW assessed relative performance against the single criterion of the monetised WLC of the Options (and thus does not require any weighting across criteria)
- Four weighting scenarios for the criteria under Affordability (the Core unweighted scenario and three alternative weighting scenarios) which affects Best Value Ranking 2 where SW assessed relative performance against overall Affordability considering monetisable and non-monetisable costs of delivery to achieve supply requirements in 2027
- Five weighting scenarios for the criteria under Net Social Impact (the Core unweighted scenario and four alternative weighting scenarios) which affects Best Value Rankings 3 and 4 where SW assessed relative performance against Net Social Impact in isolation (Ranking 3) and against Net Social Impact relative to the £ WLC of the Option (Ranking 4)
- Two weighting scenarios for combining the overall Net Social Impact score and Affordability score (using an unweighted average and an 80:20 weighted average across the two scores and drawing on the results of the five weighting scenarios for criteria within Net Social Impact described above) which affects Best Value Ranking 5 where SW assessed the combined average Net Social Impact and Affordability score of the Option

This analysis produced 25 different sets of results for the overall assessment of the Options' relative performance against Best Value for the two operating scenarios described previously in section 5.1.3.2 – a BAU and Drought scenario. These detailed results are provided in section 5.2.2, whilst the remainder of this section provides key elements of those results, and is structured as follows:

- In Section 5.2.2, SW sets out the detailed results of using the unweighted scores in a combined assessment of Best Value under SW's five different ranking approaches (i.e., based on the Core unweighted scenario results described above for Affordability and Net Social Impact)
- In Section 5.2.3, SW summarises the key findings from the results using weighted scores in a combined assessment of Best Value under SW's five different ranking approaches (i.e., based on the alternative weighting scenario results described above for Affordability and Net Social Impact, which reflect alternative views on the relative importance of the different MCDA sub-criteria when combining scores into an overall assessment of performance)
- In Section 5.2.3.14, SW presents the results of sensitivity analysis which has investigated the 'switching values' that could lead to alterative findings on the relative performance of the Options from the core analysis described above

When reviewing the results, it is important to note that the MCDA focuses on identifying the relative performance of the Options against the specific objective of Best Value for addressing SW's supply duties in a 1-in-200-year drought event (as described previously in Section 5.1.1). The MCDA does not consider the

Options' consenting and delivery risks, strict alignment with SW's Strategic Objectives for the WfLH Programme or the potential adaptability of the Option for helping to meet increases in future supply needs (i.e. beyond a 1-in-200-year drought requirement) – these are all factors considered in the wider OAP described in this annex which, taken together, have been used to identify an EPO to take forward to Gate 2 as set out in Section Appendix 5. Nor does the MCDA consider the costs and benefits of an intervention in terms of economic wellbeing / public value in absolute terms. However, given that the focus of Gate 2 is on the *relative* impacts of the Options, and in the absence of the required monetised information on all criteria in the framework to conduct a full CBA (as is to be expected at this stage of the scheme development process), within the context of an OAP, the MCDA provides a robust guide (in line with best practice guidance) on the potential relative performance of the Options against Best Value and in the context of responding to SW's S20 obligations.

5.2.2 MCDA Results based on Unweighted Scores (Core Scenario Analysis)

Below SW shows a summary of results from the MCDA using unweighted scores (based on a simple average across cluster criteria) for the Drought Scenario under each of SW's five Best Value ranking approaches (the equivalent results for the BAU scenario are presented in Appendix 4).

It is important to recognise that although these scores are labelled as 'unweighted' at the sub-criteria level, there is an implicit mathematical weighting to each cluster criterion based on the number of sub-criteria within the MCDA framework. Table 141 recaps on the implied weighting given to each cluster criteria within Net Social Impact as a result of applying a simple average at the sub-criteria level (referred to previously in Section 5.1.3.4, Table 129 to Table 1333**),** as the 'Core unweighted scenario'). The Environment cluster is given the highest weight as this contains the largest number of sub-criteria which, as set out previously in Section 5.1.3.4, is reflective of the specific decision-context for the WfLH programme, where all Options are being designed to provide capacity to meet supply duties under a 1-in-200-year event, and hence from a Best Value there is an inherent focus on protecting and enhancing impacts on the environment and wider society (as defined by our regulators).

Table 141 - Core unweighted scenario – implied weights at the cluster level – Net Social Impact

	Weighting scenarios for Net Social Impact (rounded)
Cluster	1. Core Scenario: unweighted / equal weight to sub criteria[34]
Customer	13%
Environment	69%
Society	13%
Deliverability	6%
Total	100%

[34] This weighting scenario is based upon an unweighted scenario (effectively applying equal weights to each criterion, which is based on the number of criteria being assessed). These values are the final weightings which were applied after some criteria were removed from the MCDA after initial impact assessments showed that there was no differentiation possible or not enough information to properly assess at this stage (refer to section 5.1.3.5 for more information).

Under all Best Value ranking approaches, using these unweighted sub-criteria scores, D.2 is the highest scoring Option – suggesting it is both the least cost / most affordable Option and delivers the best Net Social Impact performance relative to the other Options under consideration at this stage. B.4 is generally the second highest scoring Option under all ranking approaches, except when looking at Net Social Impact in isolation (Best Value Ranking 3; where B.4 ranks third and B.5 ranks second best, with B.5's score also being closer to that of D.2).

5.2.2.1 Unweighted results under Best Value Ranking 1 (Least cost Option) and Best Value Ranking 2 (Most affordable Option considering both monetised and non-monetised costs of delivery)

Table 142 details the unweighted scoring results of the MCDA when considering Best Value Ranking 1 (based on the single criterion A.01 – WLC of the Option) and Best Value Ranking 2 (based on the combined score of the two criteria under the Affordability cluster; criterion A.01 WLC and criterion A.02 – Potential costs of interim measures to deliver supply needs in 2027). The relative rankings of the Options under these two lenses of Best Value are the same:

- Option D.2 scores highest, ranking first of the six Options: in WLC terms it is more than a third cheaper than the next highest ranking Option B.4. In terms of affordability, it scores at least 20% better than all other Options.
- Options A.1 / A.2 is the lowest scoring: the Options cost almost three times as much as the cheapest Option D.2, over 1.5 times more than the second cheapest Option B.4, and almost 10% more than the next most expensive Option B.5. The performance of Options under the affordability score is the same in terms of rankings as the WLC, with A.1 / A.2 scoring lowest.
- Options B.2 costs around 10% less than B.5, whilst it also scores third in terms of affordability it scores around 50% better than B.5, due to the cost of interim measures required to meet supply by 2027 criterion

Table 142 - MCDA results – core unweighted scenario – Best Value Rankings 1 and 2

Option	Input score		Best Value Ranking 1		Best Value Ranking 2	
	Whole Life Cost (£m)	Cost of interim measures to meet required supply by 2027	Whole Life Cost (£m)	Rank (based on nearest £5m)	Average affordability score unweighted (Higher score = more affordable)	Rank
A.1	0	0	1,123	5	0	5
A.2	0	0	1,122	5	0	5
B.2	40	0	831	3	20	3
B.4	60	100	687	2	80	2
B.5	26	0	930	4	13	4
D.2	100	100	394	1	100	1

5.2.2.2 Unweighted results under Best Value Ranking 3 (Highest performing Option against Net Social Impact)

Table 143 details the unweighted scoring results of the MCDA when considering Best Value Ranking 3, which focuses on Net Social Impact without any reference to the cost / affordability of the Option. This

ranking is the one of the five which shows the smallest variance between Options, albeit there is still a relatively significant difference in scores between D.2 (the highest scoring Option) and the other Options:

- Option D.2 is the highest scoring Option, with its NSI score c15% higher than B.5 in terms of average unweighted NSI score
- Option B.5 is the second highest scoring Option, with its NSI score also c15% higher than B.4 which ranks third. The performance of B.4 scores is also relatively close to B.2 (scoring 46 and 44 respectively)
- Desalination scores lowest of the Options. Option A.2 scores slightly less than A.1 (due to differences in capacity affecting water abstraction and resilience)

Table 143 - MCDA results – core unweighted scenario – Best Value Ranking 3

Option	Best Value Ranking 3	
	Average Net Social Impact score unweighted	Rank
A.1	40	5
A.2	37	6
B.2	44	4
B.4	46	3
B.5	53	2
D.2	61	1

5.2.2.3 Unweighted results under Best Value Rankings 4 and 5 (Highest scoring Option considering Net Social Impact and Cost/ Affordability in combination)

Table 144 details the unweighted scoring results of the MCDA when considering Best Value Ranking 4 (based on the Net Social Impact performance of the Option relative to the £ WLC of delivery) and Best Value Ranking 5 (based on the Net Social Impact performance of the Option relative to the Affordability of the Option, considering both £ WLC of delivery the potential costs of interim measures to deliver supply needs in 2027). This ranking approach arguably most closely mirrors a 'Benefit-Cost-Ratio' in CBA of monetizable impacts and represents the two rankings which bring together all dimensions of Best Value into one ranking; considering the "pound for pound" relative performance of the Options. The ordering of the Options is the same across both ranking approaches:

- Option D.2 outscores the other Options significantly on both rankings; in terms of NSI per £100m of cost, Option D.2 delivers c15.5 points of NSI score per £100m of cost – this is more than twice that of the next highest scoring Option B.4. Using the average NSI and affordability score, Option D.2 scores 81 out of 100, more than 35% higher than B.4 (which scores 63 points).
- B.4 comes second across both rankings, with £100m of cost 'buying' c6.7 points of Net Social Impact score which is 18-26% higher than the other water recycling Options, and an affordability score c30% higher than those other Options
- Options B.5 and B.2 come third and fourth respectively in both rankings and they comfortably outscore Desalination-based Options

- Options A.1 / A.2 scores lowest, owing to having both the lowest scores for both Net Social Impact and cost / affordability. Option A.2 scores slightly less than A.1 due to slightly lower Net Social Impact Score (as shown previously in Table 143).

Table 144 - MCDA results – core unweighted scenario – Best Value Rankings 4 and 5

Option	Best Value Ranking 4		Best Value Ranking 5	
	Net Social Impact Score unweighted per £100m	Rank	Blended Net Social Impact and Affordability score (simple average)	Rank
A.1	3.6	5	20	5
A.2	3.3	6	19	6
B.2	5.3	4	32	4
B.4	6.7	2	63	2
B.5	5.7	3	33	3
D.2	15.5	1	81	1

Overall, the unweighted results show the following results:

- D.2 scores highest in all five Best Value Rankings, it is closest in performance to B.4 in Best Value Ranking 3 (scoring 61 vs. 53)
- B.4 tends to score second in all rankings bar Best Value Ranking 3 when considering Net Social Impact, where B.5 scores second
- One of the Options A.1 / A.2 scores lowest in all rankings
- B.2 scores third or fourth with B.5 typically also scoring third or fourth (except when scoring second as mentioned above)

5.2.3 MCDA Results based on Weighted Scores (Core Scenario Analysis)

Below SW outlines a summary of results from the MCDA using weighted scores for the Drought Scenario under each of SW's five Best Value ranking approaches (BAU results in Table 144).

Overall, the conclusions of this approach do not significantly change the results, namely that:

- Option D.2 scores highest across all scenarios – this is expected due to it costing the least of all Options by a considerable distance, as well as scoring highest in Net Social Impact
- B.4 tends to score second highest across all scenarios and is only ranked third in one Best Value Ranking: Net Social Impact – ranking 2
- A.1 / A.2 almost always scores lowest across all weighting scenarios and Best Value Rankings

More details on the scenarios undertaken can be found in Appendix 5 of this document.

5.2.3.1 Results of Sensitivity Analysis to Stress Test the Outcomes of the MCDA

Sensitivity testing explores the sensitivity of the expected outcomes of an Option to potential variations in input variables. It can also demonstrate, for example, the changes in key assumptions required to change the EPO on a 'best value' basis or to change the ranking of Options. For the MCDA, SW undertook

'switching value' sensitivity analysis, in line with HMT Green Book Guidance, to identify the value of certain variables that could lead to alterative findings on the relative performance / ranking of the Options from the core results described above.

For the MCDA, SW designed this sensitivity analysis to stress test the headline outcomes of the results, namely that: D.2 consistently comes top in performance, B.4 typically comes second (for all Best Value Rankings except Net Social Impact in a select number of weighting scenarios), and A.1 / A.2 consistently performs lowest of all the Options. This was achieved through the following tests:

- Test 1: Testing what the cluster weightings would need to be to push B.4 to second ranking on NSI (Best Value Ranking 3), from third under our Core unweighted scenario (noting B.4 comes second in all other Best Value rankings)
- Test 2: Testing how much cost would need to change by to affect the rankings of the lowest to highest cost Options
- Test 3: Considering that it is not just cost or NSI that affects 'Best Value', but the implicit trade-off between them, consider how much cost would need to change to alter the ranking of the Options on NSI / £100m of cost

For both Test 1 and Test 2, SW considered the following rankings:

- Switching values for Options A.1 and A.2 to come first, second and fourth, rather than last
- Switching values for Option D.2 to come second or third, rather than first
- Switching values for Option B.4 and B. 5 to come third or second

All tests were conducted using the scoring results for the Options under: (i) the Core Scenario of unweighted scores; and (ii) Weighting Scenario 5, which uses the proposed weights from SW customers following external engagement.

Through this sensitivity testing under the range of scenarios described on above, in summary SW found that:

- Significant reductions (17%) in costs are required to make A.1 / A.2 rank higher than last place (4th) of all the Options considered, and a reduction of 65% (£728 m) to rank first
- Similarly, a cost increase of 74% is needed to change the ranking of D.2 from first to second and a cost increase of 111% (£437 m) to change the ranking from first to third
- Both outcomes suggest there is a low risk that unknown variables would change their rankings

5.2.3.2 MCDA Sensitivity analysis results – Test 1

Test 1: Switching weights for B.4 under NSI (Best Value Ranking 3)

Option B.4 ranks third overall using Best Value Ranking 3 (Net Social Impact – as previously described in section 4.1.3.2) behind D.2 and B.5. When looking at cluster level scoring, it is seen that that whilst B.4 is ranked 2nd for Deliverability and Affordability, it is ranked 1st on 'Customer' and 4th on Environment and Society. This makes B.4 most sensitive to changes in the weightings given to the sub-criteria under these two clusters. Below SW shows the test undertaken to bring B.4 up to the second highest scoring Option in this ranking.

Table 145 - MCDA results by cluster

MCDA Normalised Scores	Options					
Cluster Criteria	**A.1**	**A.2**	**B.2**	**B.4**	**B.5**	**D.2**
Customer	50	38	25	75	25	75

Environment & Society	42	40	46	42	57	56
Deliverability	0	0	50	50	50	100
Affordability	0	0	20	80	13	100

As detailed in Table 146, if the weighting given to Environment and Society reduced by 25 percentage points to 57% - with Customer and Deliverability increasing proportionately[35], B.4 ranks second.

Table 146 - Switching weights for B.4 under NSI (Best Value Ranking 3)

Cluster Criteria	Original Weighting (%)	New Weighting (%)	Percentage Point Change (%)
Environment and Society	81%	57%	-25%
Customer	13%	29%	16%
Deliverability	6%	14%	8%

As detailed in Table 147, if the weighting given to Customer is increased by 19 percentage points to 31% (and again, Environment and Society and Deliverability are decreased proportionately), B.4 ranks second.

Table 147 – Switching weights for B.4 under NSI (Best Value Ranking 3)

Cluster Criteria	Original Weighting (%)	New Weighting (%)	Percentage Point Change (%)
Environment and Society	81%	64%	-17%
Customer	13%	31%	19%
Deliverability	6%	5%	-1%

5.2.3.3 MCDA Sensitivity analysis results – Test 2 and 3

Test 2a: Switching values for Best Value Ranking 1 (Least Cost) – A.1 / A.2

In the core results drought scenario, under Best Value Ranking 1 (Least Cost) (previously described in Section 4.1.2.1), Option D.2 is the highest scoring (costing £394 m), B.4 scores second (£687 m), B.2 scores third (£831 m) and B.5 scores fourth highest (£930 m).

To change the cost ranking of A.1 and A.2, the respective costs would have to reduce by between 17% (to rank joint 4th with B. 5) and 65% (to become highest scoring alongside D.2) as detailed in Table 148.

Table 148 - Switching weights for A.1 / A.2 under Least Cost (Best Value Ranking 1)

Option	Current Rank	Target Rank	Current Costs	New costs	Change in Costs	Change in Costs
	Rank 1-6	Rank 1-6	£million, PV, 2021	£million, PV, 2021	£million, PV, 2021	%

[35] According to original weighting split, noting weights must add to 100%.

Switch to rank 1						
A.1	5	1	1,123	394	-728	-65%
A.2	5	1	1,122	394	-728	-65%
Switch to rank 2						
A.1	5	2	1,123	687	-436	-39%
A.2	5	2	1,122	687	-435	-39%
Switch to rank 4						
A.1	5	4	1,123	930	-193	-17%
A.2	5	4	1,122	930	-192	-17%

Test 2b: Switching values for D.2 Best Value Ranking 1 (Least Cost)

In the core results drought scenario, under Best Value Ranking 1 (Least Cost) (previously described in Section 4.1.2.1), Option D.2 is the highest scoring (costing £394 m), B.4 scores second (£687 m), B.2 scores third (£831 m) and B.5 scores fourth highest (£930 m).

To change the ranking of D.2, costs would have to increase by between 74% (to move from 1st to 2nd / joint 1st with B.4) and 110% (to move from 1st to 3rd / joint 2nd with B.2) – see Table 149:

Table 149 - Switching weights for D.2 under Least Cost (Best Value Ranking 1)

Option	Current Rank	Target Rank	Current Costs	New costs	Change in Costs	Change in Costs
	Rank 1-6	Rank 1-6	£million, PV, 2021	£million, PV, 2021	£million, PV, 2021	%
Switch to rank 2						
D.2	1	2	394	687	292	74%
Switch to rank 3						
D.2	1	3	394	831	437	111%

Test 2c: Switching values for B.4 and B.5 Best Value Ranking 1 (Least Cost)

In the core results drought scenario, under Best Value Ranking 1 (Least Cost) (previously described in Section 4.1.2.1), Option D.2 is the highest scoring (costing £394 m), B.4 scores second (£687 m), B.2 scores third (£831 m) and B.5 scores fourth highest (£930 m).

In order to change the Least Cost ranking of B.4 and B.5:

- The costs for B.4 would have to increase by 21% to drop from ranking 2nd to being joint 3rd with B.2
- The costs for B.5 would have to reduce by 26% to improve from ranking 4th to being joint 2nd with B.4

Table 150 - Switching weights for B.4 and B.5 under Least Cost (Best Value Ranking 1)

Option	Current Rank	Target Rank	Current Costs	New costs	Change in Costs	Change in Costs
	Rank 1-6	Rank 1-6	£million, PV, 2021	£million, PV, 2021	£million, PV, 2021	%
Switch to rank 3						
B.4	2	3	687	831	144	21%
Switch to rank 2						
B.5	4	2	930	687	-244	-26%

Test 3a: Switching values for A.1 / A.2 under Best Value Ranking 4 (NSI per £100 m)

In the core results drought scenario, under Best Value Ranking 4 (NSI per £100 m of cost):

- Using unweighted NSI scores (previously described in Section 4.1.2.3), D.2 is the highest scoring Option (15.5 NSI points per £100 m), B.4 ranks second (6.7 NSI points per £100 m), B.5 ranks third (5.7 points per £100 m) and B.2 ranks fourth (5.3 points per £100 m)

To change the NSI per £100 m ranking of A.1 and A.2, their costs would have to reduce by between 33% (to rank joint 4th with B.2) and 79% (to rank joint 1st with D.2) as detailed in

Table 151.

Table 151 - Sensitivity results using the unweighted NSI Scores (Core Weighting Scenario) for switching values of Best Value Ranking 4 (NSI per £100 m) - A.1 / A.2

Option	Current Rank	Target Rank	Current Costs	New costs	Change in Costs	Change in Costs
	Rank 1-6	Rank 1-6	£million, PV, 2021	£million, PV, 2021	£million, PV, 2021	%
Switch to rank 1						
A.1	5	1	1,123	259	-864	-77%
A.2	6	1	1,122	239	-883	-79%
Switch to rank 2						
A.1	5	2	1,123	597	-526	-47%
A.2	6	2	1,122	552	-570	-51%
Switch to rank 4						
A.1	5	4	1,123	755	-367	-33%
A.2	6	4	1,122	699	-423	-38%

Using weighted NSI scores (previously described in Section 4.1.3.3), under Weighting Scenario 5 (Customer Preferences), D.2 is highest scoring (19.0 NSI points per £100 m), B.4 second (7.9 NSI points per £100 m), B.5 third (4.6 points per pound) and B.2 fourth (4.5 points per £100 m).

To change the NSI per £100 m ranking of A.1 and A.2 the respective costs would have to reduce by 33-43% (to rank joint 4th), 62%-67% (to rank joint 2nd) and 84-86% (to rank joint 1st) as detailed in Table 152.

Table 152 - Sensitivity results using the customer preferences NSI weighting (Weighting Scenario 5) for switching values of Best Value Ranking 4 (NSI per £100 m) - A.1 / A.2

Option	Current Rank	Target Rank	Current Costs	New costs	Change in Costs	Change in Costs
	Rank 1-6	Rank 1-6	£million, PV, 2021	£million, PV, 2021	£million, PV, 2021	%
Switch to rank 1						
A.1	5	1	1,123	179	-944	-84%
A.2	6	1	1,122	153	-969	-86%
Switch to rank 2						
A.1	5	2	1,123	432	-691	-62%
A.2	6	2	1,122	369	-753	-67%
Switch to rank 4						
A.1	5	4	1,123	753	-370	-33%
A.2	6	4	1,122	642	-480	-43%

Test 3b: Switching values for D.2 under Best Value Ranking 4 (NSI per £100 m)

In the core results drought scenario, under Best Value Ranking 4 (NSI per £100 m of cost):

- Using unweighted NSI scores (previously described in Section 4.1.2.3), D.2 is the highest scoring Option (15.5 NSI points per £100 m), B.4 ranks second (6.7 NSI points per £100 m), B.5 ranks third (5.7 points per £100 m) and B.2 ranks fourth (5.3 points per £100 m)

To change the NSI per £100 m ranking of D.2, its cost would have to increase by 131% (to drop to 2nd / joint 1st with B.4) and 171% (to drop to 3rd / joint 2nd with B.4) as detailed in Table 153:

Table 153 - Sensitivity results using the unweighted NSI Scores (Core Weighting Scenario) for switching values of Best Value Ranking 4 (NSI per £100 m) - D.2

Option	Current Rank	Target Rank	Current Costs	New costs	Change in Costs	Change in Costs
	Rank 1-6	Rank 1-6	£million, PV, 2021	£million, PV, 2021	£million, PV, 2021	%
Switch to rank 2						
D.2	1	2	394	910	516	131%
Switch to rank 3						
D.2	1	3	394	1071	676	171%

Using weighted NSI scores (previously described in Section 4.1.3.3), under Weighting Scenario 5 (Customer Preferences), D.2 is highest scoring (19.0 NSI points per £100 m), B.4 second (7.9 NSI points per £100 m), B.5 third (4.6 points per pound) and B.2 fourth (4.5 points per £100 m).

To change the NSI per £100 m ranking of D.2, its cost would have to increase by 142% (to drop to 2nd / joint 1st with B.4) and 316% (to drop to 3rd / joint 2nd with B.4) as detailed in Table 154:

Table 154 - Sensitivity results using the customer preferences NSI weighting (Weighting Scenario 5) for switching values of Best Value Ranking 4 (NSI per £100 m) - D.2

Option	Current Rank	Target Rank	Current Costs	New costs	Change in Costs	Change in Costs
	Rank 1-6	Rank 1-6	£million, PV, 2021	£million, PV, 2021	£million, PV, 2021	%
Switch to rank 2						
D.2	1	2	394	953	559	142%
Switch to rank 3						
D.2	1	3	394	1640	1246	316%

Test 3c: Switching values for B.4 and B.5 under Best Value Ranking 4 (NSI per £100 m)

In the core results drought scenario, under Best Value Ranking 4 (NSI per £100 m of cost):

- Using unweighted NSI scores (previously described in Section 4.1.2.3), D.2 is the highest scoring Option (15.5 NSI points per £100 m), B.4 ranks second (6.7 NSI points per £100 m), B.5 ranks third (5.7 points per £100 m) and B.2 ranks fourth (5.3 points per £100 m)

To change the NSI per £100 m ranking of B.4, its cost would have to increase by 18% (to drop to 2nd / joint 1st with B.4) or for B.5 its cost would have to decrease by 15% (to drop to 3rd / joint 2nd with B.4) as detailed in Table 155:

Table 155 - Sensitivity results using the unweighted NSI Scores (Core Weighting Scenario) for switching values of Best Value Ranking 4 (NSI per £100 m) – B.4 and B.5

Option	Current Rank	Target Rank	Current Costs	New costs	Change in Costs	Change in Costs
	Rank 1-6	Rank 1-6	£million, PV, 2021	£million, PV, 2021	£million, PV, 2021	%
Switch to rank 3						
B.4	2	3	687	807	121	18%
Switch to rank 2						
B.5	3	2	930	791	-139	-15%

Using weighted NSI scores (previously described in Section 4.1.3.3), under Weighting Scenario 5 (Customer Preferences), D.2 is highest scoring (19.0 NSI points per £100 m), B.4 second (7.9 NSI points per £100 m), B.5 third (4.6 points per pound) and B.2 fourth (4.5 points per £100 m).

To change the ranking of B.4 (to move to 3rd / joint 2nd with B. 5) its cost would have to increase by 72%, or for B.5 (to move from 3rd to joint 2nd with B.4) its cost would have to reduce by 43%, as detailed in Table 156:

Table 156 - Sensitivity results using the customer preferences NSI weighting (Weighting Scenario 5) for switching values of Best Value Ranking 4 (NSI per £100 m) – B.4 and B.5

Option	Current Rank	Target Rank	Current Costs	New costs	Change in Costs	Change in Costs
	Rank 1-6	Rank 1-6	£million, PV, 2021	£million, PV, 2021	£million, PV, 2021	%
Switch to rank 3						
B.4	2	3	687	1181	494	72%
Switch to rank 2						
B.5	3	2	930	534	-396	-43%

6 Decision-Making Process

6.1 Approach

The decision-making process took the outcomes of each of the preceding evaluations of MCDA appraisal, Consenting Evaluation and assessment against the agreed WfLH Legal and Policy Requirements and Obligations and Strategic Objectives, to identify an EPO which also met the necessary levels of solution resilience.

6.1.1 Key Steps of Decision-Making Process

For information, the key steps of the decision-making process as designed are detailed in the below table.

Table 157 - Key steps of Decision Making for OAP

Key Step		Summary	Details
1	Consenting Evaluation	Quantitative rankings (based on qualitative and quantitative information) were presented with identification of key risks for consenting	See section 3 for details
2	MCDA	Quantitative and qualitative rankings under multiple scenarios and weightings were presented	See section 4 and Appendix 4 and 5 for details
3	Assessment against Legal and Policy Obligations	A RAG assessment and supporting commentary were completed against each of the Legal and Policy Obligations, with MCDA and Consenting Appraisal information providing key sources of evidence	See this section and Appendix 6 for details
4	Assessment against Strategic Objectives	A RAG assessment and supporting commentary were completed against each of the Strategic Objectives, with MCDA and Consenting Appraisal information, in addition to an evaluation of Best Value criteria as articulated by the Water Resource Planning Guidelines document, providing key sources of evidence	See this section and Appendix 6 for details
5	Business Evaluation	Collated commentary and narrative of justification, reasoning and supporting basis for the evaluation in relation to each Option. Took into account the qualitative assessment of each Option against the Legal and Policy Obligations and Strategic Objectives, the MCDA rankings, Consenting Evaluation, Future Needs Assessment, Evolution Potential Assessment and any other relevant inputs and evidence.	See this c section and Appendix 6 for details
6	Decision Recommendation	The Options were ranked from most to least preferred as part of the Business Evaluation appraisal, concluding with a formal decision of SW's EPO and Back-Up Option for recommendation at Gate 2	See this section for details

7	EPO Evolution Plan Developed	The EPO evolution plan will be developed for the EPO (and 'Back-Up Option') demonstrating how the Option will be evolved	Future work - to be provided

6.1.2 Decision-Making Process

The decision-making process was undertaken and mandated in three phases as illustrated in the below Figure. The Decision-Making Working Group (DMWG) conducted the qualitative evaluation of each Option against the agreed Strategic Objectives, providing a recommendation to the Steering Group. Following validation, the Steering Group provided a recommendation to the WfLH Executive Programme Board, prior to approval by the SW Board.

