Environmental Report

Cambridge Water
Final Water Resources Management Plan 2019
Strategic Environmental Assessment

Final Report for Cambridge Water

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Introduction

Water companies in England and Wales are required to produce a Water Resources Management Plan (WRMP) every five years. Cambridge Water's Final 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. A draft WRMP 2019 (WRMP19) was submitted to the Secretary of State in December 2017 to seek his agreement for issuing for public consultation during early 2018. Consultation on the draft WRMP19 was held between March and May 2018, and a Statement of Response was published in August 2018 setting out the changes made to the plan in response to the consultation comments received. This Strategic Environmental Assessment Environmental Report accompanies the Final Cambridge Water WRMP19.

A Strategic Environmental Assessment (SEA) has been prepared in support of the development of Cambridge Water's WRMP19 as summarised in this Environmental 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 WRMP19.

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 on 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.

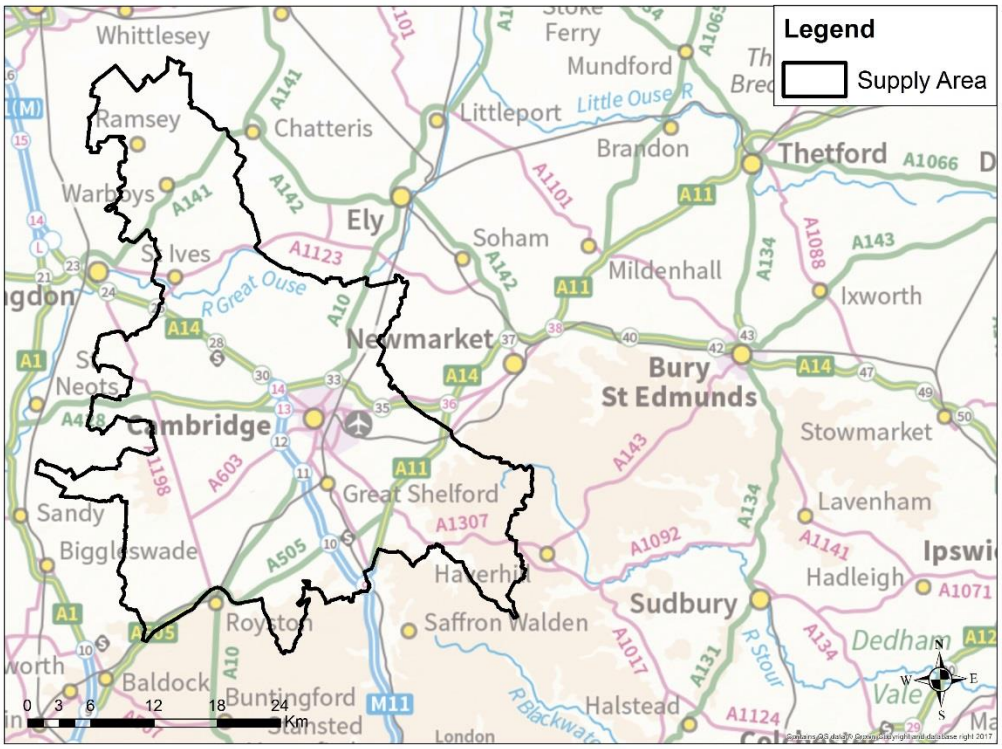
Final Water Resource Management Plan 2019

Cambridge Water provides high quality water and wastewater services to over 133,000 households and businesses over an area of 1,173 km^2 which includes the City of Cambridge and extends to Ramsey and St Ives to the north, Balsham to the East, Gamlingay to the West and Melbourn to the South. Cambridge Water provides water to 320,000 people, supplying a total of 76 million litres per day (Ml/d). Water is supplied through 2,300 km of water mains fed by groundwater abstraction from underground aquifers (porous rock). In total, 97% of the water available for supply by Cambridge Water comes from boreholes drilled into the chalk aquifer to the south and east of Cambridge, and from a single wellfield in the Thetford area of Norfolk beyond the Cambridge Water supply area. The remaining 3% comes from a greensand aquifer groundwater source to the west of the area which can supply the more local area and surrounding villages. Water supplies are both pumped directly into supply following treatment, or are distributed through a system of treated water service reservoirs with sufficient capacity to manage short term peaks in demand.

For water resource planning purposes, Cambridge Water's supply area is managed as one Water Resource Zone (WRZ), as shown in Figure A below. The SEA however has considered a wider geographical extent beyond the company's water supply boundary reflecting the consideration of water supply options across a wider area of East Anglia as well as the provision of existing water supplies from the Thetford area. Further details about the Cambridge Water supply system are provided on the Cambridge Water website (http://www.cambridge-water.co.uk).

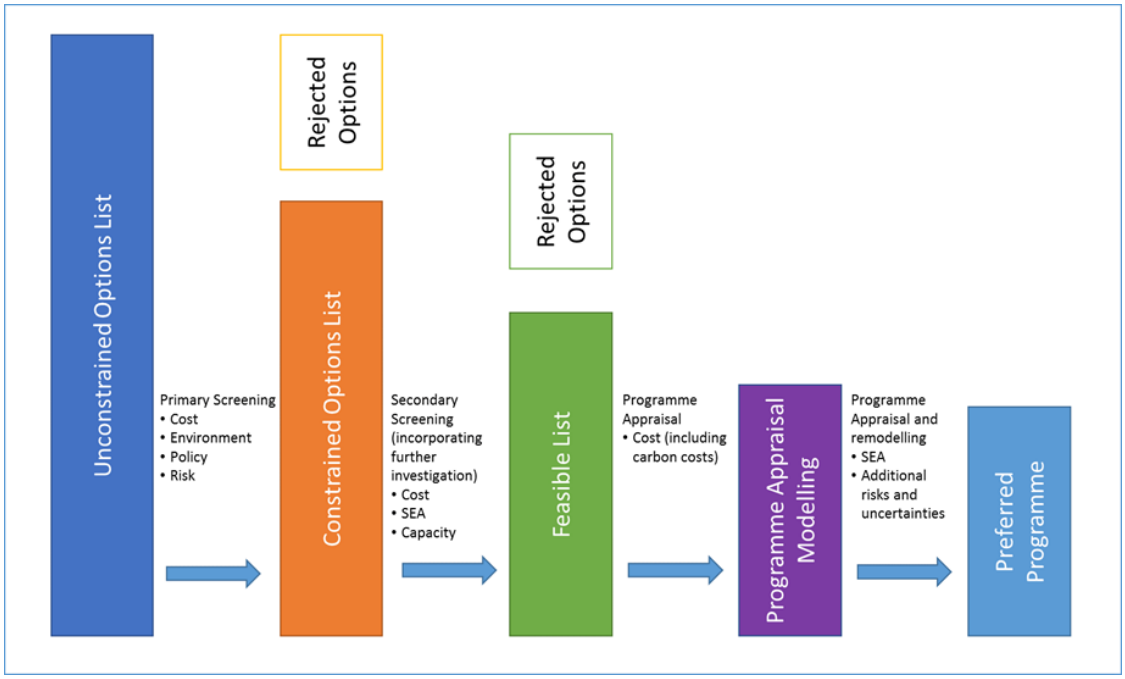
In developing its WRMP19, Cambridge Water has examined the forecast water supply/demand balance and determined how any deficit between forecast demand and reliable water supply availability should be addressed. In developing the plan, a large number of alternative options were identified and assessed to understand their costs, their benefits to the supply-demand balance 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 both the least cost and the 'best value' programme of options to maintain the supply-demand balance over the planning period.

Figure A. Cambridge Water Supply Area



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. Figure B summarises the overall approach to the evolution of the WRMP19: from the initial "unconstrained" list of options through to the consideration of alternative programmes and the development of the WRMP19.

Figure B. Options development and appraisal process

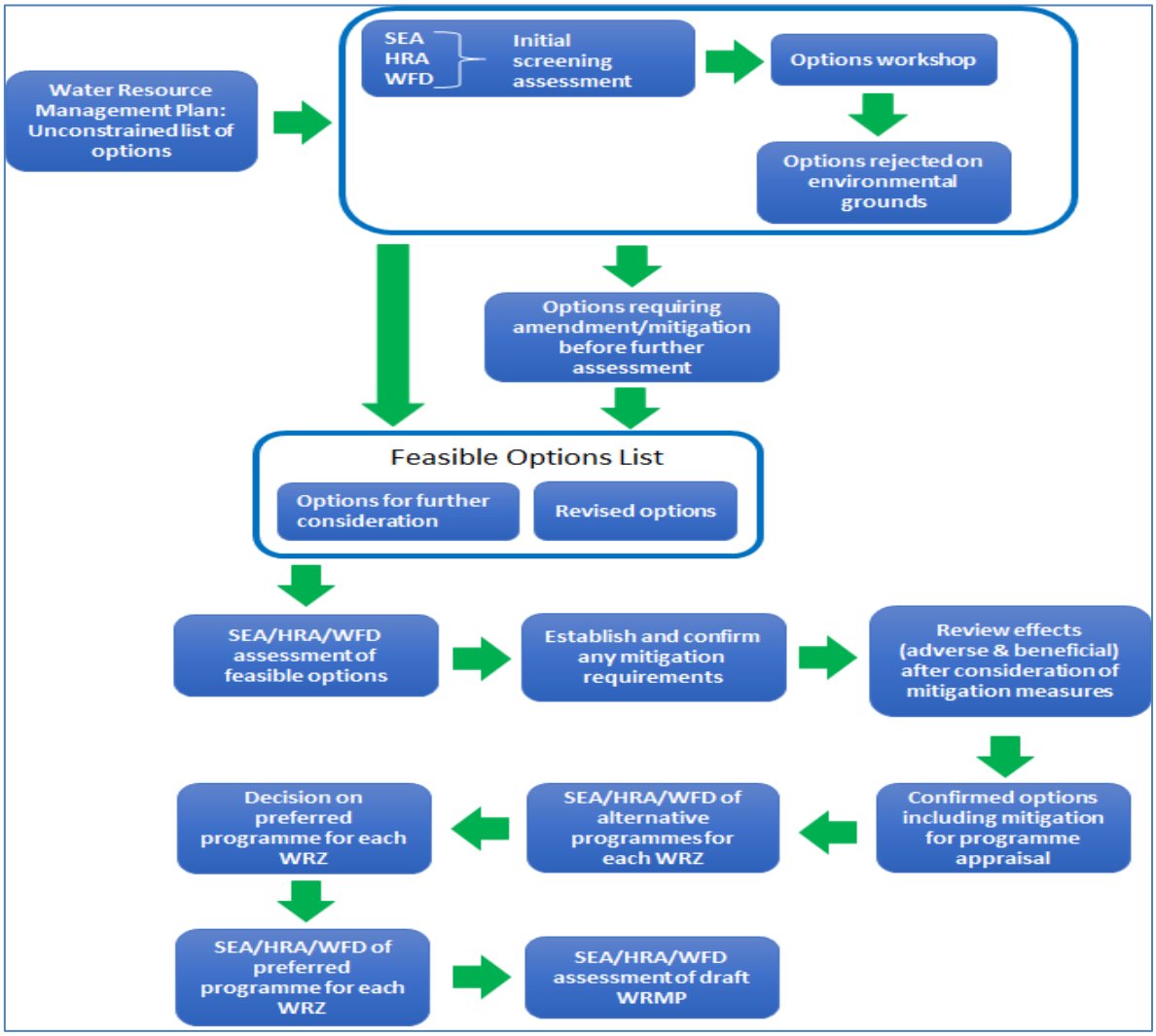


Assessment Approach

An 'objectives-led' approach was adopted for the SEA. The SEA scoping process included a review of environmental and social objectives established in law, policy or other relevant plans, programmes and a review of the baseline environmental information. This derived more than 80 key policy objectives to be taken into account in the development of SEA objectives. The SEA objectives were 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. The SEA objectives were subject to public consultation through the Scoping Report and feedback from the consultation process was taken into account in developing the final SEA objectives against which each constrained option and alternative programmes were assessed.

Consideration and assessment of environmental and social effects (both beneficial and adverse) of the wide range of alternative options for maintaining water supply reliability 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 process (see Figure C below). Detailed SEA, HRA and WFD assessments were carried out for all the Feasible List options. These assessments were documented in appraisal framework tables for each option with a colour coded effects summary (ranging from major beneficial effects to major adverse effects) providing a comparative assessment of the residual environmental effects.

Figure C. Integration of SEA, HRA and WFD assessment into the development of WRMP19



The findings were used to inform the development of the preferred programme. To meet the requirements of the SEA Directive, cumulative effects have been assessed within the preferred programme, and between the Final WRMP19 and other relevant plans, programmes or projects.

SEA Screening of Options

SEA screening of the very large set of options in the 'unconstrained' list was carried out initially. The screening included consideration of SEA topics as well as risks to WFD water body status and the risk of any likely significant effects on European sites designated under the Habitats Directive. This identified options with unacceptable adverse environmental effects which were rejected from the options list and were not taken forward to the next stage of the appraisal process. A further, more detailed stage of SEA (HRA and WFD) screening was then applied to the screening of the initial 'constrained' list of options. The screening assessment findings were discussed with the Environment Agency and Natural England, and feedback from these regulatory bodies was used to refine some of the assessments. Options assessed as having unacceptable adverse environmental or social effects were removed from the options list; the remaining options were included in a final 'Feasible' list.

Assessment of Feasible List Options

Each of the Feasible list 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 parallel HRA and WFD assessments, the Sustainable Economic Level of Leakage (SELL) assessment (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 options to fully understand the overall potential effects on the environment. Where applicable, mitigation measures were identified as part of the option assessment to prevent or reduce any identified significant adverse environmental or social effects. These mitigation measures were taken into account in assessing the potential residual effects on the SEA objectives. Equally, any opportunities for potential enhancement of benefits were taken into consideration.

The SEA involved detailed assessment 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 is provided below.

Demand Management Options

The Demand Management options comprise measures to reduce leakage (principally, active leak detection and repair activities and further actions to manage water pressure in the water supply system) and encourage greater water efficiency by customers (including further water metering of customers, changes to tariff structures to incentivise water efficiency and promotion of water efficient devices). Overall, demand management options serve to reduce pressure on water resources by reducing customer demand for water and thereby helping to reduce the volumes of water abstracted from the water environment. This, in turn, also contributes to reducing the amount of energy needed for water abstraction, treatment and distribution. The leakage and metering options have some limited, temporary adverse effects associated with vehicle movements and associated temporary disruption from working in streets to repair leaks or driving vehicles as part of meter installations.

Water Supply Options

Overall, the assessment of the water supply options revealed a wide spectrum of beneficial and adverse effects.

- **Groundwater options** may influence local groundwater levels and connected surface water bodies, with potential risk to some water-dependent habitats. However, the potential for adverse effects to connected surface waters was in many cases limited, or where the potential for effects to surface waters were identified, wider effects to other receptors was often not assessed as being

of significance. Many of the groundwater options relate to recommissioning or optimising existing sources with relatively small-scale surface infrastructure requirements and relatively limited potential for other types of effects, apart from those associated with materials use and energy linked to the abstraction and treatment of water.

- **Large reservoirs and abstraction and transfer options** exhibit the greatest magnitude of adverse effects relating to construction as well as risks of potential permanent adverse effects on landscape, local communities and heritage features. Conversely, these options bring benefits in respect of securing significant additional reliable water supplies that are more resilient to climate change effects. These options range from the construction of new large storage reservoirs sourced from the River Great Ouse, smaller storage reservoirs (with options for successive construction) that would abstract during winter higher flows, and options that involve optimising use of the Ely Ouse to Essex Transfer raw water transfer scheme.
- Further options relate to the **import of water from other water companies** with limited potential for adverse effects (other than material use and energy linked to the pumping of water) and minor to moderate beneficial effects associated with augmenting water supply availability.

Programme Appraisal

The programme appraisal process initially involved the generation of a 'least-cost' programme using a multi-criteria appraisal model. Certain environmental and social effects were monetised and included in the option costs input to this model. Cambridge Water developed a number of scenarios to test the least cost programme. Outputs from the optimisation model along with the findings of the SEA option appraisal (as well as the HRA and WFD assessments) and other factors such as regulatory requirements, customer preferences, risk and reliability, were used to identify a short-list of reasonable alternative programmes. To avoid double counting of effects, those effects identified in the SEA that had been monetised in the optimisation model (e.g. air quality) were not considered when reviewing the SEA findings to reach decisions on the short-listed programmes.

The alternative short-listed programmes were assessed through the programme-level SEA to help inform decisions on the preferred programme to be included in the Final WRMP19.

Figure D below summarises the environmental effects of the preferred programme and identifies those effects that have been partly represented by environmental and social costs in the programme appraisal model.

In general, the demand management components of the preferred programme will bring a wide range of beneficial effects with mostly negligible adverse effects.

The three supply options included in the preferred programme have similar characteristics. All three have limited construction requirements, which involve upgrades to existing borehole abstraction sites including new boreholes, pumps, small scale connecting pipework to the local network and upgraded treatment capabilities. These works would take place within the boundary of existing water company sites and therefore are anticipated to result in limited potential for adverse construction effects to environmental receptors. The potential minor adverse effects are generally associated with the effects from construction vehicle movements to and from the sites (e.g. noise and nuisance) and material assets and resource use.

In operation, recommissioning the groundwater abstractions would involve the sources being operated within existing abstraction licence conditions and are considered sustainable abstractions with a low risk of adverse effects on groundwater-dependent surface water features and associated ecology:

- The option to recommission the CRPW2 groundwater source was identified as having the potential to affect flows in the Millbridge and Potton Brooks; the risk of adverse effects on the flow regime of these brooks was considered by the WFD assessment to be low. Further assessment is however recommended to better understand the flow regime of these brooks and their connectivity with the boreholes to confirm this finding.
- The option to recommission boreholes at KIPW2 which abstracts from a greensand aquifer was identified by the WFD assessment as having the potential to affect flows within Bourn Brook; the risk of adverse impact on the flow regime and the associated ecology of Bourn Brook is

assessed as low. Further assessment is however recommended to better understand the flow regime and its connectivity with the boreholes to confirm this finding.

- The option to recommission SIPW pumping station would utilise the SIPW shallow boreholes which abstract water from gravel layers in the River Great Ouse floodplain. The licence is considered sustainable and, as identified by the WFD assessment, there is a negligible risk of deterioration to WFD status of the surrounding water bodies or on any ecological receptors.

Figure D. SEA evaluation summary of the Final WRMP19 preferred programme

Option*		SEA Topics and Objectives																				HRA Screening	WFD Assessment
		Biodiversity				Population and Human Health		Material Assets and Resource Use		Water					Soil, Geology and Land Use			Air and Climate			Archaeology and Cultural Heritage	Landscape and Visual Amenity		
		1	1	1	1	2	2	2	3	3	4	4	4	4	5	5	5	5	6	6	6	7	8		
Effects wholly or partially captured in environmental and social costs						✓													✓						
Enhanced free meter optants	Adverse																							No LSE	Compliant
	Beneficial																								
Leakage reduction measures	Adverse																							No LSE	Compliant
	Beneficial																								
Water efficiency measures	Adverse																							No LSE	Compliant
	Beneficial																								
CW5: CRPW2 recommission	Adverse																							No LSE	Compliant
	Beneficial																								
CW4: SIPW recommission	Adverse																							No LSE	Compliant
	Beneficial																								
CW6: KIPW2 recommission	Adverse																							No LSE	Compliant
	Beneficial																								

The Final WRMP19 options and preferred programme as a whole will be compliant with WFD objectives. The Habitats Regulations Assessment (HRA) has confirmed that the options and the preferred programme as whole will not lead to any likely significant effects (LSE) on any European sites.

Cumulative Effects Assessment of the Final WRMP19

Cumulative beneficial effects have been identified for all the demand management options as they will act in combination to reduce demand for water, thereby contributing to sustainable abstraction. These cumulative benefits will help reduce stress on the water environment at times of low flows as well as the water settings of heritage and landscape features. They will also help to reduce energy use for water pumping and treatment. There is a small risk that simultaneous implementation of the demand management options could lead to some minor cumulative temporary adverse effects due to disturbance to human health, increased resource use and greenhouse gas emissions arise due to leak repair and associated water network enhancement activities. However, the cumulative effects of these activities would be temporary, localised and small in scale, and could be effectively mitigated through careful project management and best practice construction methods.

There is no potential for adverse cumulative effects between the three supply side options included in the preferred programme. All three options are at least 7km apart, therefore there is a negligible risk of construction-related adverse cumulative effects. As identified by the WFD assessment, the options abstract from different water catchments and, as a consequence, no cumulative effects during operation are anticipated on the water environment. None of the options have the potential to cumulatively affect the same water receptors by any other pathways. Cumulatively, there will be minor adverse environmental effects from the concurrent use of materials and energy to abstract and treat the additional water supplies.

Cumulative effects of the Final WRMP19 with other relevant plans, programmes and projects have been considered. These include the following and the assessments are summarised below:

- Cambridge Water's Draft Drought Plan 2017
- Neighbouring water companies' latest draft 2019 WRMPs and Drought Plans
- River Basin Management Plans (RBMPs)
- Environment Agency Drought Plans
- Local Development Plans
- National Policy Statements
- National/Regional Infrastructure Plans
- Major projects.

Cumulative effects with Cambridge Water Draft Drought Plan 2017

No cumulative effects with the Cambridge Water draft Drought Plan 2017 have been identified. The draft drought plan includes demand management options and a small number of supply-side measures which relate to maintaining existing sources and a review of existing inter-company transfers. The demand management measures complement the demand management options included in the Final WRMP19. The supply-side options in the draft Drought Plan 2017 include supply options that are included in the Final WRMP19 preferred programme (recommissioning of CRPW2, KIPW2 and SIPW). Once WRMP19 options are developed then these options would cease to be drought plan options and if necessary Cambridge Water will look to identify further drought options for the drought plan. A third supply option in the drought plan is the option to recommission the FD12PW borehole; however, this allows for maintaining licenced volumes as ground water levels reduce, and as the source is located more than 30km distant from any of the Final WRMP19 supply options, no cumulative effects are anticipated with this draft Drought Plan 2017 measure.

Cumulative effects with other Water Resource Management Plans and Drought Plans

The Cambridge Water supply boundary is bordered by Affinity Water and Anglian Water. Larger regional water supply options have also been discussed by the Water Resources East (WRE) group. The

options in the Cambridge Water Final WRMP19 preferred plan do not have any cumulative adverse effects with any other WRMP options included in the revised draft 2019 WRMP of Anglian Water and those in the draft WRMP19 of Affinity Water, or any regional strategic options considered by the WRE group (as at September 2018).

