Water Resources Management Plan 2019

Annex 14: Strategic Environmental Assessment

Non-Technical Summary

December 2019

Version 1

from Southern Water

Contents

1. Introduction

Water companies in England and Wales are required to produce a Water Resources Management Plan (WRMP) every five years. Southern Water's WRMP 2019 (WRMP19) sets out how the company intends to maintain a balance between the supply and demand for water over the long term planning horizon in each of the water resource zones making up its water supply area.

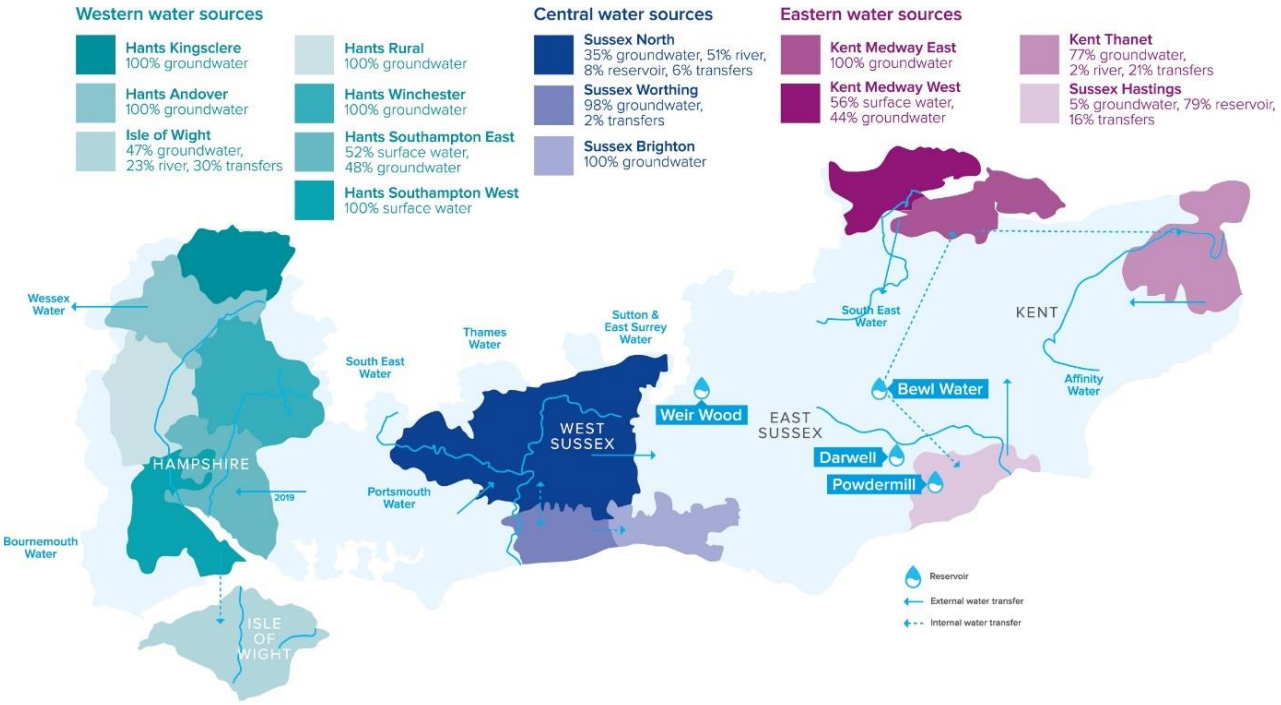
A Strategic Environmental Assessment (SEA) Environmental Report has been prepared in support of the development of Southern Water's WRMP19 as summarised in this report. The SEA has been undertaken in parallel with the Habitats Regulations Assessment (HRA) and Water Framework Directive (WFD) assessment to ensure an integrated approach to environmental assessment of the plan.

SEA became a statutory requirement in the UK following the adoption of Directive 2001/42/EC (the SEA Directive) on the assessment of effects of certain plans and programmes which could have significant environmental implications. The SEA helps to identify where there are potential impacts and how any negative impacts might be mitigated. The government has produced SEA guidance which sets out the stages of the SEA process. This, along with specific water industry national guidance for undertaking SEA (and HRA) of WRMPs, has been used to inform this SEA.

1.1 Water Resource Management Planning

Southern Water provides water supplies to just over 2.4 million customers across an area extending from East Kent, through parts of Sussex, to Hampshire and the Isle of Wight in the west. The Southern Water region is divided into fourteen water resource zones which are geographically separate and amalgamated into three larger, sub-regional areas (Western area, Central area and Eastern area). These areas are managed as semi-integrated blocks because there is significant bulk water transfer capability between the water resource zones (WRZs) in each area. A number of bulk water supplies are made between Southern Water and several adjacent water companies.

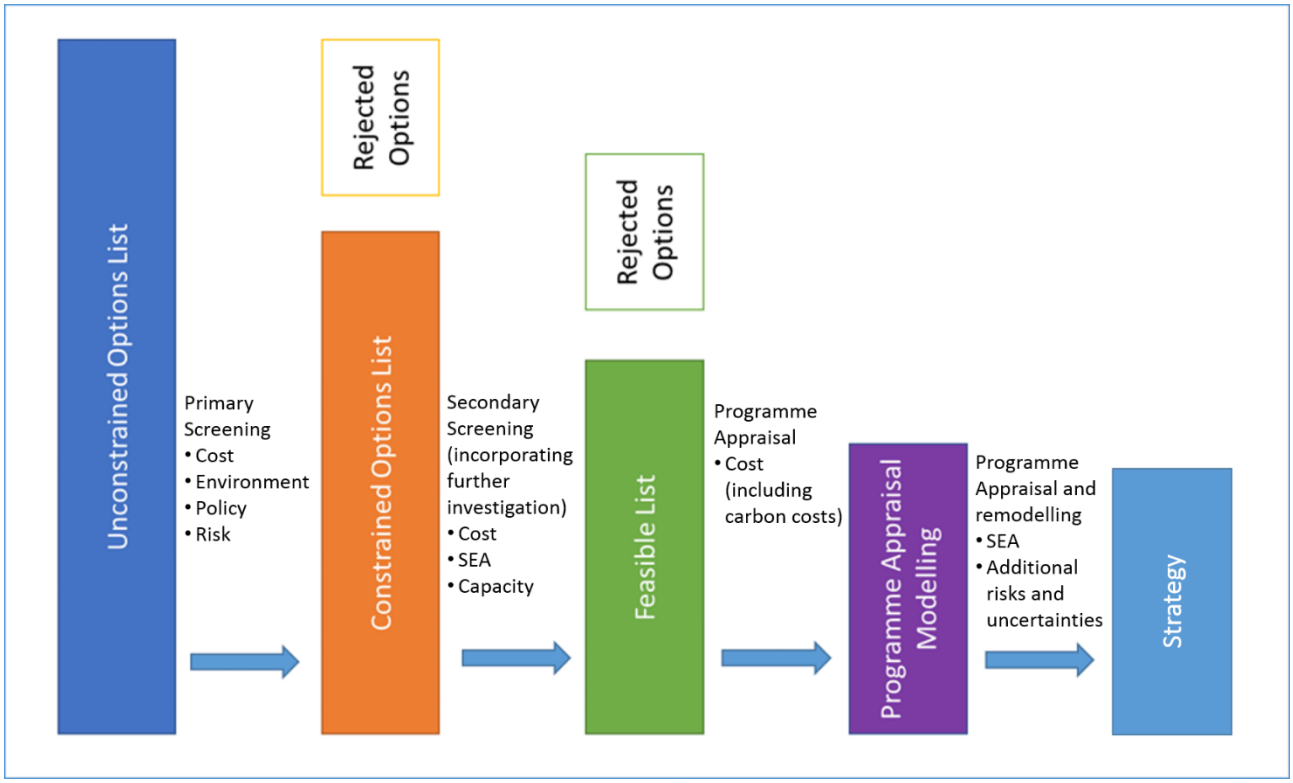
Figure 1 Southern Water Supply Area



In developing its WRMP19, Southern Water has examined the water supply/demand balance for each WRZ and determined how any deficit between forecast demand and reliable water supply

availability should be addressed. In developing the plan, a very large number of alternative options were identified and assessed to understand their costs, their benefits to the supply-demand balance, their effect on carbon emissions and their environmental and social effects (through the SEA process and associated HRA and WFD assessments). The options were subsequently compared through a comprehensive programme appraisal process to determine the 'best value' strategy for each operational area – each strategy comprises a programme of options to maintain the supply-demand balance over the planning period. Decisions on the best value programme took account of a range of factors, such as the implications for water customer bills, the resilience to future risks and uncertainties, deliverability considerations and the environmental and social effects of the programme (both adverse and beneficial effects), as informed by the SEA. The strategies developed for each operating area collectively form the WRMP19. The Figure 2 below summarises the overall approach to the evolution of the WRMP19; from the initial 'unconstrained' list of options through to the strategy for each WRZ.

Figure 2 WRMP Options and Programme Appraisal



2. Approach

The SEA process involves three key stages:

- A **Scoping Report** to set out the key baseline environmental issues in the area affected by the draft WRMP and consult on the assessment approach. This consultation took place in summer 2016.

- An **Environmental Report** that provides details of the effects assessment that has helped to shape the development of the WRMP19, as well as the likely effects of the WRMP19 once implemented. It also sets out any mitigation measures necessary to address significant adverse effects and the monitoring programme to determine whether any changes may be necessary due to observed effects of plan implementation. The Environmental Report accompanied the draft WRMP19 consultation in early 2018 and comments received on the report have been taken into account in preparing the updated report that accompanied the revised draft WRMP19.

- **SEA Statement** that is published once the WRMP19 has been approved and adopted. It sets out how the SEA has influenced the development of the plan and confirms the future monitoring programme.

We have adopted an 'objectives-led' approach to the SEA. The SEA scoping process included a review of environmental and social objectives established in law, policy or other relevant plans, programmes. This review established more than 80 key policy objectives to be taken into account in the development of SEA objectives. The SEA objectives have been categorised under the following topic areas: biodiversity, flora and fauna; population and human health; material assets and resource use; water; soil, geology and land use; air and climate; archaeology and cultural heritage; and landscape and visual amenity. These objectives were subject to a public consultation through the Scoping Report and feedback from the consultation was taken into account in developing the final objectives used to assess each option and strategy for the WRMP19.

The SEA has involved a review of the baseline environmental information for the area covering all of Southern Water's WRZs as well as the river and/or groundwater catchments of those water sources that serve the WRZs but which lie outside their boundaries. This baseline review helped to consider how the environment may change in the future in the absence of the WRMP19 and to identify key environmental problems in the area that need to be considered in assessing the effects of the WRMP19. For example, the review identified the pressures of current and future population growth on the environment and how increasing population density and urbanisation in the future may reduce the quality of the water environment.