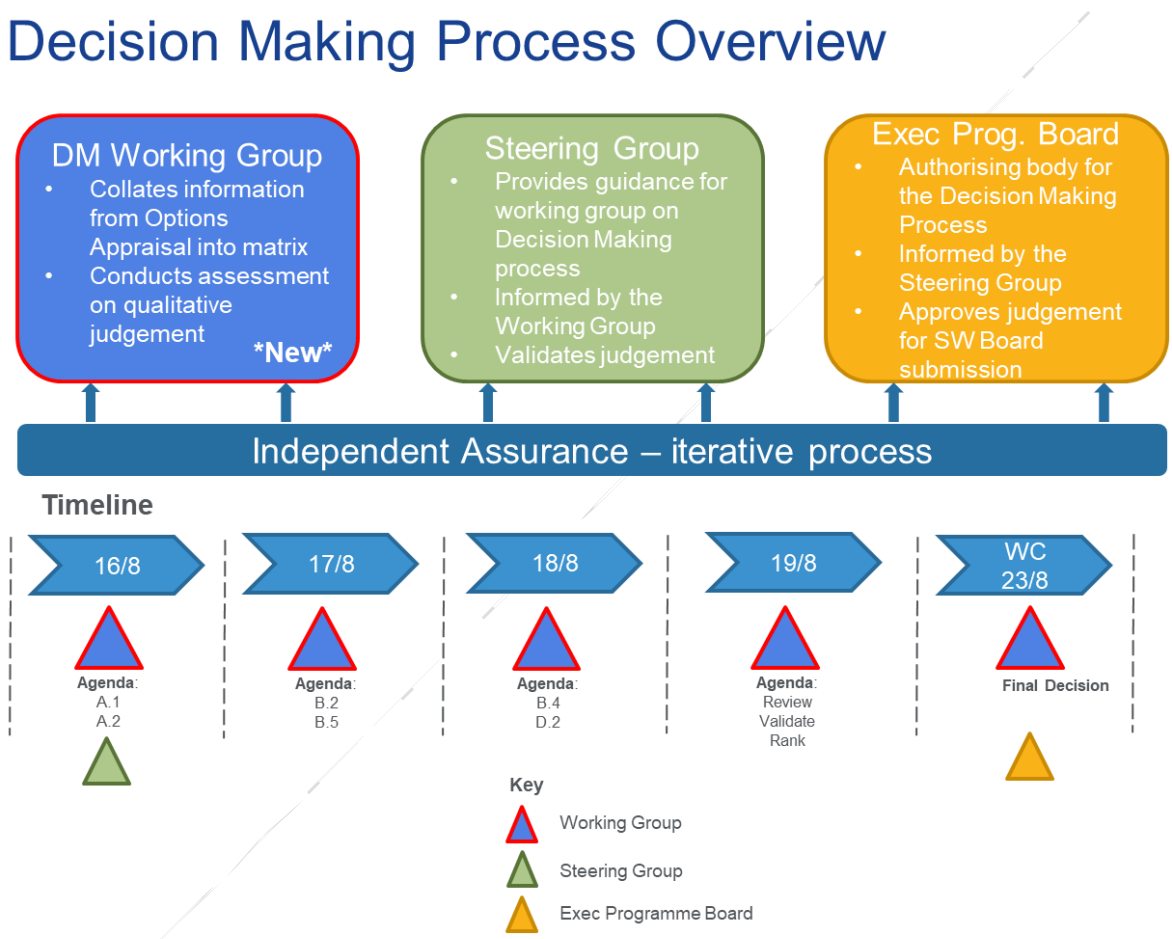

Figure 32 - Decision Making Process Overview

The DMWG was formed of suitably qualified and experienced individuals able to take a broad and balanced view and reach consensus. Evaluators were all SW staff drawn from senior roles within the WfLH programme, including from Director level. Participants were selected based upon an assessment of an individuals' capability, prior experience of similar roles, knowledge of the WfLH programme and proposed Options and, for consistency, availability to attend multiple evaluation workshops.

The DMWG comprised of the following representatives:

Table 158 - Members of the Decision-Making Working Group

Participants	Role in decision-making process
SW Director of Environment and Corporate Affairs SW Programme Design Manager - WfLH SW Head of Delivery – Strategic Projects SW Head of Corporate Strategy	Evaluators – Evaluating Option performance against the Strategic Objectives, Business Evaluation and Decision Recommendation
Programme Director	Decision Conduct Official – impartial observer
WfLH Facilitator	Workshop Facilitator – facilitating proceedings
WfLH Support	Workshop Recorder – capturing detailed evaluation notes and summaries
Environment & Planning Solicitor Senior Associate Solicitor	Legal SME – evaluation against Legal and Policy Obligations and advisory capacity
Strategic planning advisor	Planning SME – advisory capacity

Within the DMWG, only the evaluators had a decision-making mandate with the other participants attending in a facilitation, SME support and independent observer capacity.

The decision-making workshops were convened via a mixture of face to face and virtual participation sessions, focussing on evaluation of specific solution families and Options against the Strategic Objectives (see Appendix 1 for details). Three sessions were convened for Option evaluation purposes with a final session convened for Business Evaluation and decision recommendation to take forward to the WfLH Steering Group and Executive Programme Board.

The outputs and recommendations were taken to the SW Board working group, recommendations from this group and from the SW Audit and Risk committee were taken to the SW Full Board on the 21 September 2021 for formal approval.

6.1.2.1 Option Evaluation Methodology

A matrix was prepared to capture the Strategic Objective qualitative evaluation, summary narrative and RAG selection for each Option. The matrix, included in Appendix 6 was pre-populated with MCDA and consenting ranking and performance against Legal and Policy Obligation ranking RAG evaluation. The performance against Strategic Objectives and Business Evaluation were evaluated by the DMWG during the live sessions and RAG evaluated. The Strategic Objectives, definition and purpose are detailed in the following table.

Table 159 - Matrix of Option Evaluation methodology

Strategic Objective	Definition	Purpose
Best Value	SW will deliver solutions which provide the best value to its customers whilst discharging SW's "all best endeavours" legal obligation in the Section 20 agreement and all other legal and policy requirements and obligations.	To ensure a fundable plan (acceptable to Ofwat)
Net Zero Carbon	SW will deliver solutions which ensure that it can continue to make progress towards meeting, and to support and contribute to, Water UK's commitment to become net zero carbon by 2030.	To meet industry-wide commitments

Adaptability	SW will ensure that all projects within the Programme are sustainable by being flexible and adaptable, including in terms of their: 1. Capacity and scalability 2. Ability to contribute to strategic reinforcement of the regional and national network 3. Ability to rely on appropriate transitional measures to manage risks around delivery timescales, and 4. Ability to allow for technological innovation	To ensure suitability to meeting long term water supply requirements and therefore sustainability of supply

The information, relied upon to inform the Legal and Policy Obligation and Strategic Objective evaluation, is summarised in the following table.

Table 160 - Information used to inform Legal and Policy Obligation and Strategic Objectives

Obligation / Objective	Evidence Base
Legal and Policy Obligations (evaluation undertaken in advance of final decision workshop by legal team)	• Gate 2 submission – draft Annex 4: Water Resources Modelling (v0.8) • Current SRO Delivery Schedules • Information in RAPID Priority Action response dated 26 July 2021 regarding alternative interim measures • Draft Consenting Evaluation slides 12th August 2021
Best Value* Strategic Objective	• Current SRO Delivery Schedules • Draft Consenting Evaluation slides 12th August 2021 • Draft MCDA Results • Solution Evolution Assessments • Legal and Policy Obligation Assessments • Option evaluation against Water Resource Planning Guidelines definition of Best Value
Net Zero Carbon Strategic Objective	• Analysis in relation to carbon in the Consenting Evaluation • The full scheme description of each Option • Any detail of how the solution took into account carbon commitments Consideration was also given to whether any of the Options include measures such as: • Greater water efficiency • Buying green energy • Generating renewable energy • Planting trees • Restoring peatland
Adaptability Strategic Objective	• Solution Evolution summary output • Evolvability of Supply workshop output • Scalability of Supply workshop output (see Appendix 7 for outputs)

*The application of the term 'Best Value' in this table is in relation to the Strategic Objective as opposed to MCDA.

6.1.2.1.1 Best Value (Strategic Objective)

The term ‘Best Value’ is used in multiple locations within this document, both in relation to the quantitative MCDA / economic evaluation (see section 4) and the holistic and largely qualitative Strategic Objective evaluation (this section).

The WRPG sets out the requirements in relation to ‘Best Value’ and as a precursor to the Strategic Objective RAG evaluation, an exercise was undertaken to evaluate each Option against the WRPG definition of ‘best value’. The evidence base recorded from this evaluation was then used as an important reference point when evaluating against the Strategic Objectives (see Appendix 1 for Strategic Objective details, including how they were developed).

6.1.2.1.2 Required outcomes from the OAP

The primary purpose of the OAP was to use the basis of evidence gathered to date to allow the evaluation team to identify, from those Options carried forward at Gate 1, the EPO to carry forward to the pre-planning stage, and identify the least Preferred Option(s) to eliminate. The OAP undertook to evaluate against the Legal and Planning Obligations and Strategic Objectives, as detailed in the above Table 160, to reach this considered conclusion.

The EPO has been developed in order to meet a SW only need in 1-in-200-year drought. As part of a Future Needs Assessment, the EPO and Back-Up Options (B.2 / B.5) will be subjected to further testing and the OAP conclusions will be updated against the emerging 1-in-500-year drought resilience needed for the region in the context of anticipated sustainability reductions. A Preferred Option will then be identified to progress beyond Gate 2. For more information on this please see the Interim Update Activity Plan to Gate 2.

WRMP19 put forward strategic Options, based around water recycling, that could be developed in parallel with desalination (i.e., a Back-Up Option). SW continued this approach and the decision-making process asked for consideration of whether proposing a Back-Up Option was appropriate in the present situation and if so, what was the Back-Up Option?

As a programme risk mitigation measure it was determined that it would be prudent to select a Back-Up Option, in addition to an EPO, for a period of time until planning, consenting and delivery risks are matured. For an Option to act as a viable Back-Up, it must be consentable and provide capability for:

- A sufficient differentiation in routes and infrastructure (to mitigate against consenting or delivery issues)
- An alternative environmental buffer to HTR (should insurmountable difficulties arises with the reservoir)

6.2 Outcomes

As noted in section 5.1.3.1, all Options were qualitatively assessed and RAG evaluated against the agreed Legal and Policy Obligations and Strategic Objectives, drawing on a range of evidence material including MCDA and Consenting analysis. The evaluators then reviewed the range of evidence available to them as a precursor to arriving at a well-reasoned and justified Option ranking, making a comparative analysis of each Option against one another (full details and completed RAG matrices for each Option are included in Appendix 6). The evaluation process identified:

1. An EPO for progression to Gate 2
2. Maintaining viability of Back-Up Option to Gate 2
3. Any Options to be paused or not progressed past Gate 2

The RAG rating for the assessment of the Options against each Strategic Objective included in the following results was defined as follows:

- **RED**: based on the available information the Option does not meet and would not be expected to meet the relevant Strategic Objective
- **AMBER**: based on the available information there is a risk that the Option may not meet or may not fully meet the relevant Strategic Objective or that significant known or expected barriers would need to be overcome in order for it to meet or fully meet the relevant Strategic Objective
- **GREEN:** based on the available information the Option is considered to mainly or fully meet the Strategic Objective

From the perspective of meeting the requirements of WRMP19 i.e., a 1-in-200-year drought and assuming that all other parts of the programme deliver on target, a high-level summary of the outcome of this exercise is detailed in the below table. The overall ranking criteria was derived by comparing the relative performance of each Option under the evaluation lenses presented.

Table 161 - High level summary of outcome

Options	Consenting Evaluation *	Typical MCDA Ranking**	Legal Obligations	Strategic Objectives			Overall Ranking
				Best Value	Net Zero Carbon	Adaptability	
D.2	G	1	A	G	A	G	1
B.4	A	2	A	A	A	G	2
B.2	A	3	A	A	A	A	3
B.5	A	3	A	A	A	A	4
A.1	R	=5	R	R	A	A	=5
A.2	R	=5	R	R	A	A	=5

*Undertaken for original Supply Demand Deficit of 51 Ml/d
**Undertaken for original Supply Demand Deficit of 51 Ml/d. A 'typical' MCDA ranking has been shown, reflecting the typical ranking of each Option under the various MCDA lenses.

In summary, the DMWG concluded that in respect of meeting the requirements of WRMP19, and assuming all other parts of the programme deliver on target:

1. Options D.2 and B.4 were ranked 1st and 2nd respectively, with Option D.2 considered the most favourable Option to address the WRMP19 challenge on account of its lowest CAPEX. Options D.2 and B.4 are also considered the most adaptable and able to meet future needs, on account of the flexibility and evolvability afforded by their integration with HTR (which is unique to these Options).
2. Options B.2 and B.5 were ranked 3rd and 4th respectively, with neither Option being evaluated as favourably under the Adaptability lens as Options D.2 and B.4
3. Neither Option A.1 nor A.2 are regarded as consentable in this location at this time, on the basis that an Imperative Reasons of Overriding Public Interest (IROPI) case would need to be made and, on the basis that there are better performing Options available, this would not be supported. These Options were therefore ranked the joint 5th and least favoured Options, and it is recommended that they should not be progressed beyond Gate 2.

A more detailed business evaluation narrative for each Option is included in section 6.2.1, below.

The ranking outlined above assumes a supply-demand balance deficit of 51 Ml/d, incorporating a number of supply and demand elements, and it has been identified that assumptions around some elements may be open to challenge (for further details see Section 4.2 of Annex 4, Water Resources Modelling).These include bulk transfer imports and exports, leakage and demand reduction solution and sustainability reductions in supply works abstractions (influenced by work being undertaken on river flow predictions and their effect on river ecology). When re-calculated to incorporate those elements most at risk into the supply-demand balance, the revised residual deficit is 87 Ml/d, and this is considered most likely to inform the required capacity of the strategic new supply source.

When the need to meet a revised residual deficit of 87 Ml/d is applied to the Options evaluated as part of the decision-making process, the overall ranking is revised as detailed in the below table.

Table 162 - Revised ranking to meet the revised residual deficit

Options	Legal Obligations	Strategic Objectives			Overall Ranking	Resolves Revised 87 Ml/d Deficit?
		Best Value	Net Zero Carbon	Adaptability		
B.4	A	A	A	G	1	✓
B.5	A	A	A	A	2	✓
B.2	A	A	A	A	3	✓
D.2[1]	A	G	A	G	=6	×
A.1[2]	R	R	A	A	=6	✓
A.2[2]	R	R	A	A	=6	✓

[1]Option D.2 not capable of resolving revised 87 Ml/d deficit alone, therefore ranked joint 6th
[2]Options A.1 and A.2 remain not consentable in this location at this time, therefore ranked joint 6th

The 'Resolves Revised 87 Ml/d Deficit' column in the above able demonstrates that Option D.2 cannot meet this challenge alone and is therefore re-evaluated as joint least favourable Option, alongside A.1 and A.2. Whilst Options A.1 and A.2 can theoretically meet the revised residual deficit target, both Options remain not consentable in this location at this time. As such, only Options B.4; B.5 and B.2 are regarded as viable Options to meet an 87 Ml/d demand and of these Options, Option B.4 is evaluated as the most preferable Option. Option B.4 is regarded as more favoured than Options B.2 and B.5 on account of its flexibility and evolvability afforded by its integration with HTR.

SW will, subject to the availability of information, revisit the ranking for the Consenting Evaluation and MCDA rankings to test the performance of the EPO and the EBU against the 87 Ml/d deficit, and will further report on this as part of our Gate 2 submission.

6.2.1 Business Evaluation Narrative

This section gives a brief description of the reasons for the rankings shown in the table above, grouped by solution type. See Appendix 6 for details of the Strategic Objective RAG evaluation and narrative for all Options.

6.2.1.1 Desalination

6.2.1.1.1 Option A.1 (ranked joint 6th of 6)

Option A.1 was considered the joint least preferable Option by the DMWG for the following reasons:

- Based on the information currently available and taking into account the stage of Solution development, this Option is not considered consentable in this location and at this time, on the basis that an IROPI case would need to be made, and there are other better performing Options available, which would mean that an IROPI case could not be supported
- This Option carries the joint longest construction and commissioning duration and therefore does not provide 'as little recourse as reasonably possible' to using Drought Orders and Drought Permits to maintain compliance with SW's supply obligations. This would result in the prolonged use of interim measures, thus driving cost inflation.
- This Option carries the highest WLC forecasts and, relative to the other Options under consideration, a high energy burden
- Desalination is not considered easily scalable due to the fixed nature of its associated infrastructure. Marine intakes, which are both challenging to construct and consent, are sized for a specific capacity, as is receiving pipework. Whilst it is possible to scale the desalination process itself, this would be subject to land availability, supporting infrastructure capacity (including power requirements) and the viability of consenting additional brine discharge into a sensitive marine environment, which is already considered extremely challenging.

The DMWG does recognise Option A.1 to be resilient owing to the fact that its raw source is effectively infinite, and it is a water supply works in its own right and is therefore not as reliant on treatment via an existing asset.

6.2.1.1.2 Option A.2 (ranked joint 6th of 6)

Option A.2 was evaluated to be the joint least preferable Option for the same reasons as outlined for Option A.1. Option A.2 has a smaller capacity and is therefore very marginally lower cost from a WLC perspective but is also marginally less resilient for the same reason.

6.2.1.2 Water Recycling

6.2.1.2.1 Option B.2 (ranked 3rd of 6)

When considered from the perspective of meeting the requirements of WRMP19 (i.e., a 1-in-200-year drought) and assuming that all other parts of the programme deliver on target, Option B.2 was evaluated as the third most preferable Option by the DMWG for the following reasons:

- Based on the information currently available this Option is considered to carry a marginally higher consenting risk than Option B.4, owing to a new environmental buffer is required, but considerably lower than that of Options A.1 and A.2
- This Option carries the joint longest construction and commissioning duration and therefore does not provide 'as little recourse as reasonably possible' to using Drought Orders and Drought Permits to maintain compliance with SW's supply obligations. This would result in the prolonged use of interim measures, thus driving cost inflation.
- This Option carries the third lowest WLC forecasts and, relative to desalination, a low energy burden
- This Option was evaluated as marginally less impactful from an environmental perspective than Option B.5 due to its marginally smaller footprint

- In the event that other parts of the WfLH programme do not deliver on target, Option B.2 can provide the additional resource resilience and flexibility to accommodate this shortfall however, on balance, is not considered as adaptable than Option B.4

6.2.1.2.2 Option B.5 (ranked 2nd of 6)

When considered from the perspective of meeting the requirements of WRMP19 (i.e., a 1-in-200-year drought) and assuming that all other parts of the programme deliver on target, Option B.5 was evaluated as the fourth most preferable Option, behind B.2, due its relatively larger associated costs and environmental impact. However, should delivery risks be realised within the programme and a greater DO required from the Option, then Option B.5 is elevated to the second most preferable Option, owing to its larger capacity and ability to absorb wider programme shortfalls.

6.2.1.3 Havant Thicket Alternatives

6.2.1.3.1 Option D.2 (ranked joint 6th of 6)

When considered from the perspective of meeting the requirements of WRMP19 (i.e., a 1-in-200-year drought) and assuming that all other parts of the programme deliver on target, Option D.2 was evaluated as the most preferable Option by the DMWG for the following reasons:

- Based on the information currently available this Option is considered to carry the fewest risks from the perspective of consentability
- This Option carries the joint shortest construction and commissioning duration and therefore provides 'as little recourse as reasonably possible' to using Drought Orders and Drought Permits to maintain compliance with SW's supply obligations. This reduces reliance on the prolonged use of interim measures, thus driving down costs.
- This Option carries the lowest WLC forecasts and, relative to the other Options under consideration, a low energy burden
- This Option was the highest ranked under the adaptability Strategic Objective as it is a fundamental enabler for Option B.4 and the further development of HTR as a water resource asset that can potentially meet SW and PW's future needs

The DMWG does however recognise that Option D.2 cannot, by itself, replace the loss or shortfall in delivery of other parts of the programme in the event that they do not deliver on target. This is due to its reliance on the finite volume of raw water held by HTR.

6.2.1.3.2 Option B.4 (ranked 1st of 6)

Option B.4 is representative of Option D.2 with the addition of a 15 Ml/d water recycling plant 'topping up' Havant Thicket. When considered from the perspective of meeting the requirements of WRMP19 (i.e., a 1-in-200-year drought) and assuming that all other parts of the programme deliver on target, Option B.4 was evaluated as the second most preferable Option by the DMWG for the following reasons:

- Based on the information currently available this Option is considered to carry a marginally higher consenting risk than Option D.2, but lower than Option B.2 and B.5 owing to the fact that a new environmental buffer is not required, and considerably lower than that of Options A.1 and A.2
- This Option carries the joint shortest construction and commissioning duration and therefore provides 'as little recourse as reasonably possible' to using Drought Orders and Drought Permits to maintain compliance with SW's supply obligations. This reduces reliance on the prolonged use of interim measures, thus driving down costs.

- This Option carries the second lowest WLC forecasts and, relative to desalination, a low energy burden
- This Option builds on Option D.2 and is a fundamental enabler to the further development of HTR as a water resource asset that can potentially meet SW and PW's future needs

However, in the probable event that other parts of the WfLH programme do not deliver on target, Option B.4 provides the additional resource resilience and flexibility to accommodate this shortfall and when the need to meet a revised residual deficit of 87 Ml/d is considered, Option B.4 is evaluated on the information available at this stage as the most preferable Option.

7 Conclusion and Recommendations

7.1 Conclusion

7.1.1 Introduction

SW concludes that the EPO, identified as part of the OAP, is sufficiently robust to justify altering the largest component of the WRMP19 Preferred Strategy for West Hampshire. This is in the context of meeting a drought with a return period of 1-in-200-years.

However, SW has considered its Strategic Objectives for the Options carefully and recognises an issue in the WRSE developing a plan to deliver resilient water resources for the South East for a 1-in-500-year drought event.

In addition, there are risks that have emerged to the WfLH programme since publication in December 2019 of our WRMP. If other parts of the Preferred Strategy do not deliver the full capacity required, a higher capacity Option would be required.

The decision-making process has taken both issues into account and hence has indicated a preference for an EPO with a larger capacity than that set out in WRMP19 (refer to Annex 4 of the Gate 2 submission). Further work will be undertaken as part of a Future Needs Assessment to test the identification of the EPO and identify a Selection Option to take forward past Gate 2.

7.1.2 Outcomes based on Known Supply Risks at WRMP19

The OAP outcome, for ‘mitigation against known risks’, is based on the starting point of WRMP19. This stated that the SDB deficit could be resolved with a 75 Ml/d Option (allowing for 30 Ml/d surplus as a contingency).

The WRMP19 deficit, of 192 Ml/d as modelled originally, could be exactly satisfied by an Option of 51 Ml/d (if all other parts of the programme delivered on target as per WRMP19).[36]

[36] See Water Resource Modelling Annex 4 for a description of the difference between the stated surplus of c.30 Ml/d at a capacity of 75 Ml/d, and the 51 Ml/d minimum requirement, essentially because the water resource modelling arrives at a similar result to WRMP19, but with some updated technical inputs.

Table 163 - Required capacity of Options to meet the recalculated Supply-Demand-Balance (SDB) deficit

Residual Deficit	Option A.1 / A.2		Option B.2 / B.5		Option B.4		Option D.2	
	Resolves SDB Deficit?	Required Capacity (Ml/d)	Resolves SDB Deficit?	Required Capacity (Ml/d)	Resolves SDB Deficit?	Required Capacity (Ml/d)	Resolves SDB Deficit?	Required Capacity (Ml/d)
Recalculated 51 Ml/d	☑	51	☑	51	☑	51*	☑	51

* - 51 Ml/d can be supplied by the HTR alone, there is no need for any additional capacity from a WRP.

The decision-making process then considered:

- What is the EPO for continuation to Gate 2; and
- Whether to select a 'Back-Up' Option, and if so, what it would be

The conclusions of the decision-making process are detailed in Table 164 and Table 165 below.

Table 164 - Headline conclusions of the decision-making process

Headline conclusions: Consenting	Headline conclusions: Best Value (MCDA)
D.2 – Ranked highest in the Consenting Evaluation B.4 – Fewer consenting risks than B.2 and B.5 due to no need for Otterbourne EBL since this Option uses Havant Thicket for mixing B.2 and B.5 – Consenting risks remain in relation to Otterbourne EBL, that need to be worked through A.1 and A.2 – Not likely to be consentable at this location, at this time	D.2 - consistently ranks highest B.4 - most frequently ranking higher than other remaining Options A.1 and A.2 - consistently ranks lowest of all Options

Table 165 - OAP ranking, based on known supply risks at WRMP19 and considering a 1-in-200-year drought event

Overall Rank	Option
1	D.2
2	B.4
3	B.2
4	B.5
5	A.1 and A.2

7.1.3 Outcomes based on Emerging Supply Risks

There are now emerging risks to the S20 supply programme that have been identified, such as:

- A new bulk supply transfer from SWW of 20 Ml/d confirmed as no longer available
- A new bulk supply from PW that is assumed to deliver 4 Ml/d less than in the Preferred Strategy
- Demand reduction measures are assumed to deliver 12 Ml/d less than in the Preferred Strategy

SW has decided on an approach which involves taking these issues and risks into account and as a result, the component of the SDB to be met by the Option has increased from 51 Ml/d to 87 Ml/d.[37]

Table 166 below details whether each Option could be expanded to meet the higher requirement.

Table 166 - Required capacity of Options to meet the recalculated SDB deficit and the known risks

Residual Deficit	Option A.1 / A.2		Option B.2 / B.5		Option B.4		Option D.2	
	Resolves SDB Deficit?	Required Capacity (Ml/d)	Resolves SDB Deficit?	Required Capacity (Ml/d)	Resolves SDB Deficit?	Required Capacity (Ml/d)	Resolves SDB Deficit?	Required Capacity (Ml/d)
Revised for known risks	☑	87	☑	87	☑	87*	☒	N/A

* - includes a 15 Ml/d supply from the WRP

Each of the Options has been tested against its ability to meet a capacity of up to 87 Ml/d in a 1-in-200-year drought event.

The only Option which could not be scaled to meet the new deficit is D.2, the direct pipe to the reservoir. Modelling has shown that there is insufficient water in the reservoir to survive the forecast profile of a 1-in-200-year drought if the water is drawn down at up to 87 Ml/d (refer to Annex 4 Water Resource Modelling).

B.4 is the only Option which could meet this higher need as designed now, without any further change. This Option is also the one that has the most potential, if adapted, to meet the needs of SW and PW.

A.1, A.2, B.2 and B.5 could meet this capacity by increasing the capacity in the design, but these variously have associated increases in cost and environmental impacts.

SW has decided it is prudent to address the issues and risks to the S20 supply programme identified above and to seek additional flexibility and resilience. The decision process was repeated on the new basis and produced a revised ranking, as shown below.

Table 167 - Ranking based upon decision to mitigate against known risks and potential future supply requirements

Revised Rank	Option
1	B.4
2	B.5
3	B.2
n/a	D.2
n/a	A.1 and A.2

[37] 51+20+4+12 = 87 Ml/d

In summary, Option B.4 (the same features as D.2 with the addition of a 15 Ml/d WRP), is identified as the EPO, as it is the least cost and best ranking Option of all those that are capable of being scaled up to meet the higher capacity requirement.

7.2 Addressing 1-in-500-year Drought Needs and Regional Resilience

During preparation towards Gate 2 SW has considered the possibilities of incorporating the needs of both PW and SW into the accelerated gated process, to have access to resilient water supplies in an extreme drought (for greater than a 1-in-200-year return period).

SW has assessed to the extent possible what the capacities might need to be for PW and SW, anticipating the outcome of the work being carried out for the Regional Plan by WRSE. Additional needs are driven by the nationwide move to plan for a 1-in-500-year drought, further sustainability reductions and environmental direction and destination. In accordance with the Strategic Objective for adaptability, SW assessed each of the Options against potential to meet these future needs. These additional needs, identified by WRSE through the Regional Planning process, are not yet fully established and uncertainty remains about their magnitude; that uncertainty is due to be resolved in 2022. The investigations conducted to date are preliminary and will be subject to further development for SW's Gate 2 submissions, however, not all these issues will be resolved with certainty by then. Crucially, at Gate 2 SW will have to specify the capacity of the Preferred Option on the basis of the best available information at that time.

In summary, SW's conclusions to date indicate that B.4 has the most potential to be adapted to meet some of the needs described above, for example:

- Based on work undertaken to date SW currently believes that Option B.4 has the most potential to meet the following needs: it is in the right location to support both SW and PW customer needs with the shortest possible additional distances for transporting water
- The needs of PW can be readily addressed by adding a junction to the pipe between the reservoir and Otterbourne treatment works
- The WRP could be scaled up now to meet higher maximum DOs, and / or sustain a given level of output through a more extreme drought, and
- Alternatively, the WRP could be constructed in a modular way so that future capacity increases could be added once the future need is more firmly established

Further work will be carried out between the Interim Update and Gate 2 submission, for more details please see the Interim Update – Activity plan to Gate 2.

7.3 Back-Up Option

SW decided that it would be prudent to select a Back-Up Option, in addition to an EPO. For an Option to act as a viable Back-Up Option, it must be considered consentable and provide capability for:

- A sufficient differentiation in routes and infrastructure (to mitigate against consenting or delivery issues) and / or
- An alternative environmental buffer to HTR (should insurmountable difficulties arises with the reservoir)

Using these criteria, SW summarises that:

- Options A.1 and A.2 are likely to be non-consentable, at this location and this time, and will not be progressed further at this time

- Options B.2 and B.5 are currently use similar routes to B.4 and D.2 pipeline routes and would also rely on the Otterbourne treatment works but importantly do not rely on the delivery of HTR
- Options D.2 and B.4 share the route to Otterbourne WSW. Options B.2 and B.5 do not use the reservoir and could take a different route to Otterbourne WSW.

