Drainage and Wastewater Management Plan

Strategic Environmental Assessment

Final Environmental Report

May 2023

from Southern Water

Contents

Figures

Tables

Abbreviations

AA	Appropriate Assessment
AONB	Area of Outstanding Natural Beauty
AQMA	Air Quality Management Area
BNG	Biodiversity Net Gain Assessment
BRAVA	Baseline Risk and Vulnerability Assessment
CAMS	Catchment Abstraction Management Strategies
DAPs	Drainage Area Plans
Defra	Department for Environment, Food & Rural Affairs
DWF	Dry Weather Flow
DWMP	Drainage and Wastewater Management Plan
GEP	Good Ecological Potential
GES	Good Ecological Status
GHG	Greenhouse Gas
HRA	Habitats Regulations Assessment
INNS	Invasive non-native species risk assessment
LNR	Local Nature Reserves
MCAA	Marine and Coastal Access Act
MCZ	Marine Conservation Zones
NC	Natural Capital
NCA	National Character Area
NNR	National Nature Reserves
NVZ	Nitrate Vulnerable Zone
ODA	Options Development and Appraisal
PO	Planning Objective

PR24	The Ofwat 2024 price review
RBD	River Basin Districts
RBMP	River Basin Management Plan
SAC	Special Areas of Conservation
SAC	Special Areas of Conservation
SEA	Strategic Environmental Assessment
SPA	Special Protection Areas
SPZ	Source Protection Zone
SSSI	Sites of Special Scientific Interest
SuDS	Sustainable Drainage Systems
SWS	Southern Water
UK	United Kingdom
WFD	Water Framework Directive Assessment
WTW	Wastewater Treatment Works

Non-Technical Summary

Overview

A Strategic Environmental Assessment (SEA) has been undertaken to support the development of the Southern Water Services (Southern Water) Drainage and Wastewater Management Plan (DWMP). DWMPs are not currently a statutory obligation for companies and undertaking SEA is considered best practice.

SEA works to inform the decision-making process through the identification and assessment of significant and cumulative effects a plan or programme may have on the environment. The SEA process is conducted at a strategic level and enables consultation on the potential effects of a plan with stakeholders.

Southern Water commissioned Mott MacDonald Ltd to undertake the SEA process, in order to provide an independent assessment of the performance of the DWMP.

An SEA Scoping Report was issued in September 2021 to statutory consultees and to a range of stakeholders to provide an opportunity for organisations to express views on the proposed scope and assessment methods.

An SEA Draft Environmental Report was issued in June 2022 to present the comments raised by consultees, together with responses explaining how these views had been considered. Issue of the SEA Draft Environmental Report provided a further opportunity for stakeholder organisations to express views on the proposed scope and assessment methods.

This SEA Final Environmental Report presents the further comments raised by consultees, together with responses explaining how these views have been considered during the further work undertaken after the public consultation.

The plan

The DWMP (the plan) is a long-term plan for drainage and wastewater management. It sets out the investment needs for the next Price Review period from 2025 to 2030, known as AMP8, and starts to build a picture of the future investment needs for the following four AMP periods through to 2050. The DWMP forms the basis for long-term planning activities in drainage and wastewater to address multiple future pressures such as population growth, urban creep, new development and climate change.

This is the first DWMP that Southern Water has produced. The approach has been to co-create the plan with experts from the business and partner organisations, enabling the plan to reflect and incorporate partners' issues and concerns. The DWMP makes an explicit link with the current and future performance of Southern Water's wastewater systems and provides the long-term focus which will drive co-ordinated, timely and sustainable investment decisions across Southern Water's business and enable the protection and enhancement of the natural environment.

The plan is structured around 14 Planning Objectives. For each Planning Objective, the plan summarises the key risk areas and the ways of working that will deliver the improvement in performance, across areas such as pollution incident risk, internal property flooding, storm overflow performance, and several objectives relating to delivering environmental benefits. The likely future investment needs have been identified to reduce the risks for each Planning Objective. The investment needs include measures to reduce demand for wastewater services (e.g. reduce surface water run-off and behaviour change measures), measures to increase the ability to deal with wastewater (e.g. improving the sewer network and treatment quality) and measures to reduce the consequences where wastewater does impact properties and the environment. The investment needs are distributed across the 11 river basin district catchments within Southern Water's operational area.

The assessment and findings

The assessment approach adopted has been 'objectives-led'. A series of SEA objectives have been derived from environmental and social objectives established in law, policy or other relevant plans and programmes, as well as from a review of the baseline environmental information for the area covering Southern Water's water source catchment areas and water supply boundary. The SEA objectives have been categorised under the following topic areas (as defined in the SEA Regulations[1]): Biodiversity, Flora and Fauna; Soil and Geology; Water; Air; Climatic Factors; Landscape; Cultural Heritage; Population, Communities and Human Health; and Material Assets. The assessment criteria were applied to the DWMP to identify beneficial or adverse impacts on the SEA objectives.

The DWMP (Level 1) is supported by Investment Plan that set out the Investment Needs to achieve the Planning Objectives for the river basin catchments (Level 2). The Investment Needs are also collated to show the preferred options for investment in a selected number of priority wastewater systems (Level 3).

For the SEA, the assessment was undertaken in three stages, which align with the levels of the DWMP: Level 3: Wastewater systems; Level 2: River basin district catchments; Level 1: DWMP Regional Plan.

Level 3 wastewater systems: In terms of influencing the applicable SEA objectives were identified at an early stage. Priority environmental and social constraints were identified for the SEA objectives and this information helped to inform the development of options. In addition, each of the generic options (from which the Level 3 wastewater systems Investment Needs were derived) was subject to review against the SEA objectives to identify beneficial and adverse effects.

When considering the generic options, the following option types have the potential to deliver significant beneficial effects:

- Source: Control / reduce surface water run-off – SEA objectives benefitting are Water (increasing resilience and reducing flood risk, enhance quality of the water environment, reliable wastewater service); Population, Communities and Health (reduced property flooding); Biodiversity (enhancing habitats). The level of opportunity will be dependent on the actual solution, with nature-based solutions generally offering the greatest opportunity for benefits.
- Pathway: Improve sewer network – SEA objectives benefitting are Water (deliver reliable wastewater services, increase resilience and reduce flood risk and protect the water environment) and Population, Communities and Health (avoid property flooding).
- Pathway: Improve treatment quality – SEA objectives benefitting are Water (enhance quality of the water environment, reliable wastewater service and reduce flood risk) and Population, Communities and Health (avoid property flooding). Depending on the scale and location, there could be significant benefits for biodiversity.

When implementing the generic options, it is the construction phase that is most likely to give rise to adverse effects, although the scale of construction is likely to need to be large to generate significant effects (e.g. construction of a new wastewater treatment works). Adverse effects in operation include increased use of materials and energy, generating carbon emissions.

Level 2: River basin district catchments. The assessment focused on the collated Investment Needs for each of the wastewater systems within the river basin catchment. The Investment Needs focus on the location of

[1] The Environmental Assessment of Plans and Programmes Regulations 2004

the risks and problems, rather than where the investment / intervention will be located (i.e. the solution may be located some distance from the problem). Therefore, there remains a large degree of uncertainty in how the Investment Needs will impact on environmental and social receptors in the 11 river basin district catchments.

The range and mix of investment needs (based on the generic options) to deliver the planning objectives are largely similar for each catchment. Details on the scale and location of the proposed investment needs and the construction methods (amount of disturbance) will also remain as an unknown in advance of implementing the DWMP. Therefore, the results for the river basin district catchments are similar, with the main findings being:

- Construction activities could result in potential for minor adverse effects on SEA objectives for biodiversity, soil, water, air, landscape, the local community and material assets.
- Operational activities could result in major beneficial effects on SEA objectives for water (protecting and enhancing the water environment and resilience and reliability of wastewater systems) and for Population, communities and human health (reduction in flooding of properties and premises). In addition, beneficial effects on SEA objectives are also expected for biodiversity, water (reducing flood risk) and climatic factors (managing climate change risks) and the local community.
- The scale of the benefit depends on the size and type of the scheme. The results could also vary as the design of the intervention progresses, for example, by incorporating specific aims to improve the landscape or enhance recreation opportunities, which would lead to benefits for these SEA objectives.
- Many of the potential impacts can be mitigated. The construction activity to deliver the majority of the investment needs are likely to be standard practice for utility works, including working on existing assets.

Level 1: DWMP. The conclusions set out above for Level 2 are also applicable to the company-wide draft DWMP (Level 1). The assessment at Level 1 is supported by the findings from the cumulative assessment:

- The cumulative assessment identified that the construction phase could result in potential for adverse effects where a number of Investment Needs are implemented in the same location at the same time or where in the same location one after another. Applicable SEA objectives are biodiversity, soil, water, air, landscape, population and communities, and material assets.
- The cumulative assessment identified that the operational phase could result in potential for beneficial effects There is potential for beneficial cumulative effects on the local community where a number of measures are implemented to resolve wastewater issues for a particular community. There is potential for cumulative beneficial effects during operation of the schemes by reducing flooding and improving wastewater systems to increase resilience (including resilience to climate change) and reduce the instances of pollution events. Applicable SEA objectives are water, population and communities, and climatic factors.

Mitigation and monitoring

The majority of the preferred options within the DWMP are based on interventions that are part of regular activities for Southern Water, such as rehabilitating sewers, servicing combined sewer overflows and improvements at wastewater treatment works. Therefore, protocols and procedures for these activities are already in place, drawing on experience of doing this work every day and working in partnership with contractors to provide a good service to customers and respecting local communities. These protocols and procedures are expected to remain in place, alongside the responsible operation of wastewater assets. A number of existing systems are in place to monitor the effectiveness of the function of wastewater systems,

with many of these a regulatory requirement for reporting to Ofwat. The DWMP is based on a number of Planning Objectives, with measurable indicators.

Next steps

The SEA, along with the findings of the other assessments, have been used to help inform the development of the DWMP. In summary, the application of these processes has informed dialogue with stakeholder organisations as to the options to be included in the DWMP and identified a number of environmental and social benefits and risks associated with the DWMP.

The DWMP sets the strategy for the next 25 years. The final DWMP will inform the preparation of Southern Water's Business Plan (PR24), which sets out the investment plan for the next five years (2024-2029). As the Business Plan is implemented, the Investment Needs from the DWMP will be taken forward for design and development.

As part of this process, Investment Need may be subject to further assessment to understand and manage its potential environmental and social impacts. These assessments, which may include HRA and EIA, will take account of the issues discussed in this Environmental Report but will also be informed by the greater detail available as the work progresses about construction techniques, building materials, agreed locations and routes. It is anticipated that ongoing engagement with regulators and stakeholders will inform the development of those Investment Needs being taken forward.

1. Introduction

1.1. Overview

A Strategic Environmental Assessment (SEA) is being undertaken to support the development of the Southern Water Services (Southern Water) Drainage and Wastewater Management Plan (DWMP). DWMPs are not currently a statutory obligation for companies and undertaking SEA is considered best practice.

SEA works to inform the decision-making process through the identification and assessment of significant and cumulative effects a plan or programme may have on the environment. The SEA process is conducted at a strategic level and enables consultation on the potential effects of a plan with stakeholders.

An SEA Scoping Report (dated August 2021) was published. Information contained within the SEA Scoping Report included environmental and social baseline information, reviews of other plans, policies and programmes and identification of environmental and social issues and opportunities.

An SEA draft Environmental Report (dated June 2022) was also published. The draft Environmental Report set out a draft assessment of the performance of the draft DWMP against environmental and social objectives (SEA objectives). The content of the draft Environmental Report enabled stakeholders to understand the likely environmental and social impacts of the DWMP.

This document – the SEA final Environmental Report – sets out the final assessment of the performance of the DWMP against the environmental and social objectives (SEA objectives). This final report contains an update of the environmental and social baseline information, reviews of other plans, policies and programmes and identification of environmental and social issues and opportunities.

Southern Water commissioned Mott MacDonald Ltd to undertake the SEA process, to provide an independent assessment of the performance of the DWMP.