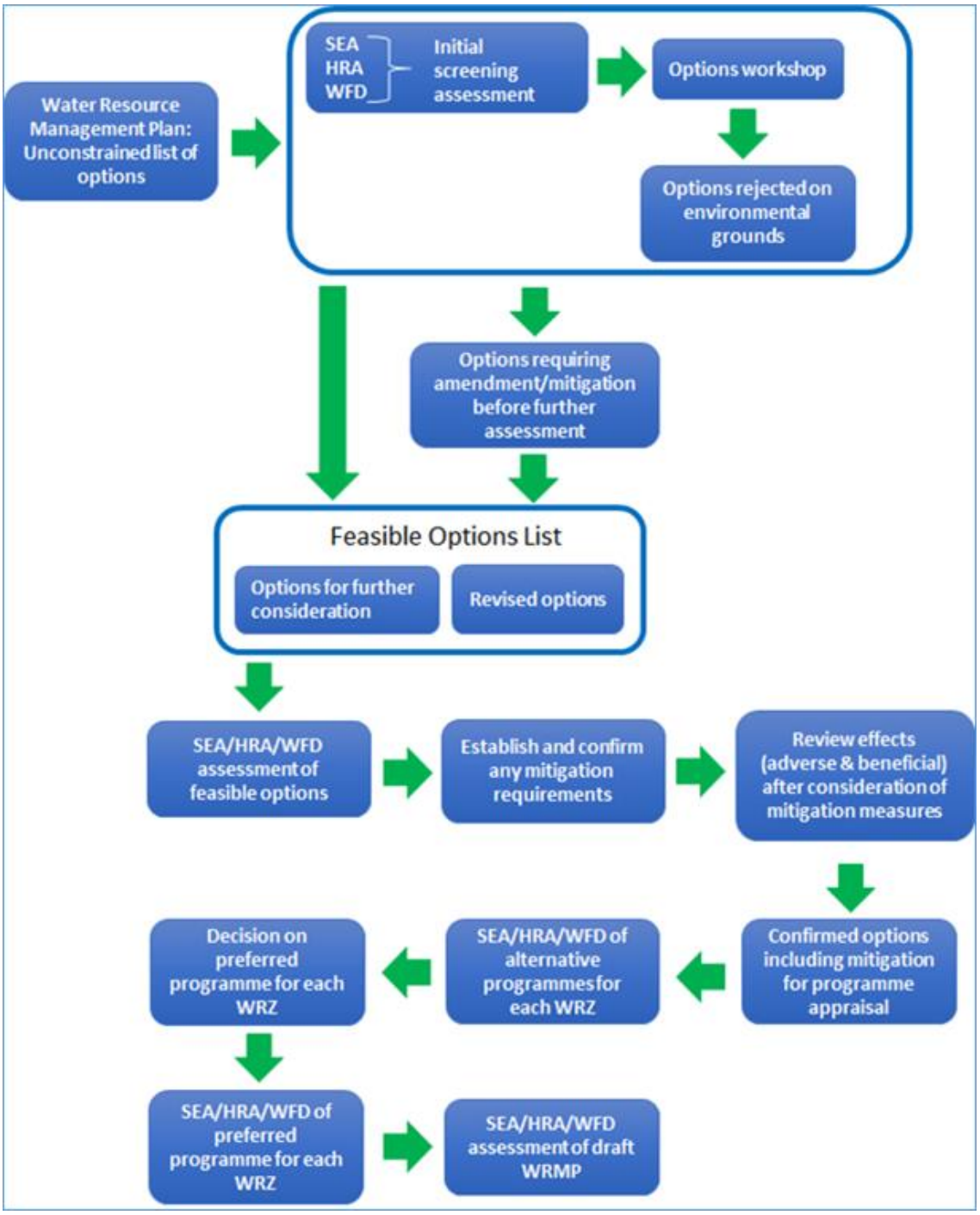
Consideration and assessment of environmental and social effects (both beneficial and adverse) of the wide range of alternative options for maintaining water supply reliability in each water resource zone was undertaken at each stage of the WRMP19 development, with an increasing level of assessment detail applied as the refinement of the list of options progressed through the planning process (see Figure 3 below).

Detailed SEA, HRA and WFD assessments were carried out for all the feasible options. These were documented in appraisal framework tables with a colour coded effects summary (ranging from major beneficial effects to major adverse effects), providing a comparative assessment of the residual environmental effects. The findings were used to inform the development of the strategies for each operating area. Finally, the strategies were assessed at the individual option level and cumulatively with all of the options making up the strategy. Cumulative assessment with other projects, programmes and plans was also carried out. In this way, a sustainable WRMP strategy has been developed for each operating area.

3. SEA screening of options

Figure 3 below shows the role of SEA in developing the WRMP19 and the initial screening stages. High level environmental screening using key relevant SEA topics (water, biodiversity, recreation, heritage and landscape) was initially carried out on the very large set of options in the 'unconstrained' list. The screening criteria also included consideration of HRA and WFD compliance risks. This identified options with unacceptable adverse environmental effects which were rejected from the options list and were not taken further in the option appraisal process.

Figure 3 Integrating SEA into the WRMP19 decision-making alongside HRA and WFD assessments



A more detailed environmental and social assessment was then applied to the screening of the 'constrained' list of options. HRA and WFD risks were assessed on a scale from negligible to high; other potential effects were assessed against the SEA effects scale ranging from major beneficial to major adverse – beneficial and adverse effects were assessed separately in line with best practice. The screening assessment of the constrained options list was also discussed with the Environment Agency and Natural England, and feedback from these regulatory bodies was used to refine assessments.

Options assessed as having unacceptable adverse environmental or social effects were removed from the options list; remaining options were included in a feasible list. For example, a desalination plant on the Test Estuary at the confluence of the River Test with Southampton Water was excluded at this stage due to the risk of adverse effects on biodiversity and the effects of poor dispersion of the hypersaline discharge from the treatment works.

Following feedback on the draft WRMP19 feasible options list, we removed the Pulborough reservoir option from the feasible list due to concerns raised about its effects on the South Downs National Park and sensitive terrestrial habitats.

4. Assessment of feasible options

All the feasible options were fully assessed against each of the SEA objectives and in compliance with statutory requirements and associated national SEA guidance. The assessments were also supported by the HRA and WFD assessments, the Sustainable Economic Level of Leakage (SELL) assessment work (which incorporates considerations of the environmental and social effects relating to leakage control options), carbon emissions assessment and valuation, and consideration of customer research evidence relating to environmental and social issues.

The SEA considered both beneficial and adverse effects of each of the feasible options to fully understand the overall potential effects of the options. Where applicable, mitigation measures were identified as part of the option assessment and incorporated into the outline option design to prevent or reduce any identified significant adverse environmental or social effects. These mitigation measures were taken into account so that the residual effects after application of the mitigation measures could be assessed against each of the SEA objectives.

The SEA involved detailed consideration of the potential adverse and beneficial effects of the option design, construction/development and operation against each of the SEA topics and objectives using an effects magnitude scale ranging from major beneficial to major adverse.

A summary of the key findings of the SEA for demand management and water supply options is provided below.

4.1 Demand management options

Demand management options serve to reduce pressure on water resources by reducing customer demand for water (e.g. through water efficient devices, water metering and tariffs, customer behavioural changes) and reducing water losses and leakage from the supply network and customer properties, thereby helping to reduce the volumes of water required to be abstracted from the water environment. This, in turn, also contributes to reducing the amount of energy needed for water abstraction, treatment and distribution. Most of these options have limited and temporary adverse effects associated with vehicle movements during their commissioning phases. They may also cause disruption or nuisance effects because of street works, for example associated with meter installations and leak repair activities.

4.2 Water supply options

The findings of the assessments for different types of supply options are summarised below:

- **Bulk water supply and trading** options can range from those that involve minimal construction work to those that require significant lengths of pipeline construction connecting different regions. Operationally, adverse effects are usually minor providing there is spare water available for abstraction within existing regulatory limits, but in some cases the abstraction may lead to adverse effects on sensitive water habitats. There is consequently the potential for a range of adverse effects associated with these options. The options do bring some benefits too by enabling the transfer of water between areas of relative surplus water availability and areas which experience ‘water stress’; they also improve flexibility in the supply network and therefore contribute to a more resilient, sustainable water resource system which helps to address potential effects of climate change.
- **Catchment management** options involve measures to enhance water source resilience and/or augment water source availability, for example by addressing diffuse pollution risks to water sources such as from pesticides and nitrates arising from agricultural activity on water source catchment land. Predominantly negligible adverse effects are anticipated a long with

a wide range of beneficial effects as a result of land management improvements, introduction or enhancement of habitat and reduced application of fertiliser or pesticides.

- **Desalination** options involve the treatment of brackish or sea water to provide potable drinking water. Desalination uses relatively more non-renewable materials and energy than more 'traditional' water sources, and generates more waste bi-products from the intensive treatment processes. Desalination generally is more resilient to the risks associated with climate change than most other supply options. The performance of the desalination options against the SEA objectives can differ depending on the specific setting and local environmental features that may be adversely affected during construction and the characteristics of the water body from which abstraction is made and brine waste discharges are made during operation.
- **Groundwater abstraction and aquifer storage and recovery** options include direct abstractions from groundwater for treatment and the artificial recharge of underground aquifers using surplus water resources during periods of low demand for storage and subsequent re-abstraction during periods of dry weather and/or high demand. This provides increased resilience to potential climate change risks. Where these options involve the use of 'confined' aquifers that are not connected to rivers or wetlands, the operational adverse effects are often negligible to minor. However, in some cases, it has been identified that options may adversely influence local groundwater levels and connected surface water bodies with a risk to dependent habitats.
- **Maximising use of existing assets** describes a number of option types (asset enhancement, water transfers, licence variations, and water supply works improvements), which, similar to bulk supply options, vary considerably according to the scale of the scheme and the infrastructure required. However, in operation many of these options would improve the flexibility and resilience of the supply network, contribute to sustainable resource management and provide beneficial effects in respect of the risks of climate change impacts.
- **Reservoir** options range from adapting existing reservoirs to the construction of new bunded storage reservoirs. Reservoirs can provide significant water storage for winter rainfall for use in dry summers with low risks to the water environment once operational and therefore provide benefits in respect of resilience to adverse effects of climate change. However, as the size of the reservoir expansion or development increases, the potential for significant adverse effects relating to construction increases along with risks of the potential for permanent adverse effects on landscape, local communities and heritage features. Reservoirs also provide opportunities for environmental and social enhancement through careful design (e.g. habitat creation, recreational and educational facilities).
- **Surface water abstraction** options are limited in number as the vast majority of available surface water resources are already fully utilised. Subject to careful design and taking water at times of high river flows, these options can provide additional supplies but there is a risk of adverse effects on the river flow regime and associated aquatic habitat. The options in the feasible list also have the potential for significant adverse effects due to construction activities.
- **Indirect potable water reuse** is the process of actively using highly treated wastewater effluent and discharging it to the river system and re-abstracting it downstream after it has mixed with the water flowing in the river. Like desalination options, these options incur relatively high consumption of non-renewable materials and energy treating the effluent to a high standard before discharge back to the freshwater river environment. Such schemes are resilient to the potential adverse effects of climate change and do not draw on already limited freshwater resources. Due to spatial distance between the wastewater treatment works and the river discharge points, these options can involve large-scale pipeline construction requirements with associated potential adverse effects to nearby sensitive receptors. The

discharge of water to rivers at times of low flow can result in artificially higher river flows which has the potential to cause adverse effects on aquatic habitats and/or species.

- **Drought Permit and Order** options are also considered in developing the WRMP. These options allow Southern Water in times of drought to seek powers to temporarily modify the abstraction licence conditions for water sources so as to allow more water to be abstracted to safeguard essential water supplies. These measures can be used for up to a maximum of 12 months and require specific applications to be made to the Environment Agency (Drought Permits) or the Secretary of State (Drought Orders).

Overall, the assessment of the feasible options revealed a wide spectrum of beneficial and adverse effects: demand management and catchment management options generally have the least adverse effects and provide some beneficial effects; desalination, water reuse, large reservoirs, large long-distance water transfer pipelines through sensitive environments exhibit the greatest adverse effects but they do bring benefits in respect of securing water supplies that are more resilient to climate change effects. Other options have lower adverse effects but also lower beneficial effects. The findings of the detailed assessment of each of the feasible options was used to help inform decision-making on the WRMP strategies for each operational area.

4.3 Existing water sources

As part of the SEA process, a review of Southern Water's existing water sources was undertaken to identify any sources that pose significant environmental risks and which may need to be considered for reduced operation or even no operation in the future with new alternative source options developed to replace them. A WFD screening exercise was also carried out to determine the risk of WFD status deterioration associated with the continued operation of each source and the findings were used to inform the SEA screening of existing sources.

Where the SEA screening identified a medium to high level of adverse environmental risk (25 existing sources in total), these sources were taken forward for further appraisal against the SEA objectives. The SEA (and WFD assessment) of these sources indicated that some may not be as sustainable as alternative new options in the feasible list; in general, these sources were the same as those identified in the WRMP planning process as potentially requiring reduction in abstraction in the future (known as 'sustainability reductions').

The findings of the SEA of existing water sources was taken into consideration in making decisions on the WRMP strategies for each operational area.