Options B.2 and B.5 have been selected as the Emerging Back-Up Options for further investigation and development from now onwards.

Further work will be carried out between the Interim Update and Gate 2 submission, for more details please see the Interim Update – Activity Plan to Gate 2.

Appendix 1. Strategic Objectives – Interim and Updated

Development of Strategic Objectives

This section describes the origin and intent behind the Legal and Policy Obligations and Strategic Objectives.

Initial Objective Drafting and Engagement

In Q4, 2020 the WfLH programme team drafted twelve Strategic Objectives, including summary and detailed descriptions of each. Summary objective details are included below.

Table 168 - WfLH Strategic Objectives 2020

Objective	Summary Description
Supply Duty	SW will ensure that SW can continue to meet our supply obligation under section 37 of the Water Industry Act 1991.
Drought Permit / Orders	SW will work with the EA and NE to ensure that SW are “application ready” in accordance with the Section 20 Agreement and meet any reasonable conditions expected in Drought Permits and orders for the Rivers Test and Itchen and the Candover boreholes.
Environmental & habitats protection	SW will ensure that the solution is compliant with the Habitats Directive and relevant UK legislation regarding protection and conservation of habitats and the environment.
Section 20	SW will ensure compliance with the Section 20 agreement between SW and the Environment Agency, namely, to use ‘all best endeavours’ to implement the long-term scheme for alternative water resources set out in WRMP19.
Use of Drought Orders	SW will ensure that SW have as little recourse as reasonably possible to resorting to the use of Drought Orders / permits in maintaining our supply obligation. In any event, SW will not seek to rely on Itchen and / or Candover DOs post 2028/29 and Test DO / DP only in extreme events after this date
Water Framework Directive	SW are aware of the Water Framework Directive driver behind the 2027 deadline and will ensure this is taken into account in our decision making.
Biodiversity Net Gain & Environmental Net Gain	SW will ensure that biodiversity and / or environmental net gain is built into the programme as appropriate in line with legal and policy requirements.
Draft National Policy Statement (dNPS)	SW will meet any other key requirements, which is likely to include, for example climate change adaptation, from the dNPS.
Environmental Bill	SW will track the progress of the Environment Bill and ensure that it takes account of Environmental Improvement Plans and other relevant provisions.
Net Zero Carbon	SW will ensure that SW can continue to progress against our commitment to support Water UK’s Net Zero commitment to become carbon neutral by 2030.
Criteria for "Good Design"	SW will comply with the criteria for "Good Design" for water resources infrastructure in the draft National Policy Statement for Water Resources Infrastructure (dNPSWRI).
Best Value	SW will deliver ‘Best Value for customers’ in the context of the section 20 all best endeavours obligation.

Adaptability	SW will ensure that projects within the Programme are flexible and adaptable, including in terms of their capacity, scalability, and ability to rely on appropriate transitional measures to manage risks around delivery timescales.

Following initial drafting of the objectives, they were shared with RAPID and Defra for comment and input in December 2020, with the wording of some of the objectives changed to take onboard the feedback received and also to update them. SW Executive and SW Board discussions led to the addition of a further objective, related to adaptability, specifically regarding the ability of the Options being appraised to be flexible in how they could meet any changes in future supply requirements.

Southern Water Senior Leadership Team (SLT) Engagement

Following engagement with RAPID and Defra, the thirteen objectives were presented at an SLT workshop, with specific consideration given to the nature and role of the objectives. Workshop discussion noted that many of the objectives followed a legal obligation theme as opposed to a more strategic purpose, with eight of the thirteen WfLH objectives identified as being more orientated around legal & policy requirements and obligations. The remaining five objectives remained as Strategic Objectives.

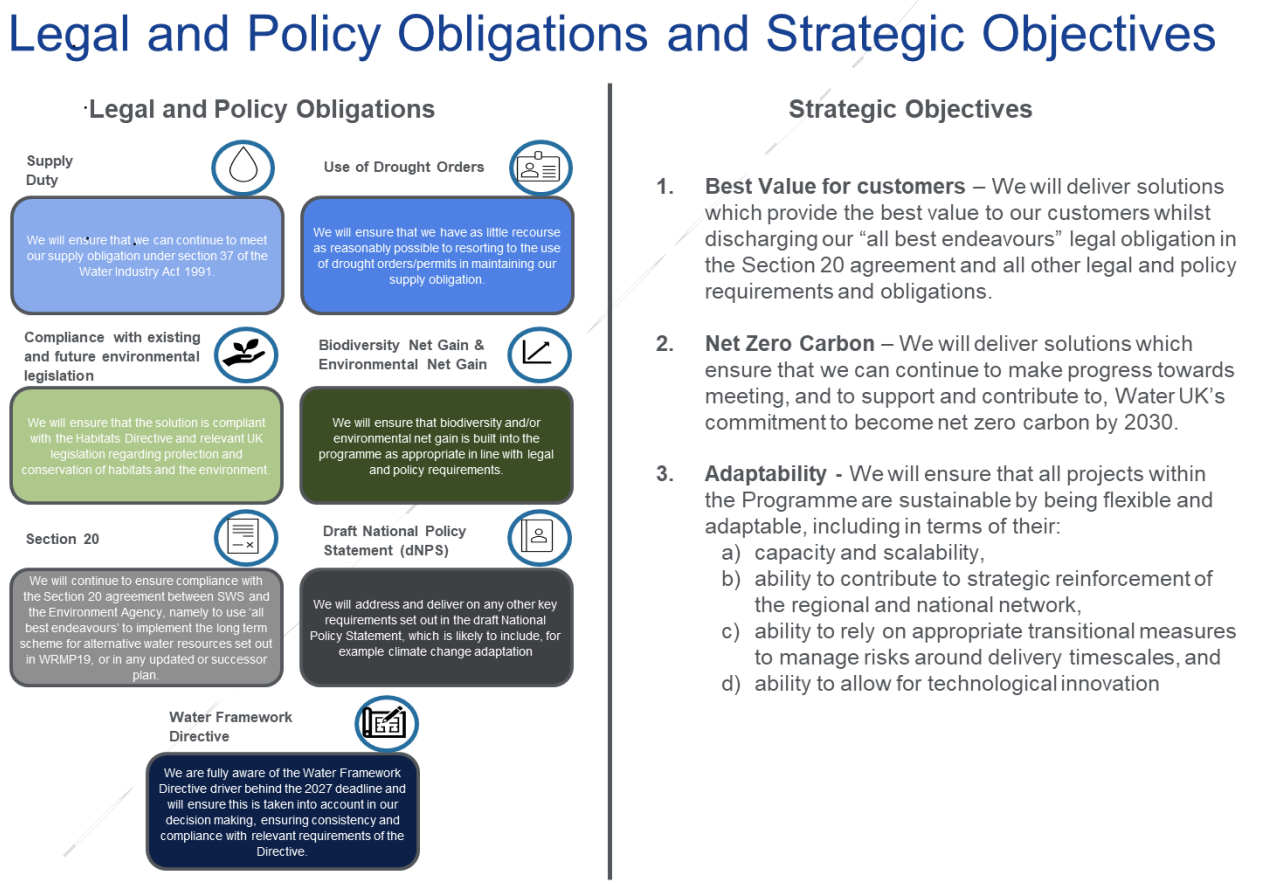

Figure 33 – WfLH Rationalised Strategic Objectives

Rationalising the Strategic Objectives

The Strategic Objectives were then reviewed in greater detail during a follow-up SLT workshop and further enhancement and rationalisation of the Strategic Objectives was considered. Following the split of objectives between Legal and Policy Requirements and Obligations and Strategic Objectives, the Strategic Objectives

were then reviewed in greater detail with further enhancement and rationalisation of the Strategic Objectives considered.

This led to the number of Strategic Objectives being reduced from five to three, although coverage of all the issues by the original five has been maintained. Mapping between the rationalisation of objectives is detailed in Table 169 and the resulting seven Legal and Policy Obligations and three Strategic Objectives are illustrated in Figure 33 above.

Table 169 - Mapping of Strategic Objectives

Initially Developed Strategic Objectives	Rationalised and Enhanced Strategic Objectives
Environment Bill	Net Zero Carbon
Net Zero Carbon	
Criteria for Good Design	Best Value
Best Value	
Adaptability	Adaptability

WfLH Sub-Board Working Group Approval

Following the split of objectives, between Legal and Policy Requirements and Obligations and Strategic Objectives, approval was sought by the SW Working Group on 21 July 2021. It was noted that having fewer and broader Strategic Objectives, which aligned with the SW strategy, were more appropriate for the WfLH programme. The objectives (as seen in Table 169) under 'Rationalised and Enhanced Strategic Objectives' were approved in principle.

Options Appraisal

In preparation for the decision-making stage of the OAP the Legal and Policy Requirements and Obligations and Strategic Objectives went through some revisions to ensure that they were measurable and achievable in the context of their use for the appraisal of each Option. The approved wording of the Legal and Policy Requirements and Obligations and Strategic Objectives is set out below.

Table 170 - Legal and Policy Requirements and Obligations and Strategic Objectives

No.	Name	Detail	Nature / Purpose
Legal and Policy Requirements and Obligations			
1	Supply Duty	SW will ensure that SW can continue to meet our supply obligation under section 37 of the Water Industry Act 1991 (WIA91).	Statutory obligation (s.37 WIA91)
2	Use of Drought Orders and Drought Permits	SW will ensure that SW have as little recourse as reasonably possible to resorting to the use of Drought Orders and Drought Permits in maintaining our supply obligation. SW will work with the EA and NE to ensure that SW are minimising our need to rely on Drought Orders and Drought Permits and are 'application ready' in accordance with the Section 20 Agreement and will meet any reasonable conditions	Legal obligation Section 20 agreement To take account of the sustainability reductions on the rivers Test and Itchen imposed by the EA in March 2019

No.	Name	Detail	Nature / Purpose
		included in the Drought Permits and orders for the rivers Test and Itchen and the Candover stream.	To reduce the environmental impact of abstraction on the rivers Test and Itchen and Candover stream
3	Water Framework Directive	SW are fully aware of the Water Framework Directive driver behind the 2027 deadline and will ensure this is taken fully into account in our decision-making, ensuring consistency and compliance with relevant requirements of the Directive.	Legal obligation Section 20 agreement
4	Compliance with existing and future environmental legislation	SW will ensure that the chosen solutions are compliant with the Habitats Directive and relevant UK legislation regarding protection and conservation of habitats and the environment. SW will track the progress of the Environment Bill and ensure that the Programme takes account of environmental principles, Environmental Improvement Plans and other relevant provisions.	Legal obligation – relevant UK legislation regarding protection and conservation of habitats and the environment
5	Section 20 agreement	SW will continue to ensure compliance with the S20 Agreement between SW and the Environment Agency dated 29 March 2018, namely, to use 'all best endeavours' to implement the long-term scheme for alternative water resources set out in WRMP19 or in any updated or successor plan.	Section 20 agreement Confidence in delivery
6	Biodiversity Net Gain and Wider Environmental Net Gain	SW will ensure that biodiversity and where appropriate wider environmental net gain are built into the Programme in line with legal and policy requirements.	Legal and Policy Obligation
7	Draft National Policy Statement for Water Resources Infrastructure (dNPSWRI)	SW will address and deliver on any other key requirements set out in the draft dNPSWRI and once designated, the NPSWRI. These are likely to include, for example, requirements in relation to climate change adaptation.	Legal and Policy Obligation
Strategic Objectives			
8	Best Value	SW will deliver solutions which provide the best value to our customers whilst discharging our "all best endeavours" legal obligation in the Section 20 agreement and all other legal and policy requirements and obligations.	To ensure a fundable plan (acceptable to Ofwat)
9	Net Zero Carbon	SW will deliver solutions which ensure that SW can continue to make progress towards meeting, and to support and contribute to, Water UK's commitment to become net zero carbon by 2030.	To meet industry-wide commitments
10	Adaptability	SW will ensure that all projects within the Programme are sustainable by being flexible and adaptable, including in terms of their: • capacity and scalability • ability to contribute to strategic reinforcement of the regional and national network	To ensure suitability to meeting long term water supply requirements and therefore sustainability of supply

No.	Name	Detail	Nature / Purpose
		• ability to rely on appropriate transitional measures to manage risks around delivery timescales, and • ability to allow for technological innovation	

Appendix 2. Guidance Used to Develop MCDA

HMT Green Book Supplementary Guidance:

- HMT Green Book Supplementary Guidance: MCDA (2013)
- HMT Green Book Supplementary Guidance: Discounting (2013)
- HMT Green Book Supplementary Guidance: OB (2013)
- HMT Green Book supplementary guidance: Environment (2020)
- HMT Green Book Supplementary Guidance: Valuation of energy use and greenhouse gas emissions for appraisal (2019)

Environment Departmental Guidance (Defra / EA):

- Flood and Coastal Erosion Risk Management (FCERM) appraisal guidance (EA, 2010)
- ENCA Guidance Natural Capital Register and Account (Defra, 2020)
- Air quality appraisal: damage cost guidance (Defra, 2021)
- Noise pollution: economic analysis guidance (Defra, 2014)
- Updating the National Water Environment Benefit Survey (NWEBS) values: summary of the peer review (EA, 2013)

Energy, Transport and Environment Departmental Guidance (DfT / BEIS)

- Carbon Valuation (BEIS, 2019)
- Transport Appraisal Guidance: Unit A3 Environmental Impact Appraisal (DfT, 2021)
- Valuation of Landscape Impacts of Transport Interventions & Mitigations Using an Ecosystem Services Approach (DfT, 2019)

Economic Resilience Guidance (CO)

- Keeping the Country Running: Natural Hazards and Infrastructure (Cabinet Office, 2011)

Appendix 3. Impact Assessment Description

Below SW outlines the different assessments that were undertaken for the MCDA. The consequences of the Options were considered under both a (i) BAU Scenario and (ii) Severe Drought Scenario (both against a 'Do Nothing') scenario, as outlined in the main annex.

Table 171 – Impact assessment description

Sub-criteria No.	Sub-criteria name	Cluster criterion	Basis of assessment	Scope of assessment	Key evidence sources informing the impact assessment
C.01	**Tap water quality**	Customer	Qualitative	Qualitative assessment undertaken by SW SMEs of the potential change in the tap water quality received by customers following the introduction of the Option, relative to the current quality levels that are experienced by customers. The potential change in quality is based on both the *expected actual change* resulting from the Option's water supply, as well as the *potential perceived change* in quality based on customer perceptions of the Option. Tap water quality is assumed to comprise a combination of taste (e.g., metallic), smell and appearance (e.g., colour / cloudiness), which are influenced by: (i) the characteristics of the Option's infrastructure used to transport/ treat water; (ii) the chemical process used to treat water; and (iii) the extent to which water from the Option becomes mixed with other sources by the time it reaches customers. The greater the extent of potential change in tap water quality from the introduction of the Option, the lower its level of performance / score (given established evidence that customers value minimal changes).	Direct scoring of Options by SW SMEs drawing on: • Technical scheme description of each Option to establish characteristics of the scheme's infrastructure and treatment process (section 2.2. of Gate 2 submission). • Outputs of Strategic Water Resource Solution Engineering Report; water quality modelling for Options to establish expected change in chemical content and hence taste/smell/appearance of the system's water supply with the introduction the Option • Outputs of customer preferences research from SW's Customer Perception Reports.
C.02	**Resilience of supply**	Customer	Qualitative	Qualitative assessment undertaken by SW SMEs of the effectiveness of the Option in improving system resilience during short-term capacity issues, with system resilience defined as the ability of the system to cope with, and recover from, disruption, and anticipate trends and variability in order to maintain services for people and protect the natural environment. There was an initial quantitative assessment of system resilience undertaken which assessed different hazards and risk factors (considering Impact, Duration, Likelihood, and Vulnerability) and resilience control factors (Redundancy, Response & Recovery, Resistance, and Reliability) for each site using pre-established SW's Resilience Assessment Procedure Tool. This quantitative analysis was then supplemented with a qualitative assessment which addressed certain limitations of the Tool in fully distinguishing the relative system resilience benefits provided by each Option (particularly those Options which are dependent	Direct scoring of Options by SW SMEs drawing on: • Technical scheme descriptions of each Option to establish characteristics of the scheme's infrastructure and water flow process/ dependencies with existing system (Annex 1,2,3 section 2.2. of Gate 2 submission). • Outputs of resilience modelling undertaken using SW's Resilience Assessment Tool (a pre-existing used

				on Otterbourne WSW). This considered the following factors which are expected to affect the extent of increased system resilience provided by the Option: 1. Option size / operational capacity; 2. raw water source availability; 3. complexity of the asset; and 4. Option dependency on WSWs in wider system, and the resilience of those WSWs. The greater the Option's contribution to system resilience, the higher its level of performance / score.	widely by SW in water resources planning)
E.01	**Biodiversity Net Gain (BNG)**	Environment	Quantitative	Quantitative assessment undertaken of the potential change in Biodiversity following the introduction of the Option and its associated land-take for construction and mitigation and offsetting measures to achieve an assumed 10% uplift in Biodiversity relative to baseline levels. This was estimated using Defra's recommended approach to the assessment of Biodiversity. Defra's measurement of Biodiversity is a habitats-based assessment. In accordance with Defra guidance, the analysis for this criterion used Defra's Biodiversity Metric Tool 3.0 and a GIS-based system to provide a full assessment of each Option component which was then aggregated to arrive at an estimated impact at the 'scheme level'. The assessment applied the principles of Net Gain, by taking a hierarchical approach to mitigation; seeking to avoid loss of key habitats (such as those identified through the Defra Metric as 'irreplaceable' habitat), and therefore species, to enable identification of lower impact alternatives. The mitigation hierarchy was also applied to net gain opportunities, first seeking to enhance existing habitats prior to succession or creation. The assessment was undertaken using open-source data for existing land uses within and beyond the construction boundary of the scheme, including for land strategically identified for enhancement/restoration that lies within close proximity to each Option component. The greater the estimated change in the Biodiversity Metric for the Option, the higher its level of performance / score.	The Biodiversity Metric score for each Option was sourced from the analytical outputs underpinning's Report: • 'Technical Report 2: Biodiversity Net Gain and Natural Capital Assessments'.
E.02	**Habitats & Biodiversity (HRA)**	Environment	Qualitative	Qualitative assessment undertaken of the extent to which the Option could potentially result in adverse impacts on marine and terrestrial habitats, based on the outputs of the HRA assessment undertaken. The assessment considered the impacts on terrestrial and marine habitats from each Option infrastructure component, such as watercourse crossings, outfalls and pipeline construction. The greater the extent of adverse HRA risks from the introduction of the Option, the lower its level of performance / score.	Direct scoring of Options based on the following reports: • Technical Report 1: Review of Pipeline Watercourse Crossings for Water Recycling and Bulk Supplies • Technical Note 3: HRA Consenting Risks Report – Desalination Solution

					• Technical Note 4: HRA Consenting Risks Report: Marine Environment – Water Recycling Solution • Technical report 6: HRA Consenting Risks: Ornithology and Airborne Noise Disturbance – Desalination and Water Recycling SROs • Gate 2 Report HRA
E.03	**Climate regulation (NC)**	Environment	Monetised	Monetised assessment undertaken of the overall change in natural carbon sequestration services (capture and storage of carbon) due to changes in the quantum / hectarage, type and condition of habitats from the Option's construction, followed by 10% BNG (onsite and offsite impacts). The assessment was based on the following analytical steps for each Option component and then aggregated to arrive at an estimated impact at the 'scheme level': • Analysis of the baseline land use types within the 50 m Zone of Influence of the Option and the monetary value of the climate regulation services they provide; • Analysis of the (negative) impact of the construction of the Options on land use and hence the change in carbon sequestration services; and • Analysis of the (positive) impact of mitigation and enhancement measures under an assumption of BNG of 10%. The carbon sequestration rates for natural capital stocks were taken from the WRPG's Supplementary Guidance and the value of carbon taken from HMT Green Book / BEIS appraisal guidance which provides forecasts of traded and non-traded carbon values over time. Annual estimates of the impacts under each of the steps set out above were expressed over a 100-year appraisal period from the Option opening year and discounted back to a 2021 present value in line with HMT Green Book discount rates. The greater the extent of positive climate regulation impacts, the higher the Option's level of performance / score.	The monetised climate regulation impacts for each Option were sourced from the analytical outputs underpinning 's report: • 'Technical Report 2: Biodiversity Net Gain and Natural Capital Assessments'.
E.04	**Natural Hazard Regulation (NC)**	Environment	Monetised	Monetised assessment undertaken of the overall change in natural flood risk management due to changes in the quantum/hectarage, type and condition of habitats from the Option's construction, followed by 10% BNG (onsite and offsite impacts). For the purposes of the assessment, flooding was determined to be the most significant natural hazard risk. This is because although the Options are likely to be	The monetised natural hazard regulation impacts for each Option were sourced from the analytical outputs underpinning's report: • 'Technical Report 2: Biodiversity Net Gain and Natural Capital Assessments'.

				operational during drought periods only, the physical changes to natural capital stocks may impact the capacity of habitats to slow the flow of flood water year-round. The assessment was based on the following analytical steps for each Option component and then aggregated to arrive at an estimated impact at the 'scheme level': • Analysis of the baseline land use types within the 50m Zone of Influence of the Option and the monetary value of the natural flood risk management services they provide; • Analysis of the (negative) impact of the construction of the Options on land use and hence the change in natural flood risk management services; and • Analysis of the (positive) impact of mitigation and enhancement measures under an assumption of BNG of 10%. Monetary values were sourced per broad habitat type from existing studies conducted in the UK. An annual monetary value was derived for the flood regulating services of woodland, semi-natural grassland, and wetland / floodplain assets. Annual estimates of the natural flood risk management impacts were expressed over a 100-year appraisal period from the Option opening year and discounted back to a 2021 present value in line with HMT Green Book discount rates. The greater the extent of positive natural hazard impacts, the higher the Option's level of performance / score.	
E.06	**Water purification (NC)**	Environment	Qualitative	Qualitative assessment undertaken of the overall change in natural water purification services due to changes in the quantum/hectarage, type and condition of habitats that from the Option's construction, followed by 10% BNG (onsite and offsite impacts). Baseline provision of water purification services is dependent on the land cover (habitat), proximity to receptor (i.e., a water body) and the current water quality of receptors. The assessment of the impacts of the Option was based on habitat data and WFD status information from the EA's Catchment Explorer combined with judgements on the anticipated changes due to the construction of the Option (given the location of its component infrastructure). The greater the extent of positive water purification impacts, the higher the Option's level of performance / score.	Direct scoring of Options taken from the outputs underpinning their report: • 'Technical Report 2: Biodiversity Net Gain and Natural Capital Assessments'.
E.07	**Food production / agriculture services (NC)**	Environment	Monetised	Monetised assessment undertaken of the overall change in food production / agriculture services due to changes in the quantum / hectarage, type and condition of habitats from the Option's construction, followed by 10% BNG (onsite and offsite impacts). The assessment estimates the annual value per ha of ecosystem services relevant to agricultural production. The assessment was based on the following analytical	The monetised food production/agricultural services impacts for each Option were sourced from the analytical outputs underpinning's report:

				steps for each Option component and then aggregated to arrive at an estimated impact at the 'scheme level': • Analysis of the baseline land use types within the 50m Zone of Influence of the Option and the monetary value of the natural flood risk management services they provide; • Analysis of the (negative) impact of the construction of the Options on land use and hence the change in natural flood risk management services; and • Analysis of the (positive) impact of mitigation and enhancement measures under an assumption of BNG of 10%. Monetary values representing the average farm output level estimates are taken from the Farm Business Survey and were used to estimate the total annual benefit values arising from changes in land use (compared to baseline levels). The values represent the annual value of provisioning services that support agricultural production for the estimated area of each Option component. Annual estimates of the food production / agriculture services impacts were expressed over a 100-year appraisal period from the Option opening year and discounted back to a 2021 present value in line with HMT Green Book discount rates. The greater the extent of positive food production/agriculture services impacts, the higher the Option's level of performance / score.	• 'Technical Report 2: Biodiversity Net Gain and Natural Capital Assessments'.
E.08	**Embodied and operational carbon**	Environment	Monetised	Monetised assessment undertaken of the overall change in carbon emissions from both the embodied carbon associated with construction of the Option infrastructure and operational carbon emissions associated the Option's operating regime. The assessment of operational carbon quantities for power use, chemical use and transport were taken from the operational cost estimates for each Option, with power and chemical use estimates provided by SW's design team. The assessment of embodied carbon quantities comprised the emissions impacts relating to both the upfront capital expenditure to construct the Option and major capital maintenance over the life of the Option. The value of carbon taken from HMT Green Book / BEIS appraisal guidance which provides forecasts of traded and non-traded carbon values over time. Annual estimates of carbon impacts were expressed over a 100-year appraisal period from the Option opening year and discounted back to a 2021 present value in line with HMT Green Book discount rates. The greater the extent of embodied and operational carbon impacts associated with the Option, the lower its level of performance / score.	The monetised carbon impacts for each Option were sourced were sourced from the analytical outputs underpinning 's reporting as part of Section 2.10 cost modelling section within Annex 1,2 and 3 of the Gate 2 submission.
E.12	**Water abstraction**	Environment	Qualitative	Qualitative assessment undertaken by SW SMEs of the potential change in the level water resources (ground or surface water) at key identified sites (rivers, lakes,	Direct scoring of Options by SW SMEs drawing on:

				canals, reservoirs or from underground strata) as a result of the Option, considering both the direct abstraction required by the Option's operation and the effects on baseline abstraction required by the existing network (thus acting as a proxy for the environmental impact of the Option). The degree of abstraction was assumed to be influenced by (i) the volume of abstraction; and (ii) the value of water sources that are abstracted, as established in HMT Green Book and Defra appraisal guidance on the value of water resources. This assumes that the value of ground and surface water is higher (in terms of the benefits it provides to the environment and wider society) than sea water or wastewater. The greater the extent of water abstraction (across the system as a whole) resulting from the Option's operation, the lower its level of performance / score.	• Technical scheme description of each Option to establish characteristics of the scheme's infrastructure and treatment process (section 2.2. of Gate 2 submission). • Outputs of SW Water Resources Modelling Study Report
E.13	**Landscape and townscape**	Environment	Qualitative	Qualitative assessment undertaken of the extent to which the Option could potentially result in adverse impacts on local landscapes and townscapes, with a particular focus on impacts on the landscape and scenic beauty of nationally-designated sites, such as National Parks, Areas of Outstanding Natural Beauty, etc. The greater the extent of adverse landscape impacts from the introduction of the Option, the lower its level of performance / score.	Direct scoring of Options based on the following reports: • Gate 2 document: WfLH – High Level Landscape Appraisal
E.14	**Flood risk**	Environment	Qualitative	Qualitative assessment undertaken of the extent to which the Option could potentially result in increased local flood risk, with a particular focus on whether the Option impacts pre-existing flood zones and flood defences and CCMAs. The greater the extent of adverse flood risks from the introduction of the Option, the lower its level of performance / score.	Direct scoring of Options based on the technical scheme description of each Option (section 2.2. of Gate 2 submission), based on the potential intersection of the parcels and pipelines with flood zones 2 and 3.
E.15	**Coastal processes**	Environment	Qualitative	Qualitative assessment undertaken of the extent to which the Option could potentially result in adverse impacts on coastal processes, with a particular focus on whether the Option impacts on coastal erosion and deposition. The greater the extent of adverse coast processes impacts from the introduction of the Option, the lower its level of performance / score.	Direct scoring of Options based on the technical scheme description of each Option (section 2.2. of Gate 2 submission), based on the potential impact of the Options on CCMAs in line with dNPS.
S.01	**Recreation & amenity**	Society	Monetised	Monetised assessment undertaken of the overall change in recreation and amenity services due to changes in the quantum/hectarage, type and condition of habitats from the Option's construction. The Outdoor Recreation Valuation Tool (ORVal) was used to estimate recreation demand from existing or new greenspace as a proxy for recreation value. The values derived from the ORVal tool are estimated using a Random Utility Model of travel cost estimates. The values represent the total welfare lost if the site in question were to be removed.	The monetised recreation and amenity services impacts for each Option were sourced from the analytical outputs underpinning's report: • 'Technical Report 2: Biodiversity Net Gain and Natural Capital Assessments'.