1.2. Purpose of the Environmental Report

The main purpose of the Environmental Report is to present the findings from assessment work, so that stakeholders can understand the potential environmental and social impacts associated with the DWMP. The report also provides feedback on the SEA Scoping Report, and the Environmental Report and plans for mitigation and monitoring of effects.

The remainder of this report is structured as follows:

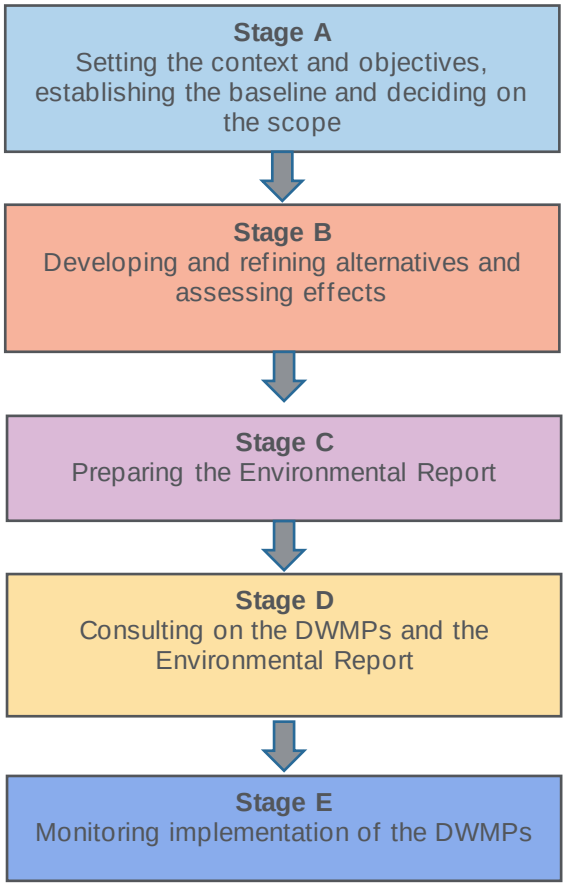
- Section 2: Summary of the DWMP – an overview of the DWMP, including information on how environmental and social considerations have influenced the DWMP at every stage of its development
- Section 3: SEA methodology – signposting to work already completed, including feedback from consultees on the SEA Scoping Report, and progress on implementing the SEA
- Section 4: SEA assessment findings – identifying likely impacts from reviewing proposals for wastewater systems (known as Level 3), river basin catchments (Level 2) and the overarching DWMP (Level 1).
- Section 5: Other Assessments – the SEA is supported by other environmental assessment processes and this section provides updates on these.
- Section 6: Findings of cumulative effects - changes to the environment caused by the combined impact of past, present and future activities and processes.
- Section 7: Mitigation and Monitoring – preliminary information on likely mitigation and monitoring measures.

- Section 8: conclusions – summary of findings.

1.3. The SEA Process

Figure 1 illustrates the stages in the SEA process. The SEA Scoping Report provided the outputs of Stage A. The SEA has influenced the development of the DWMP at Stage B. A Environmental Report was the output of Stage C and was consulted on alongside the DWMP at Stage D. This final Environmental Report will be published alongside the final DWMP, and will inform the implementation of the DWMP, including monitoring.

Figure 1: Different stages in the SEA process



This SEA is following the principles of the SEA Regulations - Environmental Assessment of Plans and Programmes Regulations 2004. A checklist of the contents of a SEA Environmental Report in compliance with the SEA Regulations is set out in Appendix A.

1.4. Limitations

Proportionate data - The Southern Water (SWS) DWMPs cover a large geographical area. Therefore, the baseline summarised in this report is currently a high-level review of conditions within the Southern Water area of operation. Once specific options and locations for DWMP interventions are known, additional datasets will be collated to inform the assessment process.

Available information - The main DWMP proposals centre around solutions to address Planning Objectives. The Investment Plan sets out the Investment Needs required to deliver each of the Planning Objectives. The Investment Needs comprise of the interventions necessary to reduce risks to customers and the

environment. The Investment Needs, on the whole, provide adequate information on the location of the problems in the wastewater system is trying to solve. There is a lack of information on the location of the solution to address the problems and risks. This is because the DWMP is a risk based strategic plan that does not go into the detail of proposing site-specific designed solutions. Some information on the location of the solution is available, for example, where the solution is focused on upgrading an existing asset such as a wastewater treatment works. Many of the SEA assessment criteria depend on knowing a location in order to identify potential impacts on nearby environmental and social receptors.

Alternatives - The Investment Needs for wastewater systems comprise a collection of feasible options, i.e. a combination of interventions derived from multiple generic options, to maximise Planning Objective risk reduction. Often one option may have multiple benefits across several planning objectives, but may not in itself provide the desired level of risk reduction. Hence, several options will be required to achieve a reduction in risk (e.g. to the target level of performance, such Band 0). These may combine traditional end of pipe solutions as well as more sustainable longer term options such as sustainable drainage systems. Clear single alternative ways of achieving the desired outcomes to provide comparison between two options are therefore not available for the wastewater systems – it's often a question of how much of each type of option will be needed and possible within the wastewater system. This influences the approach to assessing alternatives.

Prioritised wastewater systems – In the first cycle of the DWMP, only the Investment Needs for the prioritised 61 wastewater systems are considered. The costs are extrapolated by planning objective to estimate the scale of the Investment Needs across all 381 wastewater systems across the Southern Water area. Therefore, information on all of the detailed proposals for all wastewater systems is not going to be available in cycle 1. Recognising this gap, work has been undertaken to identify the types of measures that do have the potential to lead to significant effects.

Additional interventions: PO5 – In addition to the prioritised wastewater systems, the proposed Investment Needs to meet the ambitions of Planning Objective 5 (PO5: Storm Overflow performance) have been identified across the Southern Water area. These Investment Needs are not accompanied by detail on the solutions that would be required to meet the improved level of performance, although these would be drawn from the existing generic options. No additional assessment of these interventions – in addition to the assessment of generic options – has been undertaken in the SEA.

Additional interventions: WINEP – To present a joined-up picture, the final DWMP is reporting some schemes relating to drainage and wastewater that are being progressed as part of the water industry national environment programme (WINEP). Schemes being progressed as part of WINEP are subject to a separate assessment methodology set out by the Environment Agency[2] and are therefore not explicitly assessed within this SEA. WINEP has been identified as a relevant programme that informs this SEA and has been considered in the in-combination assessment.

Additional interventions: Studies – The draft DWMP included Investment Needs in the form of studies to tackle nutrient neutrality issues affecting sensitive watercourses and habitat sites. The final DWMP expands this number of studies. Undertaking a study is not likely to result in significant environmental effects. No additional assessment of these interventions – in addition to the assessment of generic options – has been undertaken in the SEA.

[2] https://www.gov.uk/government/publications/developing-the-environmental-resilience-and-flood-risk-actions-for-the-price-review-2024/water-industry-national-environment-programme-winep-methodology

2. Summary of the DWMP

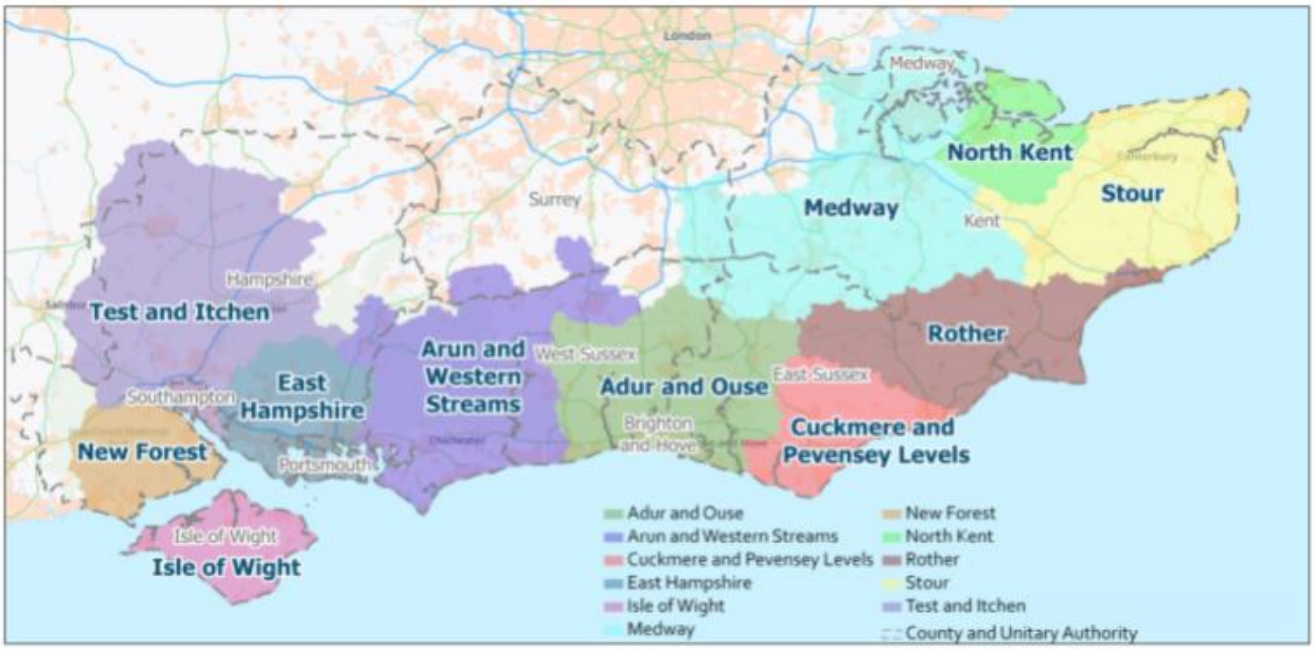
2.1. Overview

The DWMP (the plan) is a long-term plan for drainage and wastewater management. It sets out the investment needs for the next Price Review period from 2025 to 2030, known as AMP8, and starts to build a picture of the future investment needs for the following four AMP periods through to 2050.

The DWMP forms the basis for long-term planning activities in drainage and wastewater to address multiple future pressures such as population growth, urban creep, new development and climate change. The DWMP covers the 11 River Basic District Catchments (see Figure 2). The DWMP makes an explicit link with the current and future performance of wastewater systems and provides the long-term focus which will drive co-ordinated, timely and sustainable investment decisions across Southern Water's business and enable the protection and enhancement of the natural environment.

This is the first DWMP that Southern Water has produced. The approach has been to co-create the plan with experts from the business and partner organisations, enabling the plan to reflect and incorporate partners' issues and concerns.

Figure 2: Southern Water DWMP – 11 River Basin District Catchments



2.2. Planning Objectives

The plan is structured around 14 Planning Objectives (see Figure 3). For each Planning Objective, the plan summarises the key risk areas and the ways of working that will deliver improvement in performance. Actions include asset investment measures, working with customers and developers, and working collaboratively with local councils, regulators and other stakeholders to remove barriers and generate wider benefits for communities and the environment.

Figure 3: Extract from the DWMP on Planning Objectives

Box 1: Planning Objectives

Our DWMP has 14 planning objectives developed with partner organisations and our colleagues to build in the things they care about and know is important in relation to the performance of our drainage and wastewater systems. These objectives are:

PO1: Internal Sewer Flooding Risk
PO2: Pollution Risk
PO3: Sewer Collapse Risk
PO4: Risk of Sewer Flooding in a 1 in 50-year storm
PO5: Storm Overflow performance
PO6: Risk of WTW Compliance Failure
PO7: Risk of flooding due to Hydraulic Overload
PO8: Dry Weather Flow Compliance
PO9: Achieve Good Ecological Status / Potential
PO10: Improve surface water management
PO11: Secure Nutrient Neutrality
PO12: Reduce Groundwater Pollution
PO13: Improve Bathing Waters
PO14: Improve Shellfish Waters.