4.4 Drought Orders and Permits

As well as assessing the environmental effects of existing water sources, the development of the WRMP strategies included consideration of the environmental effects of the Drought Order and Drought Permit options contained in Southern Water's Drought Plan 2019 using the findings from the SEA of the Drought Plan. In this way, Southern Water was able to weigh up the relative environmental effects of developing new water sources to provide water supply resilience in drought conditions compared to reliance on applications for Drought Orders or Permits to temporarily vary the constraints set out in water abstraction licences (for example, reducing the river flow below which abstraction must cease). This information was actively used to help support decisions on the role of Drought Orders and Permits in the WRMP strategies for each operational area.

5. Role of SEA in the development of the WRMP19 strategies

The findings of the feasible option assessments were used to evaluate the environmental and social performance of a range of alternative strategies for maintaining a supply-demand balance in each operating area, with each alternative strategy comprising a different mix of options and option types.

For each alternative strategy, the likely scale of adverse and beneficial environmental and social effects for each option was considered, both on its own but also in combination with the other options included in that strategy. The potential effects in combination with any other relevant projects, plans or programmes (for example, any planned major infrastructure schemes that may be constructed and/or operated at the same time and affecting the same environment and/or communities) was also assessed. This appraisal of each alternative strategy also included consideration of the potential for any regulatory compliance risks associated with the Habitats Regulations and WFD.

The environmental and social performance of each alternative strategy was used by Southern Water to help make decisions on which strategies to explore further through the programme appraisal modelling process and to finally determine the appropriate strategies for inclusion in the WRMP19. Several modifications to the potential strategies were made as part of this process to remove options where environmental and social effects were considered to be unacceptable relative to other alternative options available to meet the forecast supply deficit. For example, the River Stour desalination option in the Eastern area was excluded from selection for the final strategy due to the risks identified in the SEA, HRA and WFD assessment about the effects on the Thanet Coast Special Area of Conservation and the Thanet Coast and Sandwich Bay Special Protection Area and Ramsar site.

In some cases, due to the scale of the forecast supply deficit, it was not considered feasible to remove an option from consideration for the final strategy entirely and further modifications were made to scheme designs for those options. For example, the Brighton WwTW Indirect Potable Reuse option was initially removed as a strategic alternative option for the Central area due to significant concerns about impacts of the treated water pipeline route across the South Downs National Park and a sensitive terrestrial SAC. However, given the importance of ensuring a strategic alternative option was available for the Central area, the decision was taken to completely re-route the treated water pipeline along the same route as the treated effluent pipeline to avoid major adverse environmental effects.

Following consultation comments on the draft WRMP19 and taking account of the SEA findings, we have refined the design of several options for the Western area where feasible (e.g. re-routing pipelines or changing the location of new assets), as well as further developing the mitigation measures necessary to reduce the magnitude of identified environmental effects. This includes the Fawley desalination plant, the import from Bournemouth Water and the Sandown WwTW indirect potable reuse options, all of which need to be delivered by 2027.

As well as the adverse effects of options, the beneficial effects of options were considered to help decide whether any options should be prioritised in view of the environmental or social benefits they may bring. This led to the decision to preferentially include additional water efficiency measures in the WRMP19 strategies as part of Southern Water's target to help its customers achieve an average per capita water consumption of 100 litres per day by 2040, along with measures to further reduce water leakage levels.

6. Assessment of the WRMP19 strategies

SEA was carried out of each of the WRMP19 strategies (and alternative strategic schemes) for each of Southern Water's three operational areas as described below. Due to the scale of the forecast supply deficit in each area, it was not considered appropriate to remove any of the feasible options from consideration for inclusion in the preferred strategy. All options were therefore considered and the SEA findings (along with the HRA and WFD assessments) were actively used in reaching a decision on the WRMP strategy.

A number of alternative options and option combinations were explored in developing the preferred strategies as well as a wide range of scenario testing model runs - the SEA, HRA and WFD assessments were used to compare the environmental performance of these alternative combination of options to inform and contribute to the decision-making process, which also took into account other factors including cost, resilience and customer preference information. Additionally, we took account of the consultation responses on the draft WRMP19. This assessment and decision-making process led to the development of the preferred strategies for each area.

Given the environmental benefits associated with demand management options as set out in the SEA, we have preferentially included in our strategies the early implementation of further measures to reduce demand for water in each of the three operational areas, in particular:

- Reducing leakage by a further 15% by 2025 and by 50% by 2050
- Water efficiency activities to help our customers reduce their consumption to an average of 100 litres per head per day by 2040 ('Target 100' programme). This involves an intensive media and engagement campaign as part of an initial phase of the 'Target 100' programme, concentrated throughout the period 2020-2025, but helping to influence customers' water use behaviour over the longer term.

Additionally, in our Western and Central areas, we will be metering more household properties to increase meter penetration from 88% to 92% which will support the achievement of the 'Target 100' programme.

We have also included catchment management schemes in our strategies for each operational area to address nitrate and/or pesticide water quality issues at some of our water sources, securing existing supplies and in the majority of cases enabling more water to be made available for supply. A number of river restoration schemes have also been included to improve the environmental resilience of the river to abstraction at times of low flow.

The ability to achieve our aim of restricting drought orders/permits to extreme drought conditions only to reduce the risk of adverse environmental effects was examined as part of developing the strategies taking account of the costs, risks, feasibility and environmental effects of the measures required to deliver this objective. Delivery of this objective requires a number of schemes in each operational area to be delivered first, along with continuing activity to further reduce leakage and customer consumption through water efficiency measures. Consequently, drought permits/orders may therefore be required in the event of a severe as well as extreme drought conditions in the next 6 to 10 years while these schemes are delivered).

As well as assessing the effect of each selected scheme in the strategy, cumulative effects were also assessed both between schemes within the strategy but also with other programmes, plans and projects (for example, River Basin Management Plans, large infrastructure projects and other water company 2019 WRMPs).

The SEA summary of the WRMP19 strategy for each area is presented in assessment tables in the following sections for Eastern, Central and Western areas. The tables show for each scheme listed, the adverse and beneficial effects assessment in two separate rows. Each coloured box in the table indicates the significance of effect assessed against the relevant SEA objective linked to the SEA topic area shown in the top row (e.g. biodiversity, flora and fauna). Some SEA topics have more than one underlying SEA objective (for example, there are four objectives linked to the SEA 'water' topic. The box below provides information about each of the SEA objectives and the key below indicates the significance of effect scale.

SEA topics and objectives codes:

Key Environmental and Social Criteria								
Criteria	**1. Biodiversity, plants and animals**	**2.1 Population and human health**	**2.2 Population and human health**	**2.3 Population and human health**	**3.1 Material assets and resource use**	**3.2 Material assets and resource use**	**4.1 Water**	**4.2 Water**
Objective Description	To conserve and enhance the variety of plant and animal life, including important sites of nature conservation interest and protected habitats and species, to enhance the local natural resources (including geology, soil, air and water) and avoid the spreading of invasive species.	To protect and enhance health and well-being through raising awareness of the importance and value of the water environment.	To protect and enhance the water environment for other users including sustainable recreation, tourism and mobility, as well as land-based recreational resources.	To promote a sustainable economy with good access to basic services, including a quick to recover, high quality and affordable supply of water.	To reduce, and make more efficient, the household, industrial and commercial consumption of resources, minimise the generation of waste, encourage its re-use and eliminate waste sent to landfill.	To promote and secure the efficient and sustainable use of water to ensure quick to recover water supplies for people and businesses.	To avoid negative impacts on surface and groundwater levels and flows, including when this impacts on habitats.	To protect and enhance surface and groundwater quality and protect and enhance coastal waterbodies.
Criteria	**4.3 Water**	**4.4 Water**	**5.1 Soil, geology and land use**	**6.1 Air and Climate**	**6.2 Air and climate**	**6.3 Air and climate**	**7.1 Archaeology and Cultural Heritage**	**8.1 Landscape and Visual Amenity**
Objective Description	To ensure appropriate and sustainable management of water whilst protecting the biological, geochemical and physical processes and components that take place or occur within a biological community of interacting organisms and their physical environment that rely on water resources.	To reduce or manage flood risk.	To protect and enhance the physical features of the surface of the Earth and their relation to its geological structures and the quality and quantity of soils.	To reduce air pollutant emissions.	To reduce energy consumption and greenhouse gas emissions.	To adapt and improve flexibility to the threats of climate change.	To conserve and enhance the historic environment, assets (building, monument, site, place, area or landscape) identified as having a degree of importance, and their settings and protect important sites preserving evidence of past activity.	To protect, enhance the quality of and improve access to landscapes identified as having a degree of importance and unimportant landscapes, urban areas (towns) and the countryside.

Key:
- Major adverse
- Moderate adverse
- Minor adverse
- Negligible beneficial or adverse
- Minor beneficial
- Moderate beneficial
- Major beneficial

6.1 Eastern area strategy

Due to the scale of the forecast supply deficit in the Eastern area, all feasible options were considered and the SEA findings were actively used in reaching a decision on our preferred strategy.

There are fourteen catchment management schemes and six supply side options in our strategy including development of a strategic Medway WwTW indirect potable water reuse scheme, an increased import of water from South East Water and improvements to a key water transfer pipeline within the operational area. Some existing licensed water sources will also need to be brought back into use. Our strategy therefore is to make the maximum use of existing water resources alongside demand management measures to deliver a robust and resilient water supply for customers without the need for major new water sources.

Drought permits / orders in the Eastern area may still be required in severe as well as extreme drought conditions in the period up to 2024 while some initial schemes are delivered alongside the demand management options. After that, the number and frequency of drought permits / orders will be significantly reduced even in extreme drought, with consequent reductions in the environmental impact (in particular by removing the requirement for a River Medway Scheme Drought Permit / Order).

The SEA summary of the WRMP19 strategy for the Eastern area is presented in the assessment table below.

Figure 4 SEA effects summary for the Eastern area strategy

Option name	Residual Effects Significance	SEA objective																
		Biodiversity, flora and fauna		Population and human health			Material assets and resource use		Water				Soil, geology and land use	Air and Climate			Archaeology and Cultural Heritage	Land-scape and Visual
		1.1	1.2	2.1	2.2	2.3	3.1	3.2	4.1	4.2	4.3	4.4	5.1	6.1	6.2	6.3	7.1	8.1
Medway WTW Indirect Potable Water Reuse (18 Ml/d)	Adverse																	
	Beneficial																	
Recommission Meopham Greensand groundwater source	Adverse																	
	Beneficial																	
Utilise full existing transfer capacity (from Faversham4)	Adverse																	
	Beneficial																	
Stourmouth WSW (10Ml/d with 20Ml covered storage)	Adverse																	
	Beneficial																	
SEW bulk supply near Canterbury	Adverse																	
	Beneficial																	
West Sandwich & Sandwich WSW licence variation	Adverse																	
	Beneficial																	
Pesticide catchment management / treatment – Darwell Reservoir	Adverse																	
	Beneficial																	
Nitrate catchment management / treatment – Deal	Adverse																	
	Beneficial																	
Nitrate catchment management / treatment – West Sandwich	Adverse																	
	Beneficial																	
Nitrate catchment management / treatment – Manston	Adverse																	
	Beneficial																	
Nitrate catchment management – North Dover	Adverse																	
	Beneficial																	
Pesticide catchment management / treatment – Powdermill Reservoir	Adverse																	
	Beneficial																	
Nitrate catchment management / treatment – Ramsgate B	Adverse																	
	Beneficial																	
Nitrate catchment management / treatment – Birchington	Adverse																	
	Beneficial																	
Nitrate catchment management / treatment – Strood	Adverse																	
	Beneficial																	
Nitrate catchment management / treatment – North Deal	Adverse																	
	Beneficial																	
Nitrate catchment management / treatment – Gravesend	Adverse																	
	Beneficial																	
Nitrate catchment management / treatment – near Canterbury	Adverse																	
	Beneficial																	
Nitrate catchment management / treatment – Sandwich	Adverse																	
	Beneficial																	
Pesticide catchment management / treatment – River Medway Scheme	Adverse																	
	Beneficial																	
Leakage reduction (15% reduction by 2025; 50% by 2050)	Adverse																	
	Beneficial																	
Target 100 water efficiency activity	Adverse																	
	Beneficial																	

The environmental effects of the fourteen catchment management options are very similar and the effects are assessed as beneficial in relation to many of the SEA objectives with predominately negligible or no adverse effects, except for minor adverse effects associated with carbon emissions for the extra water treatment necessary for the additional water made available by these schemes. These schemes also provide a beneficial effect in respect of WFD objectives to achieve good ecological status and wider environmental objectives for terrestrial ecosystems.