				Individual components of the Options were inputted into the ORVal tool to provide baseline welfare value for the recreation assets affected by each component, as well as the estimated visitation to those assets on a given year. Annual estimates of the recreation and amenity services impacts were expressed over a 100-year appraisal period from the Option scheme opening year and discounted back to a 2021 present value in line with HMT Green Book discount rates. The greater the extent of positive recreation and amenity services impacts, the higher the Option's level of performance / score.	
S.02	**Historic environment (terrestrial)**	Society	Qualitative	Qualitative assessment undertaken of the extent to which the Option could potentially result in adverse impacts on the local terrestrial historic environment, with a particular focus on whether the Option impacts on nationally and regionally important assets, such as scheduled monuments/ listed buildings, as well as potential impacts on unknown archaeology (i.e., impacts on areas of archaeological potential). The greater the extent of adverse impacts on the terrestrial historic environment from the introduction of the Option, the lower its level of performance / score.	Direct scoring of Options based on the technical scheme description of each Option (section 2.2. of Gate 2 submission), describing the potential impact (both direct and indirect) of the parcels and pipelines on nationally and regionally important heritage assets as defined in the dNPS.
D.01	**Supply chain capacity risks**	Deliverability	Qualitative	Qualitative assessment undertaken by SW SMEs to assess the potential extent to which the capacity and skills available in the market to construct the Option infrastructure poses a risk to delivery by 2027 and thus compliance with SW's supply duties under its S20 obligation. The degree of supply chain capacity was assumed to relate to the construction sector's ability to design and build the Option infrastructure by 2027 and dependent on the availability of both suitably skilled labour and suitable construction methods. This was assumed to be influenced by: (i) the maturity of the Option's technology; (ii) the scale of the scheme; and (iii) external pressures on the supply chain outside of the WfLH scheme (e.g., competing infrastructure over the same period, COVID-19 backlog, EU exit, etc). The greater the extent of uncertainties over the market's capacity to construct the Option (and in turn deliver the scheme by 2027), the lower its level of performance / score.	Direct scoring of Options by SW SMEs drawing on: • Technical scheme description of each Option to establish characteristics of the scheme's infrastructure and treatment process (section 2.2. of Gate 2 submission). • Outputs of SW Informal Market Engagement report (April 2021)
A.01	**WLC** of Option infras**tructure**	Affordability	Monetised	Monetised assessment undertaken of CAPEX, Risk, OB and OPEX over the whole life of the Option scheme (assumed to be 100 years from the scheme opening year). Construction costs were collated using the CCS Candy Estimating platform by the SW Cost Intelligence Team (CIT) to ensure a consistent approach with the supply chain. Process and Desalination plant costs were derived from a combination of SW's data and industry cost data and reviewed against market norms. Estimated operating expenditure was based on the assumed operating regime for the Option's assets and compiling water costs, staff costs, chemical costs, power	The monetised WLCs for each Option were sourced were sourced from the analytical outputs underpinning 's reporting as part of Section 2.10 cost modelling section of the Gate 2 submission.

				demand, operational transport costs, waste costs and common water sector maintenance costs (civil maintenance was calculated as 0.5% of the Infra and non-infra civil costs whilst mechanical and electrical maintenance was calculated as 2.5% of Infra and non-infra mechanical and electrical costs). Annual estimates of Option costs were expressed over a 100-year appraisal period from the Option opening year and discounted back to a 2021 present value in line with HMT Green Book discount rates. The greater the cost of the Option, the lower its level of performance / score.	
A.03	**Cost of interim measures to meet required supply by 2027**	Affordability	Qualitative	Qualitative assessment undertaken by SW SMEs to assess the potential financial implications associated with the Option if it was not operational in 2027 in line with SW's supply duties under its S20 obligations, which would require interim measures to deliver the required supply until the Option becomes operational. The scope / nature of the interim measures was assumed to be constant across the Options, and therefore the driver of the potential relative cost differences between them is the length of time those interim measures are required to be in place. The assessment used the time between SW's S20 deadline and the estimated delivery date for the Option to assess the length of time interim measures would be required and within this the number of dry seasons SW would experience during this period. The dry season was assumed to run between July and November and the time delay incurred based on the number of dry seasons (Jul to Nov) between an assumed S20 delivery date (31 March 2027) and the operational date of the Option. The greater the number of dry seasons for which interim measures are required, the lower the Option's level of performance / score.	Direct scoring of Options by SW SMEs based on quantitative information on SRO delivery dates set out in Gate 2 submission section 2.9.

Appendix 4. BAU Scenario Results - Unweighted

Below SW outlines the BAU scenario results as previously mentioned in Section 5.1.3.2. SW notes that the rankings remain the same as under the drought results (section 5.2.2), with minor changes in the absolute scores. Overall, the conclusions of the two scenarios remain the same, with D.2 scoring highest, A.1 / A.2 scoring lowest, with B.4 scoring second in all scenarios bar the Best Value Ranking 3 (Net Social Impact).

Table 172 - MCDA results – core unweighted BAU scenario – Best Value Rankings

Option	Input scores		Best Value Ranking 1		Best Value Ranking 2		Best Value Ranking 3		Best Value Ranking 4		Best Value Ranking 5	
	Whole Life Cost (£m)	Cost of interim measures to meet required supply by 2027	Whole Life Cost (£m)	Rank (based on nearest £5m)	Average affordability score unweighted (Higher score = more affordable)	Rank	Average Net Social Impact score unweighted	Rank	Net Social Impact score unweighted per £100m	Rank	Blended Net Social Impact and Affordability score (simple average)	Rank
A.1	0	0	1,119	5	0	5	40	5	3.6	5	20	5
A.2	0	0	1,119	5	0	5	38	6	3.4	6	19	6
B.2	40	0	829	3	20	3	45	4	5.4	4	33	4
B.4	60	100	684	**2**	80	**2**	48	3	7.0	**2**	64	**2**
B.5	26	0	927	4	13	4	54	**2**	5.8	3	34	3
D.2	100	100	394	**1**	100	**1**	61	**1**	15.5	**1**	81	**1**

Sub-criteria No.	Sub-criteria name	Cluster criterion	Basis of assessment	Scope of assessment	Key evidence sources informing the impact assessment
C.01	**Tap water quality**	Customer	Qualitative	Qualitative assessment undertaken by SW SMEs of the potential change in the tap water quality received by customers following the introduction of the Option, relative to the current quality levels that are experienced by customers. The potential change in quality is based on both the *expected actual change* resulting from the Option's water supply, as well as the *potential perceived change* in quality based on customer perceptions of the Option. Tap water quality is assumed to comprise a combination of taste (e.g., metallic), smell and appearance (e.g. colour / cloudiness), which are influenced by: (i) the characteristics of the Option's infrastructure used to transport/ treat water; (ii) the chemical process used to treat water; and (iii) the extent to which water from the Option becomes mixed with other sources by the time it reaches customers. The greater the extent of potential change in tap water quality from the introduction of the Option, the lower its level of performance / score (given established evidence that customers value minimal changes).	Direct scoring of Options by SW SMEs drawing on: • Technical scheme description of each Option to establish characteristics of the scheme's infrastructure and treatment process (section 2.2. of Gate 2 submission) • Outputs of Strategic Water Resource Solution Engineering Report; water quality modelling for Options to establish expected change in chemical content and hence taste/smell/appearance of the system's water supply with the introduction the Option • Outputs of customer preferences research from SW's Customer Perception Reports
C.02	**Resilience of supply**	Customer	Qualitative	Qualitative assessment undertaken by SW SMEs of the effectiveness of the Option in improving system resilience during short-term capacity issues, with system resilience defined as the ability of the system to cope with, and recover from, disruption, and anticipate trends and variability in order to maintain services for people and protect the natural environment. There was an initial quantitative assessment of system resilience undertaken which assessed different hazards and risk factors (considering Impact, Duration, Likelihood, and Vulnerability) and resilience control factors (Redundancy, Response & Recovery, Resistance, and Reliability) for each site using pre-established SW's Resilience Assessment Procedure Tool. This quantitative analysis was then supplemented with a qualitative assessment which addressed certain limitations of the Tool in fully distinguishing the relative system resilience benefits provided by each Option (particularly those Options which are dependent on Otterbourne WSW). This	Direct scoring of Options by SW SMEs drawing on: • Technical scheme descriptions of each Option to establish characteristics of the scheme's infrastructure and water flow process/ dependencies with existing system (Annex 1,2,3 section 2.2. of Gate 2 submission)

				considered the following factors which are expected to affect the extent of increased system resilience provided by the Option: • Option size / operational capacity • raw water source availability • complexity of the asset; and • Option dependency on water supply works (WSWs) in wider system, and the resilience of those WSWs The greater the Option's contribution to system resilience, the higher its level of performance / score.	• Outputs of resilience modelling undertaken using SW's Resilience Assessment Tool (a pre-existing used widely by SW in water resources planning)
E.01	**Biodiversity Net Gain (BNG)**	Environment	Quantitative	Quantitative assessment undertaken of the potential change in Biodiversity following the introduction of the Option and its associated land-take for construction and mitigation and offsetting measures to achieve an assumed 10% uplift in Biodiversity relative to baseline levels. This was estimated using Defra's recommended approach to the assessment of Biodiversity. Defra's measurement of Biodiversity is a habitats-based assessment. In accordance with Defra guidance, the analysis for this criterion used Defra's Biodiversity Metric Tool 3.0 and a GIS-based system to provide a full assessment of each Option component which was then aggregated to arrive at an estimated impact at the 'scheme level'. The assessment applied the principles of Net Gain, by taking a hierarchical approach to mitigation; seeking to avoid loss of key habitats (such as those identified through the Defra Metric as 'irreplaceable' habitat), and therefore species, to enable identification of lower impact alternatives. The mitigation hierarchy was also applied to net gain opportunities, first seeking to enhance existing habitats prior to succession or creation. The assessment was undertaken using open-source data for existing land uses within and beyond the construction boundary of the scheme, including for land strategically identified for enhancement/restoration that lies within close proximity to each Option component. The greater the estimated change in the Biodiversity Metric for the Option, the higher its level of performance / score.	The Biodiversity Metric score for each Option was sourced from the analytical outputs underpinning's Report: • 'Technical Report 2: Biodiversity Net Gain and Natural Capital Assessments'
E.02	**Habitats & Biodiversity (HRA)**	Environment	Qualitative	Qualitative assessment undertaken of the extent to which the Option could potentially result in adverse impacts on marine and terrestrial habitats, based on the outputs of the HRA assessment undertaken. The assessment considered the impacts on terrestrial and marine habitats from each Option infrastructure component, such as watercourse crossings, outfalls and pipeline construction. The greater the extent of adverse HRA risks from the introduction of the Option, the lower its level of performance / score.	Direct scoring of Options based on the following reports: • Technical Report 1: Review of Pipeline Watercourse Crossings for Water Recycling and Bulk Supplies

					• Technical Note 3: HRA Consenting Risks Report – Desalination Solution • Technical Note 4: HRA Consenting Risks Report: Marine Environment – Water Recycling Solution • Technical report 6: HRA Consenting Risks: Ornithology and Airborne Noise Disturbance – Desalination and Water Recycling SROs • Gate 2 Report HRA
E.03	**Climate regulation (NC)**	Environment	Monetised	Monetised assessment undertaken of the overall change in natural carbon sequestration services (capture and storage of carbon) due to changes in the quantum / hectarage, type and condition of habitats from the Option's construction, followed by 10% BNG (onsite and offsite impacts). The assessment was based on the following analytical steps for each Option component and then aggregated to arrive at an estimated impact at the 'scheme level': • Analysis of the baseline land use types within the 50 m Zone of Influence of the Option and the monetary value of the climate regulation services they provide • Analysis of the (negative) impact of the construction of the Options on land use and hence the change in carbon sequestration services, and • Analysis of the (positive) impact of mitigation and enhancement measures under an assumption of BNG of 10% The carbon sequestration rates for natural capital stocks were taken from the WRPG's Supplementary Guidance and the value of carbon taken from HMT Green Book / BEIS appraisal guidance which provides forecasts of traded and non-traded carbon values over time. Annual estimates of the impacts under each of the steps set out above were expressed over a 100-year appraisal period from the Option opening year and discounted back to a 2021 present value in line with HMT Green Book discount rates.	The monetised climate regulation impacts for each Option were sourced from the analytical outputs underpinning's report: • 'Technical Report 2: Biodiversity Net Gain and Natural Capital Assessments'.

				The greater the extent of positive climate regulation impacts, the higher the Option's level of performance / score.	
E.04	**Natural Hazard Regulation (NC)**	Environment	Monetised	Monetised assessment undertaken of the overall change in natural flood risk management due to changes in the quantum/hectarage, type and condition of habitats from the Option's construction, followed by 10% BNG (onsite and offsite impacts). For the purposes of the assessment, flooding was determined to be the most significant natural hazard risk. This is because although the Options are likely to be operational during drought periods only, the physical changes to natural capital stocks may impact the capacity of habitats to slow the flow of flood water year-round. The assessment was based on the following analytical steps for each Option component and then aggregated to arrive at an estimated impact at the 'scheme level': • Analysis of the baseline land use types within the 50m Zone of Influence of the Option and the monetary value of the natural flood risk management services they provide • Analysis of the (negative) impact of the construction of the Options on land use and hence the change in natural flood risk management services, and • Analysis of the (positive) impact of mitigation and enhancement measures under an assumption of BNG of 10% Monetary values were sourced per broad habitat type from existing studies conducted in the UK. An annual monetary value was derived for the flood regulating services of woodland, semi-natural grassland, and wetland/ floodplain assets. Annual estimates of the natural flood risk management impacts were expressed over a 100-year appraisal period from the Option opening year and discounted back to a 2021 present value in line with HMT Green Book discount rates. The greater the extent of positive natural hazard impacts, the higher the Option's level of performance / score.	The monetised natural hazard regulation impacts for each Option were sourced from the analytical outputs underpinning's report: • 'Technical Report 2: Biodiversity Net Gain and Natural Capital Assessments'
E.06	**Water purification (NC)**	Environment	Qualitative	Qualitative assessment undertaken of the overall change in natural water purification services due to changes in the quantum/hectarage, type and condition of habitats that from the Option's construction, followed by 10% BNG (onsite and offsite impacts). Baseline provision of water purification services is dependent on the land cover (habitat), proximity to receptor (i.e. a water body) and the current water quality of receptors. The assessment of the impacts of the Option was based on habitat data and WFD status information from the EA's Catchment Explorer combined with judgements on the anticipated changes due to the construction of the Option (given the location of its component infrastructure). The greater the extent of positive water purification impacts, the higher the Option's level of performance / score.	Direct scoring of Options taken from the outputs underpinning their report: • 'Technical Report 2: Biodiversity Net Gain and Natural Capital Assessments'

E.07	**Food production / agriculture services (NC)**	Environment	Monetised	Monetised assessment undertaken of the overall change in food production/agriculture services due to changes in the quantum/hectarage, type and condition of habitats from the Option's construction, followed by 10% BNG (onsite and offsite impacts). The assessment estimates the annual value per ha of ecosystem services relevant to agricultural production. The assessment was based on the following analytical steps for each Option component and then aggregated to arrive at an estimated impact at the 'scheme level': • Analysis of the baseline land use types within the 50m Zone of Influence of the Option and the monetary value of the natural flood risk management services they provide • Analysis of the (negative) impact of the construction of the Options on land use and hence the change in natural flood risk management services; and • Analysis of the (positive) impact of mitigation and enhancement measures under an assumption of BNG of 10% Monetary values representing the average farm output level estimates are taken from the Farm Business Survey and were used to estimate the total annual benefit values arising from changes in land use (compared to baseline levels). The values represent the annual value of provisioning services that support agricultural production for the estimated area of each Option component. Annual estimates of the food production/agriculture services impacts were expressed over a 100-year appraisal period from the Option opening year and discounted back to a 2021 present value in line with HMT Green Book discount rates. The greater the extent of positive food production/agriculture services impacts, the higher the Option's level of performance / score.	The monetised food production/agricultural services impact for each Option were sourced from the analytical outputs underpinning's report: • 'Technical Report 2: Biodiversity Net Gain and Natural Capital Assessments'
E.08	**Embodied and operational carbon**	Environment	Monetised	Monetised assessment undertaken of the overall change in carbon emissions from both the embodied carbon associated with construction of the Option infrastructure and operational carbon emissions associated the Option's operating regime. The assessment of operational carbon quantities for power use, chemical use and transport were taken from the operational cost estimates for each Option, with power and chemical use estimates provided by SW's design team. The assessment of embodied carbon quantities comprised the emissions impacts relating to both the upfront capital expenditure to construct the Option and major capital maintenance over the life of the Option. The value of carbon taken from HMT Green Book / BEIS appraisal guidance which provides forecasts of traded and non-traded carbon values over time. Annual estimates of carbon impacts were expressed over a 100-year appraisal period from the Option opening year and discounted back to a 2021 present value in line with HMT Green Book discount rates.	The monetised carbon impacts for each Option were sourced were sourced from the analytical outputs underpinning 's reporting as part of Section 2.10 cost modelling section within Annex 1,2 and 3 of the Gate 2 submission.

				The greater the extent of embodied and operational carbon impacts associated with the Option, the lower its level of performance / score.	
E.12	**Water abstraction**	Environment	Qualitative	Qualitative assessment undertaken by SW SMEs of the potential change in the level water resources (ground or surface water) at key identified sites (rivers, lakes, canals, reservoirs or from underground strata) as a result of the Option, considering both the direct abstraction required by the Option's operation and the effects on baseline abstraction required by the existing network (thus acting as a proxy for the environmental impact of the Option). The degree of abstraction was assumed to be influenced by (i) the volume of abstraction; and (ii) the value of water sources that are abstracted, as established in HMT Green Book and Defra appraisal guidance on the value of water resources. This assumes that the value of ground and surface water is higher (in terms of the benefits it provides to the environment and wider society) than sea water or wastewater. The greater the extent of water abstraction (across the system as a whole) resulting from the Option's operation, the lower its level of performance / score.	Direct scoring of Options by SW SMEs drawing on: • Technical scheme description of each Option to establish characteristics of the scheme's infrastructure and treatment process (section 2.2. of Gate 2 submission). • Outputs of SW Water Resources Modelling Study Report
E.13	**Landscape and townscape**	Environment	Qualitative	Qualitative assessment undertaken of the extent to which the Option could potentially result in adverse impacts on local landscapes and townscapes, with a particular focus on impacts on the landscape and scenic beauty of nationally designated sites, such as National Parks, Areas of Outstanding Natural Beauty, etc. The greater the extent of adverse landscape impacts from the introduction of the Option, the lower its level of performance / score.	Direct scoring of Options based on the following reports: • Gate 2 document: Water for Life Hampshire – High Level Landscape Appraisal
E.14	**Flood risk**	Environment	Qualitative	Qualitative assessment undertaken of the extent to which the Option could potentially result in increased local flood risk, with a particular focus on whether the Option impacts pre-existing flood zones and flood defences and CCMAs. The greater the extent of adverse flood risks from the introduction of the Option, the lower its level of performance / score.	Direct scoring of Options based on the technical scheme description of each Option (section 2.2. of Gate 2 submission), based on the potential intersection of the parcels and pipelines with flood zones 2 and 3.
E.15	**Coastal processes**	Environment	Qualitative	Qualitative assessment undertaken of the extent to which the Option could potentially result in adverse impacts on coastal processes, with a particular focus on whether the Option impacts on coastal erosion and deposition. The greater the extent of adverse coast processes impacts from the introduction of the Option, the lower its level of performance / score.	Direct scoring of Options based on the technical scheme description of each Option (section 2.2.of Gate 2 submission), based on the potential impact of the Options on CCMAs in line with dNPS.
S.01	**Recreation & amenity**	Society	Monetised	Monetised assessment undertaken of the overall change in recreation and amenity services due to changes in the quantum/hectarage, type and condition of habitats from the Option's construction.	The monetised recreation and amenity services impacts for each Option were sourced from

				The Outdoor Recreation Valuation Tool (ORVal) was used to estimate recreation demand from existing or new greenspace as a proxy for recreation value. The values derived from the ORVal tool are estimated using a Random Utility Model of travel cost estimates. The values represent the total welfare lost if the site in question were to be removed. Individual components of the Options were inputted into the ORVal tool to provide baseline welfare value for the recreation assets affected by each component, as well as the estimated visitation to those assets on a given year. Annual estimates of the recreation and amenity services impacts were expressed over a 100-year appraisal period from the Option opening year and discounted back to a 2021 present value in line with HMT Green Book discount rates. The greater the extent of positive recreation and amenity services impacts, the higher the Option's level of performance / score.	the analytical outputs underpinning's report: • 'Technical Report 2: Biodiversity Net Gain and Natural Capital Assessments'.
S.02	**Historic environment (terrestrial)**	Society	Qualitative	Qualitative assessment undertaken of the extent to which the Option could potentially result in adverse impacts on the local terrestrial historic environment, with a particular focus on whether the Option impacts on nationally and regionally important assets, such as scheduled monuments/ listed buildings, as well as potential impacts on unknown archaeology (i.e. impacts on areas of archaeological potential). The greater the extent of adverse impacts on the terrestrial historic environment from the introduction of the Option, the lower its level of performance / score.	Direct scoring of Options based on the technical scheme description of each Option (section 2.2. of Gate 2 submission), describing the potential impact (both direct and indirect) of the parcels and pipelines on nationally and regionally important heritage assets as defined in the dNPS.
D.01	**Supply chain capacity risks**	Deliverability	Qualitative	Qualitative assessment undertaken by SW SMEs to assess the potential extent to which the capacity and skills available in the market to construct the Option infrastructure poses a risk to delivery by 2027 and thus compliance with SW's supply duties under its S20 obligation. The degree of supply chain capacity was assumed to relate to the construction sector's ability to design and build the Option infrastructure by 2027 and dependent on the availability of both suitably skilled labour and suitable construction methods. This was assumed to be influenced by: (i) the maturity of the Option's technology; (ii) the scale of the scheme; and (iii) external pressures on the supply chain outside of the WfLH scheme (e.g., competing infrastructure over the same period, COVID-19 backlog, EU exit, etc). The greater the extent of uncertainties over the market's capacity to construct the Option (and in turn deliver the scheme by 2027), the lower its level of performance / score.	Direct scoring of Options by SW SMEs drawing on: • Technical scheme description of each Option to establish characteristics of the scheme's infrastructure and treatment process (section 2.2. of Gate 2 submission). • Outputs of SW Informal Market Engagement report (April 2021)
A.01	**WLC of Option infrastructure**	Affordability	Monetised	Monetised assessment undertaken by of CAPEX, Risk, OB and OPEX over the whole life of the Option (assumed to be 100 years from the opening year). Construction costs were collated using the CCS Candy Estimating platform by the SW CIT to ensure a consistent approach with the supply chain. Process and Desalination	The monetised whole life costs for each Option were sourced were sourced from the analytical outputs underpinning 's reporting as part of Section

				plant costs were derived from a combination of SW's data and industry cost data and reviewed against market norms. Estimated operating expenditure was based on the assumed operating regime for the Option's assets and compiling water costs, staff costs, chemical costs, power demand, operational transport costs, waste costs and common water sector maintenance costs (civil maintenance was calculated as 0.5% of the Infra and non-infra civil costs whilst mechanical and electrical maintenance was calculated as 2.5% of Infra and non-infra mechanical and electrical costs). Annual estimates of Option costs were expressed over a 100-year appraisal period from the Option opening year and discounted back to a 2021 present value in line with HMT Green Book discount rates. The greater the cost of the Option, the lower its level of performance / score.	2.10 cost modelling section of the Gate 2 submission.
A.03	**Cost of interim measures to meet required supply by 2027**	Affordability	Qualitative	Qualitative assessment undertaken by SW SMEs to assess the potential financial implications associated with the Option if it was not operational in 2027 in line with SW's supply duties under its S20 obligations, which would require interim measures to deliver the required supply until the Option becomes operational. The scope/nature of the interim measures was assumed to be constant across the Option s, and therefore the driver of the potential relative cost differences between them is the length of time those interim measures are required to be in place. The assessment used the time between SW's S20 deadline and the estimated delivery date for the Option to assess the length of time interim measures would be required and within this the number of dry seasons SW would experience during this period. The dry season was assumed to run between July and November and the time delay incurred based on the number of dry seasons (Jul to Nov) between an assumed S20 delivery date (31 March 2027) and the operational date of the Option. The greater the number of dry seasons for which interim measures are required, the lower the Option's level of performance / score.	Direct scoring of Options by SW SMEs based on quantitative information on SRO delivery dates set out in Gate 2 submission section 2.9.

Appendix 5. Unweighted Results

MCDA Results based on Weighted Scores

Below SW outlines the results of the MCDA when applying the weighting scenarios in Section **5.1.3.6** to the sub-criteria scores established under the Drought scenario. Overall, the conclusions of this approach do not change the key outcomes from the analysis using unweighted scores at the sub-criteria level (i.e., the Core unweighted scenario results), which are set out in section 5.2.2. The analysis using alternative weighting scenarios suggest that:

- Option D.2 scores highest across all scenarios – this is expected due to it costing the least of all Options by a considerable distance, as well as scoring highest of the Options considered in terms of Net Social Impact
- B.4 tends to score second highest across all scenarios and is only ranked third in one of our five Best Value approaches – Ranking 2, which considers the relative performance of the Options against Net Social Impact in isolation
- A.1 / A.2 almost always scores lowest across all weighting scenarios and all five Best Value ranking approaches

Weighted Results under Best Value Ranking 2 (Most affordable Option considering both monetised and non-monetised costs of delivery)

Table 173 shows the weighted scoring results of the MCDA when considering Best Value Ranking 2 – Affordability (comprising both WLC and the potential costs of interim measures to deliver supply needs in 2027[38]), under SW's four alternative affordability weighting scenarios, which assume different weights for the two sub-criteria within this cluster.

Although the absolute scores differ across weighting scenarios, the relative rankings remain the same:

- Option D.2 scores highest in terms of affordability across all scenarios – this is expected due to it costing the least of all Options by a considerable distance

[38] Note that the Best Value Ranking 1 against Whole Life Cost of the Option is not affected by the weighting scenarios, and as such is not presented here.

- B.4 scores a close second across all scenarios and is closest in performance to D.2 when placing most emphasis on the cost of interim measures (weighting Scenario 4), the score of B.2 and B.5 are closest to B.4 in scenario 2 (scoring 32 and 21 respectively, versus 68)
- A.1 / A.2 scores lowest across all weighting scenarios

Table 173 - MCDA results – weighted affordability score – Best Value Ranking 2

Option	Input scores		Affordability Score by Affordability Weighting Scenarios 1-4							
	Whole Life Cost	Cost of interim measures to meet required supply by 2027	Core unweighted scenario	Rank	Scenario 2	Rank	Scenario 3	Rank	Scenario 4	Rank
A.1	1,123	0	0	5	0	5	0	5	0	5
A.2	1,122	0	0	5	0	5	0	5	0	5
B.2	831	0	20	3	32	3	24	3	8	3
B.4	687	100	80	2	68	2	76	2	92	2
B.5	930	0	13	4	21	4	16	4	5	4
D.2	394	100	100	1	100	1	100	1	100	1

Scenario 1 = core unweighted (50:50 for WLC and Cost of interim measures)
Scenario 2 = core affordability weighting scenario (80:20)
Scenario 3 = less emphasis on WLC (60:40)
Scenario 4 = most emphasis on cost of interim measures (20:80)

Weighted Results under Best Value Ranking 3 (Highest scoring Option against Net Social Impact)

Table 174 shows the weighted scoring results of the MCDA when considering Best Value Ranking 3, which focuses on Net Social Impact (without any reference to the cost / affordability of the Option), under SW's five alternative weighting scenarios, which assume different weights for the sub-criteria across different clusters / themes in SW's MCDA framework (considering customer, environment and society and deliverability (a recap of these scenarios is provided below the tables).

Under the Drought scenario, alternative weightings (from the core scenario which is unweighted) do not change the highest nor the second highest scoring Options; D.2 scores highest under all weighting scenarios with B.4 scoring second. The results suggest that:

- Option D.2 scores highest in Scenario 4 (equal weighting across all clusters) where it almost doubles the score of the second highest scoring Option B.4 (81 to 45)
- The second highest scoring Option B.4 scores closest to D.2 in scenario 2 (50 to 63), but the gap between them is largest under Scenario 4 (equal weighting across all clusters)

- Option A.1 typically scores fifth across the scenarios except in Scenario 3 (customer and environ / society equal weight) where it scores third highest – this is in part due to the significant deterioration of the scores of B.5 and B.2 when compared to the core scenario from second and fourth, to fourth and fifth respectively (due to lower scores in around ten environmental / society criteria). In this scenario A.2 and B.2 both score the lowest.
- Option B.2 typically scores fourth in all scenarios except scenario 3 where it scores fifth
- The lowest scoring Option is A.2 which scores lowest across all scenarios

Table 174 - MCDA results – weighted Net Social Impact score – Best Value Ranking 3

Drought	Whole Life Cost		Weighted Average Net Social Impact score									
Option	Cost (£m)	Rank (nearest £5m)	NSI Core Unweighted Scenario 1	Rank	Scenario 2	Rank	Scenario 3	Rank	Scenario 4	Rank	Scenario 5	Rank
A.1	1,123	5	40	5	41	5	43	3	25	5	34	5
A.2	1,122	5	37	6	37	6	36	6	21	6	29	6
B.2	831	**3**	44	4	42	4	37	5	40	4	38	4
B.4	687	**2**	46	3	50	**2**	58	**2**	45	**2**	54	**2**
B.5	930	4	53	**2**	49	3	42	4	43	3	42	3
D.2	394	**1**	61	**1**	63	**1**	68	**1**	81	**1**	75	**1**

Scenario 1: Core scenario – unweighted; equal weight to sub-criteria (Environment 69%, Society 13%, Customer 13%, Deliverability 6%)
Scenario 2: Environment/society theme given less weight compared to core unweighted scenario (totalling 70%, with customer at 23% and deliverability at 6%)
Scenario 3: Customer and environment/society given equal weight (47% each, with deliverability at 6%)
Scenario 4: Equal weighting at cluster level (25% each for Environment, Society, Customer and Deliverability – greater for latter three than core unweighted scenario)
Scenario 5: Weights at cluster level based on SW Customer Panel research (Customer 39%, Environ/Society 41%, Deliverability 20%)

Weighted Results under Best Value Ranking 4 (Highest scoring Option considering Net Social Impact and Cost in combination)

Table 175 outlines the weighted scoring results of the MCDA when considering Best Value Ranking 4 which is based on the Net Social Impact performance of the Option relative to the £ WLC of delivery, under SW's five alternative NSI weighting scenarios. These weighting scenarios draw on the same NSI weights as those used to determine the weighted Net Social Impact scores under Best Value Ranking 3 (presented in section 0).