The WRMPs of Anglian Water and Affinity Water demand management components, similar to those included in Cambridge Water's Final WRMP 2019. Improved water efficiency and leakage reduction across East Anglia will provide beneficial cumulative effects in terms of reduced consumption and water abstraction, as well as reduced energy use due to less water pumping and treatment.

Both the Affinity Water Draft Drought Plan 2017 and the Anglian Water Drought Plan 2014 identify a number of demand management measures available during times of drought which would complement, and have beneficial cumulative effects with, the demand management schemes included in the Final WRMP19 preferred programme. None of the supply options listed in either of these Drought Plans will have any cumulative adverse effects with the Cambridge Water Final WRMP19.

Cumulative effects with other plans and projects

No adverse cumulative effects have been identified between the Anglian River Basin District River Basin Management Plan 2015 and the Final WRMP19. The demand management options in the Final WRMP19 may have cumulative beneficial effects in supporting some of the River Basin Management Plan 2015 objectives.

External drought management communications proposed in the Environment Agency Drought Plan may have beneficial cumulative effects with the demand management options in the Final WRMP19, reinforcing the importance of water efficiency to the public in times of drought.

One of the major projects identified by the National Infrastructure Commission for the East region is the A14 Cambridge to Huntingdon improvement scheme, involving the improvement and upgrading of a 23-mile length of strategic highway between Cambridge and Huntingdon. Some of these works would be in spatial proximity to the option to recommission the SIPW Pumping Station.

The National Infrastructure Commission for the East region has also provided Government with proposals and options to maximise the potential of the Cambridge - Milton Keynes - Oxford corridor as a single cluster. Spatial information regarding infrastructure and housing development is not specified in detail in the information available. It is possible that the infrastructure and housing upgrades could be in proximity to the supply options included in the Final WRMP19.

In respect of both of these major projects, cumulative construction effects would only arise if the timing of the infrastructure construction required for the WRMP scheme was to coincide but any potential cumulative effects are considered of minor magnitude at greatest. It is anticipated that these impacts could be effectively mitigated through appropriate scheduling of all the construction required so as to minimise concurrent works and through careful management of construction through dialogue with the different contractors working with local planners and the local community.

Habitats Directive and Water Framework Directive Assessment

The Habitats Regulations Assessment (HRA) has concluded that the Final WRMP19 is compliant with the Habitats Directive, with no likely significant effects on European sites.

The Water Framework Directive (WFD) assessment has concluded that the Final WRMP19 meets the WFD Regulations and associated objectives.

Consideration of Reasonable Alternatives

Cambridge Water considered a range of reasonable alternative programmes to balance supply and supply over the planning period, using its programme appraisal model to optimise across a range of different objectives included within the multi-criteria appraisal model to understand how a greater level of resilience or a portfolio of options that better delivered on customer preferences would change the base least-cost portfolio of options. The environmental and social performance of these alternative programmes was considered, alongside other key factors, to help determine the preferred programme for the Final WRMP19. The preferred programme differs from the least-cost programme, reflecting

customer preferences to avoid compulsory metering (instead, including measures to increase demand saving benefits of the free meter programme) as well including leakage reduction and water efficiency measures to reflect customer and stakeholder expectations. The inclusion of these demand management measures in the preferred programme resulted in a Final WRMP19 with greater environmental beneficial effects and fewer adverse effects than the least-cost plan.

Through the assessment of several reasonable alternative programmes, the SEA has also identified that a small number of feasible alternative schemes exist that could be developed with acceptable environmental and social effects that are broadly comparable to those of the schemes included in the Final WRMP19. In this way, 'substitute' schemes are available for consideration should these prove necessary during implementation of the plan over the planning period.

Mitigation and Enhancement

Mitigation may be defined as a measure to limit the effect of an identified significant impact or, where possible, to avoid the adverse impact altogether. Consideration of mitigation measures has been an integral part of the SEA process and has informed development of the Final WRMP19. The SEA appraisals have been based on the assessment of residual effects likely to remain after the implementation of identified standard construction and operational mitigation measures associated with each option.

Monitoring of the Effects during Plan Implementation

The natural, built and human receptors potentially impacted by development and operation of the schemes included in the Final WRMP19 have been set out in the table below alongside proposed monitoring indicators of effects. These proposed monitoring indicators would form the core component of a SEA 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.

Impacted Receptor	Monitoring Indicator	Information Source	Responsibility
Water resources, water quality, biodiversity	Proportion of surface waters and groundwater waterbodies at 'Good' WFD status	Environment Agency online Catchment Data Explorer	Environment Agency
	Protected species and habitats surveys	Site specific surveys during detailed design stage to confirm presence/likely absence of protected species	Cambridge Water
	Biological monitoring (macrophytes, macroinvertebrates, fish)	Environment Agency database Monitoring completed by Cambridge Water	Environment Agency Cambridge Water
	Condition of European Sites and SSSIs according to Natural England condition assessments	Natural England favourable condition assessment tables	Natural England

Impacted Receptor	Monitoring Indicator	Information Source	Responsibility
	Adherence to the Cambridge Water biodiversity strategy	Biological monitoring and surveys	Cambridge Water
	Surface water and groundwater levels	Monitoring and comparison with historic records	Cambridge Water, Environment Agency
Climate Factors	Net greenhouse gas emissions per Ml (million litres) of treated water (kg CO2 equivalent emissions per Ml)	Reported annually by Cambridge Water	Cambridge Water
Transport	Transport fleet fuel consumption, emissions and mileage	Routinely monitored by Cambridge Water	Cambridge Water
Nuisance/ Community Amenity Effects	Scheme level community disruption due to construction works / during operation (where applicable)	Monitored through an Environmental Management Plan	Cambridge Water
	Complaints logged during construction	Compile data held by Cambridge Water (and contractors) and Local Authority Environmental Health Officer	Cambridge Water, Local Authorities
	Customer satisfaction surveys	Responses gauged through and reported in Cambridge Water's annual performance processes	Cambridge Water
	Surveys of recreational and other amenities likely to be affected	Survey responses pre- and post- construction	Cambridge Water
Air Quality	Scheme-specific monitoring during construction works / during operation (where applicable)	Environmental Management Plan	Cambridge Water
	Changes in background air quality	Defra Automatic Urban and Rural Network, Local Authority monitoring	Defra, Local Authority data sources
Resource Use	Proportion of demolition materials sent to land fill or recycled	Part of Construction Environmental Management Plan	Cambridge Water (and its contractors)

Impacted Receptor	Monitoring Indicator	Information Source	Responsibility
	Proportion of construction build materials derived from recycled materials	Part of design criteria for new builds	Cambridge Water
Landscape and visual amenity	Loss of land within AONB, National Park or protected views	Landscape and Visual Impact Assessments	Complete assessments in consultation with Natural England, Local Authorities and Historic England
	Changes to townscape and views	Townscape assessment	As above
Cultural Heritage	Loss or change in condition of buried archaeology	Archaeological Written Scheme of Investigation	Complete assessment in consultation with Historic England and Local Authorities
		Environmental Management Plan	Cambridge Water
	Change in condition of existing heritage assets	Monitoring of heritage assets such as Listed Buildings and Scheduled Monuments, Registered Battlefields, Registered Parks and Gardens, in particular the 'Heritage at risk' register.	Historic England

Conclusions

Through application of the SEA process (and associated HRA and WFD assessments) from the very outset, Cambridge Water has actively considered environmental and social effects throughout the development of its Final WRMP19 and consulted regularly with regulators, stakeholders and customers to seek their views on the emerging findings. 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 national SEA Regulations.

By integrating environmental and social assessment into the development of the Final WRMP19, a long-term sustainable water resource plan has been produced that maintains water supply reliability for Cambridge Water's customers without unacceptable adverse effects on the environment or local communities.

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

- Actively pursuing further measures to reduce leakage from the water supply system and customer properties, reducing water abstraction from the environment
- Extending the promotion of free water meters to more customers and helping customers reduce their demand for water.

Consultation

The SEA Environmental Report was publicly consulted on as part of the draft WRMP19 consultation. Cambridge Water invited the statutory consultation bodies, stakeholders and the public to comment on

the draft WRMP19 and the SEA Environmental Report between March and May 2018. Comments made were considered and relevant changes made to the plan as a consequence of the comments have been addressed in the Final WRMP19 and this SEA Environmental Report, acknowledging that environmental and social considerations are not the only determining factors in formulating the WRMP.

Once the Final WRMP19 has been published, Cambridge Water will prepare a SEA Post-Adoption Statement, describing how the SEA and the responses to consultation have been taken into account during the preparation of the WRMP19. This statement will describe how environmental considerations have been integrated in the WRMP19 and explain any changes made or alternatives rejected. Information will also be provided on the environmental monitoring to be carried out during the implementation of the WRMP19 to track the environmental effects of the WRMP19 and to trigger appropriate responses where effects are identified.

1 Introduction

1.1 Background and Purpose of Report

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

This Strategic Environmental Assessment (SEA) Environmental Report has been prepared in support of the development of Cambridge Water's Final WRMP 2019 (Final WRMP19) which is being published following public consultation in spring 2018. Habitats Regulations Assessment (HRA) Habitats Regulations Assessment (HRA) and Water Framework Directive (WFD) assessment have also been carried out in parallel to ensure an integrated approach to environmental assessment.

SEA is a statutory requirement for plans or programmes which could have significant environmental implications, and helps to identify where there are potential impacts and how any negative impacts might be mitigated. More information about SEA, and its role in supporting the development of the WRMP19, is provided in Section 1.2.

This Environmental Report is the second output of the SEA process. In April 2017, the SEA Scoping Report was issued for consultation which summarised the environmental baseline and set out the proposed assessment framework. Comments and issues raised by consultees have been considered in preparing this Environmental Report (see Appendix A).

The Environmental Report presents the review of relevant policies and plans (Section 2 and Appendix B) and the baseline environment information (Section 3 and Appendix C) that set the context for the assessment that has been carried out in accordance with the assessment methodology (Section 4). High level environmental screening to establish the constrained and feasible list of options is described in Section 5. The potential effects of alternative WRMP options are described in Section 6, and the WRMP programme appraisal is presented in Section 7. The assessment of the cumulative effects between the Final WRMP19 programme and other activities, plans and projects is set out in Section 8. Section 8 explains how the SEA findings have been used to inform the development of the WRMP19. Information regarding mitigation and monitoring is provided in Section 10 and 11. SEA quality assurance is provided in Section11. Finally Section 12 provides information about conclusions and next steps.

This SEA Environmental Report accompanies Cambridge Water's Final WRMP19.

1.2 Application of SEA to Water Resource Management Planning

1.2.1 Overview of Strategic Environmental Assessment

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 on the environment. The Directive was transposed into national legislation by The Environmental Assessment of Plans and Programmes Regulations 2004 (referred to as the SEA Regulations).

The objectives of SEA are set out in Article 1 of the SEA Directive as follows:

> *'to provide for a high level of protection of the environment and to contribute to the integration of environmental considerations into the preparation and adoption of plans with a view to promoting sustainable development'.*

The SEA Directive requires preparation of an Environmental Report in which the likely significant effects on the environment of implementing the plan or programme, and reasonable alternatives taking into account the objectives and geographical scope of the plan or programme, are identified, described and evaluated. It should be noted that, as stated in the Office of the Deputy Prime Minister (ODPM) SEA

Guidelines, “it is not the purpose of the SEA to decide the alternative to be chosen for the plan or programme. This is the role of the decision-makers who have to make choices on the plan or programme to be adopted. The SEA simply provides information on the relative environmental performance of alternatives, and can make the decision-making process more transparent. The SEA process has therefore been used to help inform decisions making, including the selection of options, and the timing and implementation of WRMP options within the plan, as well as the consideration of appropriate monitoring and mitigation of identified environmental and social effects.

The range of environmental and social issues to be included in an SEA is set out in the SEA regulations, and includes biodiversity, population, human health, fauna, flora, soil, water, air, climatic factors, material assets, cultural heritage, and landscape.

As identified above, the Government has produced SEA guidance which sets out the stages of the SEA process. This, along with specific guidance for undertaking SEA and Habitats Regulations Assessment (HRA) of WRMPs, is being used to inform the SEA of Cambridge Water's WRMP. The 2016 Final Water Resources Planning Guideline (WRPG) also provides guidance on the role of SEA within the water resources management planning process.

These guidance documents and regulations have all informed Cambridge Water’s Final WRMP19 and the SEA.

1.2.2 Requirement for SEA and HRA of Cambridge Water’s Water Resources Management Plan

The SEA Scoping Report issued in 2017 set out the reasons why an SEA of the Cambridge Water’s WRMP19 was required. The Scoping Report concluded that an SEA is required when taking into account a precautionary approach and uncertainties associated with whether the plan is likely to set a framework for future development consent and the risk that the Habitats Regulations Assessment (HRA) would identify the potential for likely significant effects on certain Natura 2000 sites. An HRA has since been undertaken which accompanies the WRMP19 and which has informed the SEA.

Undertaking a SEA of the WRMP19 has aided its development and Cambridge Water’s decision-making on the options to be included in the plan, their timing and phasing taking account the assessed environmental and social effects (adverse and beneficial). The application of the SEA (and HRA) have helped ensure strategic decisions affecting the environment were made early on in the Water Resources Management Planning process.

1.3 Cambridge Water Supply Area and Water Resources Management Planning

1.3.1 Cambridge Water Supply Area

Cambridge Water provides high quality water and wastewater services to over 133,000 households and businesses over an area of 1,173 km^2 which includes Cambridge City and extends to Ramsey and St Ives in the north, Balsham in the East, Gamlingay in the West and Melbourn in the South. Cambridge Water provides water to 320,000 people, supplying 76Ml/d (see Figure 1.1). Water is supplied through 2,300 km of water mains fed by ground water abstraction from underground aquifers. In total, 97% of the water available for supply by Cambridge Water comes from boreholes drilled into the chalk strata to the south and east of Cambridge, and from a single wellfield in the Thetford area. The remaining 3% comes from a greensand source to the west of the area which can supply the more local area and surrounding villages. Water supplies are both pumped directly into supply following treatment, or are distributed through a system of service reservoirs with sufficient capacity to manage short term peaks in demand. For water resource planning purposes, Cambridge Water's supply area is managed as one Water Resource Zone (WRZ) (Figure 1.1). Further details about the Cambridge Water supply system are provided on the Cambridge Water website (http://www.cambridge-water.co.uk/).

Figure 1.1 Cambridge Supply Area

1.3.2 Area under consideration for the SEA

Development of the WRMP19 involves a sequential process to determine the preferred programme of water supply and demand management schemes to maintain a supply-demand balance for the Cambridge Water area. Sections 4 and 5 explain in more detail how SEA will inform the process for developing the WRMP19. For the SEA, the assessment area (Figure 1.1) includes the Cambridge Water supply area and the wider surrounding area, where there are either existing water sources (e.g. groundwater sources in the Thetford area) or potential new sources of water for the company

1.3.3 Temporal scope of the SEA

As discussed earlier, the temporal scope of the WRMP must cover a minimum statutory planning period of 25 years. In Section 3 of this Environmental Report and Appendix C, the current environmental and social baseline for the SEA geographical area under consideration is described together with the likely future changes to this baseline as currently understood. Over the long-term planning horizon of the WRMP19, there is uncertainty as to how the future baseline will evolve. Consequently, it is sensible to adopt a scenario approach to test the sensitivity of the WRMP19 against the central assessment of environmental and social effects based on the known or likely changes to the baseline conditions. In this way, the resilience of the WRMP options, programmes and the overall plan can be assessed and used to inform decision-making as well as recommendations for future monitoring to provide data for subsequent WRMPs and the associated SEA.

In considering this approach to the future environmental and social baseline, it is important to recognise that WRMP options for implementation beyond 2025 will be further assessed by Cambridge Water through the next statutory WRMP due to be published in 2024; this will also be subject to SEA. This process is currently assumed to be repeated every subsequent five years. This regular statutory update and review will ensure that actual changes to the baseline and updated forward projections can be taken into account in subsequent WRMPs and SEAs.

1.4 Cambridge Water Resource Management Planning Process

1.4.1 Overview and timetable

Water resources management planning is undertaken by all water companies in England and Wales in order to ensure reliable, resilient water supplies over the long-term planning horizon. The process includes calculating and forecasting how much water customers will need over the planning period (assessing demand) and how best to provide it (assessing options to reduce or constrain demand growth and/or augment reliable supplies of water) in an efficient, timely manner (programme appraisal). Companies seek to identify the preferred, ‘best value’ programme of demand management and water supply options to maintain a balance between reliable supply and demand and for their supply area as whole (the WRMP). Water companies in England and Wales have a statutory requirement to prepare a WRMP every five years.

Engagement with government, regulators, other licensed water suppliers and water companies, customers and a wide range of stakeholders is key to the WRMP process. Cambridge Water’s WRMP19 consultation programme commenced in early 2017 and includes a wide range of stakeholders and the regulators. Consultation continued throughout 2017 as the draft WRMP19 was developed. The draft WRMP19 was published for formal public consultation between March and May 2018, accompanied by the draft SEA Environmental Report.

Following comments on the draft WRMP and SEA Environmental Report, a Statement of Response was prepared and published in August 2018 by Cambridge Water setting out how the company has taken account of the comments received in finalising its WRMP19.

In developing its WRMP19, Cambridge Water has examined the supply/demand balance determine how any deficits between forecast demand and reliable water supplies should be addressed for the selected planning period.

1.4.2 Water Resource Management Plan Development

There are several future key challenges faced by Cambridge Water in providing reliable and secure water supplies to its customers. These include; increasing population, the potential effects of climate change, and possible "sustainability reductions" to the availability of water supplies from existing water sources to help meet Water Framework Directive (WFD) requirements.

As a result of these various pressures, actions are required by Cambridge Water to maintain sustainable and secure water supplies to customers. These actions include measures to reduce the demand for water and provide additional water supply availability.

The planning process considers key issues which affect future water supply reliability and demand for water, such as:

- population and housing growth
- water consumption behaviour and how these may change in the future
- climate change implications for reliability of water supplies
- reductions to the availability of water supplies due to environmental impact of existing water source abstractions ('sustainability reductions')
- raw water quality deterioration due to land use and/or climate change

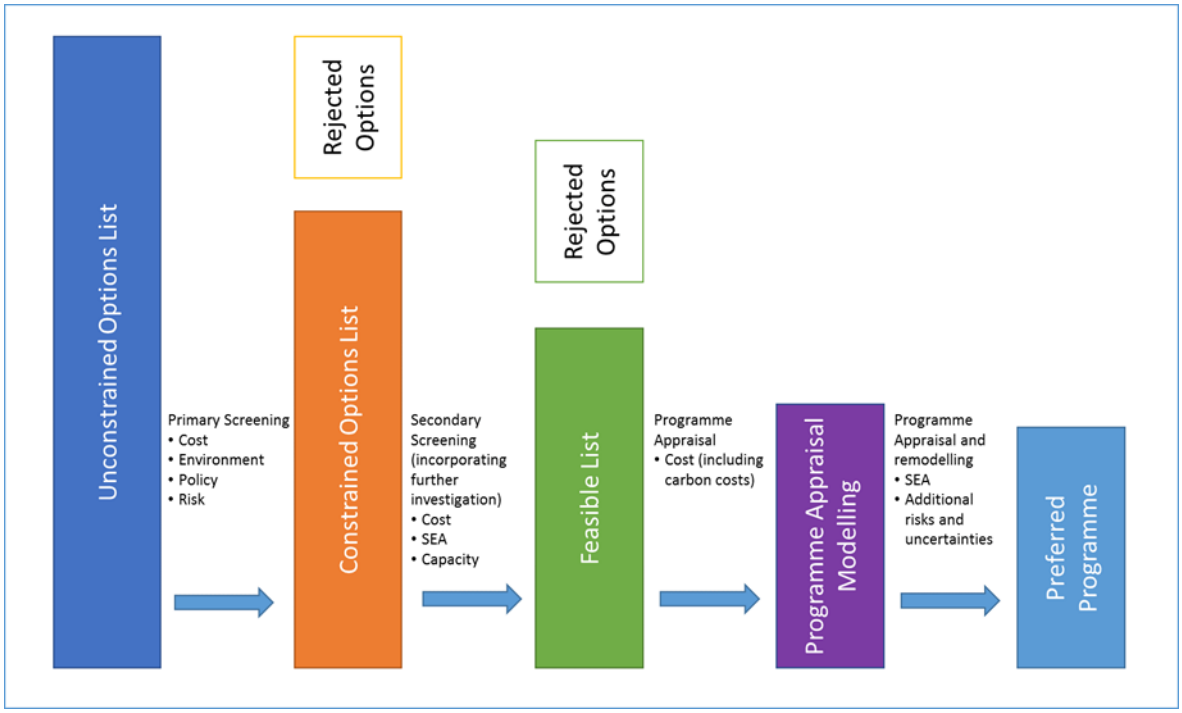
A wide range of alternative options have been considered by Cambridge Water to address any forecast supply shortfalls, including:

- promotion of water efficiency measures
- reducing water leakage from the water supply network or at customers' properties
- water transfers from other water companies or other owners of water sources
- water reuse
- changes to river or groundwater abstraction
- new abstractions from rivers or groundwater where water is available
- recommissioning unused, but licenced abstractions

Each of these options has been assessed to understand the costs, customers preferences, the benefits to the supply-demand balance, the effect on carbon emissions and the environmental and social effects (through the SEA process and associated HRA and WFD assessments). The options have subsequently been compared through a comprehensive programme appraisal process to determine both the least cost and the 'best value' programme of options to maintain a 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 programme developed from this process forms the Final WRMP19.

The UKWIR Guidance on integrating SEA into WRMPs and the WRPG provide clear direction on how SEA outputs should be used in options and programme appraisal. **Figure 1.2** summarises the overall approach to the evolution of the Final WRMP19: from the initial "unconstrained" list of options through to the consideration of alternative programmes and the development of the Final WRMP19. Costing in the second step of screening involved both engineering; and environmental and social costing. Sections 5 and 6 of this Environmental Report explain in more detail how the SEA will actively inform the WRMP process at each key stage.