The effects of the demand management measures are mainly beneficial but with some minor temporary adverse effects in respect of materials required for water leak repairs and metering, as well as the risk of temporary traffic disruption and associated carbon and air quality effects of street works for leak repair activities.

The Medway WwTW indirect potable water reuse scheme provides beneficial effects relating to the provision of additional reliable water supplies by reusing treated effluent, thereby increasing resilience to the effects of climate change. However, the scheme has the potential for major adverse effects relating to archaeology and cultural heritage due to the pipeline construction work. These effects, and the detailed design of appropriate mitigation measures, will be addressed further in consultation with Historic England and local heritage asset owners. Mitigation will be required during construction to avoid impacts to Holborough and Burham Marshes SSSI although permanent disruption to surface water drainage will be avoided by constructing in the existing road network and disturbed arable land.

The strategy includes an inter-zonal water transfer (to maximise the full existing transfer capacity from the Faversham area) and a bulk water import from South East Water in the Canterbury area, both of which were assessed as having potential moderate adverse effects to biodiversity, fauna and flora due to construction effects on sites of nature conservation interest, as well as to landscape and visual amenity within the Kent Downs AONB. We will develop appropriate mitigation measures in dialogue with the planning authority and Natural England to reduce the magnitude of effects to an acceptable level. A 5km length of pipeline is required for the inter-zonal transfer within the Kent Downs AONB. This has been routed to avoid ancient woodland and areas of woodland and parkland but will require further optimisation at the detailed planning stage to minimise landscape impacts.

The West Sandwich and Sandwich licence variation scheme and the recommission the Meopham Greensand groundwater source are assessed as having predominantly negligible adverse effects. Minor adverse effects relate to energy and materials use and associated carbon emissions for water pumping and treatment. Minor beneficial effects arise from making optimal use of existing water sources. Recommissioning of the West Sandwich and Sandwich groundwater source may have some minor adverse effects on surface water streams and aquatic ecology which will be investigated further as part of the WINEP3 investigations agreed with the Environment Agency over the next few years. This may require some additional abstraction licence control measures to be applied to protect the environment

In the longer term, there may be a requirement to recommission our Stourmouth water supply source and treatment works for delivery by 2060 depending on the actual supply-demand balance position by this time. This would have negligible to minor adverse effects whilst minor beneficial effects arise from making optimal use of existing water sources

Cumulative effects of the Eastern area strategy have been identified in relation to:

- Pipeline and related construction works some distance apart within the Kent Downs AONB relating to the South East Water import in the Canterbury area and the Faversham Main options. Careful planning, design and mitigation will be needed in relation to the pipeline construction to minimise impacts to habitats, heritage features and landscape features that provide the basis for the AONB designation but overall the cumulative effects are considered minor.

Overall, the environmental assessment has concluded that the Eastern area strategy has predominately negligible to minor adverse effects and negligible to minor beneficial effects.

6.2 Central area strategy

Due to the scale of the forecast supply deficit in the Central area, all feasible options were considered and the SEA findings were actively used in reaching a decision on our preferred strategy.

Seven supply-side options and nine catchment management schemes have been included in our strategy. This includes development of a strategic Littlehampton WwTW Indirect Potable Water Reuse scheme (20Ml/d) and a coastal desalination plant at Shoreham Harbour (10Ml/d). Additionally, there are a number of small groundwater schemes and an artificial groundwater storage and recovery (ASR) scheme for the Sussex Coast Lower Greensand aquifer. We will also maximise the use of remaining surplus water in winter when river flows are high from our Pulborough surface water source within the conditions of our existing abstraction licence.

Drought permits / orders in the Central area may still be required in severe as well as extreme drought conditions in the period up to 2024 while several new resource schemes are developed including the transfer to Midhurst WSW and Petersfield borehole rehabilitation scheme and bringing the West Chiltington supply back into service, alongside continuing activity to further reduce leakage and customer consumption through more metering and water efficiency measures.

The SEA summary of the WRMP19 strategy for the Central area is presented in the assessment table below.

SEA effects summary for the Central area strategy

Option name	Residual Effects Significance	SEA objective																
		Biodiversity, flora and fauna		Population and human health			Material assets and resource use		Water				Soil, geology and land use	Air and Climate			Archaeology and Cultural Heritage	Land-scape and Visual
		1.1	1.2	2.1	2.2	2.3	3.1	3.2	4.1	4.2	4.3	4.4	5.1	6.1	6.2	6.3	7.1	8.1
Littlehampton WTW Indirect Potable Water Reuse (20Ml/d)	Adverse																	
	Beneficial																	
Transfer to Midhurst WSW & Petersfield BH rehabilitation	Adverse																	
	Beneficial																	
Scheme to bring West Chiltington back into service	Adverse																	
	Beneficial																	
ASR (Sussex Coast - Lower Greensand)	Adverse																	
	Beneficial																	
Winter transfer Stage 2: New main Shoreham/North Shoreham and Brighton A	Adverse																	
	Beneficial																	
Coastal Desalination - Shoreham Harbour (10Ml/d)	Adverse																	
	Beneficial																	
Pulborough groundwater licence variation	Adverse																	
	Beneficial																	
Nitrate catchment management / treatment – North Falmer A	Adverse																	
	Beneficial																	
Nitrate catchment management / treatment – North Arundel	Adverse																	
	Beneficial																	
Nitrate catchment management / treatment – North Falmer B	Adverse																	
	Beneficial																	
Nitrate catchment management / treatment – Long Furlong B	Adverse																	
	Beneficial																	
Nitrate catchment management / treatment – Brighton A	Adverse																	
	Beneficial																	
Nitrate catchment management – Steyning	Adverse																	
	Beneficial																	
Pesticide catchment management / treatment – Weir Wood Reservoir	Adverse																	
	Beneficial																	
Pesticide catchment management / treatment – Pulborough Surface	Adverse																	
	Beneficial																	
Pesticide catchment management / treatment – River Arun	Adverse																	
	Beneficial																	
Leakage reduction (15% reduction by 2025; 50% by 2050)	Adverse																	
	Beneficial																	
Installation of AMR meters to take HH meter penetration from 88% to 92%	Adverse																	
	Beneficial																	
Target 100 water efficiency activity	Adverse																	
	Beneficial																	

The SEA findings of the nine catchment management options are very similar and the effects are assessed as beneficial in relation to many of the SEA objectives with predominately negligible or no adverse effects, except for minor adverse effects associated with carbon emissions for the extra water treatment necessary for the additional water made available by these schemes. These schemes also provide a beneficial effect in respect of WFD objectives to achieve good ecological status and wider environmental objectives for terrestrial ecosystems.

The effects of the three demand management measures are mainly beneficial but with some minor temporary adverse effects in respect of materials required for water leak repairs and metering, as well as the risk of temporary traffic disruption and associated carbon and air quality effects of street works for leak repair activities.

We have also included an in-stream river restoration works scheme for the River Arun and Western Rother to provide increased environmental resilience to the abstraction of water from the rivers in

times of drought. This will complement the Pulborough source options and the Littlehampton WwTW indirect potable reuse scheme included in the strategy. The effects of this option are assessed as beneficial in relation to many of the SEA objectives with only negligible adverse effects.

The seven supply-side options include a strategic water reuse scheme and desalination scheme which both provide beneficial effects relating to the provision of additional reliable water supplies by reusing treated effluent and seawater, respectively, and thereby increasing resilience to the future effects of climate change. The SEA identified a number of adverse effects for these two schemes.

- The Littlehampton reuse option would give rise to a small number of major adverse effects relating to some construction activity within proximity to the South Downs National Park, the significant use of materials for construction and operation, as well as requiring high energy usage with consequent greenhouse gas emissions.

  Since the draft WRMP19, the pipeline route for this scheme has been reviewed and revised to avoid adverse effects on the nationally rare ecological communities of the Fairmile Bottom SSSI and minimise effects on other nearby sensitive habitats within the South Downs National Park. This review has considered the permanence of impacts from the pipeline, including assessing the risk of loss of irreplaceable habitats (e.g. chalk grassland) which cannot be mitigated for. The pipeline will be installed such that there will be no direct habitat loss. Air quality impacts will need to be considered and an air quality assessment will be completed once details of the construction programme and methods have been finalised.

  The WFD assessment identified that the discharge of highly treated effluent to the Western Rother would not lead to any material adverse effects.

- Some moderate adverse effects have been identified in relation to the 10Ml/d Shoreham desalination plant including energy use and carbon emissions. The desalination plant would be located adjacent to existing industrial areas with few sensitive receptors in immediate proximity to these sites. The WFD assessment identified that the discharge of brine waste would not lead to any material adverse effects to water quality or ecology in the marine environment. Dispersion modelling of the brine discharge shows that the hypersaline plume reaches equilibrium within 20m from the outfall under worst case scenario. The option will also make use of the existing long-sea outfall from Shoreham power station, and therefore at sufficient distance from the Adur Estuary SSSI. The breakwaters at the mouth of the estuary will also deflect the plume away from the mouth of the estuary.

Once operational, negligible adverse effects are anticipated for both of these schemes, with the exception of moderate adverse effects relating to energy use and carbon emissions

Both these schemes are beneficial for water supply sustainability and resilience, optimising existing water resources, making use of higher river flows in the winter within existing abstraction licence conditions so as to protect groundwater resources for subsequent use in the drier summer months when river flows are much lower in the Western Rother. Subsequently, during the summer, additional groundwater abstraction enabled by varying the abstraction licence condition for our Pulborough groundwater source (by not restricting groundwater abstraction when river flows are low) will help secure water supplies to the north Sussex area without adverse effects on the Western Rother.

The Pulborough winter transfer scheme (Stage 2) and the Sussex Coast - Lower Greensand ASR schemes may result in some temporary moderate adverse effects as a consequence of pipeline construction activities, including in proximity to the South Downs National Park. The Pulborough scheme pipeline has been routed to minimise impacts to the South Downs National Park however, some small sections of pipeline will be required within the South Downs National Park as existing

water supply infrastructure are located within the Park and the pipeline needs to connect to these assets. Further route optimisation will be required at the detailed planning stage to minimise impacts to priority habitats. The pipeline avoids the Adur Estuary SSSI.

The options to rehabilitate the West Chiltington and Petersfield groundwater sources have limited construction-related requirements and so no adverse construction effects are likely. However, for the West Chiltington option only, the WFD assessment has identified some uncertainty regarding the potential effects to surface waters (River Chilt) and a potential risk to wetland habitats (Hurston Warren SSSI) as a result of the groundwater abstraction. Although historically the source was operated without any known effects on the water environment, further assessment of the hydrogeological connectivity between the groundwater source and these dependant ecosystems is required in order to confirm the magnitude of any potential impact during operation. These investigations will take place as part of the WINEP3 WFD no-deterioration investigations already agreed with the Environment Agency and scheduled for completion by 2022. We will work with the Environment Agency and Natural England over the coming months to agree the precise scope of these investigations, which may include groundwater modelling and/or pump test surveys. These investigations will support the development of any mitigation measures that may be required in the event that WFD status deterioration and/or adverse effects on the GWDTE SSSI site are identified.