In the Drought scenario, alternative weightings (from the core unweighted scenario) once again do not change the highest scoring Option – D.2 performs best under all five weighting scenarios, with £100 m of cost 'buying' 15.5-20.5 point scores in Net Social Impact terms – between 2.0-3.1 times more than the next best performing Option (B.4), depending on the scenario.

Similarly, alternative weightings do not alter the second-best performing Option:

- B.4 ranks second across all weighting scenarios, with £100 m of cost 'buying' 6.6-8.4 point scores in Net Social Impact terms
- Option B.5 also ranks third in all scenarios (including the unweighted Base Case) except Scenario 4 (equal weighting at the cluster-level), where B.2 comes third
- Scenario 4 also widens the gap between Options significantly compared with the unweighted scenario – A.1 / A.2 scores lower and D.2 improves to score almost ten times that of the Desalination-based Options (20.5 points to 1.9-2.2 points per £100m of cost)

Table 175 - MCDA results – weighted Net Social Impact per £100 m cost score – Best Value Ranking 4

BAU	Whole Life Cost		Weighted Average Net Social Impact per £100m score									
Option	Cost (£m)	Rank (nearest £5m)	NSI Core Unweighted Scenario 1	Rank	Scenario 2	Rank	Scenario 3	Rank	Scenario 4	Rank	Scenario 5	Rank
A.1	1,123	5	3.6	5	3.7	5	3.8	5	2.2	5	3.0	5
A.2	1,122	5	3.3	6	3.3	6	3.2	6	1.9	6	2.6	6
B.2	831	**3**	5.3	4	5.1	4	4.5	3	4.8	3	4.6	3
B.4	687	**2**	**6.7**	**2**	**7.3**	**2**	**8.4**	**2**	**6.6**	**2**	**7.9**	**2**
B.5	930	4	5.7	3	5.3	3	4.5	3	4.6	4	4.5	4
D.2	394	**1**	**15.5**	**1**	**16.0**	**1**	**17.2**	**1**	**20.5**	**1**	**19.0**	**1**

Weighted Results under Best Value Ranking 5 (Highest scoring Option considering Net Social Impact and Affordability in combination)

Table 176 shows the scoring results of the MCDA when considering Best Value Ranking 5 (based on the weighted Net Social Impact performance of the Option relative to Affordability (core scenario – unweighted), considering both the £ WLC of delivery and the potential costs of interim measures to meet supply needs in 2027). The results are based on SW's two alternative weighting scenarios for Best Value Ranking 5, where Table 176 takes a simple average of the NSI and Affordability score for each Option, and where **Table 177** takes a weighted average where the Option's NSI score is given a weight of 80% and Affordability 20% (reflecting the outcomes of engagement with SW CAG, as described in Section **5.1.3.6**, which proposed

more weight be placed on NSI). In each table, SW presents the results taking the NSI score for the Option under the five alternative NSI weighting scenarios (recap of scenarios in Section **5.1.3.6** below[39]) and the Affordability score from the core scenario (equal weight given to WLC of the Options and the cost of interim measures).

The two alternative weighting scenarios for Best Value Ranking 5 (50:50 in the first table, 80:20 in the second table) do not change the highest scoring Option:

- D.2 remains the highest performing Option, scoring between 22%-44% more than the second highest scoring Option B.4 across the scenarios
- Option B.4 consistently scores the second highest in this ranking, being significantly higher than the third highest scoring Option in all alternative weighting scenarios, B.2 (except in the core unweighted scenario where it ranks fourth)
- The lowest scoring Options remain as A.1 / A.2 which score fairly similarly across the scenarios, although A.2 generally scores lower. Under Scenario 4 (equal weighting across cluster criteria), the score for A.2 is over 8 times less than that of D.2

Table 176 - MCDA results – Combined NSI and Affordability score using a 50:50 weighting – Best Value Ranking 5

Drought	Input Scores		Blended NSI and Affordability score (NSI 50% / Affordability 50%)									
Option	Affordability (unweighted)	NSI (unweighted)	NSI Core Unweighted Scenario 1	Rank	NSI Weighting Scenario 2	Rank	NSI Weighting Scenario 3	Rank	NSI Weighting Scenario 4	Rank	NSI Weighting Scenario 5	Rank
A.1	0	40	20	5	21	5	22	5	13	5	17	5
A.2	0	37	19	6	19	6	18	6	11	6	15	6
B.2	20	44	32	4	31	3	29	3	30	3	29	3

[39] **Scenario 1 : Core scenario – unweighted; equal weight to sub-criteria** (Environment 69%, Society 13%, Customer 13%, Deliverability 6%)
Scenario 2 : Environment/society theme given less weight compared to core unweighted scenario (totalling 70%, with customer at 23% and deliverability at 6%)
Scenario 3 : Customer and environment/society given equal weight (47% each, with deliverability at 6%)
Scenario 4 : Equal weighting at cluster level (25% each for Environment, Society, Customer and Deliverability – greater for latter three than core unweighted scenario)
Scenario 5 : Weights at cluster level based on SW Customer Panel research (Customer 39%, Environ/Society 41%, Deliverability 20%)

B.4	80	46	63	2	65	2	69	2	63	2	67	2
B.5	13	53	33	3	31	3	28	4	28	4	28	4
D.2	100	61	81	1	82	1	84	1	91	1	88	1

However, there are differences in the third and fourth ranking Options under the 80:20 NSI / Affordability weighting results compared to the unweighted, depending on the NSI weighting scenario considered. As detailed in Table 177:

- B.4 is still the second highest scoring Option under all scenarios
- Meanwhile, B.2 now ranks fourth in all scenarios dropping from being third in the 50:50 scenario (joint with B.2 in NSI weighting Scenario 2)
- In addition, in the 80:20 scenario the performance of D.2 and B.4 significantly reduce in absolute terms, with almost every other Option improving significantly (Option B.5 improves significantly to overtake B.2 into third highest scoring). Option D.2 remains a strong scorer however, particularly in scenarios 4 and 5

Table 177 - MCDA results – Combined NSI and Affordability score using an 80:20 weighting – Best Value Ranking 5

Drought	Input Scores		Blended NSI and Affordability score (NSI 80% / Affordability 20%)									
Option	Affordability (unweighted)	NSI (unweighted)	NSI Weighting Scenario 1 / Base Case	Rank	NSI Weighting Scenario 2	Rank	NSI Weighting Scenario 3	Rank	NSI Weighting Scenario 4	Rank	NSI Weighting Scenario 5	Rank
A.1	0	40	32	5	33	5	34	4	20	5	27	5
A.2	0	37	30	6	30	6	29	6	17	6	23	6
B.2	20	44	39	4	38	4	34	4	36	4	34	4
B.4	80	46	53	2	56	2	62	2	52	2	59	2
B.5	13	53	45	3	42	3	36	3	37	3	36	3
D.2	100	61	69	1	70	1	74	1	85	1	80	1

Weighted Results under Best Value Rankings 2-5 – BAU Scenario

Table 178 - MCDA results – weighted affordability score – Best Value Ranking 2

Option	Input scores		Affordability Score by Affordability Weighting Scenarios 1-4							
	Whole Life Cost	Cost of interim measures to meet required supply by 2027	Core unweighted scenario	Rank	Scenario 2	Rank	Scenario 3	Rank	Scenario 4	Rank
A.1	1,119	0	0	5	0	5	0	5	0	5
A.2	1,119	0	0	5	0	5	0	5	0	5
B.2	829	0	20	3	32	3	24	3	8	3
B.4	684	100	80	2	68	2	76	2	92	2
B.5	927	0	13	4	21	4	16	4	5	4
D.2	394	100	100	1	100	1	100	1	100	1

Table 179 - MCDA results – weighted Net Social Impact score – Best Value Ranking 3

BAU	Whole Life Cost		Weighted Average Net Social Impact score									
Option	Cost (£m)	Rank (nearest £5m)	NSI Core Unweighted Scenario 1	Rank	Scenario 2	Rank	Scenario 3	Rank	Scenario 4	Rank	Scenario 5	Rank
A.1	1,119	5	40	5	41	5	43	4	25	5	34	5
A.2	1,119	5	38	6	38	6	37	5	22	6	29	6
B.2	829	3	45	4	43	4	37	5	40	4	39	4
B.4	684	**2**	48	3	51	3	59	**2**	46	**2**	55	**2**
B.5	927	4	54	**2**	52	**2**	47	3	46	**2**	47	3
D.2	394	**1**	61	**1**	63	**1**	68	**1**	81	**1**	75	**1**

Table 180 - MCDA results – weighted Net Social Impact per £100 m cost score – Best Value Ranking 4

BAU	Whole Life Cost		Weighted Average Net Social Impact per £100m score									
Illustrative Option	Cost (£m)	Rank (nearest £5m)	NSI Core Unweighted Scenario 1	Rank	Scenario 2	Rank	Scenario 3	Rank	Scenario 4	Rank	Scenario 5	Rank
A.1	1,119	5	3.6	5	3.7	5	3.8	5	2.2	5	3.0	5
A.2	1,119	5	3.4	6	3.4	6	3.3	6	2.0	6	2.6	6
B.2	829	**3**	5.4	4	5.2	4	4.5	4	4.8	4	4.7	4
B.4	684	**2**	7.0	**2**	7.5	**2**	8.6	**2**	6.7	**2**	8.0	**2**
B.5	927	4	5.8	3	5.6	3	5.1	3	5.0	3	5.1	3
D.2	394	**1**	15.5	**1**	16.0	**1**	17.3	**1**	20.6	**1**	19.0	**1**

Table 181 - MCDA results – weighted Blended NSI and affordability score (50:50 NSI / Affordability) – Best Value Ranking 5

BAU	Input Scores		Blended NSI and Affordability score (NSI 50% / Affordability 50%)									
Option	Affordability (unweighted)	NSI (unweighted)	NSI Core Unweighted Scenario 1	Rank	NSI Weighting Scenario 2	Rank	NSI Weighting Scenario 3	Rank	NSI Weighting Scenario 4	Rank	NSI Weighting Scenario 5	Rank
A.1	0	40	20	5	21	5	22	5	13	5	17	5
A.2	0	38	19	6	19	6	19	6	11	6	15	6
B.2	20	45	33	4	32	4	29	4	30	3	30	3
B.4	80	48	64	2	66	2	70	2	63	2	68	2
B.5	13	54	34	3	33	3	30	3	30	3	30	3
D.2	100	61	81	1	82	1	84	1	91	1	88	1

Table 182 - MCDA results – weighted Blended NSI and affordability score (80:20 NSI / Affordability – Best Value Ranking 5

BAU	Input Scores		Blended NSI and Affordability score (NSI 80% / Affordability 20%)									
Option	Affordability (unweighted)	NSI (unweighted)	NSI Core Unweighted Scenario 1	Rank	NSI Weighting Scenario 2	Rank	NSI Weighting Scenario 3	Rank	NSI Weighting Scenario 4	Rank	NSI Weighting Scenario 5	Rank
A.1	0	40	32	5	33	5	34	4	20	5	27	5
A.2	0	38	30	6	30	6	30	6	18	6	23	6
B.2	20	45	40	4	38	4	34	4	36	4	35	4
B.4	80	48	54	2	57	2	63	2	53	2	60	2
B.5	13	54	46	3	44	3	40	3	39	3	40	3
D.2	100	61	69	1	70	1	74	1	85	1	80	1

Conclusions of the MCDA results using weighted scores

Across SW range of Best Value rankings (which consider cost and Net Social Impact in insolation and then in combination) and weighting scenarios (which consider different assumptions on the relative importance of the MCDA sub-criteria which comprise Net Social Impact and Affordability), having considered 25 different sets of results from SW's five Best Value rankings and range of different weighting scenarios under each of these rankings, for both the BAU and Drought scenarios, SW found that:

- **D.2 consistently scored highest –** with a considerable distance between D.2 and the second highest scoring Option under all Best Value rankings and sub-criteria weighting scenarios, owing to both its high performance against Net Social Impact and cost / affordability. Indeed, the cost of D.2 is around 60% of the cost of the next highest scoring Option (B.4) and almost a third of the cost of the most expensive Options (desalination). Its Net Social Impact performance is some 15%-80% better than the second highest scoring Option (B.4 / B.5) and 61%-286% better than the lowest scoring Options (A.1/ A.2), with the ranges reflecting different NSI weighting scenarios analysed. When considering both the cost and Net Social Impact of the Option together, D.2's NSI per £100 m of cost performance is around 2.0-3.1 times higher than the second highest scoring Option (B.4) and some 4.6-10.8 times higher than the lowest scoring Option (A.1 / A.2).
- **B.4 typically came second –** again performing significantly better than other remaining Options, particularly when balancing both the cost and Net Social Impact of the Option (on customers, wider society and the environment), with its NSI per £100 m of cost performance between 18% and 87% higher than the third highest scoring Option B.5. The exception is when ranking the Options by Net Social Impact (Best Value Ranking 3) in isolation, where impacts on the environment and society are scaled down in importance relative to the unweighted score scenario. Under this scenario (out of the total c20 scenarios tested), B.5 comes second instead of B.4, although in Scenario 2 B.4 is only a seven-point score from joint second.

- **A.1/ A.2 consistently scored lowest of all the Options**, owing to having both the lowest level of performance against both Net Social Impact and cost/affordability. This means when taking these two factors together (i.e., NSI per £100 m of cost performance or NSI / Affordability average score), there is a sizeable distance between desalination and the other Options under all weighting scenarios.

Appendix 6. Strategic Objective Qualitative Evaluation Matrices

Option A.1

(A.1) MCDA Best Value Ranking (Ranked 1-6)					Consenting Evaluation (Recommendations / ranking)	Performance against Legal and Policy Obligations		Performance against the Strategic Objectives	
BV Ranking 1	BV Ranking 2	BV Ranking 3	BV Ranking 4	BV Ranking 5	Ranking 1-6	Legal Obligation	Justification	Strategic Objective (RAG)	Justification
5	5	4	5	5	5 This is not considered consentable at this time and this location on the basis of its performance against dNPS and NPPF policies. Key to this is the HRA test where there is likely to be effect on integrity of the Habitats Sites – there are better alternatives. Other key risks are: Direct impact on the National Park landscape - location of terrestrial parcel in National Park and Associated Development impacts National level biodiversity impacts – ancient woodland and SSSI impact Constructability and traffic and transport – Hythe Bypass but also linked to the above environmental constraints and potential impacts on designated sites. Solid Waste – non-compliance with zero to	Supply Duty	*Due to the potential risk of not being able to meet the deficit in a 1-in-200-year drought scenario through interim measures in the event of an* SRO delivery *delay past 2027, and the risk of not being capable of meeting the revised residual deficit in the sensitivity analysis scenario, we recommend scoring AMBER against the supply duty Legal and Policy Obligation.*	Best Value	*The Legal and Policy Obligation assessment concludes that this Option is not likely to be consentable at this location at this time on the basis that an IROPI case would need to be made, a significant risk of not being able to obtain consent on HRA grounds, and that there are better environmentally performing Options available. Furthermore, this Option has the joint longest construction and commissioning duration and therefore this Option does not ensure 'as little recourse as reasonably possible' to using Drought Orders and Drought Permits to maintain compliance with SW's supply obligations.* *The Option also carries the highest WLC forecast and, due to the immaturity of the UK desalination supply chain market and its relatively specialist nature, is the lowest scoring under the 'Supply Chain Capacity Risk' lens. Option A.1 is considered the*
						Use of Drought Orders and Drought Permits	*For Options A.1, A.2, B.2 and B.5 any alternative interim measures are assumed to be required from Q1 2027 until Q4 2030, amounting to around 3.5 years. This is around 6 months more than for Options B.4 and D.2. Therefore when compared against the other Options, all of which forecast delivery in Q1 2030, this Option does not ensure 'as little recourse as reasonably possible' to resorting to the use of Drought Orders and Drought Permits in maintaining compliance with SW's supply obligation. If the obligation is to ensure as little recourse as possible to Drought Orders, then to select this one would not be consistent with the obligation.*		

(A.1) MCDA Best Value Ranking (Ranked 1-6)					Consenting Evaluation (Recommendations / ranking)	Performance against Legal and Policy Obligations		Performance against the Strategic Objectives	
BV Ranking 1	BV Ranking 2	BV Ranking 3	BV Ranking 4	BV Ranking 5	Ranking 1-6	Legal Obligation	Justification	Strategic Objective (RAG)	Justification
					waste landfill policies Positive resilience performance				*most resilient of those Options currently under consideration.*
						Water Framework Directive	*The assessment concludes that it is considered unlikely that this Option would result in a non-compliance with the Water Framework Directive, and it could be designed to ensure consistency with the Water Framework Directive. As such selection of this Option could be consistent with the Legal and Policy Obligation, subject to appropriate mitigation.* *On the basis that mitigation, which is yet to be designed, will be relied upon to ensure compliance with the Water Framework Directive, although it is assumed that this can be achieved. On that basis, the RAG for this Option is AMBER.*	Net Zero Carbon	*Not enough information is available at the current stage of Option development maturity to make an informed judgement on this evaluation measure.* *The criteria for achieving the objective are set out within the Water UK Public Interest Committee, the 2030 Net Zero Routemap and SW Net Zero Plan. The supporting evidence needed to validate against this criteria is not yet available for each of the Options at this stage of design development.*
						Compliance with existing and future environmental legislation	*Since the assessment concludes that Options A.1 and A.2 are assessed as not likely to be consentable at this location at this time, on the basis that an IROPI case would need to be made, and there are better environmentally performing alternatives available, the RAG rating for these Options is RED.*		
						Section 20 agreement	*This Option is the long-term scheme for alternative water resources set out in WRMP19, and to continue to use 'all best endeavours' to implement Option A.1 would be to continue to ensure compliance with the S20 Agreement.*		

(A.1) MCDA Best Value Ranking (Ranked 1-6)					Consenting Evaluation (Recommendations / ranking)	Performance against Legal and Policy Obligations		Performance against the Strategic Objectives	
BV Ranking 1	BV Ranking 2	BV Ranking 3	BV Ranking 4	BV Ranking 5	Ranking 1-6	Legal Obligation	Justification	Strategic Objective (RAG)	Justification
						Biodiversity Net Gain and Wider Environmental Net Gain	*SW provided us with a 'Level 3a Natural Capital and Biodiversity Net Gain Summary' by email on 13th August 2021. This indicates, for each Option:* *Total temporary habitat lost during construction* *Total permanent habitat loss* *Total on-site re-instatement/creation* *Total off-site habitat creation/ BNG uplift* *It operates on an assumption that 10% biodiversity net gain will need to be demonstrated for any Option which is to be progressed.* *At this stage in scheme development, there is no information on exactly how biodiversity net gain would be achieved for each Option. After Gate 2 further scheme development will be undertaken in relation to the EPO (and to a more limited degree the Back-Up Option) and this will include further consideration of biodiversity net gain and environmental net gain.*	Adaptability	*As a stand-alone supply and treatment asset, desalination affords some opportunity to support bulk supply transfer at a regional level and a level of additional treatment resilience that could allow other water supply works to be taken out of service. However, it should be noted that as currently proposed, Desalination-based Options would transfer potable water to the Testwood area and have not been optimised to support wider bulk transfers.* *However, desalination is not considered scalable due to the fixed nature of its associated assets (particularly marine intakes and pipeline infrastructure) and the environmental limitations associated with discharging brine effluent.*
						Draft dNPSWRI	*Based on the risks in relation to dNPSWRI compliance regarding (i) terrestrial and marine biodiversity, and (ii) Landscape, Seascape, Townscape and Visual Amenity this Option is RAG rating AMBER in relation to this Legal and Policy Obligation.*		
Unweighted drought scenario rankings									

Option A.2

(A.2) MCDA Ranking (Ranked 1-6)					Consenting Evaluation (Recommendations / ranking)	Performance against Legal and Policy Obligations		Performance against the Strategic Objectives	
BV Ranking 1	BV Ranking 2	BV Ranking 3	BV Ranking 4	BV Ranking 5	Ranking 1-6	Legal Obligation	Justification	Strategic Objective (RAG)	Justification
5	5	6	6	6	5 This is not considered consentable on the basis of its performance against dNPS and NPPF policies. Key to this is the HRA test where there is likely to be effect on integrity of the Habitats Sites – there are better alternatives.	Supply Duty	*Due to the risk of not being able to meet the deficit in a 1-in-200-year drought scenario through interim measures in the event of an SRO delivery delay past 2027, and the risk of not being capable of meeting the revised residual deficit in the sensitivity analysis scenario, we recommend scoring AMBER against the supply duty Legal and Policy Obligation.*	Best Value	*Owing to its slightly smaller capacity and footprint, Option A.2 is considered marginally less impactful than Option A.1 however, the Legal and Policy Obligation assessment concludes that this Option is not likely to be consentable at this location at this time on the basis that an IROPI case would need to be made, a significant risk of not being*

(A.2) MCDA Ranking (Ranked 1-6)					Consenting Evaluation (Recommendations / ranking)	Performance against Legal and Policy Obligations		Performance against the Strategic Objectives	
BV Ranking 1	BV Ranking 2	BV Ranking 3	BV Ranking 4	BV Ranking 5	Ranking 1-6	Legal Obligation	Justification	Strategic Objective (RAG)	Justification
					Other key risks are: Direct impact on the National Park landscape - location of terrestrial parcel in National Park and Associated Development impacts National level biodiversity impacts – ancient woodland and SSSI impact Constructability and traffic and transport – Hythe Bypass but also linked to the above environmental constraints and potential impacts on designated sites. Solid Waste – non-compliance with zero to waste landfill policies Positive resilience performance	Use of Drought Orders and Drought Permits	*For Options A.1, A.2, B.2 and B.5 any alternative interim measures are assumed to be required from Q1 2027 until Q4 2030, amounting to around 3.5 years. This is around 6 months more than for Options B.4 and D.2. Therefore when compared against the other Options, all of which forecast delivery in Q1 2030, this Option does not ensure 'as little recourse as reasonably possible' to resorting to the use of Drought Orders and Drought Permits in maintaining compliance with SW's supply obligation. If the obligation is to ensure as little recourse as possible to Drought Orders, then to select this one would not be consistent with the obligation.*		*able to obtain consent on HRA grounds, and that there are better environmentally performing Options available. Furthermore, this Option has the joint longest construction and commissioning duration and therefore this Option does not ensure 'as little recourse as reasonably possible' to using Drought Orders and Drought Permits to maintain compliance with SW's supply obligations.* *The Option also carries the second highest WLC forecast and, due to the immaturity of the UK desalination supply chain market and its relatively specialist nature, is the joint lowest scoring under the 'Supply Chain Capacity Risk' lens. Option A.2 is considered among the most resilient of those Options currently under consideration.*

(A.2) MCDA Ranking (Ranked 1-6)					Consenting Evaluation (Recommendations / ranking)	Performance against Legal and Policy Obligations		Performance against the Strategic Objectives	
BV Ranking 1	BV Ranking 2	BV Ranking 3	BV Ranking 4	BV Ranking 5	Ranking 1-6	Legal Obligation	Justification	Strategic Objective (RAG)	Justification
						Water Framework Directive	*The assessment concludes that it is considered unlikely that this Option would result in a non-compliance with the WFD, and it could be designed to ensure consistency with the Water Framework Directive. As such selection of this Option could be consistent with the Legal and Policy Obligation, subject to appropriate mitigation.* *On the basis that mitigation, which is yet to be designed, will be relied upon to ensure compliance with the Water Framework Directive, although it is assumed that this can be achieved. On that basis, the RAG for this Option is AMBER.*	Net Zero Carbon	*Not enough information is available at the current stage of Option development maturity to make an informed judgement on this evaluation measure.* *The criteria for achieving the objective are set out within the Water UK Public Interest Committee, the 2030 Net Zero Routemap and SW Net Zero Plan. The supporting evidence needed to validate against this criteria is not yet available for each of the Options at this stage of design development.*
						Compliance with existing and future environmental legislation	*Since the assessment concludes that Options A.1 and A.2 are assessed as not consentable on the basis that an IROPI case would need to be made, and there are better environmentally performing alternatives available, the RAG rating for these Options is RED.*		

(A.2) MCDA Ranking (Ranked 1-6)					Consenting Evaluation (Recommendations / ranking)	Performance against Legal and Policy Obligations		Performance against the Strategic Objectives	
BV Ranking 1	BV Ranking 2	BV Ranking 3	BV Ranking 4	BV Ranking 5	Ranking 1-6	Legal Obligation	Justification	Strategic Objective (RAG)	Justification
						Section 20 agreement	*This Option is not part of the long-term scheme for alternative water resources set out in WRMP19. If this Option were selected SW would expect to undertake an update of WRMP19 on the basis of there being a 'material change in circumstances', so as to include this Option in an updated WRMP19. At the point when the Option was included in the updated WRMP19 it would be brought within the terms of the S20 Agreement, and to use 'all best endeavours' to implement this Option would be to continue to ensure compliance with the S20 Agreement.*		
						Biodiversity Net Gain and Wider Environmental Net Gain	*SW provided us with a 'Level 3a Natural Capital and Biodiversity Net Gain Summary' by email on 13th August 2021. This indicates, for each Option:* *Total temporary habitat lost during construction* *Total permanent habitat loss* *Total on-site re-instatement/creation* *Total off-site habitat creation/ BNG uplift* *It operates on an assumption that 10% biodiversity net gain will need to be demonstrated for any Option which is to be progressed.* *At this stage in scheme development, there is no information on exactly how biodiversity net gain would be achieved for each Option. After Gate 2 further scheme development will be undertaken in relation to the EPO (and to a more limited degree the Back-Up Option) and this will include further consideration of biodiversity net gain and environmental net gain.*	Adaptability	*As a stand-alone supply and treatment asset, desalination affords some opportunity to support bulk supply transfer at a regional level and a level of additional treatment resilience that could allow other water supply works to be taken out of service. However, it should be noted that as currently proposed, Desalination-based Options would transfer potable water to the Testwood area and have not been optimised to support wider bulk transfers.* *However, desalination is not considered scalable due to the fixed nature of its associated assets (particularly marine intakes and pipeline infrastructure) and the environmental limitations associated with discharging*

(A.2) MCDA Ranking (Ranked 1-6)					Consenting Evaluation (Recommendations / ranking)	Performance against Legal and Policy Obligations		Performance against the Strategic Objectives	
BV Ranking 1	BV Ranking 2	BV Ranking 3	BV Ranking 4	BV Ranking 5	Ranking 1-6	Legal Obligation	Justification	Strategic Objective (RAG)	Justification
						Draft dNPSWRI	*Based on the risks in relation to dNPSWRI compliance regarding (i) terrestrial and marine biodiversity, and (ii) Landscape, Seascape, Townscape and Visual Amenity this Option is RAG rating AMBER in relation to this Legal and Policy Obligation.*		*brine effluent. Additionally, owing to its slightly smaller footprint Option A.2 is considered marginally less scalable than Option A.1.*
Unweighted drought scenario rankings									

Option B.2

(B.2) MCDA Best Value Ranking (Ranked 1-6)					Consenting Evaluation (Recommendations / ranking)	Performance against Legal and Policy Obligations		Performance against the Strategic Objectives	
BV Ranking 1	BV Ranking 2	BV Ranking 3	BV Ranking 4	BV Ranking 5	Ranking 1-6	Legal Obligation	Justification	Strategic Objective (RAG)	Justification
3	3	3	4	3	3 This has less consenting risk than A.1 / A.2 and it does not have the same level of marine HRA impact which is a significant determinant of consentability for A.1 / A.2 (note this assumes that the zero pathway to Langstone can be shown) Potential HRA challenges associated with pipeline watercourse crossings to Otterbourne but potential overcome through engineering solution (applies to both Options) Pipeline routeing through National Park – need for engagement and further route development to minimise impacts and optimise the route Need to avoid direct and indirect impact on ancient woodland Uncertainty re break pressure tank and pumping station locations that would require effective siting post Gate 2 Eastney Outfall modelling indicates no risk to Langstone Harbour designations and technical evidence will need to be provided to support this Otterbourne Lake – details of the construction methodology and emergency discharge are still at an early stage, an adverse effect on integrity of the River Itchen SAC cannot be ruled out	Supply Duty	*Due to the risk of not being able to meet the deficit in a 1-in-200-year drought scenario through interim measures in the event of an SRO delivery delay past 2027, and the risk of not being capable of meeting the revised residual deficit in the sensitivity analysis scenario, we recommend scoring AMBER against the supply duty Legal and Policy Obligation.*	Best Value	*Option B.2 performs moderately against the Legal and Policy Obligations with an amber assessment under every evaluation category assessed.* *This Option has mixed results under the lenses of Biodiversity and Natural Capital, is the 3rd best least cost Option in WLC terms and is considered the least resilient of all Options under consideration, primarily due to its reliance on Otterbourne, its small environmental buffer and its smaller footprint WRP.*
						Use of Drought Orders and Drought Permits	*For Options A.1, A.2, B.2 and B.5 any alternative interim measures are assumed to be required from Q1 2027 until Q4 2030, amounting to around 3.5 years. This is around 6 months more than for Options B.4 and D.2. Therefore when compared against the other Options, all of which forecast delivery in Q1 2030, this Option does not ensure 'as little recourse as reasonably possible' to resorting to the use of Drought Orders and Drought Permits in maintaining compliance with SW's supply obligation. If the obligation is to ensure as little*		