2.3. Investment Needs

The DWMP is about planning for the uncertainties of the future and identifying the most likely future investment needs. Growth and climate change will place greater pressures on the critical infrastructure and essential services that Southern Water provides to customers. The risk assessments for 2020 and 2050 were used to assign Investment Strategies to each of the wastewater systems. These Investment Strategies underpin the approach to adaptive planning, to inform when and where future investment may be needed.

The likely future investment needs have been identified to reduce the risks for each Planning Objective. The investment needs include measures to reduce demand for wastewater services (e.g. reduce surface water run-off and behaviour change measures), measures to increase the ability to deal with wastewater (e.g. improving the sewer network and treatment quality) and measures to reduce the consequences where wastewater does impact properties and the environment.

The investment needs are distributed across the 11 river basin district catchments within Southern Water's operational area.

2.4. SEA and the influence on the DWMP

Environmental and social ambitions and issues have informed the development of the DWMP. By embedding environmental and social risks, issues and aspirations into the DWMP process, the DWMP is built upon achieving beneficial outcomes for the natural environmental and local communities. The objectives of the SEA process are also interwoven through the development of the DWMP.

Development of the DWMP has followed the stages recommended in national guidance on DWMPs published by Water UK[3]. Table 1 sets out these stages and identifies where environmental and social considerations have influenced each of the stages.

Table 1: Environmental and social integration into developing the DWMP

Stage	Stage Name	Description	Environmental and social considerations
1	Strategic context	Defines the objectives of the DWMP and the planning objectives against which current and future performance is measured.	The majority of the planning objectives are focused on achieving better outcomes for the environment and people.
2	Risk based catchment screening	Process to help focus effort where there is evidence of issues and risks.	Many of the criteria to identify risks are focused on avoiding pollution, flooding and better service for customers.
3	Baseline risk and vulnerability assessment	Process to identify the current position of issues in the catchments and the impacts of future changes.	Identifies areas where there are existing environmental and social issues and considers how these may be affected in the future, for example, climate change.
4	Problem characterisation	Identifies the nature and complexity of the interventions that are required and identifies catchments for more detailed analysis	Characterises the scale of the existing problems and the complexity of the issues to prioritise developing interventions for those catchments with environmental and social problems.
5	Options development and appraisal	Appraises a list of generic options to address problems in the catchment, to identify suitable interventions	Environmental and social data, linked to SEA objectives has informed the appraisal process.
6	Programme appraisal	Develops a prioritised list of interventions and timetable.	Prioritising investment to give the best value, balancing environmental and social benefits alongside other factors.
7	Final DWMP programme	Produced after consultation on the DWMP, to inform the formal Business Plan submission to Ofwat	This Environmental report accompanies the final DWMP.

A range of organisations have been involved in collaborative working to develop the various stages of the DWMP. A five-week consultation on the DWMP was held in autumn 2021, with responses from a wide range of statutory bodies such as regulators, County Councils and Unitary Authorities (often in their capacity as a Lead Local Flood Authority), Local Planning Authorities, neighbouring water companies, Catchment Partnerships and customers. The SEA Scoping Report also formed part of this consultation.

More technical information on each of these stages is available at: https://www.southernwater.co.uk/dwmp

The following sections describe the integration of environmental and social considerations in more detail.

2.4.1. Stage 1: Strategic context

Planning objectives are used in the DWMP process to assess the current and future performance of the drainage and wastewater systems and identify where action and/or future investment is required. The performance is considered as a risk to failure that could have an impact on people and/or the environment. Table 2 describes the environment and social issues within the planning objectives.

Table 2: Environmental and social issues within Planning Objectives

Stage	Stage Name	Description	Environmental and social considerations
1	Internal sewer flooding risk	National guidance	Internal flooding of homes or business premises by wastewater
2	Pollution risk	National guidance	Pollution from any wastewater source on land or in water, affecting terrestrial, river and marine habitats
3	Sewer collapses risk	National guidance	Collapsed sewers can interrupt services to customers, result in blockages and leaks affecting the environment and cause disruption at locations where emergency works are required.
4	Risk of sewer flooding in a 1 in 50 year storm	National guidance	This looks at resilience to a severe storm (where there is a 2% chance of happening in any 12 month period). This could result in flooding of properties.
5	Storm overflow performance	National guidance	This is non-compliance of a storm overflow (based on actual and modelled spill counts) with the permit issued by the Environment Agency which specifies the amount, frequency and concentration (of spills) allowed to be discharged into rivers or the sea (which could affect biodiversity and enjoyment of areas for recreation).
6	Risk of WTW quality compliance failure	National guidance	This is non-compliance of a WTW with its permit. The permit reflects the sensitivity of the receiving watercourse and habitats, which a compliance failure could adversely affect.
7	Annualised Flood Risk (or hydraulic overload).	Southern Water	This is the flood risk arising from different severities of rainfall (considering growth, planned development and climate change) and the resulting impact on homes and businesses.
8	WTW Dry Weather Flow compliance	Southern Water	This is the risk of non-compliance with the dry weather flow (DWF) permit that ensures discharges from WTW do not cause an unacceptable environmental impact during periods of low flow in the receiving waterbody
9	Achieve Good Ecological Status or Good Ecological Potential	Following feedback from partner organisations	This focuses on the quality and ecological health of surface waterbodies such as streams, rivers, lakes and estuaries, and the quality of the environment to support recreation, tourism and water dependent economic activities.
10	Improve surface water management	Following discussions with partner organisations	Opportunities to work with other organisations to reduce surface water flooding to enable sewers to perform better and avoid sewer flooding of properties and discharges polluting the environment.

Stage	Stage Name	Description	Environmental and social considerations
11	Secure nutrient neutrality	Following discussions with partner organisations	Identify wastewater catchments where there is a need or risk of needing to secure nutrient neutrality for growth in order to protect important designated habitats.
12	Reduce groundwater pollution	Following discussions with partner organisations	Protection of the groundwater quality ultimately enables the protection of: the quality of drinking water resources; the quality and ecological health of surface water bodies; and the quality, flora and fauna in groundwater dependant terrestrial ecosystems.
13	Improve bathing waters	Following discussions with partner organisations	Maintaining water quality in areas designated for bathing waters, so they can be enjoyed by people and support local economies.
14	Protect shellfish waters	Following discussions with partner organisations	Good water quality is vital for the production of high quality shellfish for human consumption and to support local shellfish-related economies. Shellfish waters can be impacted by pollution from various sources, such as run-off from agricultural land or discharges from sewage treatment works.

2.4.2. Stage 2: Risk based catchment screening

Due to the large number of wastewater catchments (381), an initial screening process is completed to identify which of these wastewater catchments are likely to be most vulnerable to future changes, such as climate change or new development.

The Risk based catchment screening (RBCS) involves the assessment of each wastewater catchment against 17 indicators set out in national guidance published by Water UK[3]. An additional metric on customer complaints was included in our DWMP as this provides a flag for catchments with ongoing or outstanding concerns (making 18 indicators in total).

Table 3 lists the indicators used in the RBCS, with the majority being directly relevant to identifying adverse outcomes for the natural environment and people.

Table 3: Indicators used in the RBCS

No.	Indicator	No.	Indicator
1	Catchment characterisation	10	WTW quality compliance
2	Intermittent discharges impact upon bathing or shellfish waters	11	WTW dry weather flow compliance (DWF)
3	Continuous or intermittent discharges impact upon other sensitive receiving waters (Part A)	12	Storm overflows
4	Continuous or intermittent discharges impact upon other sensitive receiving waters (Part B)	13	Risks from interdependencies between Risk Management Authority (RMA) drainage systems

[3] https://www.water.org.uk/policy-topics/managing-sewage-and-drainage/drainage-and-wastewater-management-plans/

No.	Indicator	No.	Indicator
5	Storm Overflow Assessment Framework (SOAF)	14	Planned residential new development
6	Capacity Assessment Framework (CAF)	15	Water Industry National Environment Programme (WINEP)
7	Internal sewer flooding	16	Sewer collapses
8	External sewer flooding	17	Sewer blockages
9	Pollution incidents (categories 1, 2 and 3)	18	Customer complaints

The results of the assessment of the wastewater catchments against these 18 criteria are used to determine if a wastewater catchment progresses onwards to the Baseline Risk and Vulnerability Assessment (BRAVA) stage of the DWMP. The RBCS was applied to all of the 381 wastewater catchments. This flagged that 335 catchments needed to be considered further.

2.4.3. Stage 3: Baseline Risk and Vulnerability Assessment

The Baseline Risk and Vulnerability Assessment (BRAVA) is an important stage in the development of the DWMP in order to understand current system performance and future vulnerabilities (risks). The BRAVA is a risk assessment for the current baseline (2020) and for future planning horizons for the 14 planning objectives. This includes factoring in growth (e.g. from population changes and new development) and climate change (considering issues such as change in rainfall and flooding, change in temperatures, drought conditions and sea-level rises).

For each of the planning objectives, current and future performance has been characterised into three bands.

- Band 0 (not significant) is for the wastewater catchments that are performing better than the industry upper quartile performance in 2020
- Band 2 (very significant) is based on the Ofwat performance target and is greater than the level at which the maximum penalty cap is set for Southern Water.
- Band 1 (moderately significant) then is the gap or range between Bands 0 and 2.

Examples where environmental and social performance is at the forefront these considerations are set out in Table 4.

Table 4: Examples of 'significant' performance issues (Band 1 and Band 2)

No.	Planning Objective	DWMP 'Significant' performance issue
1	Internal sewer flooding	Considers the internal sewer flooding incidents per 10,000 connections, where performance that is worse than the average AMP7 performance is rated 'significant'.
2	Pollution risk	Considers the discharge or escape of a contaminant from a sewerage asset affecting the water environment as incidents per 10,000km of sewer, where performance that is worse than the average AMP7 performance is rated 'significant'.
9	Good ecological status	Classification Status of waterbodies as Bad, Poor or Moderate is rated 'significant'.

2.4.4. Stage 4: Problem characterisation

Problem characterisation enables the drivers and causes of the risks to be understood and an appropriate investment strategy to be assigned to each wastewater system. This stage uses the results from BRAVA (Stage 3), to prioritise wastewater systems with the highest risks for each planning objective. This involved identifying the wastewater systems with the greatest number of risks in Band 2 ('very significant'), followed by the greatest number of risks in Band 1 ('moderately significant').

Other factors that influenced the problem characterisation are:

- Dominant drivers and primary causes of risks (to target significant risks and effective solutions)
- Complexity factors (how difficult the problem is to solve)

The application of the project characterisation factors resulted in selecting the appropriate Investment Strategy (an 8-point scale with the lower two categories being Do Nothing and Maintain to the upper two categories to Improve and Change), with the highest risk "Improve" systems taken forward to the next stage:

(a) 13 of the wastewater systems that were identified as having complex appraisal needs

(b) 34 wastewater systems that were identified for enhanced appraisal

The 47 systems in (a) and (b) account for approximately 70% of the population served within our operational area.

(c) Another 14 wastewater systems were identified for standard appraisal. These 14 systems were proposed by Southern Water technical experts and from partner organisations for a range of reasons. These included issues such as the level of growth planned in the area, or the impact on environmentally designated sites. Some of the wastewater systems to be taken forward into the next stage of the DWMP had a low level of concern with minimal risks identified during the BRAVA stage. These were included in order the so that DWMP processes being developed for the first cycle could be tested on wastewater systems with a comprehensive range of complexity needs, from the most complex to the simple, basic systems with limited risks to customers and the environment.