Cumulative effects of the Central area strategy have been identified in relation to:

- Potential cumulative effects to the Sussex Coastal WFD water body due to the concurrent operation of the coastal desalination plants at Shoreham were assessed as negligible.
- Potential cumulative effects to the Lower Greensand Arun & Western Streams WFD water body due to the operation of the Petersfield and West Chiltington groundwater sources were assessed as negligible.
- Four water supply options in the preferred programme would be located within or adjacent to the South Downs National Park: Pulborough winter transfer scheme Stage 2; Littlehampton water reuse scheme; Rehabilitate Petersfield boreholes; Sussex coastal ASR scheme; and two strategic alternatives if developed; Brighton WwTW Indirect Potable Reuse and Tidal River Arun Desalination. Much of the development will take place at existing Southern Water operational sites and the risk of cumulative effects in respect of construction activities is considered low. Careful planning, design and mitigation will be needed in relation to the pipeline construction elements required for some of these options to minimise impacts to habitats, heritage features and landscape features that provide the basis for the National Park designation. Close consultation will be necessary with the South Downs National Park Planning Authority, Natural England and other interested stakeholders.
- Cumulative major effects on energy use and carbon emissions during operation of several energy-intensive schemes (notably the desalination and water reuse schemes).

Overall, the environmental assessment has concluded that the strategy has predominately minor to moderate adverse effects and negligible to minor beneficial effects. The Littlehampton WwTW water reuse scheme will present some potential major adverse effects, mostly during construction but also in respect of high energy use.

6.3 Western area strategy

Due to the scale of the forecast supply deficit in the Western area, all feasible options were considered and the SEA findings were actively used in reaching a decision on our preferred strategy.

The strategy includes eleven supply side options including the desalination scheme at Fawley rather than indirect potable water reuse schemes reflecting the relatively lower magnitude of potential

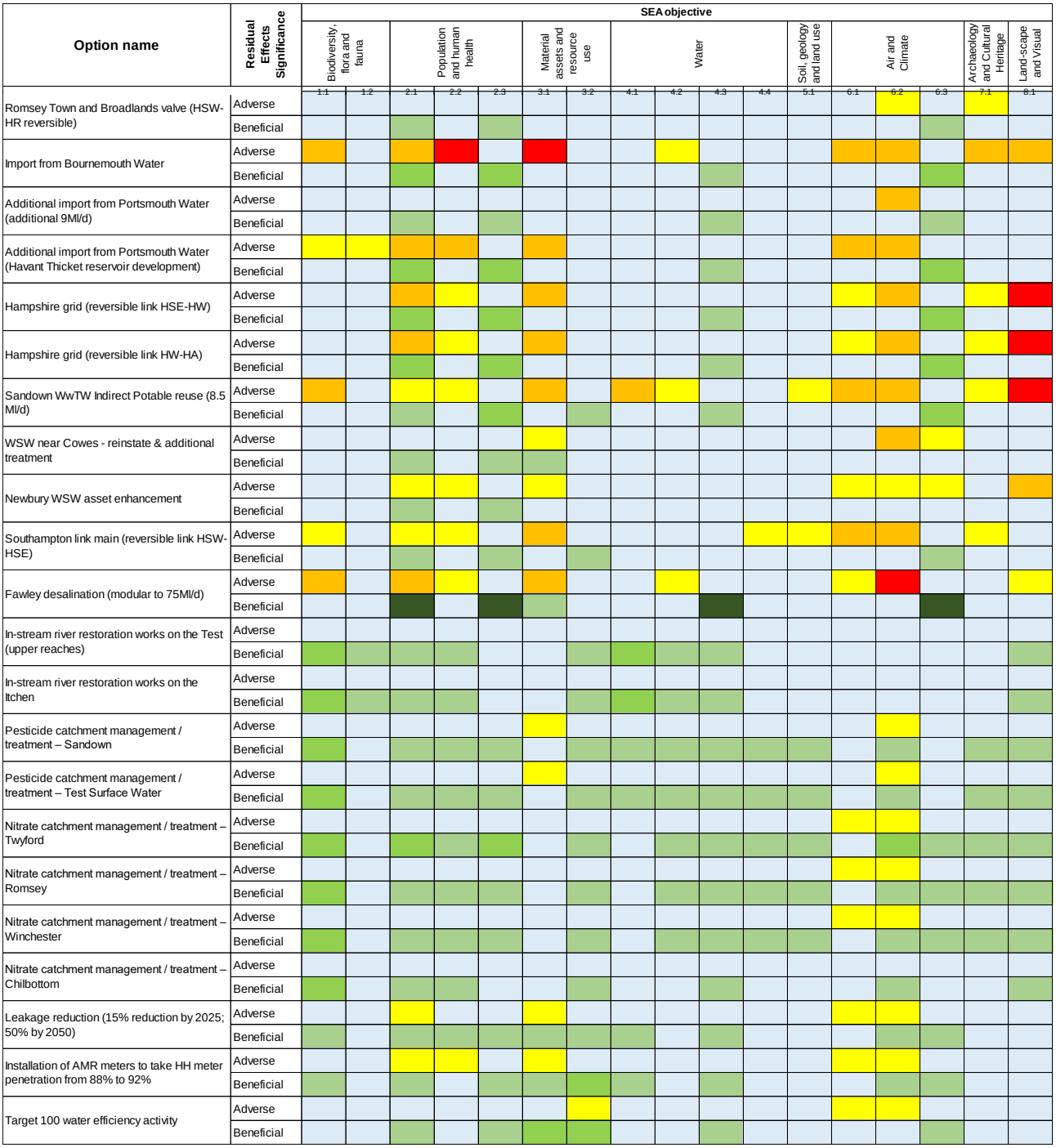
adverse environmental effects of the Fawley scheme, and ability to design mitigation into this scheme, compared to the reuse schemes that would involve discharges to the River Itchen Special Area of Conservation (SAC). Further consideration was given to the deliverability of the Fawley desalination scheme, or one of the Itchen Indirect Potable Reuse strategic alternative schemes, in the Addendum to Statement of Response submitted in June 2019, following a request for further information from Defra in March 2019 (summarised in Section 8.5 of the SEA main report). This set out the investigations and assessments required to remove the uncertainties and environmental risks of the preferred and strategic options, thereby allowing a decision to be made as to which scheme to progress with. A timetable of the work required was included to ensure the chosen scheme was operational by 2027.

We have also included eight catchment management schemes in our strategy including in-stream river restoration works for the River Itchen and the upper reaches of the River Test. These are additional to the river restoration measures already agreed with Natural England and the Environment Agency for the Test and Lower Itchen drought permits/orders.

Drought permits/orders in the Western area may still be required in severe as well as extreme drought conditions in the period up to 2024 as several strategic schemes need to be developed first including the Fawley desalination scheme and three new bulk water imports from South West Water (Bournemouth Water) and Portsmouth Water. For the Test Drought Permit only, this may be still be required in severe drought conditions up to 2028-29 when the Portsmouth Water Havant Thicket Reservoir bulk import scheme is delivered. However, the other schemes will be delivered earlier than 2029 to progressively reduce the volume of water required from any drought permit/order in the period from 2024 onwards

The SEA findings summary of the WRMP19 strategy for the Western area is presented in the table below.

SEA effects summary for the Western area strategy



The effects of the three demand management measures are mainly beneficial but with some minor temporary adverse effects in respect of materials required for water leak repairs and metering, as well as the risk of temporary traffic disruption and associated carbon and air quality effects of street works for leak repair activities.

The SEA findings of six of the catchment management options (excluding the two in-stream restoration options) are very similar and the effects are assessed as beneficial in relation to many of the SEA objectives with predominately negligible or no adverse effects, except for minor adverse

effects associated with carbon emissions for the extra water treatment necessary for the additional water made available by these schemes. These schemes also provide a beneficial effect in respect of WFD objectives to achieve good ecological status and wider environmental objectives for terrestrial ecosystems.

The in-stream river restoration works for the River Itchen and the upper reaches of the River Test, have been included in particular to provide increased environmental resilience to the abstraction of water from these rivers in times of drought. These measures are **additional** to those previously agreed with the Environment Agency and Natural England in connection with the Test drought permit/order and the Candover and Lower Itchen drought orders. The effects of these two options are assessed as beneficial in relation to many of the SEA objectives with only negligible adverse effects.

The eleven supply-side options in our strategy includes one water reuse scheme which provides beneficial effects relating to the provision of additional reliable water supplies by reusing treated effluent and thereby increasing resilience to the future effects of climate change. The SEA identified a number of adverse effects for this scheme:

- The **Sandown indirect potable water reuse scheme** could result in adverse effects regarding the Isle of Wight Area of Outstanding Natural Beauty (AONB) due to the construction of a pipeline across part of the AONB which cannot be avoided. We will work closely with planners and Natural England to optimise the precise routing of the pipeline to minimise effects on landscape and ecology as part of the detailed design of the pipeline.

  Further investigations are needed to confirm the magnitude of adverse effects on the ecology and geomorphology of the River Eastern Yar from discharges to the river of highly treated effluent at times of low flows. Although flow augmentation of this river already occurs, the WFD assessment indicated some uncertainty in respect of the risk of deterioration in WFD status class and that additional mitigation measures may be required to protect the environment. The nature of these mitigation measures (e.g. operational controls and possibly treatment processes) will be determined from the further environmental investigations to be carried out for this option. We will work closely with the Environment Agency to scope the necessary environmental investigations and discuss the need for mitigation measures in light of the findings.

  The HRA of this option concluded there would be no adverse effects on the Solent and Southampton Waters SPA and Ramsar site. No adverse effects are anticipated to the associated Brading Marshes to St. Helen's Ledges SSSI.

The **Fawley desalination scheme** brings major beneficial effects in respect of provision of a reliable water supply that is very resilient to the future effects of climate change. Some major adverse effects have been identified in relation to the operational use of non-renewable materials and generation of wastes in the treatment process, as well as carbon emissions. Additionally, there are a range of risks to the marine environment which we have considered at a strategic level and the necessary mitigation measures that may be required to protect the marine environment. Since the draft WRMP19, we have further reviewed the design of the scheme and the mitigation measures that are likely to be required such that the assessed residual effect is reduced to no greater than moderate adverse effects on the marine environment. For example, we have ensured provision of screening of the intake and outfall structures to avoid entrainment of aquatic fauna and included for on-site treatment to deal with non-brine chemical waste products from the treatment process

With careful application of mitigation measures, there should be no adverse effects on the marine European sites on the landward side of the outfall and abstraction pipeline construction activity.

Potential major adverse effects relating to biodiversity, fauna and flora as well as landscape and visual amenity may arise from construction of pipelines for the desalination scheme within or near to the New Forest National Park and associated designated European conservation sites.

The **import from Bournemouth Water** involves a proposed long-distance pipeline to bring water into our distribution system. Since the draft WRMP19, we have revised the pipeline route to avoid the New Forest National Park and associated designated European conservation sites so as to minimise the environmental effects of this scheme. The route avoids Whiteparish Common SSSI (a component of the SAC) and Cranborne Chase and West Wilshire Downs AONB, as well as avoiding potential impacts to offsite habitat use of woodlands by woodlark. Using the strategic level pipeline route, an assessment for the potential to impede groundwater flows and interrupt floodplain dynamics within the Avon Valley was completed (see Appendix C in Annex 15 HRA for full details). Further route optimisation will be carried out at the detailed planning stage to avoid any potential effects on groundwater and flood plain hydrological processes where the pipeline extends through the Avon Valley.

The **Southampton Link Main** scheme has the potential to result in adverse effects relating to biodiversity, flora and fauna due to the possible adverse effects to a designated European conservation site, but we have sought to minimise these effects through re-routing of the pipeline (including to avoid ancient woodland) wherever feasible and, where not feasible, developing mitigation measures. The launch and receptor pits will be set up in the least impactful locations avoiding lowland fens, and wherever possible avoiding coastal and floodplain grazing marsh assuming this does not compromise the ability to directionally drill.

A suite of mitigation and compensation measures have been developed to avoid adverse effects of the Southampton Link Main option to the Solent and Southampton Water SPA and Ramsar, and River Test SSSI and Lower Test Valley SSSI. Further detailed assessment, including a hydrology assessment, will be required at the detailed design stage to confirm the mitigation proposed is sufficient to avoid adverse effects.