Figure 1.2 WRMP Options and Programme Appraisal



1.4.3 Water Resource Management Options

Cambridge Water investigated a wide range of potential options to balance future supply and demand. These were assessed as to their practicability and feasibility from which a 'constrained' list and subsequently a 'feasible' list of options was produced. There are two broad categories of water resources management options: demand management options and supply options, as described below.

Demand management options are designed to reduce the demand for water. The demand management options considered in developing the WRMP19 are targeted at leakage reduction enhancing water efficiency and customer metering measures.

In parallel with this, supply options have been investigated to meet the forecast shortfall of water over the planning period. Potential supply options that have been considered in developing the WRMP19 are listed in Table 1.1.

Table 1.1 Potential supply options

Option name	Benefits (Ml/d)
CW2: Combined Ouse gravel sources	2 (5.1 peak output)
CW4: SIPW recommission	1.6 (4.5 peak output)
CW5: CRPW2 recommission	1.4 (2.5 peak output)
CW6: KIPW2 recommission	1 (1.2 peak output)
CW9: Upper Stour reservoir	40
CW9a: Upper Stour reservoir	24
CW10: Abstraction from Ely Ouse with res	25
CW10A: Abstraction from Ely Ouse, with reservoir - No delay, pipeline connection to further South into grid	25
CW11: Abstraction from Ely Ouse with res	20
CW12: Abstraction from Ely Ouse with res	40
CW13: Abstraction from Ely Ouse with res	40
CW14: New raised res on Great Ouse	40
CW14a: New raised res on Great Ouse	24 (40 peak output)
CW15: New raised res on Great Ouse	30
CW15a: New raised res on Great Ouse	18
String of high flow winter reservoirs - 1 site	10
2 high flow winter reservoirs - 2 Sites	20
3 high flow winter reservoirs - 3 Sites	30
4 high flow winter reservoirs - 4 Sites	40
String of high flow winter reservoirs - 4 sub-option with smaller overall DO	24 (40 peak output)
CW26: KDASW transfer	10
CW28: Transfer/trade with Ely Ouse Essex Transfer	10
CW29: Ely Ouse Essex Transfer reversal from Abberton	40
CW29a: Ely Ouse Essex Transfer reversal from Abberton: Sub-option with smaller DO	24
CW30: EOETS with new res	40
Ely Ouse Essex Transfer with new res (shared with AWS): Sub-option with Smaller DO	24
CW33: Adopt BRAWS	4.9 (10.7 peak output)
Optimise WEPW Licence	2 (10 peak output)
Optimise WCPW Licence	0.73 (1.73 peak output)

Option name	Benefits (Ml/d)
Optimise MGPW2 (new BH)	0 (1.4 peak output)
Optimise MGPW2 (BH south)	1 (2.4 peak output)
Optimise MEPW	0 (4.5 peak output)
Optimise MEPW	1 (5 peak output)
CW48: Licence trade at BARR with new BH	0.24 (1.2 peak output)
CW49: Trade with AWS GW licences in Thetford area	4.9 (10.7 peak output)
CW56: Treated water reservoir in A428 corridor	8
CW61:Affinity transfer via LOPW	8
CW62: Transfer from west to Caxton Gibbet	8
CW63: Transfer from Ely	10
Transfer from Ely – no delay	10
CW64: Haverhill to Shudy Camps	10
Transfer from Haverhill to RIPW / LIPW – 20Ml/d	20

1.4.4 Supporting Information

For each option, baseline information was collated to permit SEA, WFD and HRA assessments to be completed, focusing on:

- Analysis of the environmental and hydrological issues
- Strategic assessment of the residual environmental effects after mitigation (including construction/implementation and operational effects)
- Assessment of secondary, cumulative and synergistic effects
- Identification of potential monitoring requirements.

Information to support the SEA was drawn from developing option engineering and water resources information (engineering proforma) and environmental screening for each option (see Section 5), these initial screening assessments together with the WFD assessment informed not only the SEA, but also the HRA which itself informed the SEA.

1.5 Stages of Strategic Environmental Assessment

SEA incorporates the following stages:

- Stage A: Setting the context, identifying objectives, problems and opportunities, and establishing the baseline – Scoping Report published in April 2017.
- Stage B: Developing and refining options and assessing effects (impact assessment)
- Stage C: Preparing the Environmental Report (recording results)
- Stage D: Consulting on the WRMP19 and the SEA Environmental Report (seeking consensus)
- Stage E: Monitoring the significant effects of the plan or programme on the environment (verification)

This Environmental Report encompasses Stages B and C of the SEA process.

Table 1.2 is an extract from the ODPM Practical Guide[1] that sets out the main stages of the SEA process and the purpose of each task within the process. Specific guidance on the application of the SEA process to WRMPs is provided by UKWIR (2012)[2].

Table 1.2 SEA Stages and Tasks

Stage / Task	Purpose
Stage A: Setting the context and objectives, establishing the baseline and deciding on the scope	
Task A1. Identifying other relevant plans, programmes and environmental protection objectives	To establish how the plan or programme is affected by outside factors to suggest ideas for how any constraints can be addressed, and to help identify SEA objectives.
Task A2. Collecting baseline information	To provide an evidence base for environmental problems, prediction of effects, and monitoring; to help in the development of SEA objectives.
Task A3. Identifying environmental problems	To help focus the SEA and streamline the subsequent stages, including baseline information analysis, setting of the SEA objectives, prediction of effects and monitoring.
Task A4. Developing SEA Objectives	To provide a means by which the environmental performance of the plan or programme and alternatives can be assessed.
Task A5. Consulting on the scope of the SEA	To ensure the SEA covers the likely significant environmental effects of the plan or programme.
Stage B: Developing and refining alternatives and assessing effects	
Task B1. Testing the plan or programme objectives against SEA objectives	To identify potential synergies or inconsistencies between the objectives of the plan or programme and the SEA objectives and help in developing alternatives.
Task B2. Developing strategic alternatives	To develop and refine strategic alternatives.
Task B3. Predicting the effects of the plan or programme, including alternatives	To predict the significant environmental effects of the plan or programme and its alternatives.
Task B4. Evaluating the effects of the plan or programme, including alternatives	To evaluate the predicted effects of the plan or programme and its alternatives and assist in the refinement of the plan or programme.
Task B5. Mitigating adverse effects	To ensure that adverse effects are identified and potential mitigation measures are considered.
Task B6. Proposing measures to monitor the environmental effects of plan or programme implementation	To detail the means by which the environmental performance of the plan or programme can be assessed.
Stage C: Preparing the Environmental Report	

[1] Office of the Deputy Prime Minister (2005). A Practical Guide to the Strategic Environmental Assessment Directive.
[2] UKWIR (2012) Strategic Environmental Assessment and Habitats Regulation Assessment – Guidance for Water Resources Management Plans & Drought Plans (12/WR/02/A).

Task C1. Preparing the environmental report	To present the predicted environmental effects of the plan or programme, including alternatives, in a form suitable for public consultation and use by decision-makers.
Stage D: Consulting on the Draft Plan or programme and the Environmental Report	
Task D1. Consulting the public and consultation bodies on the draft plan or programme and the Environmental Report	To give the public and the consultation bodies an opportunity to express their opinions on the findings of the Environmental Report and to use it as a reference point in commenting on the plan or programme. To gather more information through the opinions and concerns of the public
Task D2. Assessing significant changes	To ensure that the environmental implications of any significant changes to the draft plan or programme at this stage are assessed and taken into account.
Task D3. Making decisions and providing information	To provide information on how the Environmental Report and consultees opinions were taken into account in deciding the final form of the plan or programme to be adopted.
Stage E: Monitoring the significant effects of the plan or programme on the environment	
Task E1. Developing aims and methods for monitoring	To track the environmental effects of the plan or programme to show whether they are as predicted; to help identify adverse effects.
Task E2. Responding to adverse effects	To prepare for appropriate responses where adverse effects are identified.

1.6 Structure of the Environmental Report

This SEA Environmental Report presents the findings of Tasks B1 to C1 set out in Table 1.2, and provides the public, stakeholders and regulatory bodies with an opportunity to express their opinions on the findings of the assessment. The Environmental Report is structured as follows:

- **Section 1** (this section): describes the requirement for, purpose and process of the SEA, and its context in relation to the Final Water Resources Management Plan.
- **Section 2** – Policy Context: identifies key messages and environmental protection objectives from other relevant plans and programmes.
- **Section 3** – Environmental Baseline Review: draws out the key environmental issues Cambridge Water intends to consider in the SEA.
- **Section 4** – Methodology: provides details of the methods employed in undertaking the assessment including the cumulative effects assessment methodology.
- **Section 5** – Describes the Environmental Screening of Water Resources Management Plan options undertaken that was undertaken and summaries the results.
- **Section 6** – Assessment of Water Resources Management Plan options: presents the potential impacts of the various Water Resources Management Plan options against the SEA framework.
- **Section 7** – Presents the assessment of the preferred programme of options for the Final WRMP
- **Section 8** - Cumulative Effects Assessment: discusses the potential for cumulative effects between WRMP options and between the Final WRMP and other plans and projects in the region.
- **Section 9** – Describes how the SEA has been used to inform the development of the Final Water Resources Management Plan.
- **Section 10** – Mitigation and Monitoring: discusses measures envisaged to prevent, reduce and offset any significant adverse effects of implementing the Final Water Resources Management

Plan and monitoring to track the environmental effects to show whether they are as predicted, to help identify any adverse impacts and trigger deployment of mitigation measures.

- **Section 11** – references the SEA quality assurance checklist.

1.7 Consultation

1.7.1 Consultation on the Scoping Report

Consultation bodies, stakeholders and the public were invited to express their views on the Scoping Report in accordance with SEA Regulation 12(5). The Scoping Report was issued on 18th April 2017 to the Environment Agency, Historic England and Natural England, and was made available to the public and stakeholders on the Cambridge Water website. The consultation period ran until 30th May 2017. The responses to comments provided on the Scoping Report and how these have been considered in carrying out the SEA are presented in Appendix A.

1.7.2 Consultation on the Environmental Report

The Environmental Report was produced taking into consideration the responses received from consultation bodies during the Scoping consultation. It provides assessments of the potential effects (adverse and beneficial) of the water resources management options considered for the Water Resources Management Plan and sets out how the findings have been used to inform the development of the plan.

The public, regulatory bodies and stakeholders were invited to express their views on the draft Environmental Report between March and May 2018 as part of consultation on the draft 2019 Water Resources Management Plan. Consultation responses have been considered and responses set out in Cambridge Water's Statement of Response published in August 2018. Comments on the SEA Environmental Report have been take into account in preparing this Final WRMP19 Environmental Report.

2 Policy Context

2.1 Introduction

Annex 1 of the SEA Directive (Directive 2001/42/EC) requires the following specific information to be included within the Environmental Report:

- *'an outline of the…relationship with other plans and programmes'*
- *'the relevant aspects of the current state of the environment and the likely evolution thereof without implementation of the plan or programme'*
- *'the environmental characteristics of areas likely to be significantly affected'*
- *'any existing environmental problems which are relevant to the plan or programme including, in particular, those relating to any areas of a particular environmental importance, such as areas designated pursuant to Directives 79/409/EEC (the 'Birds Directive') and 92/43/EEC (the 'Habitats Directive')'*
- *'the environmental protection objectives, established at international, (European) Community or Member state level, which are relevant to the plan or programme and the way those objectives and any environmental considerations have been taken into account during its preparation.'*

In accordance with the Directive, a review of relevant plans, policies and programmes is presented in Appendix B. A summary of key messages derived from the review is presented in Table 2.1 of this section.

2.2 Review of Policies, Plans and Programmes

Identifying other relevant plans, policies and programmes, as well as environmental protection and social objectives, is one of the first steps in undertaking SEA, forming part of Stage A of the SEA process. The review identifies how Cambridge Water's Final WRMP19 might be influenced by other plans, policies, programmes and other objectives which the WRMP should consider. This information helps to identify and inform the objectives for the SEA process.

Relevant plans, policies and programmes were identified from the wide range that has been produced at an international, national, regional and local level. The emphasis is on '*relevant*': plans and programmes that have no likely interaction with the WRMP (i.e. they are unlikely to influence the WRMP, or be influenced by it), have been excluded from the review. Important relevant plans, policies and programmes and strategic level plans that fall within the area under consideration have been considered.

Net environmental gain has been included as a principle in the Government's 25 year Plan to Improve the Environment[3] published in January 2018. References to achieving net gains across the three overarching objectives for sustainable development (economic, social and environmental) along with achieving net gain in biodiversity are set out in the updated National Planning Policy Framework (NPPF) 2018[4]. References to achieving net gains across each of the three sustainable development dimensions (economic, social and environmental) as well providing net gains for biodiversity were previously referenced in the 2012 NPPF[5]. Having regard to the Government's 25 year Environment Plan and the updated NPPF, it is considered that the SEA objectives established, consulted upon and adopted remain relevant.

[3] HM Government (2018). A Green Future: Our 25 year Plan to Improve the Environment
[4] Ministry of Housing, Communities and Local Government (2018). National Planning Policy Framework (NPPF) 2018
[5] Department for Communities and Local Government (2012). National Planning Policy Framework (NPPF) 2012.

The Government states that the ‘net environmental gain’ principle for development aims to deliver environmental improvements locally and nationally, primarily to "enable housing development without increasing overall burdens on developers". Cambridge Water in its Final WRMP19 further explains the benefits that are expected to arise as a result of implementing its plan and measures aimed at delivering overall net environmental gain.

The key messages derived from the review of policies, plans and programmes are documented below in **Table 2.1**. Appendix B provides a detailed summary of all the policies, plans and programmes identified through the review.

Table 2.1 Key Policy Messages derived from the Review of Policies, Plans and Programmes

SEA Topic	Key Messages
Biodiversity, flora and fauna	• Conservation and enhancement of the natural environment and of biodiversity, particularly internationally and nationally designated sites, whilst taking into account future climate change and ability to adapt. • Promote a catchment-wide approach to water use to ensure better protection of biodiversity. • To achieve favourable condition for priority habitats and species. • Avoidance of activities likely to cause irreversible damage to natural heritage. • Support well-functioning ecosystems, respect environmental limits and capacities, and maintain/enhance coherent ecological networks, including provision for fish passage and connectivity for migratory/mobile species. • Strengthen the connections between people and nature and realise the value of biodiversity. • Ensure maintenance and/or support provision of fish passage for migratory fish. • Protection, conservation and enhancement of natural capital. • Ecosystem services from natural capital contributes to the economy and therefore should be protected and, where possible, enhanced. • Avoidance of activities likely to cause the spread of Invasive Non-Native species (INNS). • A need to protect the green infrastructure network.
Population and human health	• To ensure secure, safe, reliable, dependable, sustainable and affordable supplies of water are provided for all communities and all business sectors. • Access to high quality open spaces and opportunities for sport and recreation can make an important contribution to the health and well-being of communities. • To provide a clean, healthy environment that benefits both people and the economy. • Water resources play an important role in supporting the health and recreational needs of local communities. • Increase awareness of sustainability, the true value of water and its efficient use. • Promotion of well-being and healthy communities and protection from risks to these. • Promotion of a sustainable economy supported by universal access to essential utility and infrastructure services. • Protection and improvement of drinking water quality.
Material assets and resource use	• Promote sustainable production and consumption whilst seeking to reduce the amount of waste generated by using materials, energy and water more efficiently. • Consider issues of water demand, water supply and water quality in the natural environment and ensure a sustainable use of water resources. Government expects water companies to continue reducing overall demand for water. • Contribute to a resource efficient, green and competitive low carbon economy. • Maintain a resilient, reliable public water supply and ensure there is enough water for human uses, as well as providing an improved water environment. • Minimise the production of waste, maximise resource benefits from waste and ensure waste management is in line with the 'waste hierarchy': eliminate waste sent to landfill. • Promote the sustainable management of natural resources.
Water	• Promote sustainable production and consumption whilst seeking to reduce the amount of waste generated by using materials, energy and water more efficiently. • Consider issues of water demand, water supply and water quality in the natural environment and ensure a sustainable use of water resources. Government

	expects water companies to continue reducing overall demand for water. • Contribute to a resource efficient, green and competitive low carbon economy. • Maintain a resilient, reliable public water supply and ensure there is enough water for human uses, as well as providing an improved water environment. • Minimise the production of waste, maximise resource benefits from waste and ensure waste management is in line with the 'waste hierarchy': eliminate waste sent to landfill. • Promote the sustainable management of natural resources. • Balance the abstraction of water for supply with the other functions and services the water environment performs or provides. • Steer new development to areas with the lowest probability of flooding and manage any residual flood risk, taking account of the impacts of climate change. • Promote measures to enable and sustain long-term improvement in water efficiency. • Ensure a sustainable balance between the supply and demand for water. • Reduce flood risk to people, residential and non-residential properties, community facilities and key transport links, as well as designated nature conservation sites and heritage assets and landscapes of value. • Reduce risk of flooding from reservoirs. • Support achievement of River Basin Management Plan objectives.
Soil, geology and land use	• Protect and enhance the quality and diversity of geology (including geological Sites of Special Scientific Interest) and soils including geomorphology and geomorphological processes. • Ensure that soils will be protected and managed to optimise the varied ecosystem service functions that soils perform for society (e.g. supporting agriculture and forestry, protecting cultural heritage, carbon sequestration, supporting biodiversity, as a platform for construction), in keeping with the principles of sustainable development. • Promote catchment-wide approach to land management by relevant stakeholders, in order to benefit natural resources, reduce pollution and develop resilience to climate change. • Promote mixed use developments, and encourage multiple benefits from the use of land in urban and rural areas, recognising that some open land can perform many functions. • Encourage the effective use of land by reusing land that has been previously developed (brownfield land), provided that it is not of high environmental value. • Minimise coastal erosion. • Conservation and enhancement of geological SSSIs.
Air and climate	• Reduce greenhouse gas emissions. Targets include: reduce the UK's greenhouse gas emissions by at least 80% (relative to 1990 levels) by 2050. • Reduce the effects of air pollution on ecosystems. • Improve overall air quality. • Sustain compliance with and contribute towards EU limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and the cumulative impacts on air quality from individual sites in local areas. • Minimise energy consumption, support the use of sustainable/renewable energy and improve resilience to climate change. • Build in adaption to climate change to future planning and consider the level of urgency of associated risks of climate change impacts accordingly. • Need for adaptive measures to respond to likely climate change impacts on water supply and demand.

Archaeology and cultural heritage	• Built development in the vicinity of historic buildings and Scheduled Monuments could have implications for the setting and/or built fabric and cause damage to any archaeological deposits present on the site. • Ensure active management of the Region's environmental and cultural assets. • Ensure effects resulting from changes to water level (surface or sub-surface) on all historical and cultural assets are avoided. Consider effects on important wetland areas with potential for paleo-environmental deposits. • Promote the conservation and enhancement of the historic environment, including the promotion of heritage and landscape as central to the culture of the region and conserve and enhance distinctive characteristics of landscape and settlements. • Conserve and enhance the historic environment, heritage assets and their settings. • Protect, enhance and manage the character and appearance of historic and cultural assets and their settings including maintaining and strengthening local distinctiveness and sense of place.
Landscape and visual amenity	• Protection and enhancement of landscape (including designated landscapes, landscape character, distinctiveness and the countryside). • Take account of the different roles and character of different areas, promoting the vitality of main urban areas, protecting the Green Belts around them, recognising the intrinsic character and beauty of the countryside and supporting thriving rural communities within it. • Enhance the value of the countryside by protecting the natural environment for this and future generations. • Improve access to valued areas of landscape character in sustainable ways to enhance its enjoyment and value by visitors and stakeholders.

3 Environmental Baseline Review

3.1 Introduction

An essential part of the SEA process is to identify the current baseline environmental conditions and their likely evolution during the life of the plan (in this case, a maximum of five years). The SEA Directive (Directive 2001/42/EC) also requires that the evolution of baseline conditions of the plan area (that would take place with or without implementation of the plan) is identified. This is useful when determining impact significance, particularly with regards to baseline conditions that may already be improving or worsening and the rate of such change.

Full environmental baseline data and the likely evolution of the baseline conditions are presented in Appendix C and have been drawn from a variety of sources, including a number of the plans and programmes reviewed as part of the SEA process (as set out above in Table 2.1). This environmental baseline review also summarises the likely future trends for the environmental issues being considered (as far as information is available). The key issues arising from the review of baseline conditions are summarised in Section 3.3. The key issues for the evolution of the baseline conditions in the absence of the WRMP19 are summarised in Section 3.4. The best available projections for environmental and social characteristics have been considered and summarised, but there is significant uncertainty which increases with time.

These key issues are considered as part of the assessment process. In this way, the resilience of options, programmes and the overall plan can be assessed and used to inform decision-making as well as future recommendations for monitoring of the effects of the plan to provide data for subsequent WRMPs and associated SEAs.

With knowledge of existing conditions and how these may evolve in the absence of the Water Resources Management Plan, the potential effects (adverse and beneficial) of the Water Resources Management Plan can be identified, mitigated where necessary and subsequently monitored.

3.2 Limitations of the data and assumptions made

The principal limitations surround the future social and environmental baseline where there are substantial differences in the availability and temporal resolution of robust projections across the various SEA topic areas.

The area under consideration for this SEA is substantial presenting some challenges around extrapolating information from data collated at differing spatial resolutions. Relevant spatial data have been obtained for each of the SEA topics and presented as mapped information as much as possible to summarise the extensive datasets involved.

In some instances, reporting cycles mean that the available information is dated (as indicated for each dataset) but if information is updated before the Environmental Report is produced, the more recent data will be used in the assessment.

SEA is a high-level assessment aimed at highlighting potential environmental concerns. The environmental data to be used in this assessment is based on that which is readily available from existing sources, e.g. statutory organisations. No primary research or survey work has been carried out specifically to inform the SEA and therefore it is possible that at the individual option level, there may be additional environmental issues that could have an influence on a WRMP option.

3.3 Key issues

The baseline was set out in the Scoping Report and has been updated based on feedback provided through consultation. The baseline is detailed further in Appendix C. Key issues arising from the review of baseline conditions for each of the SEA topics are summarised in Table 3.1. These key issues have been used to support the development of the SEA objectives in Section 4.