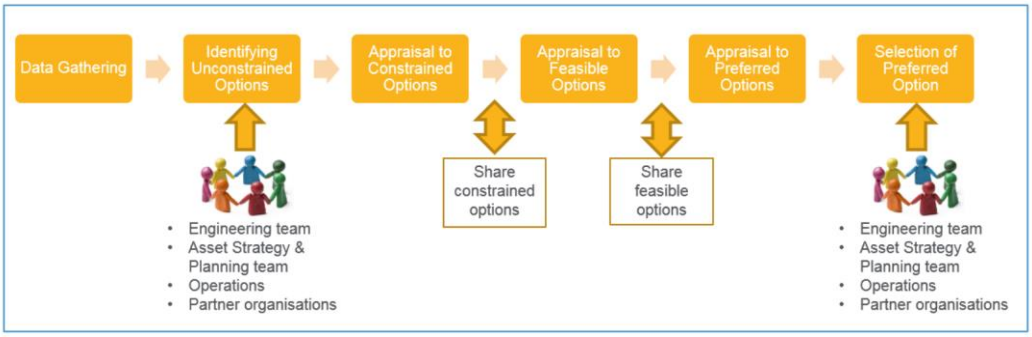
All the wastewater systems with and high and medium level of concern were prioritised and taken forward into the Options Development and Appraisal stage – a total of 61 wastewater systems. This means that the systems with the greatest number of risks in Band 2 ('very significant'), followed by the greatest number in Band 1 ('moderately significant'), were prioritised. This is because these catchments have the greatest potential for environmental and social harm.

2.4.5. Stage 5: Options Development and Appraisal

The Options Development and Appraisal (ODA) stage is where the potential solutions to the problems can be identified and appraised to determine what investment options are put forward to manage and reduce the risks in the wastewater system. The ODA process identifies potential options to reduce the risks, and then evaluates the benefits of each option to determine a preferred set of investments for inclusion within the investment programme.

A list of potential types of solution, grouped around Source, Pathway, Receptor and Other were developed (Generic option categories proposed for the DWMPs). For each of the prioritised wastewater systems, the generic options progress through the process set out in Figure 4, working alongside partner organisations, in order to select preferred option(s).

Figure 4: Approach to working with partners for the ODA stage



The SEA process has informed the approach to the ODA stage in a number of ways:

- Generic options: the environmental and social issues and opportunities associated with each of the generic options has been identified, considering each of the SEA topics.
- Unconstrained options: the question 'Are there environmental risks (in establishment/operation and outcomes), that cannot be mitigated or benefits provided?' was applied at this stage, specifically considering potential for impacts on protected / designated habitats and scheduled monuments.
- Constrained options: environmental and social criteria were considered alongside other criteria including feasibility and risk, engineering and cost, performance (delivering desired outcomes), operation of the system to review the performance of each option. Therefore, this knowledge was embedded into the ODA process at an early stage for each wastewater system.
- Feasible options: Those constrained options that perform well across the range of criteria are identified as being feasible for addressing problems within the wastewater system. The feasible options are reviewed against several issues, including the solution risks and benefits, flexibility and resilience, and environmental issues.
- Preferred options: The feasible options are costed and reviewed against the Planning Objectives to ensure the benefits delivered by the solutions are cost effective.
- Investment Needs: The preferred options and their costs are listed for each wastewater system. The Investment Needs for the wastewater systems in each River Basin District catchments were presented to partner organisations in order to get their feedback. This gave an opportunity for the environmental and social benefits to be scrutinised to ensure the right outcomes will be delivered.

The SEA assessment criteria have been applied to the Investment Needs and a summary of the outputs are reported in Section 4.

2.4.6. Stage 6: Programme appraisal

While the DWMP has a long-term horizon, the programme appraisal stage sets out to prioritise investments to identify best value options.

The first step in the Programme Appraisal was to calculate the band reduction score for each option. This was the count of the risk reduction provided by that option for each of the 14 planning objectives. The more options benefiting, the higher the risk score. This approach gave a greater weighting to options that deliver environmental benefits because of the number of planning objectives that relate specifically to delivering positive environmental outcomes.

The Investment Needs are listed for each Planning Objective. Prioritisation of Investment Needs is different for each Planning Objective (see Table 5). Factors informing prioritisation include the current risk band, the

aspirations for band reduction (i.e. reducing 'significant' performance issues), reducing the number of incidents and serving population growth.

Information and costs from the Investment Needs for the 61 wastewater systems considered in the DWMP to extrapolate the Investment Needs across all 381 of the wastewater systems in the Southern Water operating area.

Table 5: Prioritisation criteria (of Investment Needs) for each Planning Objective

Planning Objective	Prioritisation based on Greatest Risk
PO1: Internal Sewer Flooding Risk	Incident reduction AND THEN 2020 Risk band
PO2: Pollution Risk	Incident reduction AND THEN 2020 Risk band
PO3: Sewer Collapse Risk	Incident reduction AND THEN 2020 Risk band
PO4: Risk of Sewer Flooding in a 1 in 50-year storm	Properties at risk THEN 2020 Risk Band AND THEN 2050 Risk Band
PO5: Storm Overflow performance	Average EDM Spills per year 2017-2019 AND THEN 2020 Risk Band
PO6: Risk of WTW Compliance Failure	2020 Risk Band THEN 2050 Risk Band AND THEN Population Equivalent
PO7: Risk of flooding due to Hydraulic Overload	Properties at risk THEN 2020 Risk Band AND THEN 2050 Risk Band
PO8: Dry Weather Flow Compliance	2020 Risk Band THEN 2050 Risk Band AND THEN Population Equivalent
PO9: Achieve Good Ecological Status/Potential	Estimated option Risk Band Reduction THEN 2020 Risk Band AND THEN Population Equivalent
PO10: Improve surface water management	2020 Risk Band AND THEN Population Equivalent
PO11: Secure Nutrient Neutrality	2020 Risk Band THEN 2050 Risk Band AND THEN Population Equivalent
PO12: Reduce Groundwater Pollution	2020 Risk Band AND THEN Length of sewers within SPZ
PO13: Improve Bathing Waters	Average EDM Spills per year 2017-2019 AND THEN 2020 Risk Band
PO14: Improve Shellfish Waters	Average Spills per year 2017-2019 AND THEN 2020 Risk Band

The outputs from the programme appraisal inform the Final DWMP (Stage 7) and the business planning process and the next investment planning cycle, known as PR24.

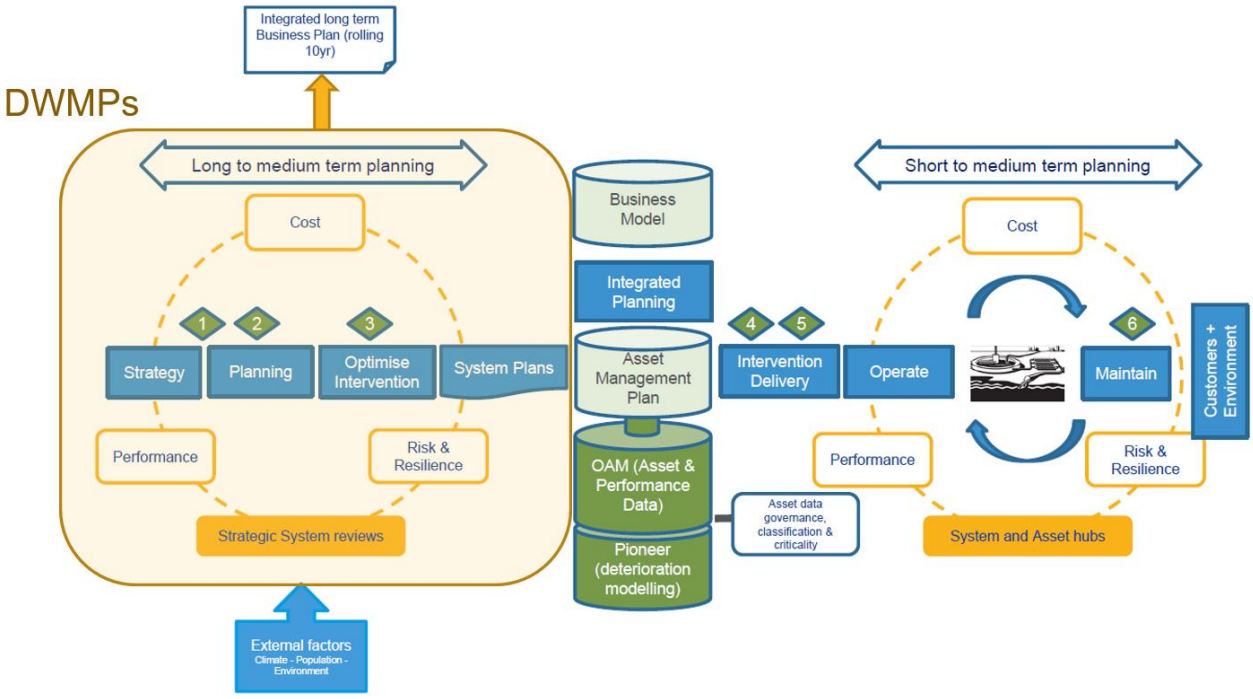
2.4.7. Stage 7: Final DWMP

This SEA Environmental Report is published alongside the final DWMP. The Final DWMP will inform the PR24 Business Plan. The DWMP will be updated every five years.

2.5. Implementation of DWMPs

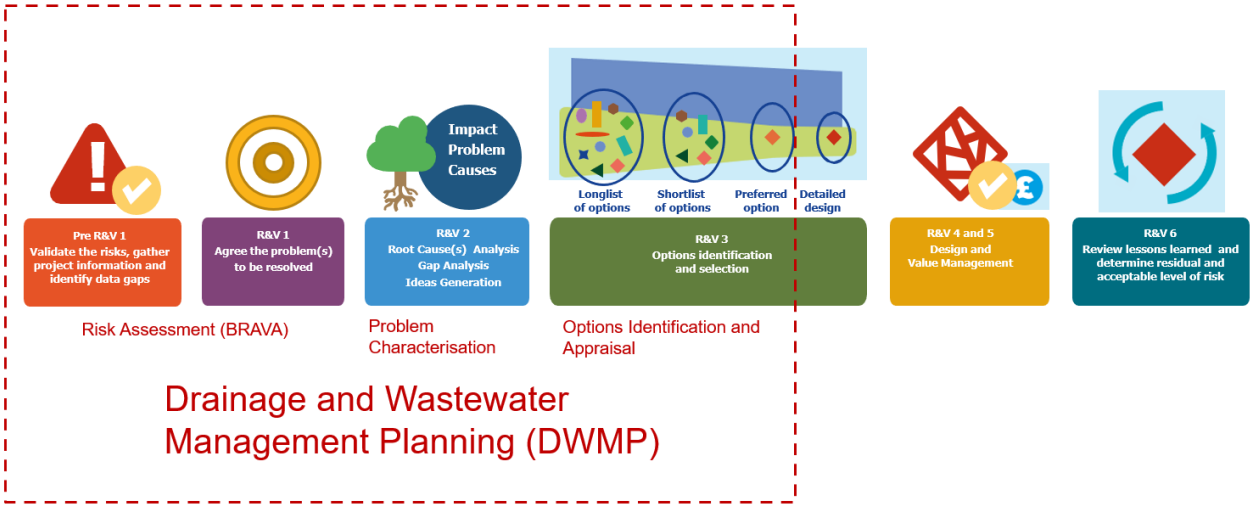
DWMPs provide the long-term plan for drainage and wastewater management. Figure 5 shows how long-term plans such as the DWMP fit within the context of asset planning and asset investment for Southern Water. The outputs from the DWMP inform the Business Plan and the endorsed Business Plan forms the basis of the Asset Management Plan. The Asset Management Plan subsequently develops interventions for delivery in the medium to short term.

Figure 5: DWMPs provide the long-term planning context for asset management



Delivery of investment in Southern Water goes through a Risk and Value (R&V) process; the stages are shown in Figure 6. The process and each of the stages are gateways to ensure that the risks of investments are understood and the value of investments is optimised. Figure 6 also illustrates the interaction with the DWMP. The DWMP goes some way through the process, but there are stages of developing investments that lie outside of the DWMP. The DWMP does identify risks, considers options and their value, moving toward identifying preferred options. However, the design of those options and detailed assessment falls within the scope of R&V stages 4 and 5. These are the stages where the solutions for the interventions described in the DWMP will be designed (including how they will be constructed), and this will influence the consenting routes (e.g. permitted development, planning application, national infrastructure project) and the level of additional environmental assessment that will be required (e.g. Environmental Impact Assessment, Habitats Regulation Assessment). Therefore, while the contents of the DWMP form part of the project lifecycle, there are subsequent stages in place for development and governance of investments. It is anticipated that engagement with regulators and stakeholders will continue through the implementation of the DWMP and the development of specific solutions.