For the **Hampshire Grid Main option**, we have routed the pipeline to avoid areas of ancient woodland and other irreplaceable priority habitat (e.g. chalk grassland). However, approximately 10km of pipeline will be required within the North Downs AONB given the destination of the pipeline. This cannot be avoided as the existing water supply asset is located within the AONB and therefore detailed route optimisation will be required at the planning stage to minimise impacts to the character of the area by utilising the local road networks and areas of poorer quality habitat. The pipeline will cross the River Test SSSI. To minimise impacts, the crossing will be directionally drilled. No land-take is proposed within the River Test SSSI, or the adjoining Chilbolton Common SSSI and Bransbury Common SSSI. Further details about the SSSI mitigation measures for this option are provided in Appendix G.

For all of these pipelines included in our strategy, careful design, planning and site environmental surveys to inform mitigation measures will be needed to minimise environmental effects.

The borehole rehabilitation scheme near Cowes is assessed as having predominantly negligible adverse effects. Minor to moderate adverse effects relate to energy and materials use and associated carbon emissions for materials for construction activities plus operational water pumping and treatment. Minor beneficial effects arise from making optimal use of existing water sources.

Cumulative effects of the Western area strategy have been identified in relation to:

- Beneficial effects for all the demand management options in relation to these measures acting in combination to increase the overall demand savings, thereby contributing to sustainable abstraction.
- Potential construction related cumulative effects due to the proximity and overlap of likely construction periods between the Hampshire grid system options (2026 and 2027) and the Test to Lower Itchen pipeline (2024-2027). The potential effects are limited to temporary effects to the local population and are considered low risk.
- Potential adverse effects on Southampton Water from abstraction for the Test Estuary WwTW industrial water reuse scheme and the Fawley desalination scheme or Itchen indirect potable reuse schemes. These potential cumulative adverse effects are considered of being no greater than minor magnitude given the volume of water in the tidal prism of Southampton Water relative to the volumes of water being abstracted or effluent diverted.
- Potential minor risk of cumulative effects with respect to three options that would be partly constructed within or in proximity to the New Forest National Park (Test Estuary WwTW industrial reuse (if required); Fawley desalination and Bournemouth Water import). Careful planning, design and mitigation will be needed in relation to the pipeline construction activities to minimise impacts to habitats, heritage features and landscape features that provide the basis for the National Park designation

Overall, the environmental assessment has concluded that the preferred programme has predominately minor to moderate residual adverse effects and negligible to minor beneficial effects. However, given the scale of the schemes required to address the supply deficit, a small number of potential major adverse effects may arise – most are related to construction in or near to sensitive environments, but there are also some permanent effects, notably in respect of high energy use and carbon emissions associated with the large desalination scheme at Fawley. We have considered a range of mitigation measures to reduce the effects on the environment and these will be further developed as part of the detailed planning and design of the schemes.

6.4 Cumulative effects with other relevant plans, programmes and projects

6.4.1 Other water company Water Resources Management Plans

All of the neighbouring water companies to Southern Water are also preparing revised draft and final 2019 WRMPs. The plans of the neighbouring companies all include demand management components. Improved water efficiency and leakage reduction across the South East of England will likely provide beneficial cumulative effects in terms of reduced water abstraction (or at least reduced growth in water abstraction) with associated benefits for the water environment, as well as lower energy use and carbon emissions from reduced pumping and treatment (or reduced growth of these activities). These measures will also reduce the scale of required new water resources across the South East.

Updated information sharing facilitated through Water Resources South East Group (WRSE) as part of the development of revised draft WRMP19s during mid-August 2018 has enabled cumulative effects assessment between the water supply options being considered for revised draft WRMP19s by the six water companies that form WRSE. This is summarised below, and has been revised further to reflect the position at November 2019.

No cumulative adverse construction or operational effects or WFD status deterioration is considered likely for the following potential cumulative effects with other Water Company WRMPs:

- Southern Water's Stourmouth WSW (10Ml/d) scheme, South East Water's Broad Oak Reservoir pumped refill abstraction and Affinity Water's Dover Docks Reservoir - Broomfield Banks Effluent Reuse scheme in the Stour catchment

- Southern Water's scheme to recommission the Meopham Greensand groundwater source and Thames Water's Southfleet/Greenhithe licence disaggregation scheme both involve abstraction from the North Kent Medway Chalk.

- Southern Water's Hampshire Grid and Newbury WSW asset enhancement in the North Wessex Downs AONB along with South East Water's scheme to address septic tanks/cess pit discharges to Woodgarston

Southern Water's SEW bulk supply near Canterbury scheme, the scheme to maximise the Faversham main and to recommission Meopham Greensand groundwater source are all in proximity to the Kent Downs AONB and may have cumulative effects with several of the groundwater schemes in the proposed Affinity Water draft final WRMP19 in the same area. There is potential for minor temporary cumulative adverse effects on visual amenity if any of the Southern Water schemes were constructed at the same time as one or more of the Affinity Water schemes. No operational effects on visual amenity or other receptors is anticipated.

As part of the further development and detailed design of the WRMP19 preferred programmes, we will discuss identified potential cumulative landscape effects with other water companies through the WRSE group and propose the development of a combined Protected Landscape Mitigation Strategy that can be discussed with Natural England and relevant Protected Landscape Officers in South East England.

6.4.2 Cumulative effects with water company Drought Plans

Southern Water Drought Plan 2019

The WRMP19 strategies include the need for drought contingency measures set out in the Drought Plan 2019 and which may lead to cumulative effects:

- **Medway water reuse scheme -** no potential major adverse cumulative effects on the Medway estuary are anticipated between the reuse scheme and the Drought Plan measure for a Sheerness emergency desalination plant.

  From 2024, the River Medway Scheme Drought Order should no longer be required even in extreme drought and therefore cumulative effects with the Medway water reuse scheme will not arise.

- **River restoration options for River Test and River Itchen** - potential for cumulative beneficial effects with the Test Surface Water and Lower Itchen sources Drought Permits/Orders by helping improve the environmental resilience of the rivers to abstraction at times of low river flows

- **Sandown WwTW indirect potable water reuse scheme** –No in-combination effects would arise between Sandown desalination scheme and with the Drought Plan 2019 scheme for a Sandown emergency desalination plant.

Assessment of the potential for in-combination impacts of this plan with drought management measures listed in neighbouring water companies' drought plans has also been undertaken.

The information used to carry out these assessments is considered to be the most up to date information available at the time of writing (November 2019).

There are no cumulative effects identified between the WRMP19 and the supply-side Drought Plan options (including Drought Orders and Permits) of the neighbouring water companies:

6.4.3 Other plans and projects

River Basin Management Plans (RBMP) (Thames River Basin District and South East River Basin District Plans)

No adverse cumulative effects between the Thames or South East RBMPs and our WRMP19 are anticipated. The demand management, catchment management and river restoration options in the WRMP19 may have cumulative beneficial effects in supporting some of the RBMP objectives and RBMP measures in the relevant river catchments benefitting from the WRMP19 schemes.

Shoreline Management Plans

Shoreline Management Plans provide a policy context for shoreline/coastal zone management and development. No in-combination likely significant effects were identified in respect of the policies set out in the plans. With the exception of one plan, none of the specific measures within the plans were assessed as having any likely cumulative effects with options in our WRMP19. Measures put forward in the Isle of Wight Shoreline Management Plan included the proposed creation of a 30.9ha compensatory habitat of coastal grazing marsh for the Solent and Southampton Water Ramsar site. Such a measure would not be adversely affected by any of the options considered in the WRMP19 that affect the Solent and Southampton Water Ramsar site.

Canal & River Trust Water Resources Strategy 2015–2020

No adverse cumulative effects between the Canal and River Trust Water Resources Strategy and the options included in our WRMP19 have been identified.

Cumulative effects with identified relevant strategic level projects

There are a number of infrastructure priorities identified in regional and local planning documents in addition to national programmes. The SEA identified the following projects where they may be potential for cumulative effects:

- **Lower Tidal Arun flood risk management scheme** – Depending on the exact location of flood defence works there is the potential for construction related cumulative effects if they are implemented at similar time frames to the company's Littlehampton WWTW indirect potable water reuse scheme and Tidal River Arun Desalination scheme (if required).
- **Leigh flood storage area** – The scheme is more than 20km from our nearest WRMP19 scheme (Medway WWTW indirect potable water reuse scheme). It is considered unlikely that construction or operation of Leigh flood storage area would lead to cumulative effects with the Southern Water's WRMP19.
- Construction and operation of a new gas-fired **Combined Heat and Power (CHP) plant near Sittingbourne**. There is the potential for cumulative construction effects with our WRMP19 option Sittingbourne industrial reuse scheme (if this strategic alternative option is required to be implemented) should the timing of the construction coincide.

Cumulative effects with identified relevant regional and local level projects

A number of potential development projects have been identified for consideration in the cumulative effects assessment:

- Fawley Power Station redevelopment scheme:
  - Fawley desalination scheme

- Potential for further port development at Marchwood Military Port / Dibden Bay (Port of Southampton):
  - Test Estuary WwTW industrial water reuse scheme
  - Fawley desalination scheme
  - Bournemouth Water import

- Planned residential allocations in emerging New Forest District Local Plan:
  - Test Estuary WwTW industrial water reuse

- Potential residential development on a former aerodrome site (as set out in the Local Plan)
  - Littlehampton WwTW indirect potable reuse scheme

- Arundel bypass: Highways England is currently consulting on its preferred route (as announced in May 2018):
  - Littlehampton water reuse scheme

None of the above developments are anticipated to result in any cumulative effects regarding the operation of our WRMP19 schemes. Cumulative construction effects would only arise if the timing of the infrastructure required by the WRMP option was to coincide. It is anticipated that these temporary cumulative effects, for example nuisance effects to local population could be effectively mitigated through appropriate scheduling of all the construction required so as to avoid any concurrent works.

There is a small risk that simultaneous implementation of our WRMP19 leakage reduction programme could lead to cumulative adverse effects with respect to other infrastructure schemes involving partial or full road closures. However, any such cumulative effects would be minor, as most of the demand management activities would be localised and small in scale. They could be effectively mitigated through careful project management and best practice construction methods, as well as co-ordination of major street works with relevant highways authorities.

7. Assessment of strategic alternative options

Consideration has also been given to the strategic alternative options for each operational area which may be required if an option in the preferred programme cannot be delivered in part or in full following more detailed planning and further environmental assessment studies.

7.1 SEA of strategic alternative option for Eastern Area

One strategic alternative option is being considered for the Eastern area: the Sittingbourne industrial water reuse scheme and this have been assessed as summarised in the Figure below.

The SEA concluded that there may be moderate adverse effects during construction after application of mitigation measures due to the proximity to important international wildlife sites, but mitigation would prevent any adverse effects on any European site. This scheme would, if required to be implemented, lead to some beneficial effects in providing additional reliable water supplies by reusing treated effluent, thereby increasing resilience to the future effects of climate change.

SEA effects summary for the Eastern area alternative option

Option name	Residual Effects Significance	SEA objective																	
		Biodiversity, flora and fauna		Population and human health			Material assets and resource use		Water				Soil, geology and land use	Air and Climate			Archaeology and Cultural Heritage	Land-scape and Visual	
		1.1	1.2	2.1	2.2	2.3	3.1	3.2	4.1	4.2	4.3	4.4	5.1	6.1	6.2	6.3	7.1	8.1	
Sittingbourne Industrial Water Reuse	Adverse																		
	Beneficial																		

7.2 SEA of strategic alternative options for Central area

Four strategic alternative options are being considered for the Central area: Brighton WwTW indirect potable reuse (10 Ml/d), Pulborough Winter Transfer Stage 1 scheme, Coastal desalination – Shoreham Harbour (up to 30Ml/d) and Tidal River Arun Desalination (10Ml/d).