Table 3.1 Summary of key sustainability issues

SEA topic	Key messages
Biodiversity, flora and fauna	• The need to protect or enhance the region's biodiversity, particularly protected sites designated for nature conservation. • The need to avoid activities likely to cause irreversible damage to natural heritage. • The need to take opportunities to improve connectivity between fragmented habitats to create functioning habitat corridors • The need to recognise the importance of allowing wildlife to adapt to climate change. • The need to control the spread of Invasive Non-Native Species (INNS) • The need to engage more people in biodiversity issues so that they personally value biodiversity and know what they can do to help, including through recognising the value of ecosystem services.
Population and human health	• The need to ensure water supplies remain affordable especially for deprived or vulnerable communities, reflecting the importance of water and sewerage services for health and wellbeing. • The need to ensure continued improvements in levels of health across the region, particularly in urban areas and deprived areas. • The need to ensure continuing safe, reliable and resilient provision of water and sewerage services to maintain health and wellbeing of the population. • The need to ensure a balance between different aspects of the built and natural environment that will help to provide opportunities for local residents and tourists, including opportunities for access to, protecting and enhancing recreation resources, green infrastructure and the natural and historic environment. • The need to accommodate an increasing population. • Sites of nature conservation importance, heritage assets, water resources, important landscapes and public rights of way contribute to recreation and tourism opportunities and subsequently health and well-being and the economy.
Material assets and resource use	• The need to minimise the consumption of resources, including water and energy. • The need to reduce the total amount of waste produced in the region, from all sources. The need to recognise waste as a potential resource and reuse waste productively where possible to support development of the circular economy. • The need to reduce the proportion of waste sent to landfill. • The need to continue to actively control leakage from the water supply system and promote the efficient use of water to help reduce future demand for water.

SEA topic	Key messages
Water	• The need to further improve the quality of the regions' river and estuarine waters taking into account WFD objectives. • The need to maintain the quantity and quality of groundwater resources taking into account WFD objectives. • The need to improve the resilience, flexibility and sustainability of water resources in the region, particularly in light of potential climate change impacts on surface water and groundwater. • The need to ensure sustainable abstraction to protect the water environment and meet society's needs for a resilient water supply. • The need to reduce and manage flood risk. • The need to ensure that people understand the value of water**.**
Soil, geology and land use	• The need to protect geological features of importance (including geological SSSIs) and maintain and enhance soil function and health. • The need to manage the land more holistically at the catchment level, benefitting landowners, other stakeholders, the environment and sustainability of natural resources (including water resources). • The need to make use of previously developed land (brownfield land) and to reduce the prevalence of derelict land in the region.
Air and climate	• The need to reduce air pollutant emissions (industrial processes/transport) and limit air emissions to comply with air quality standards. • The need to reduce greenhouse gas emissions (industrial processes and transport). • The need to mitigate against climate change through the reduction in greenhouse gas emissions in order to contribute to risk reduction over the long term. • The need to adapt to the impacts of climate change for example through, sustainable water resource management, water use efficiencies, specific aspects of natural ecosystems (e.g. connectivity), as well as accommodating potential opportunities afforded by climate change.
Archaeology and cultural heritage	• The need to conserve or enhance sites of archaeological importance and cultural heritage interest, and their settings, particularly those which are sensitive to the water environment.
Landscape and visual amenity	• The need to protect and improve the natural beauty of the region's AONBs, National Parks and other areas of natural beauty. • The need to protect and improve the character of landscapes and townscapes.

3.4 Overview of the Future Baseline

3.4.1 Biodiversity, Flora and Fauna

Policy and management plans are expected to continue to focus on improving the condition of locally, nationally or internationally designated sites and NERC habitats, in contribution to meeting their respective conservation objectives over the next 25 years. These management plans recognise the importance of local environment initiatives and community activities, which are anticipated to increase the number of locally designated sites. The importance of partnership working to achieve reduced net loss of priority habitats and enhancing people's personal connection with wildlife and nature, is emphasised in the Natural Environment White Paper and 'Biodiversity 2020' governmental policies. There is some uncertainty as to how changes to farming subsidies and policy post-Brexit may affect biodiversity, flora and fauna in the more intensive agriculture land uses within the Cambridge Water area. The Natural Environment White Paper identifies the Government's aims to work to achieve more, bigger, better and less-fragmented areas for wildlife, including targets for no net loss of priority habitat and an increase of at least 200,000 hectares in the overall extent of priority habitats and at least 50% of SSSIs to be in favourable condition, while maintaining at least 95% in favourable or recovering condition. 'Biodiversity 2020' builds on the Natural Environment White Paper, the mission of which is 'to halt overall biodiversity loss, support healthy well-functioning ecosystems and establish coherent ecological networks, with more and better places for nature for the benefit of wildlife and people'.

3.4.2 Population and Human Health

In the East and South East of England, regional populations are projected to increase by 7.3% and 6.4% respectively between 2016 and 2026, and further increasing over the longer-term planning period to 2045[6]. Specifically, the household population served by Cambridge Water is forecast to increase by 87,000 and 47,500 new homes are forecast to be built between 2015/16 and 2045. This population growth will lead to an increase of 38% in connected household properties. This growth in population has implications for future water demand and abstraction from the water environment as set out in the WRMP19. The WRMP19 sets out the strategy for addressing this growth in a sustainable manner.

Water bills are forecast to remain broadly stable in line with inflation over the planning period, taking account of ongoing reforms to the water industry to increase competition and encourage innovation in the provision of water supplies. These activities will continue to drive cost-effective responses to water resources challenges, thereby limiting the overall impact of the WRMP19 on customer bills. Additionally, water companies are able to offer support to customers at risk of affordability problems[7] through targeted water tariff structures. For example, Cambridge Water has three special tariffs (WaterSure, Assure and AquaCare Plus) aimed at people on low incomes who are struggling to pay their water and wastewater bills. Cambridge Water also has a Charitable Trust which gives grants to those who are on low incomes and have fallen into debt.

3.4.3 Material Assets and Resource Use

Total water usage will increase as regional population increases but further action is being taken by water companies and other organisation to encourage water efficiency by customers to reduce per capita/per property water consumption, alongside continuing actions and regulatory drivers to reduce water leakage. Similarly, water efficiency continues to be promoted for other water users such as agriculture and recreational uses. An increase in operational waste from the water sector will increase as the regional population rises due to need for additional water and wastewater treatment to meet the growth in demand. These issues have been reflected in the recent (2018) National Infrastructure Commission Report, which promotes the need to manage natural capital sustainably, treat water and waste in ways that sustain the environment and ensure a supply of water that meets the needs of households, businesses.

Population growth is expected to drive an overall increase in material assets and resource use in the Cambridge Water SEA assessment area, including for housing, transport and other infrastructure.

[6] Office for National Statistics (2018) Subnational population projections for England: 2016-based.
[7] Defra (2011) Water for Life - Water White Paper

Further action will be needed to ensure growth is more sustainable, including innovation measures to help reduce overall growth in material assets and resource use.

3.4.4 Water

The Environment Agency Water Strategy Regional Action Plan used future scenarios to look at future pressures on the water environment as population in the East of England increases over the next few decades. By 2050, climate change could reduce river flows by 10% to 15% on an annual average basis and could reduce summer river flows by 50% to 80%. The Water Resources Strategy Regional Action Plan for Anglian Region and UK Climate Change Risk Assessment (CCRA) 2016 Evidence Report list key priorities for the Anglian region to respond to the impacts of climate change up until 2100. For example, water will need to be shared more effectively between abstractors, because of corresponding pressure on water resources due to changes in hydrological conditions, population growth and regulatory requirements to maintain good ecological status. Sea level rise and increased storm events are likely to increase flood risk, particularly in the low-lying parts of the SEA assessment area.

The Anglian River Basin Management Plan (2015) sets out a list of specific measures necessary for each of the protected areas and water bodies to achieve good ecological status by 2027. These measures address water management issues which may potentially be exasperated by climate change effects, including; physical modifications, pollution from waste water, pollution from urban and rural areas, pollution from transport, changes to natural flow and water levels and the management of invasive non-native species.

Abstraction Licensing Strategies (ALS) developed by the Environment Agency set out how water resources are managed in each river and groundwater catchment. They provide information about where water is available for further abstraction and an indication of how reliable any new abstraction licences may be. The ALS take account of the required flows in surface waters and the balance between abstraction and recharge in groundwaters to establish the volumes of water that can sustainably be abstracted.

The government is introducing reforms to the abstraction licensing process to support achievement of WFD good ecological status and ensure sustainable use of water resources: several pilot catchments have been established by the Environment Agency to work with abstractors and existing catchment groups, such as catchment partnerships, to update abstraction licensing strategies in priority catchments. These strategies will detail solutions to remaining environmental issues and, where relevant, set out approaches to help abstractors access the water they need to enable these solutions. Four priority catchments have been set up to date, including in the Cam and Ely Ouse catchment within which is the principal catchment for Cambridge Water's water sources. Further reform is expected over the planning period given the particular stresses on water resources in the SEA assessment area.

3.4.5 Soil, Geology and Land-use

The vision of Defra's Soils Strategy for England[8] is for all England's soils to be managed sustainably and degradation threats tackled successfully by 2030. Soil quality and structure is affected by changes in land use, groundwater levels and farming practices. The Water White Paper and the subsequent Defra strategic policy supports catchment-based approaches to prevent and manage future risks to drinking water quality from agricultural activities, working in partnership with farming communities. Consequently, catchment-based approaches will be considered in the development of site management plans for water supply options of the preferred programme over the coming years. There is some uncertainty as to how changes to farming subsidies and policy post-Brexit may affect land use and soil quality in the more intensive agriculture land uses within the Cambridge Water area.

3.4.6 Air and Climate

Analysis of climate change risks by the CCRA identified several key challenges facing the water industry, including; public water demand-supply deficit, lower summer river flows, number of unsustainable water abstractions (total), the northward spread of invasive non-native species, increased soil erosion due to heavy rainfall and an increase in water demand for irrigation of crops. It is considered likely that Government policy will continue to evolve to further improve air quality in light of

[8] Defra (2009) Safeguarding our soils – A Strategy for England

continued concern as to the health impacts of air pollution arising from traffic in the Cambridge Water area.

3.4.7 Archaeology and Cultural Heritage

The NPPF aims to protect heritage assets from future development and highlight the importance of the conservation of heritage assets to enable their enjoyment by future generations. Climate change could have variable impacts on heritage assets in the future, particularly those which are sensitive to the water environment. The current focus and protection of heritage assets is considered unlikely to materially change over the next 25 years, as set out in the 2018 NPPF.

3.4.8 Landscape and Visual Amenity

One of the core planning principles reaffirmed in the 2018 NPPF is to take account of the different roles and character of areas, promoting the vitality of our main urban areas recognising the intrinsic character and beauty of the countryside. Of these, a great weight is placed on conserving landscape and scenic beauty in AONBs. Consequently, the impact of climate change towards landscape character is recognised as an increasingly pressing issue for development as well as the need to protect landscape and visual amenity in the face of the significant housing growth projections for the Cambridge Water area.

4 Assessment Methodology

4.1 Environmental Assessment Approach for WRMP

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, and has been used to inform the development of the Final WRMP19 to ensure its overall compliance with relevant legislation. Figures 4.1 and 4.2 show the overall process for integrating SEA into the development of the Final WRMP19.

Figure 4.1 Integrating SEA into WRMP decision-making alongside HRA and WFD assessments

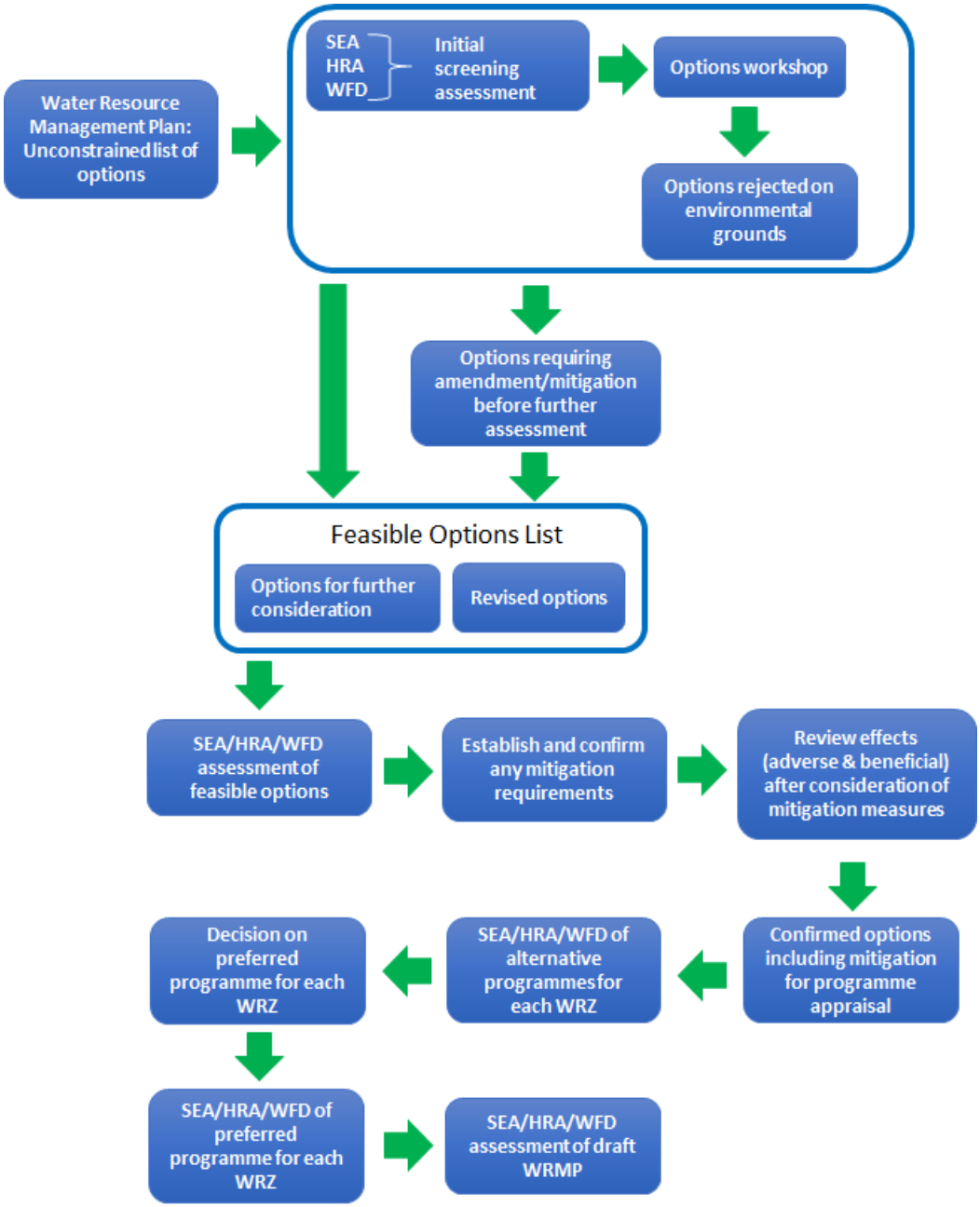


Figure 4.2 Integrating SEA into the WRMP development alongside HRA and WFD assessments

As described in Figures 4.1 and 4.2, a staged assessment approach has been followed in developing the Final WRMP19. Initially, a high-level SEA (and HRA and WFD) review was applied to an unconstrained list of options, this also considered statuary/regulatory/legal constraints. This then helped inform the development of a Constrained/Feasible list of options by screening out options where SEA (HRA or WFD) assessment identified significant environmental effects that mitigation was unlikely to be able to address to reduce the effects to an acceptable level. The constrained/feasible list of options was then subject to detailed assessment in accordance with the methodology described in this section.

4.2 SEA Methodology

This section outlines the methodology that has been used to undertake the SEA of the Water Resources management options in Cambridge Water's WRMP19, taking account of the relevant key parts of the SEA Regulations:

Regulation 12:

(2) "The report shall identify, describe and evaluate the likely significant effects on the environment of –

(a) implementing the plan or programme; and

(b) reasonable alternatives taking into account the objectives and the geographical scope of the plan or programme".

Schedule 2:

"The Environmental Report should include:

(6) The likely significant effects on the environment, including short, medium and long-term effects, permanent and temporary effects, positive and negative effects and secondary, cumulative and synergistic effects.

(8) An outline of the reasons for selecting the alternatives dealt with, and a description of how the assessment was undertaken including any difficulties (such as technical deficiencies or lack of know-how) encountered in compiling the required information".

4.2.1 Assessment methodology and SEA framework

The environmental and social assessment of the alternative Water Resources Management Plan options adopts an 'objectives-led' approach. Establishing assessment objectives is a recognised way of considering the environmental effects of a plan and comparing the effects of alternatives. The SEA objectives are derived from environmental and social objectives established in law, policy or other plans and programmes, as well as from the review of baseline information and environmental problems associated with the SEA topics.

An assessment framework of objectives has been developed based on:

- The key policy messages and environmental and social protection objectives identified in the review of policies, and other plans and programmes (see Section 2). This helps to highlight any area where the Water Resources Management Plan will support or hinder the achievement of the objectives of policies, other plans and programmes.
- The current state of the environment in the area under consideration, its likely future evolution and the key environmental issues identified (see Section 3).

The SEA objectives and key indicator questions are set out in Table 4.1 and take account of the comments received on the draft SEA objectives presented in the SEA Scoping Report (see Appendix A). The following amendments have been made:

The key indicator questions that support the SEA objectives relating to biodiversity, flora and fauna have been amended to reflect consideration for creating habitats and protecting species.

A new objective (1.4) has been added to account for the risk of spreading/introducing invasive non-native species.

Objective 7.2, concerning archaeology and cultural heritage, has been merged with objective 7.1 as they overlap.

The following sections describe how these SEA objectives have been used in the assessment of the environmental and social effects of the potential Water Resources Management Plan options. By assessing each option against these objectives, the effects of the different water resources management options can be objectively compared and the findings used to help determine the options to be included in the Water Resources Management Plan, their timing and phasing of implementation.

The assessment of each option included consideration of the following information:

- Details of each potential water resources management option;
- Likelihood and predicted frequency of deployment of the option;
- Construction (where applicable) and operational/implementation details;
- Benefits to the water supply-demand position in a drought (taking uncertainty into account); and
- Key elements of the baseline environment, such as location of designated sites, priority habitats and species, landscape areas or heritage assets, recreational facilities and other environmental features.

Table 4.1 SEA objectives and indicator questions

SEA topic	SEA objective	Key indicator questions
Biodiversity, fauna and flora	1.1 To conserve and enhance biodiversity, including designated sites of nature conservation interest and protected habitats and species (with particular regard to avoiding the effects of over-abstraction on sensitive sites, habitats and species). 1.2 To protect, conserve and enhance natural capital and the ecosystem services from natural capital that contribute to the economy. 1.3 To strengthen the connections between people and nature and realise the value of biodiversity and ecosystem services. 1.4 To avoid introducing or spreading INNS.	• Will it protect and enhance the most important sites for nature conservation? • Will it protect and enhance aquatic, transitional and terrestrial species and habitats? • Will it introduce or allow the spread of Invasive Non-Native Species (INNS)? • Will it avoid the spread of non-native invasive species? • Will it contribute to the sustainable management of natural habitats and ecosystems, i.e. within their limits and capacities taking into account climate change adaptability? • Will it affect WFD compliance e.g. good ecological potential/status? • Will it ensure maintenance or support provision of fish passage with respect to migratory fish functioning habitat connectivity? • Will it protect or enhance natural capital and ecosystem services? • Will it maintain or enhance access to areas of natural heritage conservation interest? • Will it provide educational or information resources for the public? • Will it create areas of improved biodiversity in urban or deprived areas? • Does it take account of climate change adaptation? • Will it introduce or allow the spread of Invasive Non-Native Species (INNS)?
Population and human health	2.1 To protect and enhance health and well-being (including raising awareness of the importance and value of the water environment for health and well-being). 2.2 To protect and enhance the water environment for other users including recreation and navigation, as well as terrestrial recreational resources (including National Trails and Public Rights of Way) 2.3 To promote a sustainable economy with good access to essential services, including a resilient, high quality and affordable supply of water over the long term.	• Will it help to ensure provision of access to a secure resilient and affordable supply of drinking water particularly where additional water resources may not be available? • Will it help to protect or improve drinking water quality? • Will it raise awareness of the importance and value of the water environment for health and well-being? • Will it protect or enhance opportunities for recreation and tourist activities such as public rights of way and including navigation? • Will it help to promote healthy communities and avoid risks to health and wellbeing (for example through nuisance or resulting from traffic or transport changes, disruption to safe and reliable water/sewerage services)? • Will it assist in ensuring provision of essential infrastructure and services to support health and well-being a sustainable economy? • Is it located in an area considered to be significantly more deprived than others in the region? • Will it improve access to open spaces, the natural and historic environment? Does it protect and enhance the green infrastructure network?
Material	3.1 To reduce, and make more efficient, the	• Will it help to minimise the demand for resources (including water)?

SEA topic	SEA objective	Key indicator questions
assets and resource use	domestic, industrial and commercial consumption of resources, minimise the generation of waste, encourage its re-use and eliminate waste sent to landfill. 3.2 To promote the sustainable management of natural resources including efficient and sustainable use of water; ensure resilient water supplies for homes and industry in the area is maintained.	• Will it minimise the use of energy and promote energy efficiency? • Will it make use of existing infrastructure? • Will it help to encourage sustainable design or use of sustainable materials (e.g. supplied from local resources)? • Will it reduce the amount of waste generated and increase the proportion sent to reuse or recycling? • Will it enable efficient water resource management to help maintain a supply-demand balance? • Will it encourage the productive reuse of waste including energy recovery?
Water	4.1 To avoid adverse impact on surface and groundwater levels and flows, including when this impacts on habitats and/or navigation. 4.2 To protect and enhance surface and groundwater quality and protect and enhance estuarine waterbodies. 4.3 To ensure appropriate and sustainable water resource management whilst protecting ecosystem functions that rely on water resources, including contributing to the achievement of WFD objectives 4.4 To promote measures to enable and sustain long term improvement in water efficiency. 4.5 To reduce or manage flood risk.	• Will it alter the flow regime or residence time of surface waters? • Will it prevent water pollution? • Will it affect water quality compliance or WFD protected areas? • Will it lead to changes in river flows, wetted width or river level? • Will it lead to changes in groundwater levels and recharge? • Will it present a risk to water quality of groundwater, surface waters or estuarine waters? • Will it prevent water pollution? • Will it affect water quality compliance? • Will it affect WFD protected areas? • Will it achieve WFD compliance? e.g. good ecological potential/status, prevent deterioration of WFD status between status classes? • Will it prevent the introduction of impediments to the attainment of WFD good status or potential? • Will it minimise impacts on, or contribute to achievement of, RBMP objectives? • Will it present a risk to water quality of groundwater or surface waters? • Will it ensure sustainable abstractions, taking account of water resources availability status? • Will it contribute to meeting society's needs for a sustainable, resilient water supply? • Will it achieve an appropriate balance of water supply with other functions and services? • Will it contribute towards improving the awareness of water sustainability and its true value? • Will it promote measures to enable improvements in water efficiency and assist in balancing supply and demand? • Will it avoid reducing flood plain storage, or provide opportunities to improve flood risk management?'