Figure 6: How the DWMP fits into Southern Water's Risk and Value investment process



3. SEA Assessment Methodology

3.1. Overview

This section summarises the main components of the SEA methodology, including the approach to identifying the plans, policies and programmes that are relevant to the SEA, the environmental and social baseline, consultation that has been undertaken and the criteria used to assess the DWMP.

3.2. Relationships with other Policies, Plans and Programmes

The SEA Regulations require: 'an outline of the contents and main objectives of the plan or programme, and of its relationship with other relevant plans and programmes'. An additional requirement is: 'the environmental protection objectives, established at international, 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' SEA Regulations Schedule 2 (1) and (5).

A review of the policies, plans, and programmes relevant to the DWMP was undertaken. The aim was to determine how the DWMPs may be affected by these external factors. Furthermore, the DWMPs must aim to support current relevant policies, plans, programmes, and environmental protection legislation at international, national, and local levels. The DWMPs must aim to support, and where possible, strengthen the objectives of other local plans and strategies within the Southern Water operational area.

The plan, policies and programmes that were reviewed and the main environmental objectives within these documents is set out in Appendix B.

3.2.1. Themes and messages from policies, plans and programmes

The main themes, messages and objectives from the policies, plans and programmes review that are considered relevant to the DWMPs are presented below:

- Conserve flora and fauna and their habitats, including designated and non-designated sites;
- Conservation and wise use of wetlands and their resources;
- Protection of wild birds and their habitats;
- Support environmental and biodiversity net gain,
- Halt overall biodiversity loss;
- Contribute to nature recovery and nature recovery networks and strategies;
- Creation of green infrastructure[4];
- Protection of landscape, townscape or seascape character and quality;
- Improve water quality so all waters achieve 'good status' as set out in the Water Framework Directive;

[4] The UK Government's 25-year Environment Plan includes a sub-objective for the provision of more and better-quality green infrastructure including urban trees. Available at: https://www.gov.uk/government/publications/25-year-environment-plan

- Prevent or limit inputs of pollutants into groundwater;
- Promote efficient use of water;
- Reduce and manage the risks of flooding;
- Reduce greenhouse gas emissions to support the transition to the UK Government's 2050 net zero target;
- Adapt to the impacts of climate change including drought, and flooding;
- Increase resource efficiency and reduce natural resource use and waste;
- Create a green economy and promote sustainable growth;
- Promote sustainable and healthy communities[5];
- Promote social inclusion and community participation;
- Protect cultural heritage assets including archaeology and built heritage;
- Protect best quality soils and agricultural land;
- Promote soil health;
- Improve the health and resilience of Chalk Catchments;
- Support the UK Government's 25 Year Plan to Improve the Environment[6]:
    - Using and managing land sustainably – including embedding an "environmental net gain" principle into development (as supported by the draft Environment Bill 2020);
    - Recovering nature and enhancing the beauty of landscapes;
    - Connecting people to the environment to improve health and wellbeing;
    - Increase resource efficiency and reducing pollution;
    - Securing clean, healthy and productive and biologically diverse seas and oceans; and
    - Protecting and improving the global environment.

3.2.2. DWMP planning objectives

Planning objectives are used in the DWMP process to assess the current and future performance of the drainage and wastewater systems, and to identify where action and/or future investment is required. The performance is considered in terms of a risk of harm, based on the likelihood of an event occurring and the potential impact on people, property and/or the environment.

[5] The UK Government definition of sustainable communities as outlined in the document 'Sustainable Communities: Homes for All' (ODPM, January 2005, page 74) is: "*Sustainable communities are places where people want to live and work, now and in the future. They meet the diverse needs of existing and future residents, are sensitive to their environment, and contribute to a high quality of life. They are safe and inclusive, well planned, built and run, and offer equality of opportunity and good services for all*".

[6] UK Government (2018). A Green Future: Our 25 Year Plan to Improve the Environment. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/693158/25-year-environment-plan.pdf

Developing planning objectives is an important early step in the process for DWMPs. The planning objectives enable us to consider and identify the issues that we, and the organisations we are working with, care about in each river basin catchment, such as flooding, pollution and the impact on the environment.

The six common, national planning objectives are:

1. Internal sewer flooding risk – which is internal flooding of a domestic or business premises by wastewater
2. Pollution risk – pollution from any wastewater source on land or in water
3. Sewer collapses risk
4. Risk of sewer flooding in a 1 in 50 year storm – this is a severe storm that is likely to occur once in every 50 years or, put another way, a 2% chance of happening in any 12 month period
5. Storm overflow performance – this is non-compliance of a storm overflow with the permit issued by the Environment Agency which specifies the amount, frequency and concentration allowed to be discharged into the receiving water
6. Risk of WTW quality compliance failure – this is non-compliance of a Wastewater Treatment Works (WTWs) with its permit

We identified two further planning objectives to help us identify where we have current and future risks. The first is on the capacity of our sewers and the second relates to the capacity of treatment works being exceeded as a result of new development (growth) and urban creep (paving over of land and additional connections into the sewer network). These are:

7. Annualised Flood Risk (or hydraulic overload). This is the flood risk arising from different severities of rainfall
8. WTW Compliance with the EA's permit relating to the dry weather flow (DWF) arriving at the treatment works

In September 2020, we held a workshop with partner organisations in each river basin catchment. The purpose of the workshops was to discuss the need for any additional planning objectives to reflect any concerns or local issues with input from partner organisations. As a result of these workshops the following six additional planning objectives were included within our DWMPs:

9. Achieve Good Ecological Status or Good Ecological Potential (GES/GEP)
10. Improve surface water management and reduce surface water flooding
11. Secure nutrient neutrality
12. Reduce groundwater pollution
13. Improve bathing waters
14. Protect shellfish water

These planning objectives are an important step to improving knowledge and understanding of the potential impacts (positive and negative) of drainage and wastewater operations on the environment.

The themes, messages and objectives identified from the policies, plans, and programmes review will provide an input into the process of identifying key issues and opportunities and developing the SEA Framework.

3.3. Environmental baseline

Baseline information for the Southern Water area of operation and the likely future trends for the environmental issues being considered (as far as information is available) is included in Appendix C. A summary of the baseline is set out in Table 6.

The baseline information is presented under the SEA Directive topics and provides an evidence base from which environmental issues or opportunities resulting from the DWMPs can be predicted and assessed.

Baseline information has been collected for the Southern Water area of operation, with reference to the 11 RBD catchments:

- Adur and Ouse
- Arun and Western Streams
- Cuckmere and Pevensey Levels
- East Hampshire
- Isle of Wight
- Medway
- New Forest
- North Kent
- Rother
- Stour
- Test and Itchen

Maps showing key spatial baseline information are referenced in Appendix C and presented in Appendix D.

The Southern Water area of operation covers a large geographical area (for local authorities affected, see Appendix C). Therefore, the baseline is a high-level review of conditions within the region, rather than being location specific.

Table 6: Baseline information summary

SEA topic	Baseline summary
Biodiversity, flora and fauna	The SWS area of operation contains 38 Special Areas of Conservation (SAC), 18 Special Protection Areas (SPA), 13 Ramsar sites, 369 Sites of Special Scientific Interest (SSSI), 26 National Nature Reserves (NNR), 165 Local Nature Reserves (LNR), 14 Marine Conservation Zones (MCZ) and 2 Biosphere Reserves
Soil	The majority of agricultural land in the area is classified as Grade 3, with some Grade 1 and 2 land located to the east of the area, and some Grade 5 and urban land located to the west. There are 144 authorised landfill sites and over 1800 historic landfill sites across the SWS area of operation.
Water	The SWS area of operation is one of the driest areas in the UK and is classed as an area with serious water stress. There are seven man-made reservoirs owned by various water companies within the SWS area of operation. Flood risk across the SWS area of

	operation is diverse and can occur from a wide range of sources including rivers and the sea, groundwater, reservoir and surface water
Air	Many of the RBD catchments within the SWS area of operation contain at least one air quality management area (AQMA), which are predominately designated for Nitrogen dioxide (NO_2) and Particulate Matter (PM_{10}).
Climatic factors	Current observations indicate that the UK is continuing to warm. The year 2020 was the third warmest year for the UK in a series from 1884, and the eighth warmest year for UK near-coastal sea-surface temperature (SST) in a series from 1870
Landscape	The landscape across the SWS area of operation is diverse and is made up of a mixture of lowlands and small hills. There are 2 National Parks; 2 National Tails; 6 Areas of Outstanding Natural Beauty (AONB); and 17 NCAs within the SWS area of operation.
Historic environment	The SWS area is rich in heritage with over 43,000 listed buildings, approximately 1,780 scheduled monuments, approximately 5850 conservation areas, approximately 180 registered parks and gardens, 3 registered battlefields, 3 protected wrecks, 5 heritage coasts and 2 world heritage sites
Population and human health	The South East region (which covers the SWS operational area), has the highest population of all the regions of the UK, with an estimated population of 9,217,265 in mid-2020. There are expected to be an additional five million people within the SWS operational area by 2041. The percentage of the population describing their general health (for categories very good, good, fairly good, not good, and very bad) in South-East region is aligned with the national averages.
Material assets	SWS treats and recycles 700 million litres of wastewater per day at nearly 400 wastewater treatment works, after it has travelled through 39,000 kilometers of sewers. SWS supplies approximately 535 million litres of drinking water each day to its customers. The SWS area has an extensive transport network for road and rail. International airports at Gatwick and Southampton serve the regional population and the two busiest UK sea ports (Southampton and Dover) are also located within the region. In 2019/20 the total amount of local authority managed waste was approximately 25 million tonnes.

3.4. SEA consultation

The SEA Scoping Report was consulted upon over a five week period from September 2021 to October 2022. The SEA draft Environmental Report was consulted on over a 12 week period from June 2022 to September 2022. Responses were received from stakeholders including regulators, local authorities and local interest groups; Appendix E sets out the comments received and the responses to those comments.

3.4.1. SEA Scoping Report

In summary, the comments on the SEA Scoping Report (September 2021 to October 2022) included:

- Recommendations for additional Plans, Policies and Programmes to take into account
- Adding additional information into the baseline, such as Local Wildlife Sites

- Assessing the impacts on priority habitat / species and chalk rivers / streams
- Review compatibility between DWMP Planning Objectives and SEA Objectives
- Assessment: Consider in-combination effects and cumulative effects, including relationships with water management plans, drought plans and Strategic Resource Options.

The SEA Scoping Report is available online at:

www.southernwater.co.uk/dwmp/strategic-environmental-assessment

3.4.2. SEA Draft Environmental Report

In summary, the comments on the SEA draft Environmental Report (June 2022 to September 2022) included:

- Additional baseline information on buried archaeology of significant interest, and more information on the current status of designated sites
- Review of hydrological connections influencing the Habitats Regulation Assessment (HRA) and request for additional assessment
- Results from cumulative assessments
- Additional measures for mitigation and monitoring

The SEA draft Environmental Report is available online at:

www.southernwater.co.uk/dwmp/strategic-environmental-assessment

3.5. SEA objectives

Based on a review of the environmental baseline and identification of the main environmental objectives, the key existing environmental problems have been identified; the issues and opportunities are set out in Appendix F.

The SEA objectives cover the applicable SEA topics and represent the aims against which the DWMP is assessed (see Table 7). The compatibility between the SEA objectives and the DWMP Planning Objectives has been reviewed (see Appendix G).

The SEA objectives are supported by assessment criteria (Figure 7), which define major, moderate and minor effects for each of the SEA topics (see Appendix H).