These alternative options have been assessed (see **Error! Reference source not found.**below) and the SEA concluded that:

- Since the draft WRMP19 and representations made by Natural England, the treated water pipeline route for **Brighton WwTW indirect potable reuse** option has been reviewed and completely re-routed to avoid impacting receptors including the Lewes Downs SAC, irreplaceable priority habitats, visual amenity of the South Downs National Park, Clayton to Offham Escarpment SSSI.

  As a result of this significant change to the pipeline route, the identified environmental effects of the pipeline component of the scheme have substantially reduced although there is still some pipeline construction required further east within the South Downs National Park which we cannot avoid due to the relative locations of the Brighton WwTW and the location of the discharge of treated effluent on the other side of the South Downs. However, the revised scheme will ensure there is only one construction corridor required within the South Downs National Park, thereby minimising impacts.

  Additionally, there is some uncertainty surrounding the operational effect of increased flows on aquatic ecology in the water body receiving the highly treated effluent from the Brighton WWTW scheme, with the potential risk of WFD status deterioration. If this alternative scheme

was required to be developed, further investigations would be required to assess these potential impacts in more detail, and if necessary develop appropriate mitigation measures if a WFD status deterioration risk was confirmed.

The scheme provides beneficial effects in relation to improving supply reliability by reusing treated effluent, thereby increasing resilience to the effects of climate change.

- The **Pulborough Winter Transfer Stage 1** scheme makes use of existing water resources. As such there are negligible effects from construction or operation of this scheme except for some minor adverse effects associated with additional energy and chemical use during operation and the use of materials during the construction phase.

- The **larger coastal desalination option at Shoreham (up to 30Ml/d)** would have moderate adverse effects including energy use and carbon emissions. Being located adjacent to an existing industrial area, there are few sensitive receptors in close proximity. The discharge of brine waste is not considered to lead to any material adverse effects to water quality or ecology in the marine environment. As with the smaller variant, the option will make use of the existing long-sea outfall from Shoreham power station, and therefore at sufficient distance from the Adur Estuary SSSI. The breakwaters at the mouth of the estuary will also deflect the plume away from the mouth of the estuary.

- The **Tidal River Arun Desalination (10Ml/d)** requires a pipeline which crosses the River Arun and extends partly through the South Downs National Park. The section within the South Downs National Park cannot be avoided as Perry Hill WSR is located in the National Park, therefore mitigation will be required to minimise landscape impacts. The waste brine discharge will be mixed with effluent from the Littlehampton WwTW and will be discharged using the existing outfall into the coastal waters to allow for better dispersion. Climping beach SSSI is downstream of the abstraction point on the River Arun, and therefore reduced flows in the river could have adverse effects on the site. Timing of the abstractions to avoid low tide may help to mitigate these impacts but will need to be investigated further if this scheme is to be progressed. The SSSI also has a coastal frontage and therefore dispersion modelling of the brine discharge will be required to ensure no adverse impacts to the SSSI if this scheme is to be progressed.

SEA effects summary for the Central area alternative options

Central Area: Option name		SEA objective															
	Residual effect significance	Biodiversity, flora and fauna		Population and human health			Material assets and resource use		Water				Soil, geology and land use	Air and Climate		Archaeology and Cultural Heritage	Land-scape and Visual Amenity
		1.1	1.2	2.1	2.2	2.3	3.1	3.2	4.1	4.2	4.3	4.4	5.1	6.1	6.2	6.3	7.1	8.1
Winter transfer Stage 2: turbidity/sludge handling process improvements at Pulborough	Adverse																	
	Beneficial																	
Brighton WTW Indirect Potable Reuse scheme	Adverse																	
	Beneficial																	
Coastal desalination at Shoreham (up to 30Ml/d)	Adverse																	
	Beneficial																	
Tidal River Arun Desalination	Adverse																	
	Beneficial																	

7.3 SEA of strategic alternative options for Western area

Six strategic alternative options are being considered for the Western area. The Fawley desalination (100Ml/d) option is an alternative scheme in case some of the water import schemes could not be delivered to the full volume assumed; Sandown desalination (8.5Ml/d) scheme would be an alternative to the Sandown WwTW indirect potable water reuse scheme. The Itchen indirect potable reuse schemes (Portsmouth Harbour and Fareham WWTWs indirect potable reuse (90Ml/d) or Woolston and Portswood WwTW indirect potable reuse (20.5Ml/d)) would be an alternative to a Fawley desalination scheme. The Test Estuary WwTW Industrial Reuse would be used with the Woodside transfer valve as an alternative to the Portsmouth bulk supply (9Ml/d).

We will initially commence further environmental, planning and design studies for these alternative options in the short term so as to minimise the risk of any delays to delivery of the strategy.

These alternative options have been assessed (see **Error! Reference source not found.** below) and the SEA concluded that these schemes have overall slightly greater adverse environmental effects (after consideration of mitigation measures) compared to the schemes that form Strategy A.

- The **Fawley desalination 100Ml/d scheme** has greater adverse effects than those for the 75 Ml/d desalination scheme in respect of the increase in brine discharge to the Solent. Greenhouse gas emissions and the use of materials to operate the scheme would be slightly higher. A pipeline is also required to connect to Test WSW and move water northwards to the distribution system of Southampton. A section of the pipeline will need to be routed either within or close to the New Forest SAC, SPA and Ramsar and the National Park. Discussions are ongoing with the Highways Agency about the viability of construction within the A326. However, if construction in the road is not permitted, we have also assessed a pipeline route that will utilise a less favourable area of habitat within the European sites and National Park boundary using an existing wayleave for overhead power cables. This wayleave is also the proposed routing for the Test Estuary Industrial Reuse pipeline described above. Further route optimisation will be carried out at the detailed planning stage to utilise the existing road network if possible.

- The **Itchen Indirect Potable Reuse options** would require long-distance pipelines, notably for the Portsmouth Harbour and Fareham WwTW indirect potable reuse option, would require a long-distance pipeline and more pumping of water than for the Fawley desalination scheme and therefore greater greenhouse gas emissions and use of materials. There is a risk of greater adverse effects on the freshwater environment compared to the desalination scheme, but conversely there may be a beneficial effect on the marine environment by removing a significant discharge of treated sewage effluent that is currently high in nutrients.

- The **Sandown desalination scheme** is considerably smaller than the Fawley scheme and consequently has a lower magnitude of adverse environmental effects. Effects on the marine environment are low due to the blending of the brine discharge with the existing treated sewage effluent. There are similar adverse effects associated with the pipeline route crossing an AONB to the Sandown WwTW indirect potable reuse scheme. Greenhouse gas emissions and material use would be marginally higher than the reuse scheme.

- The **Test Estuary WwTW industrial use scheme** has a lower magnitude of adverse effects on the environment. The pipeline route for this scheme has been revised since the draft WRMP19 to minimise the potential effects on the New Forest National Park and New Forest SAC and SSSI. The route now follows an existing power line wayleave within the SAC, SSSI and National Park on dry grassland habitat. There will be no adverse effects on the Test Estuary and associated European sites and SSSIs.

- The **Woodside transfer valve (HSW to HSE)** has limited environmental impacts as it is an existing transfer with the requirement for an additional booster station within the existing boundaries of the working site within a built up area.

SEA effects summary for the Western area alternative options

Western Area: Option name	Residual effect significance	SEA objective															
		Biodiversity, flora and fauna		Population and human health			Material assets and resource use		Water				Soil, geology and land use	Air and Climate			Archaeology and Cultural Heritage	Land-scape and Visual Amenity
		1.1	1.2	2.1	2.2	2.3	3.1	3.2	4.1	4.2	4.3	4.4	5.1	6.1	6.2	6.3	7.1	8.1
Sandown coastal desalination (IOW) (8.5Ml/d)	Adverse																	
	Beneficial																	
Fawley desalination (modular 75-100Ml/d)	Adverse																	
	Beneficial																	
Test Estuary Industrial WTW Reuse (9Ml/d)	Adverse																	
	Beneficial																	
Portsmouth Harbour and Fareham WwTW indirect potable reuse (90Ml/d)	Adverse																	
	Beneficial																	
Woolston and Portswood WwTW indirect potable reuse (20.5Ml/d)	Adverse																	
	Beneficial																	
Woodside transfer valve (HSW to HSE)	Adverse																	
	Beneficial																	

8. Mitigation

The need for additional mitigation measures has been identified for many of the options included in the WRMP19 strategies. However, in some cases some uncertainty remains around effects on and these will be subject to further investigation, potentially leading to additional mitigation. The SEA and WRMP19 have identified that alternative schemes are available and could be selected if the WFD compliance cannot be secured through mitigation (including operational control measures). Where HRA screening identified Likely Significant Effects from any schemes, HRA Appropriate Assessment was undertaken, which has highlighted the need for specific mitigation measures as summarised below and detailed in Annex 15.

Adverse effects identified concerning air quality and carbon emissions are less spatially specific. Air quality effects may be mitigated through improved transport logistics, and routing to avoid sensitive areas such as AQMAs. Opportunities to generate energy from renewable sources are already being taken by the company and further energy recovery and renewable energy options will be positively explored as part of the development of the detailed design of schemes included in the plan, particularly the more operationally energy-intensive schemes.

For several of the schemes, we have considered a range of mitigation measures to reduce the assessed effects on the environment and these will be further developed as part of the detailed planning and design of the schemes. We are committed to continuing dialogue with regulators, statutory bodies and interested stakeholders in developing these schemes and as we carry out detailed environmental investigations to inform precise details of any required mitigation measures.

8.1 Eastern area

Effects on biodiversity, fauna and flora

There are several options in the Eastern area that will require investigation in to potential need for additional mitigation (beyond that considered standard best practice) as a result of construction related effects. The proposed pipeline for the SEW to Canterbury scheme intersect with designated sites and will run close to areas identified as Ancient Woodland. This will require careful detailed design and pipeline routing mitigation measures to protect these features.

Further assessment of the potential localised effects on mudflat habitat in the Medway Estuary MCZ will be required to confirm if any adverse effects may arise and to inform any required mitigation in relation to the Medway WWTW indirect potable water reuse scheme.

Effects on archaeology and cultural heritage

The major adverse effects regarding the Medway WWTW indirect potable water reuse scheme relates to fact that the outline scheme for the pipeline route passes through a Scheduled Monument. Further investigation and liaison with Historic England and the site owner would be required, as well as appropriate mitigation measures such as amendment of pipeline routes.

Effects on landscape and visual amenity

The SEW to Canterbury import scheme would involve some pipeline construction within the Kent Downs AONB. The potential for medium to long term adverse effects to visual amenity following pipeline construction would be mitigated by amendment of pipeline routes to avoid key landscape features, as well as returning the visual and physical integrity of the landscape as closely as possible to its previous condition. The only permanent development within the AONB, outside of our existing sites, relates to two new booster pumping stations associated with the existing Faversham main that is within the AONB. Full consultation will be required with the AONB committee and Natural England to further discuss the detailed mitigation measures as part of the detailed design of these schemes.

8.2 Central area

The need for additional mitigation measures has been identified in the Central area preferred programme in relation to the West Chiltington groundwater scheme, Pulborough winter transfer scheme Stage 2 and the Littlehampton WwTW Indirect Potable Water Reuse scheme.

Effects on water quality and resources, particularly in terms of WFD status

The West Chiltington groundwater abstraction option assessment indicated a potential for impacts on a surface water body and a groundwater dependent terrestrial ecosystem (GWDTE). The historic operation of the boreholes did not result in any concerns about adverse effects on the SSSI or the River Chilt, but further assessment of the hydrogeological connectivity between the groundwater source and these dependant ecosystems is required in order to confirm the magnitude of any potential impact during operation. These investigations will take place as part of the WINEP3 WFD no-deterioration investigations already agreed with the Environment Agency and scheduled for completion by 2022. We will work with the Environment Agency and Natural England over the coming months to agree the precise scope of these investigations, which may include groundwater modelling and/or pump test surveys. These investigations will support the development of any mitigation measures that may be required in the event that WFD status deterioration and/or adverse effects on the GWDTE SSSI site are identified.

Effects on biodiversity, fauna and flora

Several options in the Central area will require investigation in to the potential need for additional mitigation due to construction-related adverse effects.