SEA topic	SEA objective	Key indicator questions
Soil, geology and land use	5.1 To protect and enhance geology, geomorphology, the quality and quantity of soils 5.2 To protect and enhance the ecosystem services functions of land, soils and geology, including carbon sequestration, flood attenuation, pollutant filtration and nutrient cycling. 5.3 To promote a catchment-wide approach to catchment land management.	• Will it avoid damage to and protect geologically important sites? • Will it protect and enhance geomorphology and geomorphological processes? • Will it protect and enhance the quality of soils? • Will it ensure efficient use of land (e.g. make use of previously developed land)? • Will it contribute towards a catchment-wide approach to land management? • Will it protect and enhance geological SSSIs or similar nationally protected sites?
Air and Climate	6.1 To reduce air pollutant emissions. 6.2 To reduce greenhouse gas emissions. 6.3 To adapt and improve resilience to the threats of climate change.	• Will it reduce or minimise air pollutant and greenhouse gas emissions? • Will it increase emissions to air in an areas sensitive to emissions (e.g. in proximity to an AQMA or to sensitive habitat or more deprived area)? • Will it reduce transport or energy requirements? • Will it reduce vulnerability to risks associated with climate change effects (e.g. reduce the adverse effects of droughts and floods)? • Will it improve resilience/adaptability to likely effects of climate change, e.g. by increasing resilience of water supplies? • Will it create opportunities to benefit from potential effects of climate change? • Will it make use of renewable energy?
Archaeology and cultural heritage	7.1 To conserve and enhance the historic environment, heritage assets and their settings, and protect archaeologically important sites.	• Will it avoid damage to and protect the historic environment, heritage assets and their settings, places and spaces that enhance local distinctiveness? • Will it maintain and enhance the historic environment, including palaeo-environmental deposits? • Will the hydrological setting of water-dependent assets be altered, such as important wetland areas with potential for paleo-environmental deposits? • Will it improve access, value, understanding or enjoyment of heritage assets and culturally/historically important assets in the region?
Landscape and visual amenity	8.1 To protect, enhance the quality of and improve access to designated and undesignated landscapes, townscapes and the countryside.	• Will it avoid adverse effects and enhance designated landscapes? • Will it help to protect and improve non-designated areas of natural beauty and distinctiveness (e.g. woodlands) and avoid the loss of landscape features and local distinctiveness? • Will it improve access to valued areas of landscape character?

4.3 Assessment Framework

4.3.1 SEA Screening of constrained options

At the outset of developing the alternative options to be considered for the WRMP, SEA principles were used to carry out a high-level screening assessment of the options in the 'unconstrained' list. This included consideration of several key environmental and social criteria including risk to Water Framework Directive (WFD) water body status and risk of likely significant effects on European designated conservation sites under the Habitats Regulations. This screening helped identify several options that would likely lead to unacceptable adverse effects on the environment or society; these options were therefore excluded from the 'unconstrained'.

The findings from the screening process were shared and discussed with the EA and NE, along with key stakeholders at our stakeholder meetings. Feedback from this engagement, along with the findings of the screening assessment and ongoing option development and environmental assessment (described below) resulted in several further options being excluded to form the feasible list.

4.3.2 Primary assessment of options

The appraisal framework set out in Table 4.2 below has been used to assess each of the potential WRMP options, taken forward to the constrained/feasible list, against the SEA objectives. The outcomes of the assessment have been used to inform the development of the Water Resources Management Plan, primarily the selection and phasing of options for inclusion in Cambridge Water's Water Resources Management Plan.

The first and second columns set out the SEA topics and objectives. The third column provides commentary and evaluation of the impact of each alternative measure on the objectives for each topic, with reference to the key questions set out above in Table 4.1.

The assessment assumes the implementation of standard industry best practice methods in implementing the options as well as any defined mitigation measures (which are set out in the commentary) such that the significance of effects relates to the residual effects after the application of any mitigation measures in line with the ODPM Practical Guide and UKWIR SEA national guidance.

The eighth column identifies the magnitude of the effect assessed against a scale of negligible to high. The effect magnitude includes consideration of the scale of the impact, likelihood, duration and permanence (fourth, fifth, sixth and seventh columns of Table 4.2) in compliance with criteria for determining the likely significance of effects specified in the SEA Directive Article 3(5) and Annex II, and the SEA Regulations Part 2, Regulation 9(2a) and Schedule 1.

The value and sensitivity of the receptor(s) is identified in the ninth column on a scale of negligible to high. The scale of the effect, which might relate to either geographical scale or the size of the population affected, is identified in the sixth column on a scale of negligible to large. With respect to duration, short-term effects are defined as those that last for up to six months, medium term effects are those that extend beyond six months to two years whilst long term effects are assessed as those that continue for greater than two years.

The residual adverse and beneficial effects (after application of best practice approaches and any appropriate and explicitly defined mitigation measures) are identified in the tenth and eleventh columns respectively. These are identified separately so as to avoid mixing adverse and beneficial effects, in line with SEA best practice, so that these are clearly understood and the transparency of the effects is maintained throughout the Water Resources Management Plan decision-making process.

Where qualitative and/or quantitative information was available (e.g. as identified by the HRA or WFD assessment process), this has been used to inform the assessment. Objectives or key questions that are not supported by available data or information have been evaluated using spatial analysis, professional judgement and applicable assessment guidelines relating to that topic/objective.

Varying levels of uncertainty are inherent within the assessment process. The level of uncertainty of the option assessment for each SEA objective is included in the appraisal framework. Where there is

significant uncertainty which precludes an effects assessment category being assigned for a particular SEA objective, an “uncertain” residual effects assessment label is applied to that specific SEA objective.

The residual adverse and beneficial effects (after application of best practice approaches and any appropriate and explicitly defined mitigation measures) are identified in the tenth and eleventh columns respectively. These are identified separately so as to avoid mixing adverse and beneficial effects, in line with SEA best practice, so that these are clearly understood and the transparency of the effects is maintained throughout the Water Resources Management Plan decision-making process.

Where qualitative and/or quantitative information was available (e.g. as identified by the HRA or WFD assessment process), this has been used to inform the assessment. Objectives or key questions that are not supported by available data or information have been evaluated using spatial analysis, professional judgement and applicable assessment guidelines relating to that topic/objective.

Varying levels of uncertainty are inherent within the assessment process. The level of uncertainty of the option assessment for each SEA objective is included in the appraisal framework. Where there is significant uncertainty which precludes an effects assessment category being assigned for a particular SEA objective, an “uncertain” residual effects assessment label is applied to that specific SEA objective.

Table 4.2 Example SEA appraisal matrix

SEA topics and objectives		Assessment of option								
Topic	SEA objective	Potential residual effect on sensitive receptors: Commentary	Scale of effect: geographical / population affected (low / medium / high)	Certainty of effect (low / medium / high)	Duration of effect (short-term / medium-term, long-term)	Permanence of effect (permanent / temporary)	Magnitude of effect (low/ medium/ high)	Value/ sensitivity of receptor (low / medium / high)	Residual adverse effect significance (negligible / minor / moderate / major)	Residual beneficial effect significance (negligible / minor / moderate / major)
Biodiversity, flora and fauna	1.1 To conserve and enhance biodiversity, including designated sites of nature conservation interest and protected habitats and species (with particular regard to avoiding the effects of over-abstraction on sensitive sites, habitats and species).									
	1.2 To protect, conserve and enhance natural capital and the ecosystem services from natural capital that contribute to the economy.									
	1.3 To strengthen the connections between people and nature and realise the value of biodiversity and ecosystem services.									

The SEA appraisal framework has been used to capture the assessment for each option (one table completed per option) and the WRMP as a whole.

The assessment of the options, alternative WRZ programmes and the overall WRMP has been carried out using the effects assessment matrix shown in Figure 4.1 taking account of the scale, duration and permanence of the effect. The definitions for the effect significance are explained beneath Figure 4.1. The colour coding shown in Figure 4.1 will be used to complete the columns for residual effects in the SEA appraisal framework.

The effects assessment takes account of any proposed mitigation measures that have been incorporated into the option conceptual design and costs, i.e. it is the residual effects after the application of mitigation that will be assessed. Certain mitigation measures and construction practice were assumed standard for all schemes, for example:

- Best practice mitigation measures;
- Resources for construction of the scheme would be sourced locally where possible;
- Appropriate pipeline laying techniques regarding river crossings etc.;
- Footpath diversions established regarding construction work including pipelines; and
- Siting of temporary and permanent works to minimise impacts on setting of heritage and landscape features.

For each SEA objective, a residual effects assessment was determined against a significance of effects matrix (Figure 4.3) which considers the value/sensitivity of the receptor (e.g. species, air quality, river water quality, landscape value, heritage feature) and the magnitude of the assessed effect. This significance matrix comprises effects on a scale ranging from 'major beneficial' to 'major adverse'. For the box signifying low magnitude and high receptor value/sensitivity, this could result in a greater than 'moderate' effects being assigned dependent on the sensitivity/value of the receptor. This colour coding was used to complete the columns for residual effects in the appraisal framework.

The resulting significance of effects has been used in helping Cambridge Water to select the options for inclusion in the Water Resources Management Plan and the subsequent timing and phasing of the selected options. Where major adverse effects are predicted, measures envisaged to prevent, reduce (and as far as possible, offset) these effects on the environment (as a result of implementing the measure) are outlined where relevant/appropriate.

Figure 4.1 SEA significance matrix

Significance of effect		Value/sensitivity of receptor		
		High	Medium	Low
Effect magnitude	High	Major Beneficial / Major Adverse	Major Beneficial / Major Adverse	Moderate Beneficial / Moderate Adverse
	Medium	Major Beneficial / Major Adverse	Moderate Beneficial / Moderate Adverse	Minor Beneficial / Minor Adverse
	Low	Moderate Beneficial / Moderate Adverse	Minor Beneficial / Minor Adverse	Negligible

Significance levels identified in Figure 4.1 are defined as follows:

Major - effects represent key factors in the decision-making process. They are generally associated with sites and features of international, national or regional importance. If adverse, such resources/features are generally those which cannot be replaced or relocated.

Moderate - effects are likely to be important considerations at a regional or district scale. If adverse, they are likely to be of potential concern.

Minor - effects are not likely to be decision-making issues. Nevertheless, the cumulative effect of such issues may lead to an increase in the overall effects on a particular area or on a particular resource.

Negligible - effects which are not perceptible, being within normal bounds of variation or the margin of forecasting error.

For the 'high' effect magnitude (top row), a major effect significance is assigned for both high and medium value receptors to reflect the magnitude of the effect.

For the 'low' effect magnitude and 'high' value receptor (bottom left box), the significance of effect could be minor, moderate or major dependent on the precise nature of the impact or benefit.

All options (both supply-side options and demand management options) are assessed to the same level of detail, in line with the SEA legislative requirements, national SEA guidance and the UKWIR SEA guidance. The level of detail is consistent with the strategic nature of SEA.

4.3.3 Summarising the effects assessment

The outputs derived from the completed appraisal framework tables for each Water Resources Management Plan option measure are presented in Section 6. The outputs are presented in a summary visual evaluation matrix, an example is provided below (Table 4.3).

Table 4.3 Example Visual Evaluation Matrix

Scheme		SEA Topics and Objectives																							HRA Screening	WFD Assessment	Commentary
		Biodiversity				Population and Human Health			Material Assets and Resource Use		Water					Soil, Geology and Land Use			Air and Climate			Archaeology and Cultural Heritage	Landscape and Visual Amenity			
		1.1	1.2	1.3	1.4	2.1	2.2	2.3	3.1	3.2	4.1	4.2	4.3	4.4	4.5	5.1	5.2	5.3	6.1	6.2	6.3	7.1	8.1			
Scheme 1	Adverse																							No LSE	Uncertain	
	Beneficial																									
Scheme 2	Adverse																							No LSE	Uncertain	
	Beneficial																									
Scheme 3	Adverse																							HRA Stage 2 Required	Neligligible risk	
	Beneficial																									

4.3.4 Secondary, cumulative and synergistic environmental effects

Schedule 2(6) of the SEA Regulations requires the assessment of "*The likely significant effects on the environment, including short, medium and long-term effects, permanent and temporary effects, positive and negative effects, and secondary, cumulative and synergistic effects...*" These can be defined as follows:

- Secondary or indirect effects are effects that are not a direct result of the plan, (e.g. an abstraction that changes local groundwater levels and thus affects the ecology of a nearby wetland).
- Cumulative effects arise, for instance, where several nearby groundwater sources each have insignificant effects but together have a measurable effect on river flows; or where several individual effects of a water resource zone programme (e.g. traffic disruption) have a combined effect.
- Synergistic effects interact to produce a total effect greater than the sum of the individual effects. Synergistic effects often happen as habitats, resources or human communities get close to capacity. For instance, a wildlife habitat can become progressively fragmented with limited effects on a particular species until the last fragmentation makes the areas too small to support the species at all.

The term 'cumulative effects' is being adopted as the collective term to include secondary, cumulative and synergistic effects (as suggested by the Practical Guide).

4.3.4.1 Option level cumulative effects assessment

A matrix has been used to help consider interactions between all the options in the feasible list that could potentially be implemented at the same time. Mutually exclusive options (e.g. those that draw upon the same resource or use the same site) were also identified. In assessing these effects, consideration has been given to other factors which may affect the receiving environment during implementation of the options.

4.3.4.2 Programme and WRMP level cumulative effects assessment

To meet the requirements of the SEA Directive, cumulative effects have been assessed within the preferred programmes, and between the WRMP and other relevant plans, programmes or projects. These include Cambridge Water's Drought Plan and neighbouring water companies' WRMPs and Drought Plans.

Cumulative effects with non-water resources related plans, programmes and projects have been considered where relevant, including existing completed projects, approved but uncompleted projects, ongoing activities, plans or projects for which an application has been made and which are under consideration by consenting authorities and plans and projects which are reasonably foreseeable (i.e. projects for which an application has not yet been submitted, but which are likely to progress before completion of the development and for which sufficient information is available to assess the likelihood of cumulative effects).

Sources of information for the cumulative effects assessment with non-water resources plans include the following:

- Land use and development plans to identify major development proposals (those which are likely to generate large scale construction or operational effects e.g. growth points, strategic centres.
- Transport and other infrastructure plans (e.g. flood risk management plans, energy, and other utilities).

For the Final WRMP19 there was a greater level of information available regarding neighbouring water company 2019 WRMPs. The Final WRMP19 SEA has included a review of the cumulative effects of its actions with neighbouring water companies using the most up to date information available to inform the plan (as at September 2018). A review of other local plans and projects has also been made to ensure updates have been captured for the Final WRMP19.

4.3.5 Consideration of reasonable alternatives

A wide range of alternative options have been considered for the WRMP through the SEA process, including different supply-side and demand-side options. In determining the preferred programme of options, Cambridge Water has used the findings of the option-level SEA assessments (incorporating the HRA and WFD screening assessments) to inform the programme appraisal modelling, which has identified a short-list of alternative programmes. These alternatives have been assessed through the

programme-level SEA to inform decisions on the preferred programme. Finally, the combined set of all feasible options included in the preferred programme was assessed through the WRMP-level SEA, and including identification of any further modifications to the programme prior to finalisation of the WRMP19.

4.4 Limitations of the study

SEA is a high-level assessment aimed at highlighting potential environmental concerns. The environmental data used in this assessment are based on that which is readily available from existing sources. Difficulties encountered in undertaking this SEA included the requirement to rely on varying levels of detail in design specifications of schemes, many of which are at conceptual or outline design stage only. Assessment of impacts is necessarily limited when, for example, pipeline routes are at an indicative stage only.

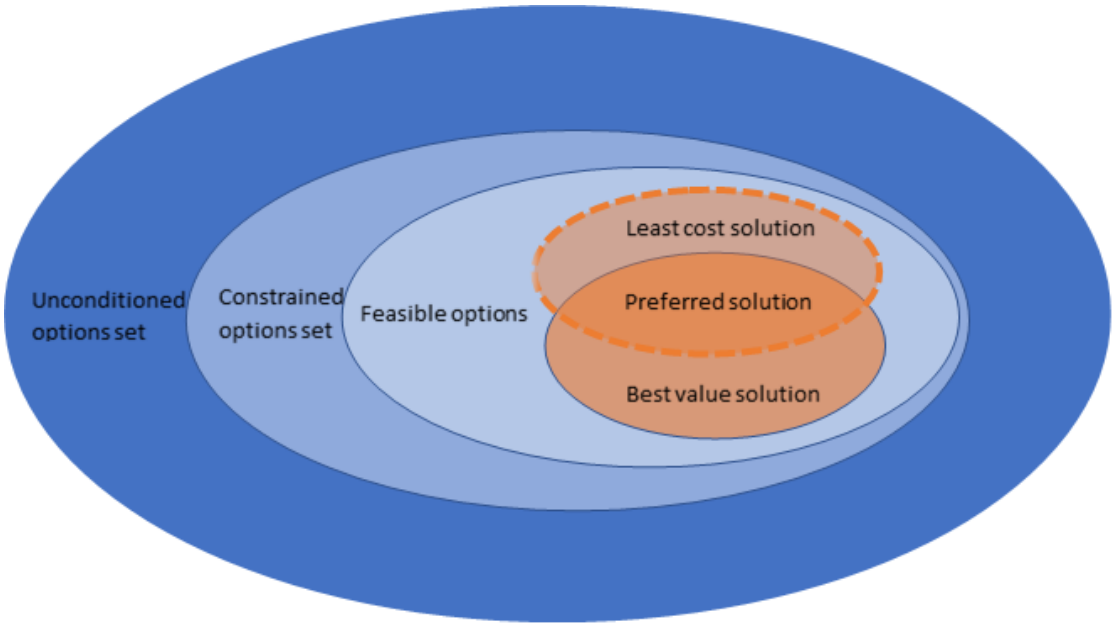
Where particular limitations or outstanding issues are known, these are briefly described in the SEA appraisal tables for the relevant option concerned. Detailed assessments of options will be conducted in project-level EIA closer to the time of option implementation.

5 Screening of Options

5.1 Overview

Options appraisal is an overarching term for the specification and assessment of options under consideration for the WRMP. The UKWIR Guidance on integrating SEA into WRMPs and the WRPG provide clear directions as to how SEA outputs should be used in options and programme appraisal. This section describes the results of this process. Figure 5.1 summarises the overall approach to the evolution of the WRMP from initial 'unconstrained' list of options through to the preferred programme for each WRZ (as described in Section 4.3.1).

Figure 5.1 WRMP Options and Programme Appraisal



The 'unconstrained' list of options is a high-level list including generic option types as well as taking account of government policy and aspirations. It is populated with previous options and studies from past WRMPs as well as new option ideas.

5.2 Moving from the unconstrained option set to the constrained List

As described in Section 4.3.1, SEA screening of the very large set of options in the 'unconstrained' list was carried out initially. High level screening assessment of the options in the 'unconstrained' list which included consideration of several key environmental and social criteria (planning and environmental, HRA and WFD compliance risks) as well as other criteria under the headings 'Location of option benefits', 'Meet customer / stakeholder needs' and 'Option Robustness'. This identified options with unacceptable adverse environmental effects which were rejected from the options "pool", which was initially formed of 61 supply options, and not taken further in the option appraisal process. The environmental screening relating to abstraction impacts on water bodies was undertaken in consultation with the EA. For example, the option to recommission the unused FEPW groundwater abstraction was screened out due to the risk concerning nearby European designated sites associated with the Ouse Washes and with respect to WFD screening identifying a significant risk concerning water quality deterioration for the River Ouse and West Brook. Options were also rejected with respect to other key screening criteria. Through this process a 'constrained' list of options was developed (44 options). The

findings from the screening process were shared reviewed and discussed with the EA and NE, and any other relevant stakeholders if applicable.

5.3 Moving from the constrained list to the feasible list

A further, more detailed stage of SEA (HRA and WFD) screening was then applied to the initial 'constrained' list of options. The screening assessment findings were discussed with the EA and NE, and feedback from these regulatory bodies was used to refine some of the assessments. Options assessed as having unacceptable adverse environmental or social effects were removed from the options list; the remaining options were included in a final 'Feasible' list (42 options). All of the options on the feasible list have been fully assessed against the SEA objectives as described in Section 6.

6 Assessment of Options

6.1 Assessment of options against SEA objectives

Each of the Feasible list 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 parallel HRA and WFD assessments, the Sustainable Economic Level of Leakage (SELL) assessment (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 assessment of the Feasible list was carried out in accordance with the methodology described in Section 4. Appraisal framework assessment tables have been completed for each water resource option on the feasible list and are presented in full in Appendix D. A summary of the assessment is presented in this section as colour-coded visual evaluation summary matrices (Figures 6.1 and 6.2). The colour coding represents a range from significant adverse impact in red through to significant beneficial impacts in dark green as shown in the legend below. The detailed assessment of the potential considered option construction/development and operation.

Legend:

Colour		Significance of Effect
	Dark Green	Major Beneficial
	Mid Green	Moderate Beneficial
	Light Green	Minor Beneficial
	Blue	Negligible
	Yellow	Minor Adverse
	Orange	Moderate Adverse
	Red	Major Adverse
	None	Not Applicable

Where applicable, mitigation measures were identified as part of the option assessment to prevent or reduce any identified significant adverse environmental or social effects. These mitigation measures were taken into account in assessing the potential residual effects on the SEA objectives. Equally, any opportunities for potential enhancement of benefits were taken into consideration.

6.1.1 Demand management option assessment findings

A visual summary of the SEA conclusions for each of the demand side measures considered for Cambridge Water's Final Water Resources Management Plan is provided in Figure 6.1.