(B.2) MCDA Best Value Ranking (Ranked 1-6)					Consenting Evaluation (Recommendations / ranking)	Performance against Legal and Policy Obligations		Performance against the Strategic Objectives	
BV Ranking 1	BV Ranking 2	BV Ranking 3	BV Ranking 4	BV Ranking 5	Ranking 1-6	Legal Obligation	Justification	Strategic Objective (RAG)	Justification
					at this stage. It is likely however that the mitigation measures supported by further design/modelling and evidencing, will allow significant adverse effects to the River Itchen be avoided		*recourse as possible to Drought Orders, then to select this one would not be consistent with the obligation.*		

(B.2) MCDA Best Value Ranking (Ranked 1-6)					Consenting Evaluation (Recommendations / ranking)	Performance against Legal and Policy Obligations		Performance against the Strategic Objectives	
BV Ranking 1	BV Ranking 2	BV Ranking 3	BV Ranking 4	BV Ranking 5	Ranking 1-6	Legal Obligation	Justification	Strategic Objective (RAG)	Justification
						Water Framework Directive	*The assessment concludes that it is considered unlikely that this Option would result in a non-compliance with the WFD, and it could be designed to ensure consistency with the WFD. As such selection of this Option could be consistent with the Legal and Policy Obligation, subject to appropriate mitigation.* *On the basis that mitigation, which is yet to be designed, will be relied upon to ensure compliance with the WFD, although it is assumed that this can be achieved. On that basis, the RAG for this Option is AMBER.*	Net Zero Carbon	*Not enough information is available at the current stage of Option development maturity to make an informed judgement on this evaluation measure.* *The criteria for achieving the objective are set out within the Water UK Public Interest Committee, the 2030 Net Zero Routemap and SW Net Zero Plan. The supporting evidence needed to validate against this criteria is not yet available for each of the Options at this stage of design development.*
						Compliance with existing and future environmental legislation	*Since the assessment concludes that an adverse effect on integrity of the River Itchen SAC cannot be ruled out, the RAG rating for these Options is AMBER.*		

(B.2) MCDA Best Value Ranking (Ranked 1-6)					Consenting Evaluation (Recommendations / ranking)	Performance against Legal and Policy Obligations		Performance against the Strategic Objectives	
BV Ranking 1	BV Ranking 2	BV Ranking 3	BV Ranking 4	BV Ranking 5	Ranking 1-6	Legal Obligation	Justification	Strategic Objective (RAG)	Justification
						Section 20 agreement	*This Option is not part of the long-term scheme for alternative water resources set out in WRMP19. If this Option were selected SW would expect to undertake an update of WRMP19 on the basis of there being a 'material change in circumstances', so as to include this Option in an updated WRMP19. At the point when the Option was included in the updated WRMP19 it would be brought within the terms of the S20 Agreement, and to use 'all best endeavours' to implement this Option would be to continue to ensure compliance with the S20 Agreement.*		

(B.2) MCDA Best Value Ranking (Ranked 1-6)					Consenting Evaluation (Recommendations / ranking)	Performance against Legal and Policy Obligations		Performance against the Strategic Objectives	
BV Ranking 1	BV Ranking 2	BV Ranking 3	BV Ranking 4	BV Ranking 5	Ranking 1-6	Legal Obligation	Justification	Strategic Objective (RAG)	Justification
						Biodiversity Net Gain and Wider Environmental Net Gain	*SW provided us with a 'Level 3a Natural Capital and Biodiversity Net Gain Summary' by email on 13th August 2021. This indicates, for each Option:* *Total temporary habitat lost during construction* *Total permanent habitat loss* *Total on-site re-instatement/creation* *Total off-site habitat creation/ BNG uplift* *It operates on an assumption that 10% biodiversity net gain will need to be demonstrated for any Option which is to be progressed.* *At this stage in scheme development, there is no information on exactly how biodiversity net gain would be achieved for each Option. After Gate 2 further scheme development will be undertaken in relation to the EPO (and to a more limited degree the Back-Up Option) and this will include further consideration of biodiversity net gain and environmental net gain.*	Adaptability	*The adaptability of this Option is considered good as it can potentially be combined in a number of configurations however, the scalability is somewhat limited by the final effluent feed limitations of Budds Farm and Peel Common WTW and the volume of the EBL at Otterbourne.*

(B.2) MCDA Best Value Ranking (Ranked 1-6)					Consenting Evaluation (Recommendations / ranking)	Performance against Legal and Policy Obligations		Performance against the Strategic Objectives	
BV Ranking 1	BV Ranking 2	BV Ranking 3	BV Ranking 4	BV Ranking 5	Ranking 1-6	Legal Obligation	Justification	Strategic Objective (RAG)	Justification
						Draft dNPSWRI	*Based on the risks in relation to dNPSWRI compliance regarding (i) terrestrial biodiversity, and (ii) Landscape, Seascape, Townscape and Visual Amenity this Option is RAG rating AMBER in relation to this Legal and Policy Obligation.*		
Unweighted drought scenario rankings									

Option B.4

(B.4) MCDA Best Value Ranking (Ranked 1-6)					Consenting Evaluation (Recommendations / ranking)	Performance against Legal and Policy Obligations		Performance against the Strategic Objectives	
BV Ranking 1	BV Ranking 2	BV Ranking 3	BV Ranking 4	BV Ranking 5	Ranking 1-6	Legal Obligation	Justification	Strategic Objective (RAG)	Justification
2	2	4	2	2	2 This has less consenting risk than A.1 / A.2 and it does not have the same level of marine HRA impact which is a significant determinant of consentability for A.1 / A.2. It has less risk than B.2 / B.5 as it does not require Otterbourne Lake – removes a further HRA risk Potential HRA challenges associated with pipeline watercourse crossings to Otterbourne but potential overcome through engineering solution Pipeline routeing	Supply Duty	*Due to the risk of not being able to meet the deficit in a 1-in-200-year drought scenario through interim measures in the event of an* SRO delivery *delay past 2027, and the fact that full modelling has not been undertaken to confirm the ability of B.4 to meet a residual deficit of 87 Ml/d in the sensitivity analysis scenario, we recommend scoring AMBER against the supply duty Legal and Policy Obligation*	Best Value	*In the round this Option is evaluated as amber. The MCDA lenses where this Option scored lowest are considered less material factors than consentability. This Option also represents the second highest performing in WLC terms. Adaptability is a category under WRPG 'Best Value' lens where B.4 is evaluated as very high performing.*
						Use of Drought Orders and Drought Permits	*For Options B.4 and D.2 any alternative interim measures are assumed to be required from Q1 2027 until Q1 2030, amounting to 3 years. Therefore, when compared against the other Option with a longer timeframe of reliance on such measures, these are more likely to be capable of satisfying the legal and policy requirement to ensure 'as little recourse as reasonably possible' to resorting to the use of Drought Orders and Drought Permits in maintaining compliance with SW's supply obligation.*		

					through National Park – need for engagement and further route development to minimise impacts and optimise the route Need to avoid direct and indirect impact on ancient woodland Uncertainty about the break pressure tank and pumping station locations that would require effective siting post Gate 2 Eastney Outfall modelling indicates no risk to Langstone Harbour designations and technical evidence will need to be provided to support this	Water Framework Directive	*The assessment concludes that it is considered unlikely that these Options would result in a non-compliance with the WFD, and it could be designed to ensure consistency with the Water Framework Directive. As such selection of this Option could be consistent with the Legal and Policy Obligation, subject to appropriate mitigation.* *On the basis that mitigation, which is yet to be designed, will be relied upon to ensure compliance with the Water Framework Directive, although it is assumed that this can be achieved. On that basis, the RAG for this Option is AMBER.*	Net Zero Carbon	*Not enough information is available at the current stage of Option development maturity to make an informed judgement on this evaluation measure.* *The criteria for achieving the objective are set out within the Water UK Public Interest Committee, the 2030 Net Zero Routemap and SW Net Zero Plan. The supporting evidence needed to validate against this criteria is not yet available for each of the Options at this stage of design development.*
						Compliance with existing and future environmental legislation	*The assessment concludes that an appropriate engineering solution would be required in order to ensure no adverse effects on the integrity of a terrestrial European site or sites as a result of construction. Since such a solution has not yet been identified, the RAG rating for these Options is AMBER.*		

						Section 20 agreement	*This Option is not part of the long-term scheme for alternative water resources set out in WRMP19. If this Option were selected SW would expect to undertake an update of WRMP19 on the basis of there being a 'material change in circumstances', so as to include this Option in an updated WRMP19. At the point when the Option was included in the updated WRMP19 it would be brought within the terms of the S20 Agreement, and to use 'all best endeavours' to implement this Option would be to continue to ensure compliance with the S20 Agreement.*		

						Biodiversity Net Gain and Wider Environmental Net Gain	*SW provided us with a 'Level 3a Natural Capital and Biodiversity Net Gain Summary' by email on 13th August 2021. This indicates, for each Option:* *Total temporary habitat lost during construction* *Total permanent habitat loss* *Total on-site re-instatement/creation* *Total off-site habitat creation/ BNG uplift* *It operates on an assumption that 10% biodiversity net gain will need to be demonstrated for any Option which is to be progressed.* *At this stage in scheme development, there is no information on exactly how biodiversity net gain would be achieved for each Option. After Gate 2 further scheme development will be undertaken in relation to the EPO (and to a more limited degree the Back-Up Option) and this will include further consideration of biodiversity net gain and environmental net gain.*	Adaptability	*Option B.4 is considered to have the second highest potential for evolvability and as an enabler for future projects that have the potential to jointly meet SW and PW's future demands.*
						Draft dNPSWRI	*Based on the risks in relation to dNPSWRI compliance regarding (i) terrestrial biodiversity, and (ii) Landscape, Seascape, Townscape and Visual Amenity this Option is RAG rating AMBER in relation to this Legal and Policy Obligation.*		
Unweighted drought scenario rankings									

Option B.5

(B.5) MCDA Best Value Ranking (Ranked 1-6)					Consenting Evaluation (Recommendations / ranking)	Performance against Legal and Policy Obligations		Performance against the Strategic Objectives	
BBV Ranking 1	BV Ranking 2	BV Ranking 3	BV Ranking 4	BV Ranking 5	Ranking 1-6	Legal Obligation	Justification	Strategic Objective (RAG)	Justification
4	4	2	3	4	3 This has less consenting risk than A.1 / A.2 and it does not have the same level of marine HRA impact which is a significant determinant of consentability for A.1 / A.2 (note this assumes that the zero pathway to Langstone can be shown) Potential HRA challenges associated with pipeline watercourse crossings to Otterbourne but potential overcome through engineering solution (applies to both Options) Pipeline routeing through National Park – need for engagement and further route development to minimise impacts and optimise the route Need to avoid direct and indirect impact on ancient woodland Uncertainty about the break pressure tank and pumping station locations that would require effective siting post Gate 2 Eastney Outfall modelling indicates no risk to Langstone Harbour designations and technical evidence will need to be provided to support this Otterbourne Lake – details of the construction methodology and emergency discharge are still at an early stage, an adverse effect	Supply Duty	*Due to the risk of not being able to meet the deficit in a 1-in-200-year drought scenario through interim measures in the event of an* SRO delivery *delay past 2027, and the risk of not being capable of meeting the revised residual deficit in the sensitivity analysis scenario, we recommend scoring AMBER against the supply duty Legal and Policy Obligation.*	Best Value	*Option B.5 performs moderately against the Legal and Policy Obligations with an amber assessment under every evaluation category assessed.* *This Option has mixed results under the lenses of Biodiversity and Natural Capital with the best performing MCDA score under the Biodiversity Net Gain lens, but the third lowest performing Option under Local Biodiversity and is the 3rd most expensive Option in WLC terms. This Option is also the second lowest performing under the resilience lens.*
						Use of Drought Orders and Drought Permits	*For Options A.1, A.2, B.2 and B.5 any alternative interim measures are assumed to be required from Q1 2027 until Q4 2030, amounting to around 3.5 years. This is around 6 months more than for Options B.4 and D.2. Therefore when compared against the other Options, all of which forecast delivery in Q1 2030, this Option does not ensure 'as little recourse as reasonably possible' to resorting to the use of Drought Orders and Drought Permits in maintaining compliance with SW's supply obligation. If the obligation is to ensure as little recourse as possible to Drought Orders, then to select this one would not be consistent with the obligation.*		

(B.5) MCDA Best Value Ranking (Ranked 1-6)					Consenting Evaluation (Recommendations / ranking)	Performance against Legal and Policy Obligations		Performance against the Strategic Objectives	
BBV Ranking 1	BV Ranking 2	BV Ranking 3	BV Ranking 4	BV Ranking 5	Ranking 1-6	Legal Obligation	Justification	Strategic Objective (RAG)	Justification
					on integrity of the River Itchen SAC cannot be ruled out at this stage. It is likely however that the mitigation measures supported by further design / modelling and evidencing, will allow significant adverse effects to the River Itchen be avoided	Water Framework Directive	*The assessment concludes that it is considered unlikely that this Option would result in a non-compliance with the WFD, and it could be designed to ensure consistency with the Water Framework Directive. As such selection of this Option could be consistent with the Legal and Policy Obligation, subject to appropriate mitigation.* *On the basis that mitigation, which is yet to be designed, will be relied upon to ensure compliance with the WFD, although it is assumed that this can be achieved. On that basis, the RAG for this Option is AMBER.*	Net Zero Carbon	*Not enough information is available at the current stage of Option development maturity to make an informed judgement on this evaluation measure.* *The criteria for achieving the objective are set out within the Water UK Public Interest Committee, the 2030 Net Zero Routemap and SW Net Zero Plan. The supporting evidence needed to validate against this criteria is not yet available for each of the Options at this stage of design development.*
						Compliance with existing and future environmental legislation	*Since the assessment concludes that an adverse effect on integrity of the River Itchen SAC cannot be ruled out, the RAG rating for this Option is AMBER.*		

(B.5) MCDA Best Value Ranking (Ranked 1-6)					Consenting Evaluation (Recommendations / ranking)	Performance against Legal and Policy Obligations		Performance against the Strategic Objectives	
BBV Ranking 1	BV Ranking 2	BV Ranking 3	BV Ranking 4	BV Ranking 5	Ranking 1-6	Legal Obligation	Justification	Strategic Objective (RAG)	Justification
						Section 20 agreement	*This Option is not part of the long-term scheme for alternative water resources set out in WRMP19. If this Option were selected SW would expect to undertake an update of WRMP19 on the basis of there being a 'material change in circumstances', so as to include this Option in an updated WRMP19. At the point when the Option was included in the updated WRMP19 it would be brought within the terms of the S20 Agreement, and to use 'all best endeavours' to implement this Option would be to continue to ensure compliance with the S20 Agreement.*		
						Biodiversity Net Gain and Wider Environmental Net Gain	*SW provided us with a 'Level 3a Natural Capital and Biodiversity Net Gain Summary' by email on 13th August 2021. This indicates, for each Option:* *Total temporary habitat lost during construction* *Total permanent habitat loss* *Total on-site re-instatement/creation* *Total off-site habitat creation/ BNG uplift* *It operates on an assumption that 10% biodiversity net gain will need to be demonstrated for any Option which is to be progressed.* *At this stage in scheme development, there is no information on exactly how biodiversity net gain would be achieved for each Option. After Gate 2 further scheme development will be undertaken in relation to the EPO (and to a more limited degree*	Adaptability	*The adaptability of this Option is considered good as it can potentially be combined in a number of configurations however, the scalability is somewhat limited by the final effluent feed limitations of Budds Farm and Peel Common WTW and the volume of the EBL at Otterbourne.*

(B.5) MCDA Best Value Ranking (Ranked 1-6)					Consenting Evaluation (Recommendations / ranking)	Performance against Legal and Policy Obligations		Performance against the Strategic Objectives	
BBV Ranking 1	BV Ranking 2	BV Ranking 3	BV Ranking 4	BV Ranking 5	Ranking 1-6	Legal Obligation	Justification	Strategic Objective (RAG)	Justification
							the Back-Up Option) and this will include further consideration of biodiversity net gain and environmental net gain.		
						Draft dNPSWRI	*Based on the risks in relation to dNPSWRI compliance regarding (i) terrestrial biodiversity, and (ii) Landscape, Seascape, Townscape and Visual Amenity this Option is RAG rating AMBER in relation to this Legal and Policy Obligation.*		
Unweighted drought scenario rankings									

Option D.2

(D.2) MCDA Best Value Ranking (Ranked 1-6)					Consenting Evaluation (Recommendations / ranking)	Performance against Legal and Policy Obligations		Performance against the Strategic Objectives	
BV Ranking 1	BV Ranking 2	BV Ranking 3	BV Ranking 4	BV Ranking 5	Ranking 1-6	Legal Obligation	Justification	Strategic Objective (RAG)	Justification
1	1	1	1	1	1 Has least consenting risk Potential HRA challenges associated with pipeline watercourse crossings to Otterbourne but potential overcome through engineering solution Pipeline routeing through National Park – need for engagement and further route development to minimise impacts and optimise the route Need to avoid direct and indirect impact on ancient woodland Uncertainty about the break pressure tank and pumping station locations that would require effective siting post Gate 2 Technical evidence to be provided about the ability of this Option to provide against the Section 20 requirements under all drought conditions and providing sufficient level of long-term resilience	Supply Duty	*Due to the risk of not being able to meet the deficit in a 1-in-200-year drought scenario through interim measures in the event of an* SRO delivery *delay past 2027, and the risk of not being capable of meeting the revised residual deficit in the sensitivity analysis scenario, we recommend scoring AMBER against the supply duty Legal and Policy Obligation.*	Best Value	*In the round, this Option is evaluated as green. The MCDA lenses where this Option scored lowest are considered less material factors than consentability and best value, where D.2 scored highest. Adaptability is a category under WRPG 'Best Value' lens where B.4 is evaluated as very high performing.*
						Use of Drought Orders and Drought Permits	*For Options B.4 and D.2 any alternative interim measures are assumed to be required from Q1 2027 until Q1 2030, amounting to 3 years. Therefore when compared against the other Option with a longer timeframe of reliance on such measures, these are more likely to be capable of satisfying the legal and policy requirement to ensure 'as little recourse as reasonably possible' to resorting to the use of Drought Orders and Drought Permits in maintaining compliance with SW's supply obligation.*		

(D.2) MCDA Best Value Ranking (Ranked 1-6)					Consenting Evaluation (Recommendations / ranking)	Performance against Legal and Policy Obligations		Performance against the Strategic Objectives	
BV Ranking 1	BV Ranking 2	BV Ranking 3	BV Ranking 4	BV Ranking 5	Ranking 1-6	Legal Obligation	Justification	Strategic Objective (RAG)	Justification
						Water Framework Directive	*The assessment concludes that it is considered unlikely that this Option would result in a non-compliance with the WFD, and they could be designed to ensure consistency with the Water Framework Directive. As such selection of this Option could be consistent with the Legal and Policy Obligation, subject to appropriate mitigation.* *On the basis that mitigation, which is yet to be designed, will be relied upon to ensure compliance with the Water Framework Directive, although it is assumed that this can be achieved. On that basis, the RAG for this Option is AMBER.*	Net Zero Carbon	*Not enough information is available at the current stage of Option development maturity to make an informed judgement on this evaluation measure.* *The criteria for achieving the objective are set out within the Water UK Public Interest Committee, the 2030 Net Zero Routemap and SW Net Zero Plan. The supporting evidence needed to validate against these criteria is not yet available for each of the Options at this stage of design development.*
						Compliance with existing and future environmental legislation	*The assessment concludes that an appropriate engineering solution would be required in order to ensure no adverse effects on the integrity of a terrestrial European site or sites as a result of construction. Since such a solution has not yet been identified, the RAG rating for these Options is AMBER.*		

(D.2) MCDA Best Value Ranking (Ranked 1-6)					Consenting Evaluation (Recommendations / ranking)	Performance against Legal and Policy Obligations		Performance against the Strategic Objectives	
BV Ranking 1	BV Ranking 2	BV Ranking 3	BV Ranking 4	BV Ranking 5	Ranking 1-6	Legal Obligation	Justification	Strategic Objective (RAG)	Justification
						Section 20 agreement	*This Option is not part of the long term scheme for alternative water resources set out in WRMP19. If this Option were selected SW would expect to undertake an update of WRMP19 on the basis of there being a 'material change in circumstances', so as to include this Option in an updated WRMP19. At the point when the Option was included in the updated WRMP19 it would be brought within the terms of the S20 Agreement, and to use 'all best endeavours' to implement this Option would be to continue to ensure compliance with the S20 Agreement.*		
						Biodiversity Net Gain and Wider Environmental Net Gain	*SW provided us with a 'Level 3a Natural Capital and Biodiversity Net Gain Summary' by email on 13th August 2021. This indicates, for each Option:* *Total temporary habitat lost during construction* *Total permanent habitat loss* *Total on-site re-instatement/creation* *Total off-site habitat creation/ BNG uplift* *It operates on an assumption that 10% biodiversity net gain will need to be demonstrated for any Option which is to be progressed.* *At this stage in scheme development, there is no information on exactly how biodiversity net gain would be achieved for each Option. After Gate 2 further scheme development will be undertaken in relation to the EPO (and to a more*	Adaptability	*Option D.2 is a fundamental enabling project which must be completed either prior to or as part of a wider scheme including water recycling (i.e., Option B.4). Without the direct pipeline and pumping station, no Havant Thicket Alternative Options are viable.* *However, Option D.2 is considered to have the highest potential for evolvability and as an enabler for Option B.4 and future projects that have the potential to jointly meet SW and PW's future demands.*

(D.2) MCDA Best Value Ranking (Ranked 1-6)					Consenting Evaluation (Recommendations / ranking)	Performance against Legal and Policy Obligations		Performance against the Strategic Objectives	
BV Ranking 1	BV Ranking 2	BV Ranking 3	BV Ranking 4	BV Ranking 5	Ranking 1-6	Legal Obligation	Justification	Strategic Objective (RAG)	Justification
							limited degree the Back-Up Option) and this will include further consideration of biodiversity net gain and environmental net gain.		
						Draft dNPSWRI	*Based on the risks in relation to dNPSWRI compliance regarding terrestrial biodiversity, this Option is RAG rating AMBER in relation to this Legal and Policy Obligation.*		
Unweighted drought scenario rankings									

Appendix 7. Adaptability – Supporting Evidence

MCDA Evolvability of Supply Workshop

Business As Usual (BAU)

Consensus evaluators & facilitators:	Ross Kettle, James Rushworth, Mark Wintringham, Varsha Wylie
Date completed:	13/07/2021
Criterion name:	**Evolvability of supply**
Criterion description:	**The extent to which the SRO could be modified / transformed post-2027 to support Southern Water's future asset strategy and the needs of customers across the region, as future supply needs increase as a result of long term trends.**
Scoring guidance:	**Extent of evolvability of an SRO is assumed to be influenced by it's ability to be modified / transformed (beyond its existing engineering configuration) into a future strategic option within the wider regional system and in turn meet additional strategic demands on Southern Water and its regional partners (including, but not limited to, Portsmouth Water). These additional strategic demands are likely to be influenced by long term trends, including (but not restricted to): (i) future sustainability reductions; (ii) enhanced system resilience requirements (e.g. system resilience up to a 1 in 500 year event); and (iii) macroeconomic trends such as climate change and population growth.**
Technical evidence referred to when undertaking assessme	- Level 4 technical reports and appendices, drawings, cost estimating & risk outputs.
Date when technical evidence has been accessed:	13/07/2021
Key assumptions underpinning assessment:	- No difference between BAU and Drought scenarios - this is about the ability of the SRO to be modified / transformed (beyond its existing engineering configuration) into a future strategic option within the wider regional system and in turn meet additional strategic demands on Southern Water and its regional partners (including, but not limited to, Portsmouth Water) i.e. a circa 50-60% increase in ML/d capactity. - Peak and duration of increased supply does matter (because WRMP will require SW to meet two different types of need) (1) If the need is peaky – 1 in 500 year drought (2) If the need is duration – sustainability reductions that you need to meet **(this is now the BAU scenario)** Note macroeconomic trends (e.g. climate change) were not considered as future strategic demands given directionality of pressure of water supply is unclear.
Scenario	**BAU Scenario i.e. non-max capacity**

		EVALUATION ANSWERS					
		Desal		Water recycling			Alternatives
KEY QUESTIONS		A.1	A.2	B.2	B.4	B.5	D.2
1	In principle, is the SRO capable of being modified / transformed into a future strategic option?	Yes, in principle it is always possible to modify a works, however, to enlarge this works would be difficult given the marine works, fixed civils assets and the likely constraints of the negotiated discharges / abstractions to/from the environment.	Yes, in principle it is always possible to modify a works, however, to enlarge this works would be difficult given the marine works, fixed civils assets and the likely constraints of the negotiated discharges / abstractions to/from the environment.	Yes	Yes	Yes	Yes, however, this option is based on PW transferring 21MLD of treated water (also sourced from HT res but treated at Farlington WSW) and the design of the reservoir with winter fill and summer draw does not lend itself to risk mitigation in a BAU scenario.
2	If no to Q1, explain why						
3	If yes to Q1, describe the nature of this future strategic option and explain what would need to be true for the SRO to be transformed (i.e. key underpinning assumptions)	- Desal output can be increased in BAU to provide additional network resilience and reduce reliance on Testwood and Otterbourne WSWs. - Desal water would reduce the loading of iron residuals in the network which would assist in addressing the discolouration issues affecting parts of the distribution network. - Would allow Testwood/Otterbourne to be taken offline more frequently for essential maintenance. - Increase in Desal capacity & support into ExxonMobil would allow SW to reduce its drought needs. - Need somewhere for the water to go and wider acceptability of the cost of desalinated water. - - New membrane technology to allow higher recovery from seawater.	Same as A.1.	- Need somewhere for the water to go and wider acceptability of the cost of recycled water - Two options: (1) Bringing Peel Common into the WRP @ Budds Farm (e.g. no tying it into the option B5) (2) Putting WRP flow into HT at a later date and using tranfer as either a HT/ WRP mix in the pipe or HT only transfer - The design of this option is based on taking source water from Budds Farm WTW only, which may be considered a single point of failure. For this to be more secure, adding flows from PC would be required.	- Need somewhere for the water to go and wider acceptability of the cost of recycled water - Three options: (1) Bringing Peel Common into the WRP @ Budds Farm (e.g. no tying it into the option B5) (2) Putting WRP flow into HT at a later date and using tranfer as either a HT/ mix ot HT only transfer (3) Increase the transfer to HT and then support other HT needs e.g. Hoads Hill or Ems WSW needs. This could be by a new WRP at Peel Common to support Gater's Mill and therefore reduce HT transfer to GM - In a BAU situation, additional flows HT Res could be obtained (up to 75MLD) based on the 15MLD of recycled water transferred to HT. As there is less reliance on Bedhampton and Havant Springs to fill the Res, this option is very flexible and to increase flexiblitity, a connection to Testwood WSW may be investigated in the event of an oeprational challenge at Otterbourne WSW, SW would still be able to treat up to 75MLD at Testwood.	- Need somewhere for the water to go and wider acceptability of the cost of recycled water - Posibility of combining with HT in the future wider support to the region (note Peel Common already tied into Budds Farm). - This option includes the use of an EBL constructed on SW's site with blending with the River Itchen during BAU. With the includsion of the Southampton Link Main between Testwood WSW and Otterbourne WSW and a potential deployment of up to 75MLD from the WRP if required in BAU, this option offers significant benefit to SW	- Need somewhere for the water to go but lots of opportunity to combine with a WRP and provide additional regional suport. - For this option to be transformed the inlet/outlet pipe should be changed to allow a separate off take pipe to enable SW to abstract from the Res during filling time if necessary.
4	If yes to Q1, potentially what additional capacity would this future strategic option provide (i.e. Ml/d)?	- If ramped up to full DO, it could allow Testwood to be taken OOS. - Assuming this is running at a sweetening flow of 15ml/d the balance of the design process limit would be available	Same as A.1.	- Assuming this is running at a sweetening flow of 5ml/d the balance of the design process limit would be available. - Otherwise, Peel Common up to 40 ML/d, and if combined with HT peak support could be up to 85 ML/d.	- Assuming this is running at a sweetening flow of 5ml/d the balance of the design process limit would be available. - Otherwise, Peel Common up to 40 ML/d, and if combined with HT peak support could be up to 85 ML/d.	- Assuming this is running at a sweetening flow of 5ml/d the balance of the design process limit would be available - Otherwise, if combined with HT peak support could be up to 45 ML/d	- Assuming this is running at a sweetening flow of 5ml/d the balance of the design process limit would be available. - Otherwise, could be up to 100 Ml/d depending on configurations
5	How would this help to address additional strategic demands on Southern Water?	- May assist with CRI and ERI scores.		'- Additional peak and duration depending on option	'- Additional peak and duration depending on option	- Additional peak and duration depending on option - If PW's Farlington site was	'- Additional peak and duration depending on option
6	How would this help to address additional strategic demands on Portsmouth Water and/or other regional partners?	- Enhanced resilience in BAU scenarios may increase resilience for PW - desal could be used to offset bulk transfers e.g. Gaters Mill should PW require additional water to resolve short term deficits / allow maintenance activities to be completed.		- Additional peak and duration depending on option - Reliance on 21MLD from PW would reduce in a BAU situation as the WR plant would be able to produce up to 61MLD if required	- Additional peak and duration depending on option - Reduced reliance on 21MLD from PW	- Additional peak and duration depending on option - Reduced reliance on 21MLD from PW	'- Additional peak and duration depending on option