Table 7: SEA Objectives

SEA topic	SEA Objective
Biodiversity, Flora and Fauna	1.1. Protect and enhance Biodiversity, Flora and Fauna
Soil and Geology	2.1. Protect and enhance Soil and Geology
Water	3.1. Increase resilience and reduce flood risk
	3.2. Protect and enhance the quality of the water environment
	3.3. Deliver reliable and resilient wastewater services
Air	4.1. Reduce and minimise air emissions
Climatic Factors	5.1. Reduce embodied and operational carbon emissions
	5.2. Reduce vulnerability to climate change risks and hazards
Landscape	6.1. Conserve, protect and enhance landscape, townscape and seascape character and visual amenity
Cultural Heritage	7.1. Conserve, protect and enhance the historic environment, including archaeology
Population, Communities and Human Health	8.1. Supporting communities and economic growth
	8.2. Maintain and enhance tourism and recreation
Material Assets	9.1. Minimise resource use and waste production

Figure 7: Assessment criteria

Effect	Description
?	Uncertain
+++	Major Positive
++	Moderate Positive
+	Minor Positive
0	Neutral
-	Minor Negative
--	Moderate Negative
---	Major Negative

The lack of site-specific information on the majority of the interventions set out in the DWMP, means that the application of the assessment criteria is subject to greater uncertainty. While it is prudent to take a precautionary approach, the high level of uncertainty in the information available at this stage means that a precautionary approach could result in identifying blanket significant effects. Alternatively, all potential impacts could be assessed as being 'uncertain'. This is unlikely to provide any meaningful differentiation in the assessment.

Where the location of a proposed solution is known, the assessment will be able to apply the assessment criteria that relate to land use, including likely construction phase impacts. Where the location of a proposed solution is not known, the assessment may have less certainty on construction phase impacts. However, it is assumed that some general impacts associated with construction activity will apply, for example, some disturbance to road traffic (due to works within a highway) which may cause delays to local people, plus noise and dust (affecting air quality), as well as visual impact of construction activity. These impacts are often

collectively referred to as the impacts on amenity of local people. Often there is more information available on the intended operational benefit of the intervention (e.g. improvements to water quality or reduced sewer flooding), as the interventions have been specifically identified to deliver that benefit (i.e. level of performance in achieving a Planning Objective).

Therefore, the application of the assessment criteria will include assumptions underlying the categorisation, so as to provide a reasonable most likely view of the effects.

Work to date has focused on applying assessment criteria to the river basin district catchments (Level 2) rather than wastewater systems (Level 3). Engagement with external stakeholders has focused on discussions at the river basin district catchment level. This enables all Investment Needs (across the different Planning Objectives) to be considered collectively, which means that potential cumulative effects between wastewater systems in the same catchment can be easily identified. This is also considered more proportionate than applying assessment criteria to wastewater systems, where the same level of uncertainty exists on the location of interventions and there are limited / no alternatives to consider (therefore no additional information would be generated from this exercise to inform the assessment for Level 2 catchments).

The findings from applying the SEA objectives and assessment criteria to the DWMP are set out in Section 4.

3.6. Alternatives

The consideration of alternatives includes a range of factors. One of these is considering an alternative geographical scope. The geographic scope of the DWMP is Southern Water's operational area. Other water and sewerage companies are responsible for surrounding areas.

Another factor is considering alternative objectives. The DWMP has 14 Planning Objectives at its heart. There are six common, national planning objectives (which must be applied). Another eight Planning Objectives have been added; with six of these resulting from discussions with partner organisations. This means that alternative objectives have been considered and the objectives of the DWMP reflect relevant national and local priorities.

In developing options to address wastewater system risks and problems, the Option Development and Appraisal process started with a wide range of alternative interventions (the generic options). These were screened and developed, leaving feasible options. The feasible options were generally a combination of interventions for each wastewater system, which are taken forward as Investment Needs. Different groups of feasible options have not been generated and therefore distinct alternatives are not available for the wastewater systems.

The consequences of the 'do nothing' alternative is considered as part of the Baseline Risk and Vulnerability Assessment (BRAVA[7]) stage of developing the DWMP. The BRAVA assessed the current (2020) risks to customers and the environment from the performance of drainage and wastewater systems, and the future risks, for 2050. The outputs of this work has been documented for each of the 11 river basin districts[7].

3.7. Other assessments

[7] https://www.southernwater.co.uk/dwmp/baseline-risk-and-vulnerability-assessment

Other assessments of environmental effects often inform the SEA. These assessments are listed below and the approach to these assessments and, where relevant, findings are set out in Section 5.

- Water Framework Directive Assessment
- Habitats Regulations Assessment
- Invasive non-native species risk assessment (INNS)
- Natural Capital Assessment
- Biodiversity Net Gain Assessment

3.8. Cumulative and in-combination effects

The SEA considers cumulative effects at two levels:

- Cumulative effects of the plan as a whole – for example effects that occur where a receptor is affected by multiple impacts arising from the plan
- In-combination effects of the plan with other plans, programme and projects.

Cumulative effects of the DWMP are likely to include those between wastewater systems (Level 3) where interventions could affect neighbouring wastewater systems in the same river basin catchment (Level 2). For example, a protected habitat could be in proximity to proposals from two or more nearby catchments.

In-combination effects of the DWMP are likely to include those between the DWMP and other relevant plans and programmes. These plans and programmes include other plans promoted by Southern Water, neighbouring water company DWMPs and other catchment and flood management plans.

4. SEA Assessment Findings

4.1. Overview

The DWMP is about planning for the uncertainties of the future and identifying the most likely future investment needs. The DWMP sets out the Planning Objectives that measure the performance and resilience of the drainage and wastewater systems. The DWMP (Level 1) is supported by the Investment Plan that set out the Investment Needs to achieve the Planning Objectives for the river basin catchments (Level 2). The Investment Needs are also collated to show the preferred options for wastewater systems (Level 3).

This report provides the findings from the SEA process. This information directly informs the development of the DWMP and those stakeholders who need to be aware of the environmental and social impacts of the DWMP.

This section summarises findings across the following components of the DWMP:

- Level 3: Wastewater systems
- Level 2: River basin district catchments
- Level 1: DWMP Regional Plan

4.2. Findings – Level 3: Wastewater systems

The DWMP process considered 61 wastewater systems to develop preferred options to managing and reducing the risks. These wastewater systems progressed through the Options Development and Appraisal (ODA) process.

The ODA process identified which of the generic options could be deployed to address a risk or deliver improved performance. The preferred options are those options that could address an identified risk or deliver the required improvement in performance in the local context.

There are two aspects of this work where the SEA process has been applied. The first aspect is that a list of environmental and social constraints, relating to the SEA topics, formed part of the evidence that was applied to screening options (see Table 8).

Table 8: Constrained Options – SEA considerations

SEA topic	Environmental and social information to inform assessment of option performance
Biodiversity, Flora and Fauna	HRA (internationally designated sites) SSSIs, national nature reserves (national level sites) Risk of Invasive Species
Soil and Geology	Agricultural land classification Landfill sites
Cultural Heritage	Protected structures Designated sites
Water	Groundwater source protection zones Areas of Flood Risk WFD waterbodies
Air	Air Quality Management Areas
Climatic Factors	Additional carbon emissions
Landscape	International designations Areas of Outstanding Natural Beauty and National Parks

Population, Communities and Human Health	National and regional recreation facilities
Material Assets	Minimise resource use and waste production

Applying this information has embedded knowledge into the ODA process at an early stage for each wastewater system, enabling potential significant environmental and social effects to be avoided, by taking forward options that can be delivered without affecting the environmental and social constraints. Therefore, generic options that have passed through the process to the 'feasible options' stage are intended to be those which do not cause unmitigable environmental risks.

The second aspect recognises that while the location of the risk is known, the location of the intervention to deal with that risk is not known at the point of screening for feasible and preferred options. The preferred options could be implemented at locations remote from the risk (e.g. surface water separation occurring some distance from the properties subject to flood risk).

Therefore, while information on the location of where the preferred option will be implemented is not known, it is important to understand the potential environmental and social issues associated with the preferred option. To do this, the generic options have been reviewed to identify their potential SEA impacts (considering the SEA objectives in Table 7).

The generic options are grouped into four types of measures:

- Source (Demand) Measures (to reduce likelihood)
- Pathway (Supply) Measures (to reduce likelihood)
- Receptor Measures (to reduce consequences)
- Other Measures

4.2.1. Source (Demand) Measures

The source (demand) measures and the potential impacts across the SEA objectives are summarised in Table 9.

Across the source (demand) measures, the majority of construction impacts are not likely to result in adverse impacts across the SEA objectives. The largest impacts are likely to arise from large scale measures such as natural flood management or new blue-green infrastructure, where some temporary disturbance to biodiversity and soils could occur. However, the operational stage of these interventions is likely to deliver the greatest benefits, for most of the SEA objectives, biodiversity, soils, landscape, population and potentially significant beneficial outcomes for water (i.e. water resilient wastewater systems, improving water environment and reducing flood risk).

Table 9: Potential SEA impacts for Source (Demand) Measures

Generic Option Category	Potential SEA impacts
Control / reduce surface water run-off: Natural flood management, rural land management, SuDS, blue-green infrastructure	**Construction**: Impacts will vary depending on the form and scale of the management measures. For larger schemes, there may be temporary disturbance to sensitive receptors (if present). This may include some loss of habitats and soils. There is also the potential for temporary impacts to groundwater during construction, particularly should the location be within a SPZ or NVZ. There is the potential for additional emissions and embodied carbon in materials. **Operation**: Impacts will vary depending on the form and scale of management measures. Where measures are implemented to provide management of flood, land and catchment areas, then benefits are likely to be experienced for biodiversity, soil and landscape (including townscape). There is potential for new blue- green infrastructure to benefit communities

	and the economy (e.g. recreation). Reducing surface water run-off can lead to benefits for managing climate change risks, including flood risk, by diverting / delaying this water from the wastewater system. This in turn avoids overloading sewers and reduces the risk of flooding and pollution events, thereby increasing the reliability of the wastewater systems.
Reduce groundwater levels: Reduce leakage from water supply pipes; pump away water to local areas of lower groundwater	**Construction**: The focus of interventions are likely to be on existing assets or in proximity to existing assets and therefore a change in land use is not expected. Some minor disruption to amenity in local areas from construction activity may affect communities. **Operation**: This option would improve resilience of the wastewater system. Benefits are also expected for conserving water resources. Targeting these measures where existing sewers are at risk of flooding will help to reduce this risk of flooding, therefore benefitting communities and habitats. There is potential for increased emissions during operation associated with the additional pumping required.
Improve quality of wastewater: Customer education, behaviour change (reduce blockages); on-site black water and/or greywater pre-treatment	**Construction**: The majority of interventions are likely to behaviour change, monitoring and small-scale installations. These measures could be integrated with the wider construction activities. No specific impacts associated with the construction phase of this option have been identified. **Operation**: This option would increase understanding and support behaviour change. Screening at source will help improve the reliability of wastewater services. Improving the quality of wastewater is expected to benefit water quality. This option could also have benefits to businesses, where monitoring of trade waste could improve operations, by avoiding risks and potential for avoiding costs.
Reduce the quantity / demand: Water efficient appliances and measures, blackwater / greywater re-use and treatment at source	**Construction**: The majority of interventions are likely to be made at a domestic level or very local to housing / business premises. If outside of existing premises, these measures could be integrated with the wider construction activities (for new development). No specific impacts associated with the construction phase of this option have been identified. **Operation**: Interventions to reduce the quantity of wastewater going into the system will improve the overall resilience of the wastewater system, with benefits of reducing flooding and protecting the water environment. The focus on efficiency will benefit the use of water resources.

4.2.2. Pathway (Supply) Measures

The pathway (supply) measures and the potential impacts across the SEA objectives are summarised Table 10.

The construction impacts of the pathway (supply measures) are likely to be greatest where new assets are being provided, such as new storage or new wastewater treatment works (WTW). Where existing assets can be improved or optimised, this avoids generating embodied carbon and using resources. Where new assets are provided, there are potential for adverse effects if habitats, soils or communities are disturbed. During operation of improved sewerage network and improved wastewater treatment quality are both expected to bring significant beneficial outcomes for improving the water environment (wastewater system resilience, quality of the waterbodies and dependent biodiversity and reducing flood risk). Reducing sewer flooding will bring a significant benefit to local communities.