The Demand Management schemes comprise measures to reduce leakage (e.g. Active Leakage Control and Pressure Management) and water efficiency measures (e.g. metering, changings to tariff structures, and promotion of water efficient devices). Overall, demand management options serve to reduce pressure on water resources by reducing customer demand for water and thereby helping to reduce the volumes of water abstracted from the water environment. This, in turn, also contributes to reducing the amount of energy needed for water abstraction, treatment and distribution. The options all have limited and temporary effects associated with vehicle movements during their commissioning phases. They may also cause disruption as a result of streetworks or nuisance, for example those relating to meter installations.

6.1.2 Supply option assessment findings

Each of the supply options on the Feasible List of schemes (see Table 1.2 earlier) considered for Cambridge Water's WRMP19 has been assessed against the SEA objectives. The completed appraisal tables for each of the options are provided in Appendix D and should be referred to for full details of potential adverse and beneficial effects of each feasible option. The findings of the WFD assessments and the HRA have also been incorporated into the SEA assessment. A visual summary of the SEA conclusions is provided in Figure 6.2.

The assessment shows that while numerous **groundwater options** have the potential to influence local groundwater levels (e.g. CW2: Combined Ouse gravel sources and SIPW recommission) and connected surface waterbodies, the risk is often limited or where identified the potential for wider effects is not considered significant. Many of the groundwater options relate to recommissioning or optimising existing sources with relatively small-scale surface infrastructure requirements and relatively limited potential for other types of effects, apart from those associated with materials use and energy linked to the abstraction and treatment of water.

Large reservoirs and abstraction and transfer options exhibit the greatest magnitude of adverse effects relating to construction as well as risks of potential permanent adverse effects on landscape, local communities and heritage features (e.g. options CW9: Upper Stour reservoir and to CW15a: New raised res on Great Ouse). Conversely, these options bring benefits in respect of securing significant additional reliable water supplies that are more resilient to climate change effects. These options range from the construction of new large bankside storage reservoirs, smaller storage reservoirs (with options for successive construction) that would abstract during winter higher flows, and options that involve optimising use of the Ely Ouse to Essex Transfer raw water transfer scheme.

Further options relate to the **import of water from other water companies** ((e.g. options CW61:Affinity transfer via LOPW and CW62: Transfer from west to Caxton Gibbet, which have limited potential for adverse effects (other than material use and energy linked to the pumping of water) and minor to moderate beneficial effects associated with augmenting water supply availability.

Figure 6.1 Visual evaluation matrix summary for demand management options

Option*		SEA Topics and Objectives																					HRA Screening	WFD Assessment	Commentary
		Biodiversity				Population and Human Health			Material Assets and Resource Use		Water					Soil, Geology and Land Use			Air and Climate			Archaeology and Cultural Heritage	Landscape and Visual Amenity			
		1.1	1.2	1.3	1.4	2.1	2.2	2.3	3.1	3.2	4.1	4.2	4.3	4.4	4.5	5.1	5.2	5.3	6.1	6.2	6.3	7.1	8.1			
Effects wholly or partially captured in environmental and social costs						✓													✓							
Enhanced free meter optants	Adverse																							No LSE	Compliant	Predominantly negligible effects with minor adverse effects mainly as a result of the manufacture and installation of meters which relate to population and human health; material assets and resource use; and emissions to air. Several minor beneficial effects as a result of reducing customer demand which relate to population and human health; resource use; the sustainable management of water resources; adapting to climate change and with respect to the promotion of water efficiency.
	Beneficial																									
Leakage reduction measures	Adverse																							No LSE	Compliant	Predominantly negligible effects with minor adverse effects mainly as a result of the temporary installation works, associated material use and vehicle movements which relate to population and human health; material assets and resource use; and emissions to air . Moderate beneficial effects associated with helping to reduce the growth in demand for water and consequently small-scale improvements to the water environment and associated users of the environment.
	Beneficial																									
Water efficiency measures	Adverse																							No LSE	Compliant	Predominantly negligible effects with two minor adverse effects relating material assets and resource use and emissions to air (manufacture of water efficient devices and house visits). Several minor beneficial effects as a result of reducing customer demand which relate to population and human health, the sustainable management of water resources, adapting to climate change and with respect to the promotion of water efficiency.
	Beneficial																									

Figure 6.2 Visual evaluation matrix summary for supply-side options

Option*		SEA Topics and Objectives: Biodiversity 1.1	1.2	1.3	1.4	Population and Human Health 2.1	2.2	2.3	Material Assets and Resource Use 3.1	3.2	Water 4.1	4.2	4.3	4.4	4.5	Soil, Geology and Land Use 5.1	5.2	5.3	Air and Climate 6.1	6.2	6.3	Archaeology and Cultural Heritage 7.1	Landscape and Visual Amenity 8.1	HRA Screening	WFD Assessment	Commentary
Effects wholly or partially captured in environmental and social costs						✓													✓							
CW2: Combined Ouse gravel sources	Adverse																							No LSE	Compliant	Only minor adverse effects are anticipated related to population and human health, water, air and climate. The WFD assessment indicates that no risks of deterioration between status classes. Minor beneficial effects associated with population and health due to the supply of water (1.99Ml/d average and 5.1Ml/d peak) for health and wellbeing, and for promotion of sustainable socio-economic development.
	Beneficial																									
CW4: SIPW recommission	Adverse																							No LSE	Compliant	Only minor adverse effects anticipated related to material assets and resource use, water, air and climate. The WFD assessment indicates that the abstraction from the gravel layers in the Ouse floodplain is unlikely to affect flows in the River Ouse, however, there is some uncertainty regarding West Brook and its connectivity to the gravels (further investigation required). Minor beneficial effects associated with population and health due to the supply of water (1.6Ml/d average and 4.5Ml/d peak) for health and wellbeing, and for promotion of sustainable socio-economic development.
	Beneficial																									
CW5: CRPW2 recommission	Adverse																							No LSE	Compliant	Minor adverse effects identified. As identified by the WFD assessment, the abstraction from the Upper Bedford Ouse Woburn Sands groundwater body has a low risk deterioration regarding a dependent surface waterbody (Millbrook and Potton Brooks (GB105033037820). A change in flow regime on these surface waters has possible knock on effects regarding associated ecology of the watercourses. Minor beneficial effects associated with population and health due to the supply of water (1.4Ml/d average and 2.5Ml/d peak).
	Beneficial																									
CW6: KIPW2 recommission	Adverse																							No LSE	Compliant	Minor adverse effects were identified relating to biodiversity, flora and fauna, material assets, water, air and climate. As identified by the WFD assessment, the abstraction from the Cam and Ely Ouse Woburn Sands groundwater waterbody has a low risk deterioration regarding a dependent surface waterbody (Bourn Brook GB105033042690). A change in flow regime on these surface waters has possible knock on effects regarding associated ecology of the watercourses. Further assessment is needed to understand the flow regime and its connectivity with the boreholes. Minor beneficial effects associated with population and health due to the supply of water (1Ml/d average and 1.2Ml/d peak).
	Beneficial																									
CW9: Upper Stour reservoir	Adverse																							HRA Stage 2 Required	Compliant	Seven major adverse effects (with high uncertainty) relating to construction effects potentially affecting designated sites, residual construction effects on the local population; significant anticipated resource use; carbon emissions; loss of a large area of high grade soil; and archaeology and cultural heritage (e.g. adverse effects to Denny Abbey scheduled monument). Eight moderate adverse effects (with high uncertainty) relating to recreation; water flows/quality; emissions to air; and landscape and visual amenity. The HRA identifies that due to high uncertainty LSE can not be ruled out and Stage 2 Assessment is required. Three major beneficial effects associated with promotion of health and well-being (40Ml/d) and improved resilience to the risks associated with climate change.
	Beneficial																									
CW9a: Upper Stour reservoir	Adverse																							HRA Stage 2 Required	Compliant	Seven major adverse effects (with high uncertainty) relating to construction effects potentially affecting designated sites, residual construction effects on the local population; significant anticipated resource use; carbon emissions; loss of a large area of high grade soil; and archaeology and cultural heritage (e.g. adverse effects to Denny Abbey scheduled monument). Eight moderate adverse effects (with high uncertainty) relating to recreation; water flows/quality; emissions to air; and landscape and visual amenity. The HRA identifies that due to high uncertainty LSE can not be ruled out and Stage 2 Assessment is required. Three major beneficial effects associated with promotion of health and well-being (24Ml/d) and improved resilience to the risks associated with climate change.
	Beneficial																									
CW10: Abstraction from Ely Ouse with res and CW10A: Abstraction from Ely Ouse, with reservoir - No delay, pipeline connection to further South into grid	Adverse																							No LSE	Compliant	Five major adverse effect relating to construction effects on the local population; the significant anticipated resource use; carbon emissions; loss of a large area of high grade soil; and archaeology and cultural heritage due to designated sites located in the planned pipeline corridor and close to the reservoir location (e.g. Romano-British Settlement at Chittering, Cambs). Five moderate adverse effects relating to biodiversity fauna and flora; recreation; land use; emissions to air; and landscape and visual amenity. The Habitat Regulations Assessment (HRA) shows that there would be no likely significant effects (LSE) on European sites. The Water Framework Directive (WFD) assessment indicates no likely risk to WFD status. Three moderate beneficial effects associated with promotion of health and well-being (25Ml/d) and improved resilience to the risks associated with climate change.
	Beneficial																									

Option*		SEA Topics and Objectives: Biodiversity 1.1	1.2	1.3	1.4	Population and Human Health 2.1	2.2	2.3	Material Assets and Resource Use 3.1	3.2	Water 4.1	4.2	4.3	4.4	4.5	Soil, Geology and Land Use 5.1	5.2	5.3	Air and Climate 6.1	6.2	6.3	Archaeology and Cultural Heritage 7.1	Landscape and Visual Amenity 8.1	HRA Screening	WFD Assessment	Commentary
Effects wholly or partially captured in environmental and social costs						✓													✓							
CW10A: Abstraction from Ely Ouse, with reservoir - No delay, pipeline connection to further South into grid	Adverse																							No LSE	Compliant	Five major adverse effect relating to construction effects on the local population; the significant anticipated resource use; carbon emissions; loss of a large area of high grade soil and cultural heritage due to designated sites located in the planned pipeline corridor and close to the reservoir location (e.g. Romano-British Settlement at Chittering, Cambs). Five moderate adverse effects relating to biodiversity fauna and flora; recreation; land use; emissions to air; and landscape and visual amenity. The Habitat Regulations Assessment (HRA) shows that there would be no likely significant effects (LSE) on European sites. The Water Framework Directive (WFD) assessment indicates no likely risk to WFD status. Three moderate beneficial effects associated with promotion of health and well-being (25Ml/d) and improved resilience to the risks associated with climate change.
	Beneficial																									
CW11: Abstraction from Ely Ouse with res	Adverse																							No LSE	Compliant	Five major adverse effect relating to construction effects on the local population; the significant anticipated resource use; carbon emissions; loss of a large area of high grade soil and cultural heritage due to designated sites located in the planned pipeline corridor and close to the reservoir location (e.g. Romano-British Settlement at Chittering, Cambs).Five moderate adverse effects relating to biodiversity fauna and flora; recreation; land use; emissions to air; and landscape and visual amenity. . The Habitat Regulations Assessment (HRA) shows that there would be no likely significant effects (LSE) on European sites. The Water Framework Directive (WFD) assessment indicates no likely risk to WFD status. Three moderate beneficial effects associated with promotion of health and well-being (20Ml/d) and improved resilience to the risks associated with climate change.
	Beneficial																									
CW12: Abstraction from Ely Ouse with res	Adverse																							No LSE	Compliant	Five major adverse effect relating to construction effects on the local population; the significant anticipated resource use; carbon emissions; loss of a large area of high grade soil; and cultural heritage due to designated sites located in the planned pipeline corridor and close to the reservoir location (e.g. Romano-British Settlement at Chittering, Cambs). Five moderate adverse effects relating to biodiversity fauna and flora; recreation; land use; emissions to air; and landscape and visual amenity. The Habitat Regulations Assessment (HRA) shows no LSE. The Water Framework Directive (WFD) assessment indicates no likely risk to WFD status. Three major beneficial effects associated with promotion of health and well-being (40Ml/d) and improved resilience to the risks associated with climate change.
	Beneficial																									
CW13: Abstraction from Ely Ouse with res	Adverse																							No LSE	Compliant	Five major adverse effect relating to construction effects on the local population; the significant anticipated resource use; carbon emissions; loss of a large area of high grade soil; and cultural heritage due to designated sites located in the planned pipeline corridor and close to the reservoir location (e.g. Romano-British Settlement at Chittering, Cambs). Nine moderate adverse effects relating to biodiversity fauna and flora (loss of large area of non-designated habitats); population and human health; resource use; emissions to air; land-use change; and landscape and visual amenity. The Habitat Regulations Assessment (HRA) shows no LSE. The Water Framework Directive (WFD) assessment indicates no likely risk to WFD status. Three major beneficial effects associated with the promotion of health and well-being and ensuring a resilient supply for customers and economic activity and improved resilience to the risks associated with climate change. A range of minor beneficial effects are also likely associated with the scheme design including scope for wider environmental benefits. The specifics are unknown so there is the potential that these effects are of greater significance.
	Beneficial																									
CW14: New raised res on Great Ouse	Adverse																							HRA Stage 2 Required	Compliant	Major adverse effects relate to biodiversity flora and fauna; construction effects on the local population; the significant anticipated resource use; carbon emissions; loss of a large area of high grade soil and archaeology and cultural heritage due to designated sites located in the planned pipeline corridor and close to the reservoir location. Four moderate adverse effects relating to recreation; land use; air quality; and landscape and visual amenity. Three moderate beneficial effects associated with promotion of health and well-being (40Ml/d) and improved resilience to the risks associated with climate change. The HRA Stage 1 Screening has identified uncertainty with operational impacts on the Ouse Washes SAC, SPA and Ramsar.
	Beneficial																									

Option*		SEA Topics and Objectives: Biodiversity 1.1	1.2	1.3	1.4	Population and Human Health 2.1	2.2	2.3	Material Assets and Resource Use 3.1	3.2	Water 4.1	4.2	4.3	4.4	4.5	Soil, Geology and Land Use 5.1	5.2	5.3	Air and Climate 6.1	6.2	6.3	Archaeology and Cultural Heritage 7.1	Landscape and Visual Amenity 8.1	HRA Screening	WFD Assessment	Commentary
Effects wholly or partially captured in environmental and social costs						✓													✓							
CW14a: New raised res on Great Ouse	Adverse																							HRA Stage 2 Required	Compliant	Major adverse effects relate to biodiversity flora and fauna; construction effects on the local population; the significant anticipated resource use; carbon emissions; loss of a large area of high grade soil and archaeology and cultural heritage due to designated sites located in the planned pipeline corridor and close to the reservoir location. Four moderate adverse effects relating to recreation; land use; air quality; and landscape and visual amenity. Three moderate beneficial effects associated with promotion of health and well-being (24Mld average and 40Ml/d peak) and improved resilience to the risks associated with climate change. The HRA Stage 1 Screening has identified uncertainty with operational impacts on the Ouse Washes SAC, SPA and Ramsar.
	Beneficial																									
CW15: New raised res on Great Ouse	Adverse																							HRA Stage 2 Required	Compliant	Six major adverse effects that relate to biodiversity fauna and flora and archaeology and cultural heritage due to designated sites located in the proposed construction areas; construction effects on the local population; the significant anticipated resource use; carbon emissions; loss of a large area of high grade soil and archaeology and cultural heritage due to designated sites located in the planned pipeline corridor and close to the reservoir location. Five moderate adverse effects relate to; recreation; land use; air quality; and landscape and visual amenity. Three major beneficial effects associated with promotion of health and well-being (30Ml/d) and improved resilience to the risks associated with climate change. Three major beneficial effects associated with the promotion of health and well-being and ensuring a resilient supply for customers and economic activity and improved resilience to the risks associated with climate change. A range of minor beneficial effects are also likely associated with the scheme design including scope for wider environmental benefits. The specifics are unknown so there is the potential that these effects are of greater significance. The HRA Stage 1 Screening has identified uncertainty with operational impacts on the Ouse Washes SAC, SPA and Ramsar.
	Beneficial																									
CW15a: New raised res on Great Ouse	Adverse																							HRA Stage 2 Required	Compliant	Six major adverse effects relating to biodiversity fauna and flora (due to designated sites located in the proposed construction areas (SSSI); construction effects on the local population; the significant anticipated resource use; carbon emissions; loss of a large area of high grade soil and archaeology; and cultural heritage due to designated sites located in the planned pipeline corridor and close to the reservoir location. Five moderate adverse effects relate to recreation; land use; air quality; and landscape and visual amenity. Three major beneficial effects associated with promotion of health and well-being (18Ml/d) and improved resilience to the risks associated with climate change. Three major beneficial effects associated with the promotion of health and well-being and ensuring a resilient supply for customers and economic activity and improved resilience to the risks associated with climate change. A range of minor beneficial effects are also likely associated with the scheme design including scope for wider environmental benefits. The specifics are unknown so there is the potential that these effects are of greater significance. The HRA Stage 1 Screening has identified uncertainty with operational impacts on the Ouse Washes SAC, SPA and Ramsar.
	Beneficial																									
String of high flow winter reservoirs - 1 site	Adverse																							No LSE	Compliant	Four major adverse effects relating to construction effects on the local population; the significant anticipated resource use; carbon emissions; loss of a large area of high grade soil; and archaeology and cultural heritage due to designated sites located in the planned pipeline corridor and close to the reservoir location. Five moderate adverse effects relating to biodiversity fauna and flora; recreation; flood risk; air quality; and landscape and visual amenity. Three moderate beneficial effects associated with promotion of health and well-being (associated with the 10Ml/d deployable output) and improved resilience to the risks associated with climate change. A range of minor beneficial effects are also likely associated with the scheme design including scope for wider environmental benefits. The specifics are unknown so there is the potential that these effects are of greater significance.
	Beneficial																									
2 high flow winter reservoirs - 2 Sites	Adverse																							HRA Stage 2 Required	Compliant	Two major adverse effect relating to construction effects on biodiversity fauna and flora (due to potential for adverse effects to designated sites); and archaeology and cultural heritage (due to designated sites located in the planned pipeline corridor and close to the reservoir location). Seven moderate adverse effects relating to the local population; the significant anticipated resource use; carbon emissions; loss of a large area of high grade soil recreation; flood risk; and landscape and visual amenity. The HRA could not rule out the potential for LSE due to construction (Breckland SPA/SAC) and further assessment at Stage 2 HRA is required. Three moderate beneficial effects associated with promotion of health and well-being (associated with the 20Ml/d deployable output) and improved resilience to the risks associated with climate change. A range of minor beneficial effects are also likely associated with the scheme design including scope for wider environmental benefits. The specifics are unknown so there is the potential that these effects are of greater significance.
	Beneficial																									

Option*		SEA Topics and Objectives: Biodiversity 1.1	1.2	1.3	1.4	Population and Human Health 2.1	2.2	2.3	Material Assets and Resource Use 3.1	3.2	Water 4.1	4.2	4.3	4.4	4.5	Soil, Geology and Land Use 5.1	5.2	5.3	Air and Climate 6.1	6.2	6.3	Archaeology and Cultural Heritage 7.1	Landscape and Visual Amenity 8.1	HRA Screening	WFD Assessment	Commentary
Effects wholly or partially captured in environmental and social costs						✓													✓							
3 high flow winter reservoirs - 3 Sites	Adverse																							HRA Stage 2 Required	Compliant	Six major adverse effect relating to construction effects on the biodiversity fauna and flora (due to potential for adverse effects to designated sites); construction related effects to the local population; the significant anticipated resource use; carbon emissions; loss of a large area of high grade soil and archaeology and cultural heritage (due to designated sites located in the planned pipeline corridor and close to the reservoir location). Five moderate adverse effects relating to recreation; flood risk; emissions to air; and landscape and visual amenity. The HRA could not rule out the potential for LSE due to construction (Breckland SPA/SAC) and further assessment at Stage 2 HRA is required. Three moderate beneficial effects associated with promotion of health and well-being (associated with the 30Ml/d deployable output) and improved resilience to the risks associated with climate change. A range of minor beneficial effects are also likely associated with the scheme design including scope for wider environmental benefits. The specifics are unknown so there is the potential that these effects are of greater significance.
	Beneficial																									
4 high flow winter reservoirs - 4 Sites	Adverse																							HRA Stage 2 Required	Compliant	Six major adverse effect relating to construction effects on the biodiversity fauna and flora (due to potential for adverse effects to designated sites); construction related effects to the local population; the significant anticipated resource use; carbon emissions; loss of a large area of high grade soil and archaeology and cultural heritage (due to designated sites located in the planned pipeline corridor and close to the reservoir location). Four moderate adverse effects relating to flood risk; air quality; archaeology and cultural heritage; and landscape and visual amenity. The HRA could not rule out the potential for LSE due to construction (Breckland SPA/SAC) and further assessment at Stage 2 HRA is required. Three major beneficial effects associated with promotion of health and well-being (associated with the 40Ml/d deployable output) and improved resilience to the risks associated with climate change. A range of minor beneficial effects are also likely associated with the scheme design including scope for wider environmental benefits. The specifics are unknown so there is the potential that these effects are of greater significance.
	Beneficial																									
String of high flow winter reservoirs - 4 sub-option with smaller overall DO	Adverse																							HRA Stage 2 Required	Compliant	Six major adverse effect relating to construction effects on the biodiversity fauna and flora (due to potential for adverse effects to designated sites); construction related effects to the local population; the significant anticipated resource use; carbon emissions; loss of a large area of high grade soil and archaeology and cultural heritage (due to designated sites located in the planned pipeline corridor and close to the reservoir location). Four moderate adverse effects relating to flood risk; air quality; archaeology and cultural heritage; and landscape and visual amenity. The HRA could not rule out the potential for LSE due to construction (Breckland SPA/SAC) and further assessment at Stage 2 HRA is required. Three moderate beneficial effects associated with promotion of health and well-being (associated with the 24Ml/d average and 40Ml/d peak deployable output) and improved resilience to the risks associated with climate change. A range of minor beneficial effects are also likely associated with the scheme design including scope for wider environmental benefits. The specifics are unknown so there is the potential that these effects are of greater significance.
	Beneficial																									
CW26: Kings Delph	Adverse																							HRA Stage 2 Required	Compliant	The scheme, which requires the construction of a transfer pipeline and pumping to allow the transfer of potable water between different water company resource zones has relatively limited potential to adversely affect the environment. However, as identified by the HRA screening, due to the uncertainty regarding scheme location and the notional area for site location including part of the Nene Washes SAC and Ramsar, LSE could not be ruled out and further assessment is required. Moderate effects were identified as a consequence of construction effects on the local population. Three moderate beneficial effects associated with promotion of health and well-being (10Ml/d) and improved resilience to the risks associated with climate change.
	Beneficial																									
CW28: Transfer/trade with Ely Ouse Essex Transfer	Adverse																							HRA Stage 2 Required	Compliant	Five moderate adverse effects relating to the pipeline construction biodiversity, fauna flora (due to proximity to Devils Dyke SSSI and Wilbraham Fens SSSI); material assets and resource use; construction effects on the local population; GHG emissions; and archaeology and cultural heritage (construction through heritage assets). Three moderate beneficial effects associated with promotion of health and well-being (>10Mld) and improved resilience to the risks associated with climate change. The HRA Stage 1 Screening concluded that there could be likely significant effects on the Devil's Dyke SAC water quality and potential pollution incidents during construction.
	Beneficial																									