Pulborough winter transfer scheme Stage 2

The Pulborough winter transfer scheme Stage 2 pipeline has been rerouted since the draft WRMP19 to avoid crossing the Adur Estuary SSSI. Given the small scale of construction works required for the pipeline installation air quality impacts are considered unlikely, however best practice construction methods and use of hoarding will be used where necessary.

The pipeline has been routed to minimise impacts to the South Downs National Park (SDNP) by extending alongside or within the A27 where possible. Sections of pipeline will be required within the SDNP as existing Southern Water infrastructure are located within it. Further route optimisation will be required at the detailed planning stage to minimise impacts to priority habitats including avoiding the lowland calcareous grassland and long-term habitat loss will occur along sections of the pipeline route where existing access tracks can't be used. Route optimisation will be required at the detailed planning stage to avoid extensive loss of trees alongside the A27 and close to Patcham Recreation Ground.

Littlehampton WwTW Indirect Potable Water Reuse

Only one pipeline route is now proposed for the Littlehampton WwTW Indirect Potable Water Reuse option, extending further to the west and away from the River Arun. Therefore, there will be no crossings required on the River Arun.

The route will be almost entirely with the South Downs National Park and minimising impacts will involve further route optimisation to avoid sensitive habitats and utilise existing infrastructure where possible. Impacts will be temporary during the construction phase, although recovery of habitats is likely to be short-medium term. Impact will be minimised with measures such as reducing the working width where possible and only topsoil stripping the trench and using of ground protection mats. Topsoil and subsoil layers will be separated to ensure the existing root balls and seedbank is retained and replaced in the right sequence to maximise potential for habitat recovery. Re-seeding may also be required and species mixes would need to be agreed with the relevant stakeholders at the detailed planning stage.

The pipeline route has also been reviewed in relation to. Commitment is made to avoid both Fairmile Bottom SSSI and areas of ancient woodland. Air quality impacts, including dust from the break-up of the road and the potential for increased loading due to plant movements and stationary (NOx) will need to be considered. An air quality assessment will be completed once details of the plant, construction programme and construction methods have been finalised.

Effects on archaeology and cultural heritage

Pulborough winter transfer Stage 2 option

Pipeline rerouting or specific mitigation measures may be required to avoid adverse effects on two Scheduled Monuments within 1km of the proposed pipeline. Considering the length of the pipeline, there is a risk of unknown assets being at risk from the excavation. A watching brief, surveys and investigation would minimise risk of harm to unknown assets.

Littlehampton WwTW Indirect Potable Water Reuse option pipelines

There are several areas with archaeological importance within 2km (such as the Scheduled Monument 'Madehurst Wood Earthworks') which could be avoided with detailed routing. However due to the length of the proposed pipeline (~19km) and its location in largely undeveloped rural areas there remains a risk of damaging undiscovered archaeological remains. A watching brief, surveys and investigation would minimise risk of harm to unknown assets.

Effects on landscape and visual amenity

Most of the options in the Central area will involve construction within, or in close proximity to, the South Downs National Park. Effects on landscape and visual amenity would be mitigated as far as possible by amendment of pipeline routes and returning the visual and physical integrity of the landscape as closely as possible to its previous condition. Schemes that will result in permanent development within the National Park, and outside of our existing sites, is limited to the revised Pulborough winter transfer Stage 2 option scheme and the Littlehampton WwTW Indirect Potable Water Reuse option

Pulborough winter transfer Stage 2 option

Potential impacts on the South Downs National Park will mainly occur during the construction phase (for example adverse effects on visual amenity associated with the excavation works). Impacts could be mitigated to some extent through detailed routing of the pipeline and construction best practices.

The sensitivity rating for the Pulborough Winter Transfer option is considered Medium (rather than High) for the majority of the route. No impact on irreplaceable habitat will arise as the pipeline routing will avoid such habitat. Where there is any vegetation loss, it may take a number of years for vegetation to fully recover from residual effects of construction, but the effects are temporary.

For the Littlehampton reuse option, construction works may be visible to sensitive receptors, for example, where it passes in the vicinity of public rights of way. Mitigation measures (such as avoidance of landscape features and screening) will lessen these temporary adverse effects.

8.3 Western area

The need for additional mitigation measures for the preferred programme has been identified in the Western area in relation to the Bournemouth and Portsmouth Water bulk supply options, desalination at Fawley, the Southampton Link Main, the Hampshire Grid options and the Sandown WwTW Indirect Potable Water Reuse scheme.

Effects on biodiversity, fauna and flora

Sandown indirect potable water reuse scheme

The pipeline route has been revised to extend along the perimeter of the urban area of Sandown before extending north thereby avoiding previous potential impacts to Alvington Marshes SSSI. Crossings of the River Medina and Lukely Brook will still be required however if at all possible these will utilise road crossings over the rivers.

Further optimisation of the pipeline route will be undertaken at the planning stage to determine if habitats (coastal and floodplain grazing marsh and deciduous woodland) can be avoided during construction, or lengths within them minimised further. If not, a suitable mitigation and compensation package will need to be developed, and opportunities for biodiversity enhancements will need to be explored.

Fawley desalination scheme

We will work closely with Natural England and the Environment Agency to develop the detailed surveys to inform the detailed design of mitigation measures through the proposed Steering Work and scheme-specific Working Groups. We have already revised the strategic outline design to reduce the risks of adverse effects and have considered mitigation measures including:

- best practice pollution control measures during construction of the outfall and abstraction pipelines
- noise, vibration and dust suppression measures
- optimising the precise location of the outfall pipe and design/configuration of the dispersers to maximise mixing of the brine discharge
- consider operational control rules to optimise the dispersion of brine discharges if adverse effects are not addressed by the design of the outfall infrastructure.

Further information was requested by Defra in March 2019, with regards the viability of the Fawley desalination option, and how Southern Water would be addressing the uncertainties and environmental risks with the scheme. An Addendum to the Statement of Response was submitted to Defra in June 2019 providing this information, which is included in Section 8.5 of the main SEA report.

Bournemouth Water Import

We will liaise with South West Water on their WFD risk of status deterioration study which will need to be completed by 2020 at latest. These investigations will inform the development of any mitigation measures associated with the increased abstraction (within existing licence limits).

Effects on archaeology and cultural heritage

A number of scheduled monuments and designated archaeological and cultural heritage assets are identified within the Western area, with a reasonable risk of damaging undiscovered archaeological remains. A watching brief, surveys and investigation would minimise risk of harm to unknown assets and known monuments.

Effects on landscape and visual amenity

Many of the strategic schemes in the Western area preferred programme will involve construction within, or in close proximity to, designated landscapes. Effects on landscape and visual amenity would be mitigated as far as possible by amendment of pipeline routes and returning the visual and physical integrity of the landscape as closely as possible to its previous condition. The development of permanent, above ground features outside of our existing operational sites is relatively low but in such cases, these should be designed to blend with the existing landscape as far as possible. Full consultation will be required with the National Park Planning Authorities, AONB committee and Natural England to further discuss mitigation measures.

9. Monitoring of effects during WRMP19 implementation

The natural, built and human receptors potentially impacted by the development and operation of the options included in the WRMP19 strategies and possible indicators of effects have been set out in **Error! Reference source not found.**. These proposed indicators would form the core component of a monitoring programme to assess whether the identified effects in the SEA are occurring as anticipated, or whether it is giving rise to greater or lesser effects (adverse or beneficial). In turn, the monitoring may identify changes to the mitigation measures necessary to minimise adverse effects and/or modifications to scheme design or operation to further augment beneficial effects.

For biodiversity, flora and fauna, as supply schemes move into the detailed design stage, a range of surveys will be required for HRA, WFD and other environmental regulatory requirements. For example, Protected Species surveys will be carried out to confirm the presence or absence of Protected Species. Where Protected Species are identified, we will follow Natural England's Standing Advice for Protected Species and consult further with Natural England to discuss how the scheme design and operation can be optimised to avoid adverse effects on the relevant species.

Impacted receptor	Monitoring indicators
Water resources, water quality, biodiversity	Proportion of surface waters and groundwater waterbodies at 'Good' WFD status Specific species and habitats surveys Condition of European Sites and SSSIs according to Natural England condition assessments Progress against the Southern Water biodiversity action plan
Climate factors	Net greenhouse gas emissions per Ml (million litres) of treated water (kg CO2 equivalent emissions per Ml) reported annually by Southern Water
Transport	Transport fleet fuel consumption, emissions and mileage, as monitored routinely by Southern Water
Nuisance / community	Scheme level community disruption due to construction works / during operation (where applicable) would be monitored through an Environmental Management Plan agreed as part of the planning permission process Complaints logged with Southern Water and Local Authority Environmental Health Officers or equivalent Responses gauged through customer satisfaction surveys and reported in Southern Water's annual performance processes
Air quality	Scheme-specific monitoring during construction works / during operation (where applicable) would be monitored through an Environmental Management Plan agreed as part of the planning permission process Changes in air quality as monitored by the Defra Automatic Urban and Rural Network, including using this data to establish the baseline conditions
Landscape and visual amenity	Baseline, construction phase and operational phase Landscape and Visual Impact Assessments or equivalent assessment techniques of sensitive landscapes and visual amenity identified in the SEA (and subsequent planning application submissions) as being at a major or moderate adverse effect. Assessments to be carried out in consultation with appropriate bodies, such as the National Park Planning Authorities, relevant AONB committees and Natural England. These surveys will aid planning and evaluation of the success of proposed mitigation measures to reduce adverse effects on landscape and visual amenity.

Impacted receptor	Monitoring indicators
Cultural heritage	Condition of buried archaeology would be monitored during construction works as part of a watching brief and associate response measures as set out in the Environmental Management Plan agreed as part of the planning permission process Consultation with Historic England, heritage asset owners and other relevant stakeholders to ensure adverse impacts are minimised and opportunities sought for heritage discovery and/or maintenance. Reference to Historic England's monitoring of heritage assets such as Listed Buildings and Scheduled Monuments, Registered Battlefields, Registered Parks and Gardens, in particular the 'Heritage at risk' register.

As options are brought forward for development, further specific monitoring requirements may be set out in detailed designs and plans accompanying scheme development (including, where applicable, formal applications for any required environmental permits or abstraction licences, planning permission, as well as any scheme-specific HRA and WFD assessments). These will be discussed with relevant regulatory and statutory bodies and stakeholders to agree the appropriate scale and duration of such scheme-specific monitoring activities proportionate to the assessed environmental risks.

10. Conclusions

Through application of the SEA process (and associated HRA and WFD assessments) from the very outset, we have actively considered environmental and social effects throughout the development of the WRMP19 and consulted regularly with regulators, stakeholders and customers to seek their views on the emerging findings from the effects assessment. The SEA process complies with the regulatory requirements and national best practice guidance. The assessments have been based on a broad range of objective environmental and social criteria, developed through public consultation, to ensure all options were considered on a consistent basis, in line with the meeting the requirements of the SEA Directive and the SEA Regulations.

By integrating environmental and social assessment into the development of the WRMP19, a long-term sustainable water resource plan has been produced that

- maintains water supply reliability and resilience for Southern Water's customers without unacceptable adverse effects on the environment or local communities
- ensures the use of Drought Orders and Drought Permits to temporarily modify abstraction licence conditions is restricted to only extreme drought conditions in the longer term (beyond the 2020s).

As well as protecting the environment, the WRMP19 provides opportunities for environmental enhancement through various measures, in particular:

- reducing water abstraction from a number of existing water sources where there is a risk of adverse effects on the water environment
- actively pursuing further measures to reduce leakage from the water supply system and customer properties, reducing water abstraction from the environment
- extending water metering to more customers and helping customers reduce their demand for water to achieve Southern Water's long-term target of reducing water consumption to an average of 100 litres per person per day
- implementing catchment management measures that will enhance catchment land quality and water quality in local rivers and groundwater
- catchment and in-river restoration measures for the lower River Test and lower River Itchen to increase the environmental resilience of these two rivers to the effects of abstraction, particularly at times of low river flow.