Table 10: Potential SEA impacts for Pathway (Supply) Measures

Generic Option Category	Potential SEA impacts

Improve sewer network: Asset optimisation, additional capacity, storage, separate flows, structural repairs, sewer re-lining	**Construction**: Where these measures focus on optimising, repairing and improving existing sewers, construction impacts are likely to be limited to disruption to amenity in the locality of the works, e.g. noise, dust, traffic. Extending the life of existing assets has benefits of avoiding additional embodied carbon. Where measures require construction of new infrastructure to separate flows or to provide new storage, the temporary construction impacts may be greater, impacting population and communities. **Operation**: Improving the sewer network will provide benefits of improving the reliability of the wastewater systems. Increasing available capacity and additional storage avoids overloading sewers (particularly in heavy rain events) and reduces the risk of flooding to properties and pollution events affecting the natural environment.
Improve treatment quality: Increase capacity, rationalisation of WTW, install treatment plant and technology, new WTWs	**Construction**: The construction impacts will vary depending on how the quality improvement is to be achieved. If this is work within an existing WTW site, the impacts are likely to be limited. Rationalisation of WTW is likely to be a longer process and could result in disturbance to local residents. Similarly, new WTW could take years to construct and cause disturbance to local communities (air quality, traffic, visual impacts) and result in embodied carbon and require materials and resources. It is possible that extensions to WTW or new WTW are on land that has some biodiversity value and therefore there could be adverse effects. **Operation**: Improving treatment capacity and quality is likely to improve the quality of effluent discharged to the water environment which has benefits for biodiversity and people's enjoyment of waterbodies. The increased capacity will also help reduce discharges from other locations on the sewer network, particularly during storm events, thereby reducing flood risk, which will benefit local communities. Communities living adjacent to new WTW may experience a deterioration in their amenity.
Wastewater transfer to treatment elsewhere: transfer flows to other networks or WTW, transport sewage by tanker	**Construction**: The construction impacts are likely to depend on the scale of the transfer required. Some wastewater systems could be linked or some flows could be transferred to other discharge points. Larger scale transfers could adversely affect habitats, soils, landscape and communities. **Operation**: Transferring treatment is likely to benefit sensitive environments (waterbodies and habitats) and improve the resilience of the existing system (e.g. to reduce the risk of flooding or manage the impacts of climate change). In some cases, pumping may be required which would generate carbon emissions and ongoing use of resources. It is likely that tankering of wastewater would only be deployed in smaller or rural catchments. Therefore, air quality impacts are likely to be small, but there may be incidents of disturbance to the local communities.

4.2.3. Receptor Measures

The receptor measures and the potential impacts across the SEA objectives are summarised in Table 11.

The relatively small scale of these measures means that no significant impacts are expected during construction. The operation of these measures are likely to deliver localised benefits, but these are not expected to result in significant beneficial impacts. In some wastewater systems, effective measures to enhance rivers has the potential to deliver significant beneficial outcomes for the quality of the water environment.

Table 11: Potential SEA impacts for Receptor Measures

Generic Option Category	Potential SEA impacts

Mitigate impacts on air quality: Carbon offsetting, noise suppression, odour control.	**Construction**: The measures are likely to be implemented through installations on existing sites / assets rather than broader construction activities, therefore no impacts are expected. **Operation**: These systems are likely to provide benefits to local air quality and the amenity of nearby residents through reduced noise and odour. Where carbon is offset, this will benefit climate change (assuming the offsetting programme is effective).
Improve land and soils: Biosolid soil enhancement	**Construction**: The measures are likely to use existing products and therefore no construction impacts are expected. **Operation**: Using biosolids on agricultural land is likely to benefit soil health and, as an alternative to other fertilisers, is also likely to benefit biodiversity and water quality.
Mitigate impacts on receiving waters: river enhancement, aeration	**Construction**: The construction impacts will depend on the scale of the intervention, particularly river enhancement. **Operation**: The measures are likely to improve the quality of waterbodies, which will also benefit biodiversity. This could also have benefits for recreation in some locations. Some methods of aeration are likely to generate carbon emissions as a result of energy used for operating the systems.
Reduce impact on properties: Property flood resilience, non-return valves, flood guards	**Construction**: The majority of interventions are likely to be small-scale installations. No specific impacts associated with the construction phase of this option have been identified. **Operation**: This option is primarily focused on protecting individual properties and premises from flooding and therefore benefits to population, health and communities are the focal point.

4.2.4. Other Measures

The other measures and the potential impacts across the SEA objectives are summarised in Table 12.

It is assumed that the studies and investigations are largely desk-based, although they may be informed by some on-site survey activity. This is not expected to result in any significant effects. However, the studies in particular areas such as nutrient neutrality could lead to positive outcomes for sensitive habitats. The outputs from the studies and investigations would become source/pathway/receptor measures in due course.

Table 12: Potential SEA impacts for Other Measures

Generic Option Category	Potential SEA impacts
Other: Studies and investigations.	**Construction**: No impacts are expected. **Operation**: No impacts are expected.

4.2.5. Summary

When considering the generic options outside of a locational context, the following options have the potential to deliver significant beneficial effects:

Source: Control / reduce surface water run-off – SEA objectives benefitting are Water (increasing resilience and reducing flood risk, enhance quality of the water environment, reliable wastewater service); Population, Communities and Health (reduced property flooding); Biodiversity (enhancing habitats). This option also has the potential to provide benefits across most of the other SEA objectives.

Pathway: Improve sewer network – SEA objectives benefitting are Water (deliver reliable wastewater services, increase resilience and reduce flood risk and protect the water environment) and Population, Communities and Health (avoid property flooding).

Pathway: Improve treatment quality – SEA objectives benefitting are Water (enhance quality of the water environment, reliable wastewater service and reduce flood risk) and Population, Communities and Health (avoid property flooding). Depending on the scale and location, there could be significant benefits for biodiversity.

The construction phase is most likely to give rise to adverse effects, although the scale of construction is likely to need to be large to generate significant effects (e.g. construction of a new wastewater treatment works). Adverse effects in operation include increased use of materials and energy, generating carbon emissions.

The preferred options for each wastewater system consisted of a number of different generic options to deal with the identified risks and problems. The preferred options across the Level 3 wastewater systems were focused on measures within the Pathway group, particularly 'Improve sewer network', due to the need to provide costs to scale the investment need to reduce the risks. However, the overriding finding was that tackling the problem at source would provide better, longer-term and more sustainable options that provide opportunities to deliver wider, multiple benefits to communities. The preferred options were combined, creating a basket of measures for each wastewater system – these are the 'Investment Needs'. Distinct alternatives were not produced at Level 3, as the options were not developed into specific proposals (e.g. identifying alternative locations for storage and locations for separation, and combinations of these). Further work to create these multiple options will be necessary as the DWMP is implemented. From an SEA perspective, the main alternative remains the 'do nothing' scenario (see Section 3.6).

4.3. Findings – Level 2: River Basin District Catchments

The 61 wastewater systems taken through the ODA process from Level 3 are distributed across 11 river basin district catchments. The 11 river basin districts are:

- Adur and Ouse
- Arun and Western Streams
- Cuckmere and Pevensey Levels
- East Hampshire
- Isle of Wight
- Medway
- New Forest
- North Kent
- Rother
- Stour
- Test and Itchen

For the river basin district catchment, the Investment Needs for each of the wastewater systems (Level 3) within that catchment are collated. As mentioned previously, the Investment Needs focus on the location of the problems, rather than where the investment / intervention will be located. Therefore, there remains a large degree of uncertainty in how the Investment Needs will impact on environmental and social receptors in the catchment.

The following sections summarise the outputs from applying the SEA objectives (Table 7) and assessment criteria (Figure 7) to each of the 11 river basin catchments. Each section includes:

- Catchment wastewater systems – total number of wastewater systems in the catchment and identifies the priority wastewater systems.
- Catchment area summary – high level summary of the main settlements and physical features.
- Investment Needs summary – summary of the proposed options to reduce risks and deliver improvements
- Construction and Operation impacts – description of the main impacts associated with constructing and operating the investment needs

- A summary matrix of performance against the assessment criteria (identifying beneficial and adverse impacts that are rated as minor, moderate or major) (Table 13 to Table 23).

4.3.1. Adur and Ouse

Catchment wastewater systems: There are 68 wastewater systems in Adur and Ouse. BRAVA identified very significant issues relating to the majority of Planning Objectives. In particular, very significant issues across multiple planning objectives were identified in Peacehaven (BRIG), East Worthing (WOEA) Newhaven East (NEWE) and Shoreham (PORT).

Catchment area summary: Together, the two catchments that form the Adur and Ouse river basin catchment have a population of approximately 720,000 people. There are two major ports, Newhaven and Shoreham. Other conurbations include Brighton and Hove, Worthing and Lewes. Designated sites within the catchment include: Ashdown Forest Special Area of Conservation (SAC) and Beachy Head West Marine Conservation Zone (MCZ). The South Downs National Park is an important designated area for landscape and recreation.

Investment Needs summary: A full list of the Investment needs identified for the Adur and Ouse river basin district catchment can be found in the DWMP Investment Plan. A summary of the investment needs is outlined below:

- Control / reduce surface water run-off: Surface water separation, particularly at storm overflows in Brighton and Hove (BRIG), Worthing and Worthing Wastewater Treatment Works (WTW) (WOEA), Lewes, Seaford, Newhaven (NEWE) and Shoreham (PORT).
- Improve quality of wastewater: Customer education programmes (BRIG, WOEA)
- Improve sewer network: Enhanced maintenance (WOEA, NEWE)
- Improve sewer network: Pipe rehabilitation programme in all wastewater systems
- Improve sewer network: Attenuate excess flows, including new storage in Goring and Sompting
- Improve treatment quality: Review permit for the WTW for WOEA, NEWE, PORT
- Studies: Drainage model improvements for BRIG, WOEA and NEWE

Construction impacts: Construction activities such as upsizing sewers, creating new sewers, surface water separation, construction of flood storage tanks, delivering associated works to increase capacity, and the transferring of the wastewater for treatment elsewhere have potential for minor adverse effects across a number of the SEA objectives:

- Potential for disturbance effects from noise and air pollution associated with construction impacts to designated sites and sensitive receptors should these be within the vicinity of the options construction.
- Options to increase size of sewers and construction of new sewers could result in permanent soil loss, although the majority of land affected is likely to be in urban areas.
- There is potential for impacts to groundwater sources during construction including risk of pollution with large areas of Peacehaven Brighton, East Worthing, Newhaven East Shoreham being located within a Source Protection Zone (SPZ), potential receptors include nitrate vulnerable areas in Peacehaven Brighton, East Worthing, Newhaven East Shoreham. Potential for construction locations to intercept areas of flood zone 2 and 3 which may affect construction.

- Likely temporary increase in emissions from construction and temporary impact on air quality, although likely to be avoided through use of best practice construction techniques.
- Depending on the location of construction works, there is potential to impact on the visual setting of historic assets during construction. Excavation required during construction works may have potential to impact buried archaeology if present.
- Prior to the start of construction impacts on the local community will need to be assessed, noise potential as well as disruption to traffic and public rights of way. Depending on the location of construction works potential receptors may include schools, medical facilities, open and green spaces and residential areas.
- Likely temporary impacts during construction on roads and traffic from increased congestion and partial road closures during works; potential receptors include the A27.