Option*		SEA Topics and Objectives: Biodiversity 1.1	1.2	1.3	1.4	Population and Human Health 2.1	2.2	2.3	Material Assets and Resource Use 3.1	3.2	Water 4.1	4.2	4.3	4.4	4.5	Soil, Geology and Land Use 5.1	5.2	5.3	Air and Climate 6.1	6.2	6.3	Archaeology and Cultural Heritage 7.1	Landscape and Visual Amenity 8.1	HRA Screening	WFD Assessment	Commentary
Effects wholly or partially captured in environmental and social costs						✓													✓							
CW29: Ely Ouse Essex Transfer reversal from Abberton	Adverse																							No LSE	Compliant	Four major adverse effects relating to biodiversity fauna and flora (pipeline construction through a SSSI and operational effects on Abberton Reservoir); material assets and resource use associated with pipeline material; construction effects on the local population; GHG emissions; and archaeology and cultural heritage (construction through heritage assets). Two moderate adverse effects relating torecreation and landscape and visual amenity. Three major beneficial effects associated with promotion of health and well-being (40Ml/d) and improved resilience to the risks associated with climate change.
	Beneficial																									
CW29a: Ely Ouse Essex Transfer reversal from Abberton - Suboption with smaller DO	Adverse																							No LSE	Compliant	Four major adverse effects relating to biodiversity fauna and flora (pipeline construction through a SSSI and operational effects on Abberton Reservoir); material assets and resource use associated with pipeline material; construction effects on the local population; GHG emissions; and archaeology and cultural heritage (construction through heritage assets). Two moderate adverse effects relating torecreation and landscape and visual amenity. Three major beneficial effects associated with promotion of health and well-being (24Ml/d) and improved resilience to the risks associated with climate change.
	Beneficial																									
CW30: EOETS with new res	Adverse																							HRA Stage 2 Required	Compliant	Six major adverse effects relate to construction effects on biodiversity fauna and flora (e.g. pipeline construction through Breckland SAC/SPASSSI, Breckland Forest SSSI, Cherry Hill and The Gallops, Barton Mills SSSI); the local population; the significant anticipated resource use; carbon emissions; loss of a large area of high grade soil; and archaeology and cultural heritage due to designated sites located in the planned pipeline corridor. Five moderate adverse effects relating to recreation; land use; air quality; and landscape and visual amenity. The HRA identified uncertainty regarding potential for effects to European designated sites and further investigation and appropriateness of mitigation measures will need to be examined through more detailed Stage 2 assessment. Three major beneficial effects associated with promotion of health and well-being (40Ml/d) and beneficial effect regarding improved resilience to the risks associated with climate change.
	Beneficial																									
Ely Ouse Essex Transfer with new res (shared with AWS) - Suboption with Smaller DO	Adverse																							HRA Stage 2 Required	Compliant	Two major adverse effects relate to construction effects on biodiversity fauna and flora (e.g. pipeline construction through Breckland SAC/SPASSSI, Breckland Forest SSSI, Cherry Hill and The Gallops, Barton Mills SSSI); and archaeology and cultural heritage due to designated sites located in the planned pipeline corridor. Eight moderate adverse effects relating to construction effects on the local population; the significant anticipated resource use; carbon emissions; loss of a large area of high grade soil recreation; land use; emissions to air; and landscape and visual amenity. The HRA identified uncertainty regarding potential for effects to European designated sites and further investigation and appropriateness of mitigation measures will need to be examined through more detailed Stage 2 assessment. Three moderate beneficial effects associated with promotion of health and well-being (24Ml/d) and improved resilience to the risks associated with climate change.
	Beneficial																									
CW33: Adopt Beck Row	Adverse																							HRA Stage 2 Required	Compliant	Adverse effects are limited to major adverse effects relating to biodiversity fauna and flora (pipeline construction through Breckland Forest SSSI); and moderate adverse effects relating to material assets and resource use associated with pipeline materials. The HRA identified the potential for LSE to Breckland SPA and further information is required on the nature and timing of the works to assess whether the impacts can be fully mitigated. One moderate beneficial effect is associated with promotion of health and well-being (4.7Mld (average) and 10.7Ml/d (peak)).
	Beneficial																									
Optimise WEPW License	Adverse																							No LSE	Uncertain	One moderate adverse effect has been identified with respect to sustainable water management. The WFD assessment indicates (with uncertainty) there is a risk of deterioration between status classes Swaffham-Bulbeck Lode. Three minor beneficial effects associated with promotion of health and well-being (2Ml/d (average) and 10.7Ml/d (peak)) and improved resilience to the risks associated with climate change.
	Beneficial																									
Optimise WCPW License	Adverse																							No LSE	Compliant	Three minor adverse effects have been identified that relate to sustainable water management; material assets and resource; and GHG emissions. Minor beneficial effects associated with population and health due to the supply of water (0.73 Ml/d (average) and 1.73Ml/d (peak) for health and wellbeing, and for promotion of sustainable socio-economic development.
	Beneficial																									

Option*		SEA Topics and Objectives: Biodiversity 1.1	1.2	1.3	1.4	Population and Human Health 2.1	2.2	2.3	Material Assets and Resource Use 3.1	3.2	Water 4.1	4.2	4.3	4.4	4.5	Soil, Geology and Land Use 5.1	5.2	5.3	Air and Climate 6.1	6.2	6.3	Archaeology and Cultural Heritage 7.1	Landscape and Visual Amenity 8.1	HRA Screening	WFD Assessment	Commentary
Effects wholly or partially captured in environmental and social costs						✓													✓							
Optimise MGPW2 (new BH)	Adverse																							No LSE	Compliant	Only minor adverse effects are anticipated. Construction requirements are within an existing sites. The WFD assessment indicates that the abstraction from the Cam and Ely Ouse Chalk will result in a low risk of reducing flows in the headwaters of the Mill stream. However, considering that the scheme is the optimisation of an existing source, is a small increase in peak abstraction (1.4Ml/d) and there is a mitigating effect of the River Rhee augmentation scheme, no deterioration between status classes is anticipated. Further assessment needed to confirm this conclusion. Minor beneficial effects associated with population and health due to the supply of water (1.4Ml/d peak only) for health and wellbeing, and for promotion of sustainable socio-economic development.
	Beneficial																									
Optimise MGPW2 (BH south)	Adverse																							No LSE	Compliant	Only minor adverse effects are anticipated. In operation the scheme will operate within licence and involve a small increase in abstraction from a source identified as having resource availability. The WFD assessment indicates that the abstraction from the Cam and Ely Ouse Chalk will result in a low risk of reducing flows in the headwaters of the Mill stream. However, considering that the scheme is the optimisation of an existing source, is a small increase in peak abstraction (1.4Ml/d) and there is a mitigating effect of the River Rhee augmentation scheme, no deterioration between status classes is anticipated. Further assessment needed to confirm this conclusion. Minor beneficial effects associated with population and health due to the supply of water 1Ml/d (average) and 2.4 (peak) for health and wellbeing, and for promotion of sustainable socio-economic development.
	Beneficial																									
Optimise MEPW	Adverse																							No LSE	Uncertain	Three moderate effects have been identified relating to Fowlmere Watercress Beds SSSI which is groundwater dependent and includes spring fed fen habitats. Furthermore, the increased abstraction may adversely impact the fen due to the potential reductions in spring flows and headwaters of the River Shep. The WFD assessment indicates (with uncertainty) there is a risk of deterioration between status classes Cam and Ely Ouse Chalk and further assessment is required. Minor beneficial effects associated with population and health due to the supply of water (4.5Ml/d peak) for health and wellbeing, and for promotion of sustainable socio-economic development.
	Beneficial																									
Optimise MEPW	Adverse																							No LSE	Uncertain	Three moderate effects have been identified relating to Fowlmere Watercress Beds SSSI which is groundwater dependent and includes spring fed fen habitats. Furthermore, the increased abstraction may adversely impact the fen due to the potential reductions in spring flows and headwaters of the River Shep. The WFD assessment indicates (with uncertainty) there is a risk of deterioration between status classes Cam and Ely Ouse Chalk and further assessment is required. Minor beneficial effects associated with population and health due to the supply of water (1Mld average and 5Ml/d peak) for health and wellbeing, and for promotion of sustainable socio-economic development.
	Beneficial																									
CW48: Licence trade at Barrington with new BH	Adverse																							No LSE	Compliant	Minor adverse effects have been identified relating to population and human health, material assets and resource use, air and climate, archaeology and cultural heritage. Three minor beneficial effects associated with promotion of health and well-being (0.24Mld (average) and 1.2Mld peak)) and improved resilience to the risks associated with climate change.
	Beneficial																									
CW49: Trade with AWS GW licences in Thetford area	Adverse																							HRA Stage 2 Required	Compliant	Major adverse effects relate to biodiversity fauna and flora, and moderate adverse effects relate to archaeology and cultural heritage. The proposed pipeline route will intercept the Breckland SAC and SPA boundary, while the pipeline route follows existing roads the site, more detail is required to determine whether direct habitat loss can be avoided and the methods/timing of works to determine whether impacts to the interest features (nesting birds) can be avoided. The proposed pipeline will would intercept a scheduled monument (Castle Hill) and several other Scheduled Monuments and listed buildings in Thetford. Three minor beneficial effects associated with promotion of health and well-being (4.9Ml/d (average) and 10.7Ml/d (peak)) and improved resilience to the risks associated with climate change.
	Beneficial																									
CW56: Treated water reservoir in A428 corridor	Adverse																							No LSE	Compliant	Three major adverse effects relate to the significant anticipated resource use; loss of a large area of high grade soil and archaeology and cultural heritage due to designated sites located in the planned pipeline corridor and close to the reservoir location. Five moderate adverse effects relate to construction effects to designated sites for nature conservation; the local population; emissions to air; and landscape and visual amenity. The HRA screening identified the potential for habitat fragmentation, however, these are fully resolved through the inclusion of the incorporated mitigation measures leading to no LSE. The Water Framework Directive (WFD) assessment indicates no likely risk to WFD status. Three minor beneficial effects associated with promotion of health and well-being (DO of 8Mld (average)) and improved resilience to the risks associated with climate change.
	Beneficial																									

Option*		SEA Topics and Objectives: Biodiversity 1.1	1.2	1.3	1.4	Population and Human Health 2.1	2.2	2.3	Material Assets and Resource Use 3.1	3.2	Water 4.1	4.2	4.3	4.4	4.5	Soil, Geology and Land Use 5.1	5.2	5.3	Air and Climate 6.1	6.2	6.3	Archaeology and Cultural Heritage 7.1	Landscape and Visual Amenity 8.1	HRA Screening	WFD Assessment	Commentary
Effects wholly or partially captured in environmental and social costs						✓													✓							
CW61:Affinity transfer via LOPW	Adverse																							No LSE	Compliant	Adverse effects are limited to three minor adverse effect relating to material assets and resource use associated with pipeline materials; and GHG emissions associated with the pumping and transfer of water and landscape and visual amenity. Three minor beneficial effects associated with promotion of health and well-being (DO of 8Ml/d (average)) and improved resilience to the risks associated with climate change.
	Beneficial																									
CW62: Transfer from west to Caxton Gibbet	Adverse																							No LSE	Compliant	Adverse effects are limited, moderate adverse effects relate to biodiversity fauna and flora (pipeline construction 0.1km from Weaveley and Sand Woods SSSI); and material assets and resource use associated with pipeline materials. Four minor beneficial effects associated with promotion of health and well-being (8Ml/d) and improved resilience to the risks associated with climate change.
	Beneficial																									
CW63: Transfer from Ely and Transfer from Ely – no delay	Adverse																							HRA Stage 2 Required	Compliant	Adverse effects are limited, major adverse effects relate to potential LSEs on Fenland SAC and the proposed pipeline being in proximity to Ely Pits and Meadows SSSI; material assets and resource use associated with pipeline materials; and GHG emissions. Four moderate beneficial effects associated with promotion of health and well-being (10Ml/d) and improved resilience to the risks associated with climate change.
	Beneficial																									
Transfer from Ely – no delay	Adverse																							No LSE	Compliant	Adverse effects are limited, moderate adverse effects relate to the proposed pipeline will being in proximity to Ely Pits and Meadows SSSI; material assets and resource use associated with pipeline materials; and emissions to air. Four moderate beneficial effects associated with promotion of health and well-being (10Ml/d) and improved resilience to the risks associated with climate change.
	Beneficial																									
CW64: Haverhill to Shudy Camps	Adverse																							No LSE	Compliant	Adverse effects are limited and relate to material assets and resource use associated with pipeline materials; adverse construction effects to the local population; and emissions to air through construction and operation. Four moderate beneficial effects associated with promotion of health and well-being (10Ml/d) and improved resilience to the risks associated with climate change.
	Beneficial																									
Transfer from Haverhill to RIPW / LIPW – 20Ml/d	Adverse																							No LSE	Compliant	Adverse effects are limited and relate to material assets and resource use associated with pipeline materials; adverse construction effects to the local population; and emissions to air through construction and operation. Four moderate beneficial effects associated with promotion of health and well-being (20Ml/d) and improved resilience to the risks associated with climate change.
	Beneficial																									

6.1.3 Cumulative effects of options

This section provides an assessment of potential interactions, and therefore cumulative effects, between all options on the Feasible List of options considered for Cambridge Water's Water Resources Management Plan. The interactions are categorised by the potential for cumulative effects to arise due to construction, operation and the potential for cumulative effects on European designated sites and large landscape scale features. While these categories used to identify potential interactions, where interactions are identified all the SEA objectives have been considered. The assessment of these potential cumulative effects are summarised in Figure 6.3.

Assessment of these interactions identified in Figure 6.3 concluded that none of the selected options would result in adverse cumulative effects if operated together.

Figure 6.3 Cumulative effects matrix: Supply options

7 SEA Programme Appraisal

As outlined in Section 1.4, programme appraisal initially involved the generation of a 'least-cost' programme using a multi-criteria appraisal model. The costs considered by the model are capital costs (CAPEX) and operating costs (OPEX). In addition, certain environmental and social effects are monetised according to methods set out in the Environment Agency's Benefits Assessment Guidance (BAG) and these are included in the costs input to the model. Cambridge Water developed a number of scenarios to test the least cost programme. Outputs from the optimisation model along with the findings of the SEA option appraisal (as well as the HRA and WFD assessments) and other factors such as regulatory requirements, customer preferences, risk and reliability, were used to identify a short-list of reasonable alternative programmes. This process is explained in full in Section 10 of the final WRMP. To avoid double counting of effects, those effects identified in the SEA that had been monetised in the optimisation model (e.g. air quality) were not considered when reviewing the SEA findings to reach decisions on the short-listed programmes. The alternative short-listed programmes were assessed through the programme-level SEA to help inform decisions on the preferred programme to be included in the Final WRMP19.

7.1 The least-cost programme

The matrix in Figure 7.1 lists the options included within the least-cost programme modelled for the Final WRMP19 and summarises the non-monetised environmental effects. None of the options contained in the least-cost programme would result in major adverse effects. Several of the demand management components have a wide range of beneficial effects.

The CRPW2 recommission option has been identified as resulting in minor adverse construction and operational effects regarding a number SEA objectives. However, due to the nature of the construction requirements and the low risk concerning operational effects, most of the construction effects are assessed as being of minor adverse significance. The CRPW2 groundwater abstraction is from the confined Greensands Aquifer and has the potential to impact the flows in surface waters (Millbridge and Potton brooks); however, as identified by the WFD assessment, the risk of adverse effects on the brook's flow regime is considered low. Nevertheless, further assessment is identified as needed to understand the flow regime and its connectivity with the boreholes. In operation, as with most options, there will be carbon emissions associated with the abstraction and treatment of water. However, unlike some other options, as groundwater recharge is considered sensitive to hydrological effects of climate change, the source is less resilient to potential effects of climate change.

In terms of cumulative effects, none of the selected options would result in adverse cumulative effects if operated together.

As described in the Final WRMP19, Cambridge Water reviewed this initial least-cost programme plan against the SEA findings, including ensuring that the environmental and social effects were not 'double-counted' in both the monetisation process and the SEA, as this could potentially skew the options and programme appraisal process.

Figure 7.1 Visual evaluation matrix for the least-cost programme

Option*		SEA Topics and Objectives																						HRA Screening	WFD Assessment
		Biodiversity				Population and Human Health			Material Assets and Resource Use		Water					Soil, Geology and Land Use				Air and Climate			Archaeology and Cultural Heritage	Landscape and Visual Amenity	
		1	1	1	1	2	2	2	3	3	4	4	4	4	5	5	5	5	6	6	6	7	8		
Effects wholly or partially captured in environmental and social costs						✓													✓						
Enhanced free meter optants	Adverse																							No LSE	Compliant
	Beneficial																								
Leakage reduction measures	Adverse																							No LSE	Compliant
	Beneficial																								
Water efficiency measures	Adverse																							No LSE	Compliant
	Beneficial																								
CW5: CRPW2 recommission	Adverse																							No LSE	Compliant
	Beneficial																								

7.2 Alternative programmes and scenario testing

Having reviewed the least-cost programme, Cambridge Water investigated a series of alternative programmes through scenario testing to successfully demonstrate that the programme portfolio is effective and robust in meeting a range of future uncertainties, including:

- Reduced deployable output as a result of a more extreme view of the impact of sustainability reductions
- Reduced deployable output and demand due to drought
- A higher rate of growth than currently predicted
- Exclusion of options where there was some particular uncertainty
- Increasing operational resilience

Cambridge Water then overlaid the outputs of its specific WRMP customer engagement work to ensure that customer preferences around the supply and demand options were reflected within the portfolio so as to demonstrate the plan has been co-created through customer engagement.

The programme appraisal modelling outputs of each of these scenarios were then considered in the context of the distribution network to ensure that customer priorities were met in relation to key performance standards for continuous supplies and excellent water quality. Findings from the SEA (and associated HRA and WFD assessments) were used to consider the relative environmental performance of the different programmes.

7.3 The preferred programme

After reviewing the various alternative programmes from the scenario testing and their relative performance against a range of evaluation criteria, Cambridge Water decided to modify the least-cost programme and created a hybrid portfolio that it considered demonstrates a robust flexible approach to ensuring the balance of supply and demand into the future. The preferred portfolio has been shaped by

what customers have told the company is important to them. In essence, this promotes demand-side opportunities and balances resilience benefits against cost for supply-side options.

The matrix in Figure 7.2 summarises the non-monetised environmental effects of the preferred programme. As with the least-cost programme, several of the demand management components have a wide range of beneficial effects. The supply options included in the preferred programme have similar characteristics. All three options have limited construction requirements, which involve upgrades to existing borehole abstraction sites including new boreholes, pumps, small scale connecting pipework to the local network and modern treatment capabilities. These works that would take place within existing water company sites are therefore anticipated to result in limited potential for adverse effects to environmental receptors. The potential minor adverse effects are generally associated with the effects from vehicle movements to and from the sites (noise, nuisance and emissions to air).

In operation, recommissioning the groundwater abstractions would involve the sources being operated within existing abstraction licence conditions and are considered sustainable abstractions with a low risk of adverse effects on groundwater-dependent surface water features and associated ecology:

- The option to recommission the CRPW2 groundwater source was identified as having the potential to affect flows in the Millbridge and Potton Brooks; the risk of adverse effects on the flow regime of these brooks was considered by the WFD assessment to be low. Further assessment is however recommended to better understand the flow regime of these brooks and their connectivity with the boreholes to confirm this finding. During the SEA appraisal process the annual average yield of this option was reduced from the fully licensed quantity (1.99Ml/d) to a recent actual quantity (1.4Ml/d) as this was a complaint with the current CAMS assessment of availability of water.
- The option to recommission boreholes at KIPW2 which abstracts from a greensand aquifer was identified by the WFD assessment as having the potential to affect flows within Bourn Brook; the risk of adverse impact on the flow regime and the associated ecology of Bourn Brook is assessed as low. Further assessment is however recommended to better understand the flow regime and its connectivity with the boreholes to confirm this finding. Connectivity of the confined greensand aquifer with surface water features, and any significant associated impact would need to be determined.
- The option to recommission SIPW pumping station would utilise the SIPW shallow boreholes which abstract water from gravel layers in the River Great Ouse floodplain. The licence is considered sustainable and, as identified by the WFD assessment, there is a negligible risk of deterioration to WFD status of the surrounding water bodies or on any ecological receptors.

Figure 7.2 Visual evaluation matrix summary for options within the preferred programme

Option*		SEA Topics and Objectives																					HRA Screening	WFD Assessment
		Biodiversity				Population and Human Health			Material Assets and Resource Use		Water					Soil, Geology and Land Use				Air and Climate			Archaeology and Cultural Heritage	Landscape and Visual Amenity		
		1	1	1	1	2	2	2	3	3	4	4	4	4	5	5	5	5	6	6	6	7	8		
Effects wholly or partially captured in environmental and social costs						✓													✓						
Enhanced free meter optants	Adverse																							No LSE	Compliant
	Beneficial																								
Leakage reduction measures	Adverse																							No LSE	Compliant
	Beneficial																								
Water efficiency measures	Adverse																							No LSE	Compliant
	Beneficial																								
CW5: CRPW2 recommission	Adverse																							No LSE	Compliant
	Beneficial																								
CW4: SIPW recommission	Adverse																							No LSE	Compliant
	Beneficial																								
CW6: KIPW2 recommission	Adverse																							No LSE	Compliant
	Beneficial																								

In terms of cumulative effects, none of the selected options would result in adverse cumulative effects.