		EVALUATION ANSWERS					
		Desal		Water recycling			Alternatives
KEY QUESTIONS		A.1	A.2	B.2	B.4	B.5	D.2
7	Any other comments (free-form response)	- May provide additional resilience to support Fawley refinery, reducing pressure on SWW supplies. - These opportunities are likely to be afforded to other options as well so may not act as differentiators. - The conveyance system is only designed to take flows to Testwood WSW however, for this to be evolvable, then additional network connectivity from the desal plant may be required over and above the Southampton Link Main.	- This option is identical to A.1 with a variation on throughput - therefore, in essence, this option in BAU can only provide up to 61MLD and if more flow was required, due to design limitation, this would not be possible.	- This option under BAU includes the use of the river Itchen for blending in the EBL. For evolvability in a BAU situation, more flow can be produced from the WRP (15MLD up to 61MLD) to bolster the production from Otterbourne WSW obtained from ground and river water supply.	- This option is based on modelled data however, agreement for using up to 75MLD from HT requires signficant re-design not currently part of PW's planning application, therefore this is a major risk	- Water recycling source water is predicated on the smooth operation of the donor wastewater treatment plants, Peel Common and Budds Farm WTWs. The combined availability from these 2 sites allow the production of up 95MLD of recycled water; however, land take would be a limiting factor and the EBL at Otterbourne WSW will see a reduction of HRT from 24 hours to circa 18hours which may not be acceptable bby the DWI.	
Overall assessment, taking into account the factors listed above and key underpinning evidence (justification of RAG rating)		- Overall limited ability to combine with other options to bring benefit. - When constructed this will essentaillly be a fixed asset on a constrained site with negotiated inlet / outfall permit conditions boarderd by the national park, options will be very limited.	- Overall limited ability to combine with other options to bring benefit. - When constructed this will essentaillly be a fixed asset on a constrained site with negotiated inlet / outfall permit conditions boarderd by the national park, options will be very limited.	- Only one WTW has been considered as source water (Budds Farm). The positive is the increased residence time in the EBL due to lower flows from the WRP. - Potential to combine and in a number of configuration - Good evolvability but could be constrained if connection to HT is impractical in the future due to development reducing viable corridors. Future direct potable opportunities. - This a high performing option as more recycled water can be produced by SW given the size of the WTWs (and doesn't tie up Peel Common like B5). - Small buffer lack constraints makes evolution more tricky but scope to increase against current design parameter. Conveyance pipe could be an issue if not considered at design	- This option offers flexibilty from an increased fill rate, the buffer volume in the Res and the benefit with public perception that it may offer (although the perception of water recycling is positive with SW's customers) especially with Regulators. - Potential to combine and in a number of configuration - Link between Otterbourne WSW and HT very adaptable. Expandable WRP at Budds Farm. Options still avaialble to develop Peel Common and Portswood WRPs. Potential transfers east. Future direct potable opportunities. - Conveyance pipe could be an issue if not considered at design. - Overall this option ulitmately opens up multiple futures for (given chance to work with PW may expire) which ultimately puts it above D2 **i.e. SW value the certainty of optionality in the future vs the potential for greater optionality today.**	- Peel Common WTW feed water augmnetation to Budds Farm WRP appears sub-optimal and possibly a more viable option exists. Large DO of WRP means potentially more surplus water available in the Havant area or at Otterbourne WSW. Could be constrained if connection to HT is impractical in the future due to development reducing viable corridors. Future direct potable opportunities. - Already evolved toward final state and ties up Peel Common , reducing it's ability to be used in an alternative way. - Conveyance pipe could be an issue if not considered at design	- No connection of a WRP so potential for lots of configurations - Most limited CAPEX leaving more options on the table for the future. This may not be beneficial in WR at Budds Farm is ultimately required to support HT during a 1 in 500 yr drought as would be more sensible to develop common infrastructure with PW now (and secure land for WRP) rather than waiting and trying to adpat existing infrastructure and seek available land in 5-10 years time. Future direct potable opportunities. - Conveyance pipe could be an issue if not considered at design as could treatment capacity at Otterbourne.
Evaluator's RAG rating (SRO performance):		Lowest performance	Lowest performance	High performance	Highest performance	Moderate performance	High performance
Inferred MCDA score (auto-populated)		0	0	75	100	50	75
Inferred rank (auto-populated)		5	5	2	1	4	2

Drought

Consensus evaluators & facilitators:	Ross Kettle, James Rushworth, Mark Wintringham, Varsha Wylie
Date completed:	13/07/2021
Criterion name:	**Evolvability of supply**
Criterion description:	**The extent to which the SRO could be modified / transformed post-2027 to support Southern Water's future asset strategy and the needs of customers across the region, as future supply needs increase as a result of long term trends.**
Scoring guidance:	**Extent of evolvability of an SRO is assumed to be influenced by it's ability to be modified / transformed (beyond its existing engineering configuration) into a future strategic option within the wider regional system and in turn meet additional strategic demands on Southern Water and its regional partners (including, but not limited to, Portsmouth Water). These additional strategic demands are likely to be influenced by long term trends, including (but not restricted to): (i) future sustainability reductions; (ii) enhanced system resilience requirements (e.g. system resilience up to a 1 in 500 year event); and (iii) macroeconomic trends such as climate change and population growth.**
Technical evidence referred to when undertaking assessme	- Level 4 technical reports and appendices, drawings, cost estimating & risk outputs.
Date when technical evidence has been accessed:	13/07/2021
Key assumptions underpinning assessment:	- No difference between BAU and Drought scenarios - this is about the ability of the SRO to be modified / transformed (beyond its existing engineering configuration) into a future strategic option within the wider regional system and in turn meet additional strategic demands on Southern Water and its regional partners (including, but not limited to, Portsmouth Water) i.e. a circa 50-60% increase in ML/d capactity. - Peak and duration of increased supply does matter (because WRMP will require SW to meet two different types of need) (1) If the need is peaky – 1 in 500 year drought **(this is now the Drought scenario)** (2) If the need is duration – sustainability reductions that you need to meet - Note macroeconomic trends (e.g. climate change) were not considered as future strategic demands given directionality of pressure of water supply is unclear.
Scenario	**Drought Scenario i.e. max capacity**

		EVALUATION ANSWERS					
		Desal		Water recycling			Alternatives
	KEY QUESTIONS	A.1	A.2	B.2	B.4	B.5	D.2
1	In principle, is the SRO capable of being modified / transformed into a future strategic option?	- Yes, in principle it is always possible to modify a works, however, to enlarge this works would be difficult given the marine works, fixed civils assets and the likely constraints of the negotiated discharges / abstractions to/from the environment. - Difficult to envisage how to adapt the source to meet a different need within the system based on the current understanding of deficits and loss of source water. Increasing output at the desal plant isn't really evolution of the system but rather expansion of the system (which is covered more by scalability)	Yes, in principle it is always possible to modify a works, however, to enlarge this works would be difficult given the marine works, fixed civils assets and the likely constraints of the negotiated discharges / abstractions to/from the environment.	Yes but location means adaptability and evolution of the system is difficult to envisage. Transfer to Otterbourne has limited felxibility and alternative benefits.	Yes	Yes	Yes, however, this option is based on PW transferring 21MLD of treated water (also sourced from HT res but treated at Farlington WSW) and the design of the reservoir with winter fill and summer draw does not lend itself to risk mitigation in a BAU scenario.
2	If no to Q1, explain why						
3	If yes to Q1, describe the nature of this future strategic option and explain what would need to be true for the SRO to be transformed (i.e. key underpinning assumptions)	- Desal output can be increased to provide additional network resilience and reduce reliance on Testwood and Otterbourne WSWs. - Desal water would reduce the loading of iron residuals in the network which would assist in addressing the discolouration issues affecting parts of the distribution network. - Would allow Testwood/Otterbourne to be taken offline more frequently for essential maintenance. - Increase in Desal capacity & support into ExxonMobil would allow SW to reduce its drought needs. - Need somewhere for the water to go and wider acceptability of the cost of desalinated water. - Another possible way to evolve the option (rather than expand) to meet a 1 in 500 drought scenario is to pair it with a storage solution (either above or below ground) which can be used in times of drought and drawn from (much the same as Havant Thicket but to th west of southampton water). There are large gravel workings ajacent to Slow Hill Copse	Same as A.1.	- Need somewhere for the water to go and wider acceptability of the cost of recycled water - Two potential options: (1) Bringing Peel Common into the WRP @ Budds Farm (e.g. no tying it into the option B5) (2) Putting WRP flow into HT at a later date and using tranfer as either a HT/ WRP mix in the pipe or HT only transfer - The design of this option is based on taking source water from Budds Farm WTW only, which may be considered a single point of failure. For this to be more secure, adding flows from PC would be required. - Other potential options: (1) Direct potable reuse - opportunities to support local sources e.g. Bedhampton Springs. (2) Direct potable reuse - could support supply to customers along transfer pipeline route. (3) WRP at Peel Common WTW could be used as source water at Gaters Mill (potentially alongside water from Portswood WTW).	- Need somewhere for the water to go and wider acceptability of the cost of recycled water - Options include: (1) Bringing Peel Common into the WRP @ Budds Farm (e.g. no tying it into the option B5) (2) Putting WRP flow into HT at a later date and using tranfer as either a HT/ mix ot HT only transfer (3) Increase the transfer to HT and then support other HT needs e.g. Hoads Hill or Ems WSW needs. This could be by a new WRP at Peel Common to support Gater's Mill and therefore reduce HT transfer to GM. (4) Reverse flow in HT transfer pipeline to provide winter refill of HT from R. Itchen at Otterbourne WSW. This frees up surplus DO from WRP to support local sources or possible transfer east from HT to Sussex North / PW East as part of Network 2030 grid supply. (5) WRP at Peel Common WTW could be used as source water at Gaters Mill (potentially alongside water from Portswood WTW).	- Need somewhere for the water to go and wider acceptability of the cost of recycled water - Posibility of combining with HT in the future wider support to the region (note Peel Common already tied into Budds Farm). - This option includes the use of an EBL constructed on SW's site with blending with the River Itchen during BAU. With the includsion of the Southampton Link Main between Testwood WSW and Otterbourne WSW and a potential deployment of up to 75MLD from the WRP if required in BAU, this option offers significant benefit to SW. - Other options include: (1) Direct potable reuse - opportunities to support local sources e.g. Bedhampton Springs. (2) Direct potable reuse - could support supply to customers along transfer pipeline route. (3) Additional DO could be sent to an alternate EB (HT or local EBL) to support source water to Farlington in lieu of Bedhampton Springs source.	- Need somewhere for the water to go but lots of opportunity to combine with a WRP and provide additional regional suport. - For this option to be transformed the inlet/outlet pipe should be changed to allow a separate off take pipe to enable SW to abstract from the Res during filling time if necessary. - Options include: (1) Addition of WRP at Budds Farm to provide additional source water for HT refill (would require new transfer pipeline for year round refill). (2) Reverse flow in HT transfer pipeline to provide winter refill of HT from R. Itchen at Otterbourne WSW. This frees up surplus DO from WRP to support local sources or possible transfer east from HT to Sussex North / PW East as part of Network 2030 grid supply. (3) Direct potable reuse - opportunities to support local sources e.g. Bedhampton Springs.
4	If yes to Q1, potentially what additional capacity would this future strategic option provide (i.e. Ml/d)?	- If ramped up to full DO, it could allow Testwood to be taken OOS. - Assuming this is running at a sweetening flow of 15ml/d the balance of the design process limit would be available	Same as A.1.	- Assuming this is running at a sweetening flow of 5ml/d the balance of the design process limit would be available. - Otherwise, Peel Common up to 40 ML/d, and if combined with HT peak support could be up to 85 ML/d.	- Assuming this is running at a sweetening flow of 5ml/d the balance of the design process limit would be available. - Otherwise, Peel Common up to 40 ML/d, and if combined with HT peak support could be up to 85 ML/d. - The design of the WRP is fixed at 15MLD but if this was increase potentially more than 75MLD could be obtained from the Res. The additional capacity would only be limited by Otterbourne WSW's design flow of 91MLD. - Potentially >100 ml/d depending on configurations	- Assuming this is running at a sweetening flow of 5ml/d the balance of the design process limit would be available - Otherwise, if combined with HT peak support could be up to 45 ML/d.	- Assuming this is running at a sweetening flow of 5ml/d the balance of the design process limit would be available. - Otherwise, could be up to 100 Ml/d depending on configurations

		EVALUATION ANSWERS					
		Desal		Water recycling			Alternatives
KEY QUESTIONS		A.1	A.2	B.2	B.4	B.5	D.2
5	How would this help to address additional strategic demands on Southern Water?	- May assist with CRI and ERI scores. - Provision of alternate source water to testwood during drought periods	Same as A.1.	- Additional peak and duration depending on option. - Maintain bulk transfer at Gaters Mill should PW need to reduce their abstraction at existing sources during droughts. - Additional source water avaialble at Otterbourne	- Additional peak and duration depending on option. - Significant raw water available (and poss potable in futre if direct water recycling is accepted). Water can assist in maintaining bulk transfers, source water at Otterbourne and also offer opportunity to transfer water east. - Utilises full potential of HVT to address droght issues, not just 21l/d flow.	- Additional peak and duration depending on option - If PW's Farlington site was comprromised, SW would be able to abstract 75MLD from HT Res to treat at Otterbourne WSW. - Maintain bulk transfer at Gaters Mill should PW need to reduce their abstraction at existing sources during droughts. Additional source water avaialble at Otterbourne.	- Additional peak and duration depending on option. - Significant raw water available (and poss potable in futre if direct water recycling is accepted). Water can assist in maintaining bulk transfers, source water at Otterbourne and also offer opportunity to transfer water east. - Utilises full potential of HVT to address droght issues, not just 21l/d flow.
6	How would this help to address additional strategic demands on Portsmouth Water and/or other regional partners?	- Enhanced resilience in BAU scenarios may increase resilience for PW - desal could be used to offset bulk transfers e.g. Gaters Mill should PW require additional water to resolve short term deficits / allow maintenance activities to be completed. - Potential to reduce demands on bulk transfers from PW e.g Gaters Mill - 21MLD from PW may still be required	Same as A.1.	- Additional peak and duration depending on option - Additional raw / potable water available up to 10 Mld in Havant area. -21MLD from PW may still be required	- Additional peak and duration depending on option - Reduced reliance on 21MLD from PW (but may still be required) - Several opportuniites to support PW with raw or potable water into the future.	- Additional peak and duration depending on option - Reduced reliance on 21MLD from PW (but may still be required) - Additional raw / potable water available up to 24 Mld in Havant area.	- Additional peak and duration depending on option - Several opportuniites to support PW with raw or potable water into the future. -21MLD from PW may still be required .
7	Any other comments (free-form response)	- May provide additional resilience to support Fawley refinery, reducing pressure on SWW supplies. - These opportunities are likely to be afforded to other options as well so may not act as differentiators. - The conveyance system is only designed to take flows to Testwood WSW however, for this to be evolvable, then additional network connectivity from the desal plant may be required over and above the Southampton Link Main.	- This option is identical to A.1 with a variation on throughput - therefore, in essence, this option in BAU can only provide up to 61MLD and if more flow was required, due to design limitation, this would not be possible.	- This option under BAU includes the use of the river Itchen for blending in the EBL. For evolvability in a BAU situation, more flow can be produced from the WRP (15MLD up to 61MLD) to bolster the production from Otterbourne WSW obtained from ground and river water supply.	- This option is based on modelled data however, agreement for using up to 75MLD from HT requires signficant re-design not currently part of PW's planning application, therefore this is a major risk. - Transfer pipeline is less flexible (although it could be extended to allow transfers from HT aswell. Peel Common / Portswood WRP could be seen as a standalone scheme to support Gaters Mill WSW.	- Water recycling source water is predicated on the smooth operation of the donor wastewater treatment plants, Peel Common and Budds Farm WTWs. The combined availability from these 2 sites allow the production of up 95MLD of recycled water; however, land take would be a limiting factor and the EBL at Otterbourne WSW will see a reduction of HRT from 24 hours to circa 18hours which may not be acceptable bby the DWI. - B4 just pips D2 in terms of its evolvability. Ideally the infrastructure (pipelines) would be installed for maximum transfers of source water at the outset and the land purchased for the WRP. WRP could then be design to be expanded over its lifetime in steps over several AMPs (15, 30, 45, 60). If B4 is not developed now, efficiencies may be lost in terms of transfer infrastructure (HT pipelines and feed water and waste return lines) as well as land availability to construct WRP in an optimum location.	

	EVALUATION ANSWERS					
	Desal		Water recycling			Alternatives
KEY QUESTIONS	A.1	A.2	B.2	B.4	B.5	D.2
Overall assessment, taking into account the factors listed above and key underpinning evidence (justification of RAG rating)	- Overall limited ability to combine with other options to bring benefit. - When constructed this will essentailly be a fixed asset on a constrained site with negotiated inlet / outfall permit conditions boarderd by the national park, options will be very limited.	- Overall limited ability to combine with other options to bring benefit. - When constructed this will essentailly be a fixed asset on a constrained site with negotiated inlet / outfall permit conditions boarderd by the national park, options will be very limited.	- Only one WTW has been considered as source water (Budds Farm). The positive is the increased residence time in the EBL due to lower flows from the WRP. - Potential to combine and in a number of configuration - Good evolvability but could be constrained if connection to HT is impractical in the future due to development reducing viable corridors. Future direct potable opportunities. - This a high performing option as more recycled water can be produced by SW given the size of the WTWs (and doesn't tie up Peel Common like B5). - Small buffer lack constraints makes evolution more tricky but scope to increase against current design parameter. Conveyance pipe could be an issue if not considered at design	- This option offers flexibilty from an increased fill rate, the buffer volume in the Res and the benefit with public perception that it may offer (although the perception of water recycling is positive with SW's customers) especially with Regulators. - Potential to combine and in a number of configuration - Link between Otterbourne WSW and HT very adaptable. Expandable WRP at Budds Farm. Options still avaialble to develop Peel Common and Portswood WRPs. Potential transfers east. Future direct potable opportunities. - Conveyance pipe could be an issue if not considered at design. - Overall this option ulitmately opens up multiple futures for (given chance to work with PW may expire) which ultimately puts it above D2 **i.e. SW value the certainty of optionality in the future vs the potential for greater optionality today.**	- Peel Common WTW feed water augmnetation to Budds Farm WRP appears sub-optimal and possibly a more viable option exists. Large DO of WRP means potentially more surplus water available in the Havant area or at Otterbourne WSW. Could be constrained if connection to HT is impractical in the future due to development reducing viable corridors. Future direct potable opportunities. - Already evolved toward final state and ties up Peel Common reducing it's ability to be used in an alternative way. However, this option allows SW to fully control and operate the EBL as well as all input sources into the EBL. There is flexibility in terms of source water and no single point of failure with both PC and BF as donor sites. - Conveyance pipe could be an issue if not considered at design	- No connection of a WRP so potential for lots of configurations - Most limited CAPEX leaving more options on the table for the future. This may not be beneficial in WR at Budds Farm is ultimately required to support HT during a 1 in 500 yr drought as would be more sensible to develop common infrastructure with PW now (and secure land for WRP) rather than waiting and trying to adpat existing infrastructure and seek available land in 5-10 years time. Future direct potable opportunities. - Conveyance pipe could be an issue if not considered at design as could treatment capacity at Otterbourne.
Evaluator's RAG rating (SRO performance):	Lowest performance	Lowest performance	High performance	Highest performance	Moderate performance	High performance
Inferred MCDA score (auto-populated)	0	0	75	100	50	75
Inferred rank (auto-populated)	5	5	2	1	4	2

MCDA Scalability of Supply Consensus Workshop

Business As Usual (BAU)

Consensus evaluators & facilitators:	Ross Kettle, James Rushworth, Mark Wintringham
Date completed:	13/07/2021
Criterion name:	**Scalability of supply**
Criterion description:	**The extent of flexibility in being able to expand the capacity of the SRO in future (post-2027 opening) incrementally / in modular stages to help meet any future increases in supply requirements (e.g. to provide capacity for a 1 in 500 year event).**
Scoring guidance:	**Extent of scalability of supply is assumed to be influenced by: (i) the characteristics of the SRO technology/ engineering solution; (ii) source water availability; and (iii) wider delivery factors/constraints such as land availability, planning consent, cost, Best Value impacts, regulatory/ policy environment etc. We are only considering (i) and (ii) in this qualitative assessment, as sufficient information does not exist on (iii) and such factors would be considered in detail in future as part of scheme development/ appraisal activity when considering different options for meeting increased supply requirements. Therefore the key question for this assessment is to what extent, in principle, the SRO infrastructure could be expanded post-2027 to provide additional capacity/ supply. The greater the flexibility to incrementally expand capacity, the higher the SRO's performance / score.**
Technical evidence referred to when undertaking assessmer	- Level 4 technical reports and appendices, drawings, cost estimating & risk outputs (incl. supporting design calculations) - Gate 2 Level 3 report and documents
Date when technical evidence has been accessed:	
Key assumptions underpinning assessment:	- No difference between BAU and Drought scenarios - this is about the ability of engineering solution / source water availablity to be stretched / incrementally expanded in the future beyond the supply requirements for a 1 in 200 year flood. - Peak and duration of increased supply does matter (because WRMP will require SW to meet two different types of need) (1) If the need is peaky – 1 in 500 year drought (2) If the need is duration – sustainability reductions that you need to meet **(this is now the BAU scenario)**
Scenario	**BAU Scenario i.e. non-max capacity**

		EVALUATION ANSWERS					
		Desal		Water recycling			Alternatives
KEY QUESTIONS		A.1	A.2	B.2	B.4	B.5	D.2
1	**What assets / components of the SRO are adaptable / expandable which could in principle provide an additional 'x' Ml/d, considering civils infrastructure, civils non-infrastructure and mechanical and electrical systems?**	- The main limiting factors are the inlet tunnel / pipe and then the transfer pipe to Testwood. There would be some capacity within these pipe due to pipe diameter steps and possible increases in velocity - probably less than 15% which would limit output to c 5% (35% of input). - Intake screens & pumps would need to be replaced - Building housing RO &UF membranes could be adapted to accommodate new treatment technologies to increase outputs - Other constraints include general civil structures and consents required in the natural environment - Site layout can be planned to allow expansion of storage tanks and above ground modular process units e.g. lamellas, GFS tanks, CO2 tanks and lime silos. - Pipeline to testwood could transfer additional flows subject to pressures.	- As plant is the same size as A.1. there is more capcity to increase over A1, but still limited by the same constrains. So additional 25 % increase in output from 61 to 75 . - Otherwsie same constraints as A.1. apply.	- As plant is the same size as B.5 there is more capcity to increase over B5, but still limited by the same transfer constrains. So additional 25 % increase in output from 61 to 75 . The main limit is the transfer from the WRP to Otterbourne and the Evironmental buffer residence time. - Building housing RO &MF membranes can be adapted to accommodate new treatment technologies to increase outputs - Intake and discharge pipelines can accommodate additional flow (as they are oversized due to constructability considerations. - Majority of process equipment is above ground and modular and can therefore be replaced should more efficient technologies become available. - Site layout can be planned to allow expansion of storage tanks and above ground modular process units e.g. GFS tanks, lime silos. - Pipeline to Otterbourne could transfer additional flows subject to pressures. - Site layout could be designed to allow the addition of new buildings (there is sufficient land available) providing an additional treatment train.	- Site could be ramped up to 15Mld. Site could be exapnded to initially provide 30Mld and then possibly 61Mld. - The transfer constraint between the Havant Thicket and Otterbourne is the key limitation, it would be complicated to twin over such a distance. However, increaseing the transfer to the WRP, from Budds Farm, and then up to Havant Thicket and also increasing the WRP size would be possible - this would increase the wider support of Havant Thicket, and duration to Otterbourne, but not the peak transfer flow. - Transfer to HT can probably be increased to ~27Mld without augmenting the pipeline (subject to pressure limits). - Building housing RO &MF membranes can be adapted to accommodate new treatment technologies to increase outputs - Intake and discharge pipelines can accommodate additional flow (as they are oversized due to constructability considerations. - Majority of process equipment is above ground and modular and can therefore be replaced should more efficient technologies become available. - Site layout can be planned to allow expansion of storage tanks and above ground modular process units e.g. GFS tanks, lime silos. - Site layout could be designed to allow the	- The main limiting factors are the inlet transfers and then the transfer pipe to Otterbourne & the EBL capacity. There would be some capacity within these pipe due to pipe diameter steps and possible increases in velocity - probably less than 30% which would limit output to c 10% (35% of input) - Building housing RO &MF membranes can be adapted to accommodate new treatment technologies to increase outputs - Intake and discharge pipelines can accommodate additional flow (as they are oversized due to constructability considerations. - Majority of process equipment is above ground and modular and can therefore be replaced should more efficient technologies become available. - Site layout can be planned to allow expansion of storage tanks and above ground modular process units e.g. GFS tanks, lime silos. - Pipeline to Otterbourne could transfer additional flows subject to pressures. - Site layout could be designed to allow the addition of new buildings (there is sufficient land available) providing an additional treatment train.	- The transfer constraint between the Havant Thicket and Otterbourne is the key limitation, it would be complicated to twin over such a distance. However, constructing the additional supply to Havant Thicket with a WRP would be possible - this would increase the wider support of Havant Thicket to PWC, and the duration to Otterbourne, but not the peak transfer flow. - At BAU this option will have a sweetedning flow of 6 ml/d so therfore has headroom of 60+ ml/d
2	**From an engineering perspective, what (if any) factors would limit the extent to which these components could provide additional capacity (i.e. are they adaptable up to a certain point)?**	- Key limitation is the pipeline size and therefore capacity. Intake and discharge pipelines have limited options to increase capacity. These would more likely need to be augmented rather than adapted subject to checking pipeline velocities and pressure limits. - Chemical storage capacity also a limiting factor. - Expansion is limited by process units using heavy civil construction (DAF, RGF and CT). These processes offer little adaptability or expansion opportunities adn would need to be augmented. - Site power supply would need to be upgraded and there may be insufficient capacity available a local GSP. - Ashlett Creek site does not present as an easily expandable site due to its location, shape and topography.	- Key limitation is the pipeline size and therefore capacity. Intake and discharge pipelines have limited options to increase capacity. These would more likely need to be augmented rather than adapted subject to checking pipeline velocities and pressure limits. - Chemical storage capacity also a limiting factor. - Expansion is limited by process units using heavy civil construction (DAF, RGF and CT). These processes offer little adaptability or expansion opportunities adn would need to be augmented. - Site power supply would need to be upgraded and there may be insufficient capacity available a local GSP. - Ashlett Creek site does not present as an easily expandable site due to its location, shape and topography.	- Key limitation is the pipeline size and therefore capacity. - Chemical storage capacity also a limiting factor alongside volume of the buffer lake (24hr turnover) - Would likley require a new environmental buffer to be constructed (likely offsite in a new location) - Site power supply would need to be upgraded and there may be insufficient capacity available a local GSP.	- Key limitation is the pipeline size and therefore capacity, alongside treatment works and infrastructure which may require major civil upgrades. E.g. Increasing capacirty to +30Mld would require the feed and waste return pipelines to be augmented - this would likely require jacked pipelines to replace smaller HDD pipelines and shaft over Eastney tunnel (for waste discharge). - May also be constrained by HT resevoir. - Site power supply would need to be upgraded and there may be insufficient capacity available a local GSP.	- Key limitation is the pipeline size and therefore capacity. - Chemical storage capacity also a limiting factor alongside volume of the buffer lake (24hr turnover) - Would likley require a new environmental buffer to be constructed (likely offsite in a new location) - Site power supply would need to be upgraded and there may be insufficient capacity available a local GSP.	- Key limitation is the pipeline size and therefore capacity. - Transfer may also be limited by HT operating levels and source water inputs. - Site power supply would need to be upgraded and there may be insufficient capacity available a local GSP.
3	**What is the water source the SRO would rely on to scale up supply to provide an additional 'x' Ml/d?**	- Sea intake, so source not limited	- Sea intake, so source not limited	- Additioanal source would be from Peel Common. Which could transfer another c 39Ml/d. - Uses final effluent which for the purpose of BAU could be considered infinite	- Increasing the flow from Budds Farm and potentially a transfer from Peel Common Too	- The flows from Budds Farm and Peel Common combined potentially could be increased from the 75 Ml/d to c90 Ml/d, subject to transfer capacity, this could be to Havant Thicket rather than Otterbroune - therefore securing capacity for the 1:500 HT Classic - Uses final effluent which for the purpose of BAU could be considered infinite	- Additional WRP flow could be transferred into the reservoir to augment the winterflows from Bedhampton Springs. - Bedhampton Springs increased abstration or increased seasonal period thatwater can be abstracted. - Addition of recycled water at Bedhampton and seasonal transfer to HT.