7.4 Summary of HRA and WFD Assessments

7.4.1 Habitats Regulations Assessment

The HRA of the Final WRMP19 concluded that the preferred programme is compliant with the Habitats Directive, with no likely significant effects (LSE) on European sites, either alone or in combination with any plans and projects. Detailed information is provided in the accompanying Habitats Regulations Assessment Report.

7.4.2 Water Framework Directive Assessment

The WFD assessment of the Final WRMP19 has demonstrated compliance with WFD objectives and statutory requirements for the Cambridge Water Final WRMP19 preferred programme. Potential risks of cumulative adverse effects between other water companies revised draft WRMPs are considered unlikely. Detailed information is provided in the accompanying Water Framework Directive Assessment Report.

7.5 Summary of role of SEA in Final WRMP19 decision making

The updated SEA, along with the findings of the updated HRA and WFD assessments, have been used to help inform the development of the Final WRMP19.

The findings of the SEA feasible option assessments were initially used (alongside the HRA and WFD assessments) to evaluate the environmental and social performance of a range of alternative programmes, as described in Section 7.2.

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 the programme. 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 programme also included consideration of the potential for any regulatory compliance risks associated with the Habitats Regulations and WFD, as well as other statutory obligations (including effects on SSSIs, landscape designations and heritage features).

These assessments, together with the consultation responses to the draft WRMP19, helped to determine the appropriate programme for inclusion in the Final WRMP19.

7.6 Delivering on national environmental policy objectives

Net environmental gain has been included as a policy principle in the Government's 25 year plan to improve the environment (published in January 2018). References to achieving net gains across the three overarching objectives for sustainable development (economic, social and environmental) along with achieving net gain in biodiversity are also set out in the updated National Planning Policy Framework (NPPF) published in July 2018 (and were previously included in the 2012 NPPF). The National Infrastructure Commission (NIC) report on water infrastructure (published in April 2018) also emphasises the economic and social benefits of improving water supply resilience.

The SEA incorporates these key policy principles within the various topic area objectives against which each option and the Final WRMP19 as a whole has been assessed. Regard has therefore been had to these national planning objectives in developing the Final WRMP19.

Cambridge Water is committed to delivering the principles set out the NPPF as each supply scheme included in the Final WRMP19 is developed, working in dialogue with regulators, planners and stakeholders as options progress to the detailed design stage and detailed consideration of any required environmental mitigation measures.

At the WRMP level as a whole, Cambridge Water will continue to embed the principles of achieving net gain across the three overarching objectives for sustainable development (economic, social and environmental) in line with the government’s 25 Year Plan and the NPPF as the plan is delivered.

8 Cumulative Effects Assessment

8.1 Option-level cumulative assessment

The cumulative assessments presented in this section have been carried out in line with the methodology described in Section 4.

Cumulative beneficial effects have been identified for all demand management options in relation to these measures acting together to increase the overall demand savings, thereby contributing to sustainable abstraction. The cumulative benefits will help reduce stress on the water environment and the water settings of heritage and landscape features, as well as reducing energy use for water pumping and treatment. There is a small risk that simultaneous implementation of the demand management options could lead to cumulative adverse effects, whereby disturbance to human health, resource, and greenhouse gas emissions could increase due to supply network repair and enhancement activities. However, any such cumulative impacts would be minor, as most of these activities would be localised and small in scale, and could be effectively mitigated through careful project management and best practice construction methods.

8.2 Preferred programme cumulative assessment

There is no potential for adverse cumulative effects between the three supply side options included in the preferred programme, as shown in Figure 6.3. All three options are at least 7km apart, therefore no potential for construction related adverse effects. As identified by the WFD assessment, the options abstract from different waterbodies and catchments and no cumulative effects during operation due to hydrological or hydrogeological connectivity are anticipated. None of the options have the potential to adversely affect the same landscape scale receptor (such as AONBs).

8.3 Cumulative effects with other relevant plans, programmes and projects

Cumulative effects of the WRMP with other relevant plans, programmes and projects have been considered. These include the following:

- Cambridge Water's Draft Drought Management Plan 2017;
- Neighbouring water companies' WRMPs and Drought Plans;
- River Basin Management Plans (RBMP);
- Environment Agency Drought Plans;
- Local Development Plans; and
- National Policy Statements and National/Regional Infrastructure Plans
- Relevant major infrastructure projects.

8.3.1 Cambridge Water's Draft Drought Management Plan 2017

The Cambridge Water draft Drought Management Plan 2017 includes demand management options and a small number of supply-side measures which relate to maintaining existing sources and review of intercompany transfers. The demand side measures complement the demand management options included in the Final WRMP19. While their implementation may exacerbate some of the potential adverse effects of the demand management measures (e.g. in relation to vehicle movements and nuisance) their implementation in combination with demand management options included in the Final WRMP19 should cause a beneficial cumulative effect on water resources (with indirect beneficial effects on environmental receptors such as biodiversity) because of improved water efficiency and less wasted water. The drought plan was developed prior to the development of the Final WRMP19. The supply

side options in the draft Drought Plan 2017 include supply options that are included in the Final WRMP19 preferred programme (recommissioning of CRPW2, KIPW2 and SIPW). Once WRMP19 options are developed then these options would cease to be drought plan options and if necessary Cambridge Water will look to identify further drought options for the drought plan. A third option in the drought plan is the option to recommission FD12PW borehole, however, this allows for maintaining licenced volumes as ground water levels reduce, and as the source is located more than 30km distant from any of the Final WRMP19 supply options no cumulative effects are anticipated with this draft Drought Plan 2017 measure.

8.3.2 Neighbouring water companies' WRMPs and Drought Plans

The Cambridge Water supply boundary is bordered by Affinity Water and Anglian Water. Larger regional water supply options have also been discussed by the Water Resources East (WRE) group. The options in the Cambridge Water Final WRMP19 preferred plan do not have any cumulative adverse effects with any other WRMP options included in the revised draft 2019 WRMP of Anglian Water and those in the draft WRMP19 of Affinity Water, or any regional strategic options considered by the WRE group (as at September 2018).

The WRMPs of Anglian Water and Affinity Water demand management components, similar to those included in Cambridge Water's Final WRMP 2019. Improved water efficiency and leakage reduction across East Anglia will provide beneficial cumulative effects in terms of reduced consumption and water abstraction, as well as reduced energy use due to less water pumping and treatment.

The Affinity Water Draft Drought Management Plan 2017[9] identifies a number of demand side options available during times of drought (e.g. publicity campaign to use water wisely; encourage meter optants; and leakage reduction). These initiatives would complement and have beneficial cumulative effects with the demand management schemes included in the Final WRMP19 preferred programme. No cumulative effects are anticipated between any of the supply options listed in Affinity Water's Drought Plan and the Cambridge Water Final WRMP19.

Similarly, the Anglian Water Drought Management Plan 2014[10] identifies demand management activities through enhanced customer communications, water-efficiency promotions, metering and enhanced leakage. The company state that they would review the need to set up regional or national drought groups with neighbouring companies and/or Water UK to enable collaborative approaches as were employed in the 2011-12 drought. These initiatives would complement and have beneficial cumulative effects with the demand management schemes included in the Final WRMP19 preferred programme. No cumulative effects are anticipated between any of the supply options listed in Anglian Water's Drought Plan and the Cambridge Water Final WRMP19.

8.3.3 River Basin Management Plans (Anglian river basin district)

Assessment of the potential for cumulative effects with the Anglian River Basin Management Plan (RBMP) has been undertaken. The information used to carry out these assessments is the most up to date information available at the time of writing, but the assessments should be reviewed at the time of option implementation to ensure that no changes to the River Basin Management Plans have been made in the intervening period, and that the assessment, therefore, remains valid.

The RBMP describes the planned steps to implement the measures required to achieve the environmental objectives of the WFD. They provide the framework for protecting and enhancing the water environment. The SEA[11] of the RBMP determined that the plan is likely to have significant positive effects on the environment, particularly in respect of biodiversity, water, population and human health and that any local negative effects would expect to be mitigated during implementation. Therefore, there will be no adverse cumulative effects between the Anglian RBMP and Cambridge Water's Final WRMP19. The demand management options in the Final WRMP19 may have cumulative beneficial effects in supporting some of the RBMP objectives.

[9] Affinity Water (2017) Draft Drought Management Plan 2017. Accessed at: https://stakeholder.affinitywater.co.uk/docs/2017-AW-Draft-DMP.pdf
[10] Anglian Water (2014) Drought Management Plan 2014. Accessed at http://www.anglianwater.co.uk/_assets/media/2014_Drought_Plan.pdf
[11] Environment Agency (2015) *River basin management plan for the Anglian River Basin District Strategic Environmental Assessment*: Statement of Particulars. Updated December 2015.

8.3.4 Environment Agency drought plans

Assessment of the potential for cumulative effects of the preferred plan with the EA Drought response framework[12] has been undertaken. The information used to carry out these assessments is the most up to date information available at time of writing, but the assessments should be reviewed at the time of option implementation to ensure that no changes to the EA Drought response framework have been made in the intervening period, and that the assessment therefore remains valid.

Drought actions and triggers are given in the EA Drought response framework. Actions described include communications (internal and external), monitoring and potential drought order applications to protect the environment. Of these actions, those which are applicable for cumulative assessment with Cambridge Water's preferred programme are external communications and potential environmental drought orders. External communications may have positive cumulative effects with Cambridge Water's demand management options that have water efficiency components as drought communication messages may reinforce each other, thereby resulting in increased demand savings and greater recognition by the public to use water wisely. Cambridge Water's preferred programme involves three options that could affect groundwater and surface waters in connectivity. However, the risk is considered low. Further assessment identified with respect to these options should include the potential for cumulative effects with other abstractors in proximity including any potential supply side drought permits or orders.

8.3.5 Local Development Plans

The options identified in the preferred programme are unlikely to result in any cumulative effects with local development plans considering limited construction and development involved, which mainly takes place within existing water company sites.

8.3.6 Major Infrastructure Projects

One of the major projects identified by the National Infrastructure Commission for the East region is the A14 Cambridge to Huntingdon improvement scheme, involving the improvement and upgrading of a 23-mile length of strategic highway between Cambridge and Huntingdon. Some of these works would be in spatial proximity to the option to recommission the SIPW Pumping Station.

The National Infrastructure Commission for the East region has also provided Government with proposals and options to maximise the potential of the Cambridge - Milton Keynes - Oxford corridor as a single cluster. Spatial information regarding infrastructure and housing development is not specified in detail in the information available. It is possible that the infrastructure and housing upgrades could be in proximity to the supply options included in the Final WRMP19.

In respect of both of these major projects, cumulative construction effects would only arise if the timing of the infrastructure construction required for the WRMP scheme was to coincide but any potential cumulative effects are considered of minor magnitude at greatest. It is anticipated that these impacts could be effectively mitigated through appropriate scheduling of all the construction required so as to minimise concurrent works and through careful management of construction through dialogue with the different contractors working with local planners and the local community.

[12] Environment Agency (2017) *Drought response: our framework for England* June 2017

9 Mitigation and Enhancement

9.1 Overview

Key stages of the SEA process include Task B5: Mitigating adverse effects and Task B6: Proposing measures to monitor the environmental effects of implementing a plan or programme, as well as Stage E: Monitoring the significant effects of the plan or programme on the environment. The sections below describe how Task B5: Mitigating adverse effects tasks have been or will be addressed, as applicable and the appropriate mitigation measures are implemented for any adverse effects identified.

9.2 Mitigation Measures

Mitigation may be defined as a measure to limit the effect of an identified significant impact or, where possible, to avoid the adverse impact altogether. Consideration of mitigation measures has been an integral part of the SEA process and has informed development of the Water Resources Management Plan. The SEA appraisals set out in Sections 6 and 7 above have been based on the assessment of residual impacts, i.e. those impacts likely to remain after the implementation of identified mitigation measures. Certain assumptions have been made regarding mitigation in carrying out the assessments, notably:

- Where suitable mitigation measures have been identified, these have been taken into account, such that the resultant residual impact has been determined in this SEA; and
- In line with recommendations made in the UKWIR SEA Guidance[13], the SEA appraisals have assumed the implementation of reasonable mitigation measures such as operation of water sources in line with regulatory requirements, the use of good construction practice and mitigation measures such as:
    - Best practice mitigation measures;
    - Resources for construction of the scheme would be sourced locally where possible;
    - Appropriate pipeline laying techniques regarding river crossings etc.;
    - Footpath diversions established regarding construction work including pipelines; and
    - Siting of temporary and permanent works to minimise impacts on setting of heritage and landscape features.

Only minor adverse residual effects were identified for the preferred programme of options. Potential measures to further reduce these are discussed further below, it is noted that in some cases, these would be implemented through the planning process. In this way, effective mitigation plans can be developed to minimise many of the residual adverse effects currently identified in the SEA appraisals.

9.2.1 Effects on water flows

The WFD assessment identified that the CRPW2 recommission option and the KIPW2 recommission option have the potential to affect flows in surface waters (Millbridge /Potton brooks and Bourn Brook respectively). Although abstraction would be within existing licence limits and the risk of adverse effects is considered low, further assessment of the hydrogeological connectivity between the groundwater sources and surface waters is required in order to confirm the magnitude of any potential effects during operation.

9.2.2 Effects on biodiversity, fauna and flora

In operation, the CRPW2 recommission option (groundwater abstraction) and the KIPW2 recommission option have the potential to affect surface water flows (Millbridge /Potton brooks and Bourn Brook respectively) and therefore related aquatic ecology. Further assessment of the hydrogeological connectivity between the groundwater source and these dependant ecosystems is required to confirm the nature of potential effects.

[13] UKWIR (2012) Strategic Environmental Assessment and Habitats Regulations Assessment of Water Resources Management Plans (UKWIR Project WR/02/A)

9.2.3 Air and Climate

Adverse effects 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, energy recovery and renewable energy options will be positively explored as part of the development of the detailed design of options included in the plan.

9.3 Mitigation of cumulative impacts with other plans and programmes

Section 8 identified no material potential cumulative impacts with other plans, programmes and projects. Potential water resource impacts that could arise due to future, as yet, unknown new abstractions from common sources would be assessed and considered by the EA as informed by detailed environmental assessment work as part of the abstraction licensing and water resources planning processes.

Liaison with local planning authorities will also be essential to assess any required mitigation measures from any identified cumulative effects on development plans and major projects as discussed in Section 8.

10 Monitoring Proposals

A key stage of the SEA process with regard to monitoring is Stage E: Monitoring the significant effects of the plan or programme on the environment. The sections below describe how this task has been addressed and how Cambridge Water proposes to monitor the effects of implementation of the WRMP19, noting that no significant adverse environmental effects have been identified.

10.1 Monitoring Requirements

Monitoring will be required to track the residual environmental effects to show whether they arise as anticipated in the SEA appraisal, to help identify any adverse impacts and trigger deployment of any of the mitigation measures.

Monitoring for options identified in the preferred plan is set out in Section 10.2. These monitoring recommendations are based on the current understanding of the option design. As options are brought forward for development, further monitoring requirements may be set out in planning applications, or in Cambridge Water's voluntary best-practice monitoring plans accompanying scheme development. This will be discussed with relevant key regulatory bodies and stakeholders. In practice, close dialogue should occur between Cambridge Water, Environment Agency, Natural England, Historic England and any affected third parties to agree the appropriate scale and duration of such scheme-specific monitoring activities proportionate to the assessed environmental risks.

10.2 Proposed Monitoring

Table 10.1 lists the potentially affected receptors from implementation of the Final WRMP19 and which require monitoring in accordance with the SEA Regulations.

Key monitoring parameters at the strategic WRMP level will be those relating to the abstraction of water and the effects that this may have on waterbodies and their functions as habitats. There are also direct potential effects on humans, the built environment, terrestrial habitats, the atmosphere and heritage assets, which may arise from construction activities and/or option operation. These parameters should, therefore, be included within the monitoring programme where it is practicable to do so. Extensive primary data collection is neither feasible nor appropriate for this programme level of monitoring, and use should be made where possible of existing datasets and monitoring regimes.

Site-specific monitoring requirements for the two supply options included in the preferred plan (CRPW2 recommission option and the KIPW2 recommission option) will be developed during the planning process closer to the time of implementation.

The monitoring programme will be refined through the detailed planning and environmental approvals stage. The plan will include:

- Scheme-specific monitoring requirements and targets that focus on scheme-specific risks, habitats, species and sites; and
- Strategic, regional and local monitoring requirements and targets to ensure that monitoring is conducted at a suitable spatial scale that reflects the scale and risks of each scheme and the overall plan.

The monitoring plan will be owned and implemented by Cambridge Water and will be developed to reflect phasing of the plan. The monitoring plan will be further developed beyond this report during the implementation of this plan in consultation with the Environment Agency, Natural England and Historic England to make best use of available data, to share existing monitoring locations and locate new monitoring sites where possible in locations that not only meet scheme-specific requirements but provide additional value to the Environment Agency, Natural England and Historic England's monitoring programmes.

Table 10.1 Proposed SEA monitoring parameters – strategic WRMP monitoring

Impacted Receptor	Monitoring Indicator	Information Source	Responsibility
Water resources, water quality, biodiversity	Proportion of surface waters and groundwater waterbodies at 'Good' WFD status	Environment Agency online Catchment Data Explorer	Environment Agency
	Protected species and habitats surveys	Site specific surveys during detailed design stage to confirm presence/likely absence of protected species	Cambridge Water
	Biological monitoring (macrophytes, macroinvertebrates, fish)	Environment Agency database Monitoring completed by Cambridge Water	Environment Agency Cambridge Water
	Condition of European Sites and SSSIs according to Natural England condition assessments	Natural England favourable condition assessment tables	Natural England
	Adherence to the Cambridge Water biodiversity strategy	Biological monitoring and surveys	Cambridge Water
	Surface water and groundwater levels	Monitoring and comparison with historic records	Cambridge Water, Environment Agency
Climate Factors	Net greenhouse gas emissions per Ml (million litres) of treated water (kg CO2 equivalent emissions per Ml)	Reported annually by Cambridge Water	Cambridge Water
Transport	Transport fleet fuel consumption, emissions and mileage	Routinely monitored by Cambridge Water	Cambridge Water
Nuisance/ Community Amenity Effects	Scheme level community disruption due to construction works / during operation (where applicable)	Monitored through an Environmental Management Plan	Cambridge Water
	Complaints logged during construction	Compile data held by Cambridge Water (and contractors) and Local Authority Environmental Health Officer	Cambridge Water, Local Authorities

Impacted Receptor	Monitoring Indicator	Information Source	Responsibility
	Customer satisfaction surveys	Responses gauged through and reported in Cambridge Water's annual performance processes	Cambridge Water
	Surveys of recreational and other amenities likely to be affected	Survey responses pre- and post- construction	Cambridge Water
Air Quality	Scheme-specific monitoring during construction works / during operation (where applicable)	Environmental Management Plan	Cambridge Water
	Changes in background air quality	Defra Automatic Urban and Rural Network, Local Authority monitoring	Defra, Local Authority data sources
Resource Use	Proportion of demolition materials sent to land fill or recycled	Part of Construction Environmental Management Plan	Cambridge Water (and its contractors)
	Proportion of construction build materials derived from recycled materials	Part of design criteria for new builds	Cambridge Water
Landscape and visual amenity	Loss of land within AONB, National Park or protected views	Landscape and Visual Impact Assessments	Complete assessments in consultation with Natural England, Local Authorities and Historic England
	Changes to townscape and views	Townscape assessment	As above
Cultural Heritage	Loss or change in condition of buried archaeology	Archaeological Written Scheme of Investigation	Complete assessment in consultation with Historic England and Local Authorities
		Environmental Management Plan	Cambridge Water
	Change in condition of existing heritage assets	Monitoring of heritage assets such as Listed Buildings and Scheduled Monuments, Registered Battlefields, Registered Parks and Gardens, in particular the 'Heritage at risk' register.	Historic England

The SEA Directive states that monitoring must enable appropriate remedial action to be taken. For the monitoring programme to be effective, there must therefore be a mechanism in place to detect trends and to ensure that action is taken where trends are progressively adverse.

Five-yearly assessment of monitoring and any measures taken would be included within the SEA for the subsequent draft WRMP development. Through the proposed monitoring and analysis of the results obtained over the five-year period, the SEA will inform and influence the development of the WRMP for future periods.

11 Quality Assurance

ODPM Guidance on SEA contains a quality assurance checklist to help ensure that the requirements of the SEA Directive are met. The checklist is reproduced in Appendix E, demonstrating how this Environmental Report meets the requirements.

12 Conclusions

Through application of the SEA process (and associated HRA and WFD assessments) from the very outset, Cambridge Water has actively considered environmental and social effects throughout the development of its Final WRMP19 and consulted regularly with regulators, stakeholders and customers to seek their views on the emerging findings. 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 national SEA Regulations.

Cambridge Water formally consulted on its draft WRMP19 and the SEA Environmental Report between March and May 2018, with statutory consultation bodies, stakeholders and the public invited to comment on the draft WRMP19 and the SEA Environmental Report. Comments made have been taken into account in producing the Final WRMP, acknowledging that environmental and social considerations are not the only determining factors in formulating the WRMP. Any significant changes made to the WRMP, including changes based on consultation responses and the SEA will be assessed to identify their likely significant effects. The findings of the assessment are reported in this final report and have been taken into account in developing the final WRMP.

By integrating environmental and social assessment into the development of the Final WRMP19, a long-term sustainable water resource plan has been produced that maintains water supply reliability for Cambridge Water's customers without unacceptable adverse effects on the environment or local communities.

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

- Actively pursuing further measures to reduce leakage from the water supply system and customer properties, reducing water abstraction from the environment
- Extending the promotion of free water meters to more customers and helping customers reduce their demand for water.

Once the Final WRMP19 is published, Cambridge Water will publish a SEA Post Adoption Statement, describing how the SEA and the responses to consultation have been taken into account during the preparation of the WRMP19. This statement will describe how environmental considerations have been integrated in the WRMP19 and explain any changes made or alternatives rejected. Information will also be provided on the environmental monitoring to be carried out during the implementation of the WRMP19 to track the environmental effects of the WRMP19 and to trigger appropriate responses where effects are identified.

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