		EVALUATION ANSWERS					
		Desal		Water recycling			Alternatives
KEY QUESTIONS		A.1	A.2	B.2	B.4	B.5	D.2
4	What is the extent of availability (or conversely, scarcity) of this water source, and how would this limit the extent to which the additional supply could be provided?	- Limit is not the source, it's the capacity of the source to receive the waste stream. - There are also constraints around permits and consent - Sea water not limited in theory	- Limit is not the source, it's the capacity of the source to receive the waste stream. - There are also constraints around permits and consent - Sea water not limited in theory	- Uses final effluent which for the purpose of BAU could be considered infinite - There is also known additonal capcity by transfering Peel Common to the WRP. - Expansion would require a new source water e.g. Peel Common WTW which could be considered as evolvability rather than scalabilty	- At BAU could potentially be considered limitless - There is known additonal capcity by transfering additional flows from Budds Farm and also Peel Common to the WRP. - Budds Farm WtW - Upto 61Mld capacity (feed flow of 78Mld) would required provision of feed flow buffer storage tanks of 20Mld net capacity.	- Uses final effluent which for the purpose of BAU could be considered infinite - Also possiblity of increasing he utilisaation of Budds Farm and Peel Common - Peel Common WTW - up to 40Mld. Budds Farm WTW - Up to 61Mld capacity (feed flow of 78Mld) would required provision of feed flow buffer storage tanks of 20Mld net capacity.This could increase DO capacity up to ~92Mld (fed flow 118Mld)	- At BAU could potentially be considered limitless - There is known additonal capcity by transfering additional flows from Budds Farm and also Peel Common to the WRP. - Limited by infrastructure (common inlet/outlet pipeline) to seasonal transfer regardless of water availability, - Subject to Havant Thicket operational levels and inputs, and the length of the drought. No ability to "top up" HT under this option should drought "volume" be underestimated by modelling.
5	Any other factors that are relevant? (freeform response)		- Although some additional build in capacity to go from 61 ml/d to 75 ml/d, this would require a decisison to be made pre-construction and hence this is not more flexible than A.1.				
Overall assessment, taking into account the factors listed above and key underpinning evidence (justification of RAG rating)		- A desalination plant will be designed to operate "reliably" at a given process flow, therefore operating outside of this would cause issues or not be possible. - Assets very inflexible given constraints of inlet, outlet, general civil structures and consents required in the natural environment. - While source is relatively unlimited, the marine and trestrial transfers once build are limited. - Any major expansion in DO would require extensive construction of infra and non-infra assets to augment existing pipeline transfers and treatment trains. Some adaptability in built into some processes / assets however, large civil based treatment process will constrain any expansion without significant land purcahse and construction activities.	- A desalination plant will be designed to operate "reliably" at a given process flow, therefore operating outside of this would cause issues or not be possible. - Assets very inflexible given constraints of inlet, outlet, general civil structures and consents required in the natural environment. - While source is relatively unlimited, the marine and trestrial transfers once build are limited. - Any major expansion in DO would require extensive construction of infra and non-infra assets to augment existing pipeline transfers and treatment trains. Some adaptability in built into some processes / assets however, large civil based treatment process will constrain any expansion without significant land purcahse and construction activities. - Although some additional build in capacity to go from 61 ml/d to 75 ml/d, this would require a decisison to be made pre-construction and hence this is not more flexible than A.1.	- Raw water source (final effluent via WRP) not the constraint on expansion (given it is effectively "infinite" in supply). - Constrained by the volume of the buffer lake (24hr turnover) and the physical volume of the transmission pipe. - Site is adapatable with modular treatment process units and buildings. Site could be expanded. - There is the potential to increase the capacity of B2 by developing this option into B5 (or even a varient of B4). - Need for a new environmental buffer constrains this option. No additional feed water available at Budds Farm.	- There is the potential to increase the capacity of the WRP to support Havant Thicket, or a direct blend of HT and WRP in the future. - With this option SW already secured a site (and within current design have redundancy in feed pipelines i.e. have already infra laid to HT), thus securing pipeline corridor and can optmise with PW (lose this with other options). - Can also link with Budds Farm with site SW have purchased in optimal location. - Source water available at Budds Farm - can double capacity in source water transfer. - Site is adapatable with modular treatment process units and buildings - Site could be expanded.	- As per B2, constrained by the volume of the buffer lake (24hr turnover) and the physical volume of the transmission pipe, however, simpler to expand an existing WRP site (which has been laid out with this in mind rather than to start from scratch) than the resevoir / desalination based options. - Additional feed water available at Peel Common could increase capacity by ~23% (to 92Mld). - Site is adapatable with modular treatment process units and buildings. - Site could be expanded.	- There is significant potential to increase the capacity / druration of supply with either combining with a direct feed from a WRP (final effluent can be added to it to make the source essentially limitless). - New source water to HT would be required (recycled water) which could be challnging in the future as available land is used and pipeline corridors reduce. - Simpler to expand an existing WRP site (which has been laid out with this in mind rather than to start from scratch). - Length of drought may have significant implications for this options ability to maintain sufficient supply in the short term as no ability to ramp up HT augmnetation in the short to mid term.
Evaluator's RAG rating (SRO performance):		Lowest performance	Lowest performance	Moderate performance	High performance	Highest performance	High performance
Inferred MCDA score (auto-populated)		0	0	50	75	100	75
Inferred rank (auto-populated)		5	5	4	2	1	2

Drought

Consensus evaluators & facilitators:	Ross Kettle, James Rushworth, Mark Wintringham
Date completed:	13/07/2021
Criterion name:	**Scalability of supply**
Criterion description:	**The extent of flexibility in being able to expand the capacity of the SRO in future (post-2027 opening) incrementally / in modular stages to help meet any future increases in supply requirements (e.g. to provide capacity for a 1 in 500 year event).**
Scoring guidance:	**Extent of scalability of supply is assumed to be influenced by: (i) the characteristics of the SRO technology/ engineering solution; (ii) source water availability; and (iii) wider delivery factors/constraints such as land availability, planning consent, cost, Best Value impacts, regulatory/ policy environment etc. We are only considering (i) and (ii) in this qualitative assessment, as sufficient information does not exist on (iii) and such factors would be considered in detail in future as part of scheme development/ appraisal activity when considering different options for meeting increased supply requirements. Therefore the key question for this assessment is to what extent, in principle, the SRO infrastructure could be expanded post-2027 to provide additional capacity/ supply. The greater the flexibility to incrementally expand capacity, the higher the SRO's performance / score.**
Technical evidence referred to when undertaking assessment:	- Level 4 technical reports and appendices, drawings, cost estimating & risk outputs (incl. supporting design calculations) - Gate 2 Level 3 report and documents
Date when technical evidence has been accessed:	
Key assumptions underpinning assessment:	- No difference between BAU and Drought scenarios - this is about the ability of engineering solution / source water availablity to be stretched / incrementally expanded in the future beyond the supply requirements for a 1 in 200 year flood. - Peak and duration of increased supply does matter (because WRMP will require SW to meet two different types of need) (1) If the need is peaky – 1 in 500 year drought **(this is now the Drought scenario)** (2) If the need is duration – sustainability reductions that you need to meet
Scenario	**Drought Scenario i.e. max capacity**

		EVALUATION ANSWERS					
		Desal		Water recycling			Alternatives
KEY QUESTIONS		A.1	A.2	B.2	B.4	B.5	D.2
1	What assets / components of the SRO are adaptable / expandable which could in principle provide an additional 'x' Ml/d, considering civils infrastructure, civils non-infrastructure and mechanical and electrical systems?	- The main limiting factors are the inlet tunnel / pipe and then the transfer pipe to Testwood. There would be some capacity within these pipe due to pipe diameter steps and possible increases in velocity - probably less than 15% which would limit output to c 5% (35% of input). - Other constraints include general civil structures and consents required in the natural environment	- As plant is the same size as A.1. there is more capcity to increase over A1, but still limited by the same constrains. So additional 25 % increase in output from 61 to 75 . - Otherwsie same constraints as A.1. apply.	- As plant is the same size as B.5 there is more capcity to increase over B5, but still limited by the same transfer constrains. So additional 25 % increase in output from 61 to 75 . The main limit is the transfer from the WRP to Otterbourne and the Evironmental buffer residence time.	- Site could be ramped up to 15Mld. Site could be exapnded to initially provide 30Mld and then possibly 61Mld. - The transfer constraint between the Havant Thicket and Otterbourne is the key limitation, it would be complicated to twin over such a distance. However, increaseing the transfer to the WRP, from Budds Farm, and then up to Havant Thicket and also increasing the WRP size would be possible - this would increase the wider support of Havant Thicket, and duration to Otterbourne, but not the peak transfer flow.	- The main limiting factors are the inlet transfers and then the transfer pipe to Otterbourne & the EBL capacity. There would be some capacity within these pipe due to pipe diameter steps and possible increases in velocity - probably less than 30% which would limit output to c 10% (35% of input)	- The transfer constraint between the Havant Thicket and Otterbourne is the key limitation, it would be complicated to twin over such a distance. However, constructing the additional supply to Havant Thicket with a WRP would be possible - this would increase the wider support of Havant Thicket to PWC, and the duration to Otterbourne, but not the peak transfer flow. - At BAU this option will have a sweetedning flow of 6 ml/d so therfore has headroom of 60+ ml/d
2	From an engineering perspective, what (if any) factors would limit the extent to which these components could provide additional capacity (i.e. are they adaptable up to a certain point)?	- Key limitation is the pipeline size and therefore capacity. Intake and discharge pipelines have limited options to increase capacity. These would more likely need to be augmented rather than adapted subject to checking pipeline velocities and pressure limits. - Chemical storage capacity also a limiting factor. - Expansion is limited by process units using heavy civil construction (DAF, RGF and CT). These processes offer little adaptability or expansion opportunities adn would need to be augmented. - Site power supply would need to be upgraded and there may be insufficient capacity available a local GSP. - Ashlett Creek site does not present as an easily expandable site due to its location, shape and topography.	- Key limitation is the pipeline size and therefore capacity. Intake and discharge pipelines have limited options to increase capacity. These would more likely need to be augmented rather than adapted subject to checking pipeline velocities and pressure limits. - Chemical storage capacity also a limiting factor. - Expansion is limited by process units using heavy civil construction (DAF, RGF and CT). These processes offer little adaptability or expansion opportunities adn would need to be augmented. - Site power supply would need to be upgraded and there may be insufficient capacity available a local GSP. - Ashlett Creek site does not present as an easily expandable site due to its location, shape and topography.	- Key limitation is the pipeline size and therefore capacity. - Chemical storage capacity also a limiting factor alongside volume of the buffer lake (24hr turnover) - Would likley require a new environmental buffer to be constructed (likely offsite in a new location) - Site power supply would need to be upgraded and there may be insufficient capacity available a local GSP.	- Key limitation is the pipeline size and therefore capacity, alongside treatment works and infrastructure which may require major civil upgrades. E.g. Increasing capacirty to +30Mld would require the feed and waste return pipelines to be augmented - this would likely require jacked pipelines to replace smaller HDD pipelines and shaft over Eastney tunnel (for waste discharge). - May also be constrained by HT resevoir. - Site power supply would need to be upgraded and there may be insufficient capacity available a local GSP.	- Key limitation is the pipeline size and therefore capacity. - Chemical storage capacity also a limiting factor alongside volume of the buffer lake (24hr turnover) - Would likley require a new environmental buffer to be constructed (likely offsite in a new location) - Site power supply would need to be upgraded and there may be insufficient capacity available a local GSP.	- Key limitation is the pipeline size and therefore capacity. - Transfer may also be limited by HT operating levels and source water inputs. - Site power supply would need to be upgraded and there may be insufficient capacity available a local GSP.
3	What is the water source the SRO would rely on to scale up supply to provide an additional 'x' Ml/d?	- Sea intake, so source not limited	- Sea intake, so source not limited	- Additioanal source would be from Peel Common. Which could transfer another c 39Ml/d. - Uses final effluent which for the purpose of BAU could be considered infinite	- Increasing the flow from Budds Farm and potentially a transfer from Peel Common Too	- The flows from Budds Farm and Peel Common combined potentially could be increased from the 75 Ml/d to c90 Ml/d, subject to transfer capacity, this could be to Havant Thicket rather than Otterbroune - therefore securing capacity for the 1:500 HT Classic - Uses final effluent which for the purpose of BAU could be considered infinite	- Additional WRP flow could be transferred into the reservoir to augment the winterflows from Bedhampton Springs.
4	What is the extent of availability (or conversely, scarcity) of this water source, and how would this limit the extent to which the additional supply could be provided?	- Limit is not the source, it's the capacity of the source to receive the waste stream. - There are also constraints around permits and consent - Sea water not limited in theory	- Limit is not the source, it's the capacity of the source to receive the waste stream. - There are also constraints around permits and consent - Sea water not limited in theory	- Uses final effluent which for the purpose of BAU could be considered infinite - There is also known additonal capcity by transfering Peel Common to the WRP. - Expansion would require a new source water e.g. Peel Common WTW which could be considered as evolvability rather than scalabilty	- At BAU could potentially be considered limitless - There is known additonal capcity by transfering additional flows from Budds Farm and also Peel Common to the WRP. - Budds Farm WtW - Upto 61Mld capacity (feed flow of 78Mld) would required provision of feed flow buffer storage tanks of 20Mld net capacity.	- Uses final effluent which for the purpose of BAU could be considered infinite - Also possiblity of increasing he utilisaation of Budds Farm and Peel Common - Peel Common WTW - up to 40Mld. Budds Farm WTW - Up to 61Mld capacity (feed flow of 78Mld) would required provision of feed flow buffer storage tanks of 20Mld net capacity.This could increase DO capacity up to ~92Mld (fed flow 118Mld)	- At BAU could potentially be considered limitless - There is known additonal capcity by transfering additional flows from Budds Farm and also Peel Common to the WRP. - Limited by infrastructure (common inlet/outlet pipeline) to seasonal transfer regardless of water availability, - Subject to Havant Thicket operational levels and inputs, and the length of the drought. No ability to "top up" HT under this
5	Any other factors that are relevant? (freeform response)						

	EVALUATION ANSWERS					
	Desal		Water recycling			Alternatives
KEY QUESTIONS	A.1	A.2	B.2	B.4	B.5	D.2
Overall assessment, taking into account the factors listed above and key underpinning evidence (justification of RAG rating)	- A desalination plant will be designed to operate "reliably" at a given process flow, therefore operating outside of this would cause issues or not be possible. - Assets very inflexible given constraints of inlet, outlet, general civil structures and consents required in the natural environment. - While source is relatively unlimited, the marine and trestrial transfers once build are limited. - Any major expansion in DO would require extensive construction of infra and non-infra assets to augment existing pipeline transfers and treatment trains. Some adaptability in built into some processes / assets however, large civil based treatment process will constrain any expansion without significant land purcahse and construction activities.	- A desalination plant will be designed to operate "reliably" at a given process flow, therefore operating outside of this would cause issues or not be possible. - Assets very inflexible given constraints of inlet, outlet, general civil structures and consents required in the natural environment. - While source is relatively unlimited, the marine and trestrial transfers once build are limited. - Any major expansion in DO would require extensive construction of infra and non-infra assets to augment existing pipeline transfers and treatment trains. Some adaptability in built into some processes / assets however, large civil based treatment process will constrain any expansion without significant land purcahse and construction activities. - Although some additional build in capacity to go from 61 ml/d to 75 ml/d, this would require a decisison to be made pre-construction and hence this is not more flexible than A.1.	- Raw water source (final effluent via WRP) not the constraint on expansion (given it is effectively "infinite" in supply). - Constrained by the volume of the buffer lake (24hr turnover) and the physical volume of the transmission pipe. - Site is adapatable with modular treatment process units and buildings. Site could be expanded. - There is the potential to increase the capacity of B2 by developing this option into B5 (or even a varient of B4). - Need for a new environmental buffer constrains this option. No additional feed water available at Budds Farm.	- There is the potential to increase the capacity of the WRP to support Havant Thicket, or a direct blend of HT and WRP in the future. - With this option SW already secured a site (and within current design have redundancy in feed pipelines i.e. have already infra laid to HT), thus securing pipeline corridor and can optmise with PW (lose this with other options). - Can also link with Budds Farm with site SW have purchased in optimal location. - Source water available at Budds Farm - can double capacity in source water transfer. - Site is adapatable with modular treatment process units and buildings - Site could be expanded.	- As per B2, constrained by the volume of the buffer lake (24hr turnover) and the physical volume of the transmission pipe, however, simpler to expand an existing WRP site (which has been laid out with this in mind rather than to start from scratch) than the resevoir / desalination based options. - Additional feed water available at Peel Common could increase capacity by ~23% (to 92Mld). - Site is adapatable with modular treatment process units and buildings. - Site could be expanded.	- There is significant potential to increase the capacity / druration of supply with either combining with a direct feed from a WRP (final effluent can be added to it to make the source essentially limitless). - New source water to HT would be required (recycled water) which could be challnging in the future as available land is used and pipeline corridors reduce. - Simpler to expand an existing WRP site (which has been laid out with this in mind rather than to start from scratch). - Length of drought may have significant implications for this options ability to maintain sufficient supply in the short term as no ability to ramp up HT augmnetation in the short to mid term.
Evaluator's RAG rating (SRO performance):	Lowest performance	Lowest performance	Moderate performance	High performance	Highest performance	High performance
Inferred MCDA score (auto-populated)	0	0	50	75	100	75
Inferred rank (auto-populated)	5	5	4	2	1	2

Solution Evolution Summary

Evolution Assessment: Desalination

Rating Scale:

- Very high performing/low risk & impact/high value
- Somewhat high performing
- Somewhat low performing
- Very low performing/high risk & impact/low value

A high-level summary of the adaptability and scalability evolution potential of the desalination-based options (Options A.1 and A.2) is provided in the table below.

Area	Key Consideration area	Rating	Supporting Commentary
Technical (Scalability)	Construction and Project Delivery complexity • Relative to other solution types, how complex is the delivery of additional infrastructure requirements	🔴	• Increasing to greater than 20% of current design would be extremely complex (smaller increase in scale would be more achievable) • Key limitation is the pipeline size; including the intake and discharge pipelines which have limited options to increase capacity without significant complexity • Heavy civil construction (DAF, RGF and CT) processes would need to be expanded (10-12 processes) which would be very complex
Environmental (Scalability)	Perceived environmental impacts • Relative to other solution types, what is the perceived environmental impact of the additional infrastructure requirements – consider items such as expected carbon, habitat and receiving water impacts	🔴	• More significant impacts on the environment the larger the Desalination plant • Increased power supply requirements – associated negative carbon impacts • Increased impact during construction – driven by the volume of construction
Consenting and Planning (Scalability)	Complexity in obtaining the required consents and approvals • Perceived complexity in obtaining the necessary consents and approvals to delivery the expected required infrastructure	🔴	• Consenting within this geographic region is unlikely to be attained – Very complex consenting environment (e.g. Fawley location neighbouring National Parks, receiving water / discharge impacts on the Solent etc.) • Expectation is for difficulty in obtaining consent to increase in future
Stakeholder, Customer and Public Reputation	Perceived stakeholder, customer and reputation risks • Likely stakeholder, customer and reputational impacts associated with the expected infrastructure requirements	🔴	• Least preferred option from regulators due to environmental impacts and consenting issues • Customers may prefer the concept of desalination to alternatives such as water recycling
Cost (Scalability)	Perceived cost (CAPEX and OPEX) cost impacts • Potential range of additional CAPEX costs to deliver the expected required infrastructure • Perceived impact on OPEX costs to operate the expected required infrastructure	🟠	• Most costly solution type (CAPEX) making potential option, implied reduced affordability for further evolution • Much greater OPEX cost associated with a larger desalination plant than other solution types. Proportional increased in OPEX to size of plant
Other	• Any other key risks associated with the delivery of expected additional infrastructure requirements. • Perceived impact of these risks, relative to other solution types	🔴	• Desalination is effectively unscalable. Increasing capacity is highly complex – effectively requires a new plant to be constructed • Source supply is infinite (sea-water) but treatment infrastructure scalability is the primary constraint
Adaptability to other SROs	• Perceived capacity of the solution type options to complement other SROs current under consideration, e.g. Thames to Southern Water transfer	🟠	• Some, but limited potential to complement other water supply projects planned or being considered by SW

Evolution Assessment: Water Recycling

Rating Scale:

- Very high performing/low risk & impact/high value
- Somewhat high performing
- Somewhat low performing
- Very low performing/high risk & impact/low value

A high-level summary of the adaptability and scalability evolution potential of the water recycling-based options (B.2 and B.5) is provided in the table below.

Area	Key Consideration area	Rating	Supporting Commentary
Technical (Scalability)	Construction and Project Delivery complexity • Relative to other solution types, how complex is the delivery of additional infrastructure requirements		• Maximum capacity of 92Ml/d – max Final Effluent feed from Budds Farm and Peel Common WTWs is the constraining factor • Increasing capacity to above 92Ml/d far more complex – would likely require new plant to be constructed at an alternative site • Transfer pipelines also limiting factors, but design changes are possible
Environmental (Scalability)	Perceived environmental impacts • Relative to other solution types, what is the perceived environmental impact of the additional infrastructure requirements – consider items such as expected carbon, habitat and receiving water impacts		• Increased power supply requirements – associated carbon impacts • Increased impact depending on construction timing – trade-offs in construction can limit negative impacts (e.g. building larger pipelines ahead of when required)
Consenting and Planning (Scalability)	Complexity in obtaining the required consents and approvals • Perceived complexity in obtaining the necessary consents and approvals to delivery the expected required infrastructure		• Relative to desalination, easier consenting pathway for increased capacities (up to 92Ml/d). In addition to WRP footprint, additional complex pipeline required from B2 to B5 (not without challenge). • Significant consenting and stakeholder / customer perception should the required capacity be increased above 92Ml/d due to the volume of civil and infrastructure requirements. Additional environmental buffering volumes may be required.
Stakeholder, Customer and Public Reputation	Perceived stakeholder, customer and reputation risks • Likely stakeholder, customer and reputational impacts associated with the expected infrastructure requirements		
Cost (Scalability)	Perceived cost (CAPEX and OPEX) cost impacts • Potential range of additional CAPEX costs to deliver the expected required infrastructure • Perceived impact on OPEX costs to operate the expected required infrastructure		• Increased costs with additional infrastructure CAPEX and OPEX. • CAPEX impact reduced depending on the timing of delivery
Other	• Any other key risks associated with the delivery of expected additional infrastructure requirements. • Perceived impact of these risks, relative to other solution types		• The evolution potential is largely constrained by the feed from Budds Farm and Peel Common – 92Ml/d maximum supply, which provides only 17Ml/d additional capacity beyond Option B.5 • Scaling beyond 92Ml/d would require the identification of a new final effluent feed to the WRP, in addition to upgrading the WRP or building a new plant in a different location.
Adaptability to other SROs	• Perceived capacity of the solution type options to complement other SROs current under consideration, e.g. Thames to Southern Water transfer		• Similar level of adaptability to HTA solution, although marginally less adaptable in relative terms as does not benefit from interconnectivity with HT.

Evolution Assessment: Havant Thicket

Rating Scale:

- Very high performing/low risk & impact/high value
- Somewhat high performing
- Somewhat low performing
- Very low performing/high risk & impact/low value

A high-level summary of the adaptability and scalability evolution potential of the Havant Thicket-based options (D.2 and B.4) is provided in the table below.

Area	Key Consideration area	Rating	Supporting Commentary
Technical (Scalability)	Construction and Project Delivery complexity • Relative to other solution types, how complex is the delivery of additional infrastructure requirements		• Key limitation is the pipeline size (to Otterbourne) and supply capacity – although pump stations could be utilised • High number of options to expand these solutions – particularly D.2 and B.4 is an extension of Option D.2 • Larger head-room in feed supply from Budds Farm and Peel Common – max. supply 92Ml/d – refer to water recycling page
Environmental (Scalability)	Perceived environmental impacts • Relative to other solution types, what is the perceived environmental impact of the additional infrastructure requirements – consider items such as expected carbon, habitat and receiving water impacts		• As per Water Recycling. Expansion of this option would likely involve the use of water recycling technology, plants etc. • Does not need an additional environmental buffer as Havant Thicket can be used.
Consenting and Planning (Scalability)	Complexity in obtaining the required consents and approvals • Perceived complexity in obtaining the necessary consents and approvals to delivery the expected required infrastructure		• As per Water Recycling. Worth noting that in the event of solution scaling to meet joint PW-SW future, water recycling would likely be BaU daily supply as opposed to a drought driven response.
Stakeholder, Customer and Public Reputation	Perceived stakeholder, customer and reputation risks • Likely stakeholder, customer and reputational impacts associated with the expected infrastructure requirements		• Evolution of this option would require more closer working with PW. There is potential option which has capacity to cater for PW and SW needs in certain cases
Cost (Scalability)	Perceived cost (CAPEX and OPEX) cost impacts • Potential range of additional CAPEX costs to deliver the expected required infrastructure • Perceived impact on OPEX costs to operate the expected required infrastructure		• Lowest cost – greater affordability potential for additional infrastructure • Evolution would require increased CAPEX and OPEX, but more affordable to do so. Evolution is expected to require water recycling, so CAPEX and OPEX increases are expected to be in line with water recycling option. Potential reduction if storage capacity in HT reservoir can be increased
Other	• Any other key risks associated with the delivery of expected additional infrastructure requirements. • Perceived impact of these risks, relative to other solution types		• Has the ability to support neighbouring company BAU water supply requirements – best suited to do so relative to other solution types
Adaptability to other SROs	• Perceived capacity of the solution type options to complement other SROs current under consideration, e.g. Thames to Southern Water transfer		• Greatest potential for link with other infrastructure types and other water sourcing infrastructure

Appendix 8. Strategic Objectives – Best Value Matrix

No.	Best Value factor from WRPG	Individual MCDA Criteria	Consenting Evaluation	Other relevant information	Narrative for decision-making process
Option A.1					
1	Government policy and regulator expectations (see sub-section 9.3 of the WRPG)			See performance against Legal and Policy Objectives	
2	*Regional Plans (see Section 2 of the WRPG)*	*N/A*	*N/A*	*N/A*	*Insufficient evidence owing to the early stage of solution development*
3	Customers' preferences	Reflected across multiple MCDA criteria across all five themes / cluster criteria			Refer to MCDA
4	Protecting and meeting the needs of vulnerable customers				*Insufficient evidence owing to the early stage of solution development*
5	Environmental improvements	Multiple sub-criteria within Environment and Society clusters	Consenting Evaluation slides		*Insufficient evidence owing to the early stage of solution development*
6	Biodiversity	E.02 – Local Biodiversity	HRA assessments in Consenting Evaluation Legal and Policy Obligation regarding compliance with environmental legislation		
7	Costs	Affordability criteria: A.01 – WLC of Option A.02 - Cost of interim measures to meet required supply by 2027			
8	Benefits (both monetary and non-monetary) for customers, environment and society (such as public health, well-	Multiple sub-criteria within Customer, Environment and Society clusters.	Consenting Evaluation slides		

No.	Best Value factor from WRPG	Individual MCDA Criteria	Consenting Evaluation	Other relevant information	Narrative for decision-making process
	being, and recreation) and how these are distributed spatially and over time	Natural capital criteria (see below) alongside Consenting Evaluation criteria (exposure to noise, landscape, flood risk, coastal processes, environmental water quality, air quality from infrastructure operations historic environment) take into account location. All criteria use present value estimates (i.e. distributed over time).			
9	Natural capital	E.01 - Biodiversity Net Gain E.03 - Climate regulation E.04 - Natural Hazard Regulation E.05 - Air quality - natural pollutant removal E.06 - Water purification E.07 - Food production / agriculture services		Biodiversity Net Gain and Natural Capital Assessment	
10	Both short- and long-term risks and benefits, including delivery risk	Deliverability criterion: D.01 - Supply chain capacity risks	Recommend that Consenting Evaluation ranking is used to represent delivery risk		
11	The flexibility and adaptability of your Options to meet future uncertainties			See assessment against adaptability Strategic Objective	
12	The resilience of your network and supplies (see sub-section 9.5 of the WRPG)	C.02 – Resilience of supply	Consenting Evaluation slides		
13	The regional and national need and the needs of other sectors			Future Needs Assessment	
14	The impact of your preferred programme on the affordability of your customers' bills				*Insufficient evidence owing to the early stage of solution development*

No.	Best Value factor from WRPG	Individual MCDA Criteria	Consenting Evaluation	Other relevant information	Narrative for decision-making process
15	The level of uncertainty and sensitivity of your assessment of best value	MCDA sensitivity analysis – stress tested rankings of Options under multiple weighting scenarios. Switching value approach also underway (whereby we test how altering the cost of solutions could alter the ranking, alongside altering specific weightings to test how rankings change).			
16	Non-drought resilience such as water supply system resilience	Customer criteria: C.02 – Resilience of supply	Consenting Evaluation slides	Resilience Assessment	
17	Economic factors such as affordability, distributional impacts, local regeneration and economic growth	Sub-criteria within Affordability cluster	Consenting Evaluation slides		
18	Achieving net zero and the climate emergency			See assessment against Net Zero Carbon Strategic Objective	
19	Your objectives to further biodiversity and enhance the natural environment by providing opportunities for biodiversity net gain where planning permission will be needed and other measures to conserve and enhance biodiversity consistent with actions you can properly take	E.01 – Biodiversity Net Gain Factored into Whole Life Costs of delivering BNG +10%		See assessment against Biodiversity Net Gain Legal and Policy Obligation	
	Summary / overall performance of the Option				