Operational impacts: Major benefits to the resilience and reliability of wastewater systems anticipated as well as potential benefits to water quality within the environment, the local community and material assets, climate change risks and hazards. The following operational impacts were identified:

- Potential benefits biodiversity and to the condition of designated sites through potential reduction of ground water pollution, and flooding: potential benefits to Brighton to Newhaven Cliffs Site of Special Scientific Interest (SSSI), Adur Estuary SSSI, Lewes Brooks SSSI, Lewes Downs SAC.
- Potential major reduction in flood risk catchment wide. Reduction of flooding and increased sewer capacity and attenuation capacity will reduce the instances of pollution events, in line with WFD objectives. Potential for long-term positive effects on the chemical and ecological status of water environments.
- Likely benefits to flooding associated climate change risks and hazards.
- Potential major benefits to public health, safety and hygiene will likely result from measures to reduce flooding and keep wastewater within sewage systems prior to treatment. Benefits to residential areas including Falmer, Patcham, Portslade, Poynings, Preston, Pyecombe, Rottingdean, Saltdean, Southwick, Hove, Peacehaven, Saltdean, Lancing, Sompington, Worthing, Ferring, Findon, Goring on Sea, Tarring, Shoreham on Sea, Lewes, Newhaven, Piddinghoe, South Heighton, Tarring Neville, Seaford, Bishopstone, Norton, Seaford, Brighton, Portslade, Shoreham by Sea, Southwick, Hove, Lancing, Fishersgate, Lewes, Newhaven, Piddinghoe, South Heighton, Tarring Neville, Seaford, Bishopstone, Norton, Seaford.
- Decisions to upgrade sewer assets are likely to be based on whole-life costs and replacing assets avoids constructing new assets and therefore additional embodied carbon, reducing material requirements in the longer term.

Table 13: Level 2 findings for Adur and Ouse

	SEA Topics and Objectives

River basin district catchment		Biodiversity flora & fauna	Soil, geology & land use	Water			Air	Climatic Factors		Landscape	Cultural Heritage	Population, Communities and Human Health		Material Assets
		1.1	2.1	3.1	3.2	3.3	4.1	5.1	5.2	6.1	7.1	8.1	8.2	9.1
Adur and Ouse	Construction	-	-	o	-	o	-	-	o	-	o	-	-	-
	Operation	+	o	+	+++	+++	o	-	++	o	o	+++	o	-

See Figure 7 for scoring key

4.3.2. Arun and Western Streams

Catchment wastewater systems: There are 60 wastewater systems in Arun and Western Streams river basin district. BRAVA identified very significant issues relating to the majority of the Planning Objectives. In particular, very significant issues across multiple planning objectives were identified in Bosham (BOSH), Chichester (CHIC), Ford (FORW), Horsham New (HONE), Lavant (LAVA), Lidsey (LIDS), Pagham (PAGM) Sidlesham (SIDL), Tangmere (TANG) and Thornham (THOR).

Catchment area summary: The Arun and Western Streams river basin district catchment contains the city of Chichester, and some major towns such as Petersfield, Midhurst, Pulborough and Horsham to the north of the South Downs National Park, and Littlehampton, Bognor Regis and Arundel on the coastal plain. Other designated sites within the catchment include SACs, two Special Protection Areas (SPAs) (Arun Valley and Wealden Heaths Phase 2), three Ramsar sites (Arun Valley, Chichester and Langstone Harbours and Pagham Harbour), and MCZs. There are also three chalk streams in the catchment, Costers Brook, Ems and Lavant, which combined cover 41km.

Investment Needs summary: A full list of the Investment needs identified for the Arun and Western river basin district catchment can be found in the Investment Plan. A summary of the investment needs is outlined below:

- Control / reduce surface water run-off: Surface water separation, to tackle flooding all priority wastewater systems and at Chichester WTW, Horsham New WTW, Thornham WTW, Lidsey WTW, Lavant WTW and Pagham WTW.
- Improve quality of wastewater: Customer education programmes (most priority wastewater systems).
- Improve sewer network: Pipe rehabilitation programme in CHIC (A285/A286), FORD, SIDL, THOR, TANG and BOSH wastewater systems and new sewers in BOSH
- Improve treatment quality: Review permit and increase capacity for the WTW for SIDL, THOR, LIDS, BOSH and PAGM and increase capacity of WTW at HONE and TANG.
- Wastewater transfer: Transfer some flows from Chichester WTW to Tangmere (CHIC) and from Warnham to Horsham WTW (HONE).
- Studies: Develop nutrient budget to understand risks and sources impacting the following habitat sites – Chichester Harbour, Langstone Harbour, Pagham Harbour, Solent and Dorset Coast, Solent Maritime, and Arun Valley.
- Studies: Drainage model improvements for majority of priority wastewater systems.
- Studies: Consider 'Total Catchment Scheme' for SIDL, tackling climate change, sea level rise, flooding, water resources, water quality, biodiversity and habitat loss.

Construction impacts: Construction activities such as upsizing sewers, creating new sewers, surface water separation, construction of flood storage tanks, delivering associated works to increase capacity, and the transferring of the wastewater for treatment elsewhere have potential for minor adverse effects across a number of the SEA objectives:

- Potential for disturbance effects from noise and air pollution associated with construction impacts to designated sites and sensitive receptors should these be within the vicinity of the options construction, such as habitats.
- Options to increase size of sewers and construction of new sewers could result in permanent soil loss, depending on location.
- There is potential for impacts to groundwater sources during construction, especially where WTW are located within an SPZ, including Tangmere WTW. There may also be a temporary increased risk of flooding during construction. Prior to the start of construction activities, potential impacts on local water bodies will need to be assessed.
- Prior to the start of construction impacts on the local community will need to be assessed, noise potential as well as disruption to traffic and public rights of way. Potential receptors include schools, medical facilities, open access areas, green spaces, residential areas.
- Likely temporary increase in emissions from construction and temporary impact on air quality, which can generally be avoided by best practice construction activities.
- Impacts to landscape and visual amenity are likely to be temporary during construction period.
- Likely temporary impacts during construction on roads and traffic from increased congestion to partial closures.

Operational impacts: Major benefits to the resilience and reliability of wastewater systems anticipated as well as potential benefits to water quality within the environment, the local community and material assets, climate change risks and hazards. The following operational impacts were identified.

- Potential benefits biodiversity and to the condition of designated sites through potential reduction of ground water pollution, and flooding: potential benefits to Chichester Harbour, Langstone Harbour, Pagham Harbour, Solent and Dorset Coast, Solent Maritime, and Arun Valley.
- Reduction in the risk of pollution catchment wide. Increased sewer capacity and attenuation capacity will reduce the instances of pollution events, in line with WFD objectives.
- Likely benefits to flooding associated climate change risks and hazards.
- Potential for long-term positive effects on the chemical and ecological status of water environments.
- Potential major benefits to public health, safety and hygiene will likely result from measures to reduce flooding and keep wastewater within sewage systems prior to treatment. Benefits to residential areas including those within Arundel, Amberley, Crossbush, Houghton, Slindon, Walberton, Yapton, Bognor Regis, Felpon, Middleotn on Sea, North Bearsted, Pagham, Rose Green, South Bearsted, Littlehampton, Angmering, Climping, East Preston, Wick, Rustington, Ferring, Middlton on Sea, Lyminster, Chichester, Birdham, Bracklesham Bay, Earnley, West Wittering, Itchenor, Selsey, Sidelsham Common, Almodington, Highleigh, Emsworth, Prinsted, Southbourne, Thorney Island, Woodmancote, Nutbourne, Hambrook, Westbourne, Chidham,Bosham, Chichester, Havent, Emsworth, Prinsted, Southbourne, Thorney Island, Woodmancote, Nutbourne, Hambrook, Westbourne, Chidham, Bosham, Chichester, Havent,

Halnaker, Maudlin, Oving, Tangmere, Boxgrove, Westhampnett, Chichester, Bohsam, Funtington, West Ashling, Hunston, Chichester, North Mundham, Runcton, Bognor Regis, Pagham, Rose Green.

- Decisions to upgrade sewer assets are likely to be based on whole-life costs and replacing assets avoids constructing new assets and therefore additional embodied carbon, reducing material requirements in the longer term.

Table 14: Level 2 findings for Arun and Western Streams

River basin district catchment		SEA Topics and Objectives												
		Biodiversity flora & fauna	Soil, geology & land use	Water			Air	Climatic Factors		Landscape	Cultural Heritage	Population, Communities and Human Health		Material Assets
		1.1	2.1	3.1	3.2	3.3	4.1	5.1	5.2	6.1	7.1	8.1	8.2	9.1
Arun and Western Streams	Construction	-	-	o	-	o	-	-	o	-	o	-	-	-
	Operation	+	o	+	+++	+++	o	-	++	o	o	+++	o	-

See Figure 7 for scoring key

4.3.3. Cuckmere and Pevensey Levels

Catchment wastewater systems: There are 18 wastewater systems in Cuckmere and Pevensey Levels. BRAVA identified very significant issues relating to the majority of Planning Objectives. In particular, very significant issues across multiple planning objectives were identified in Bexhill and Hastings (HABX), Eastbourne (EALP), Hailsham North (HAIN) and Hailsham South (HAIS). Pollution Risk, Storm Overflow performance and Risk of flooding due to Hydraulic Overload were identified as very significant issues across several of the wastewater systems.

Catchment area summary: The Cuckmere and Pevensey Levels river basin district catchment has a residential population of around 323,000. The catchment is largely rural and the main land use is agriculture. The coastal towns of Bexhill, Hastings and Eastbourne lie within the catchment as does the growing urban area of Hailsham. Natura 2000 sites within the catchment include Hastings Cliffs SAC, Pevensey Levels SAC, Ramsar, NNR, Dungeness, Romney Marsh and Rye Bay marine SPA.

Investment Needs summary: A full list of the Investment needs identified for the Cuckmere & Pevensey Levels river basin district catchment can be found in the Investment Plan. A summary of the investment needs is outlined below:

- Control / reduce surface water run-off: Surface water separation, to tackle flooding in Hastings, Bexhill (HABX), Hailsham, Polegate (HAIS), Eastbourne (EALP) and at Bexhill and Hastings WTW and Eastbourne WTW.
- Improve quality of wastewater: Customer education programmes (HABX, HAIN, EALP).
- Improve sewer network: Enhanced maintenance (HABX, HAIS, HAIN, EALP).
- Improve sewer network: Pipe rehabilitation programme (HABX, HAIS, HAIN).
- Improve treatment quality: Review permit for the WTW for HABX, HAIS, HAIN, EALP.
- Studies: Develop nutrient budget to understand risks and sources impacting habitat sites – Hastings Cliff (HABX).

- Studies: Drainage model improvements for HABX, HAIS, HAIN.
- Studies: Understand the risks and sources that Phosphate, Macrophytes and Phytobenthos have on the linked waterbodies - HABX (Doleham Ditch, East Stream); HAIN (Cuckmere from Warbleton to Lower Horsebridge).

Construction impacts: Construction activities from surface water separation solutions, sewer improvements, WTW capacity increases and studies have potential for minor adverse effects across a number of the SEA objectives:

- Potential for pollution effects associated with construction impacts to designated sites and sensitive receptors.
- Options to increase size of sewers and construction of new sewers could result in permanent soil loss, although majority of land is not high grade agricultural land.
- There is potential for impacts to groundwater sources during construction including risk of pollution, receptors include Hastings Beds Cuckmere and Pevensey Levels, potential receptors include SPZ depending on location of sewer system upgrades, Eastbourne WTW is located with SPZ2. Potential construction impacts on Hurst Haven at Hailsham Nitrate Vulnerable Zone (NVZ). There may be a temporary increased risk of flooding during construction depending on location; there are areas of flood zone 2 and 3 within the catchment.
- Impacts to landscape and visual amenity are likely to be temporary during construction period, receptors include Pevensey Levels National Character Area (NCA).
- Likely temporary increase in emissions from construction and temporary impact on air quality can be mitigated by best practice construction techniques.
- Depending on the location of construction works, there is potential to impact on the visual setting of historic assets during construction. Excavation required during construction works may have potential to impact buried archaeology if present.
- Prior to the start of construction impacts on the local community will need to be assessed, noise potential as well as disruption to traffic and public rights of way. Depending on the location of construction works potential receptors may include schools, open access areas, green spaces and residential areas, potential to impact community and facilities.
- Likely temporary impacts during construction on roads and traffic from increased congestion and partial road closures; potential receptors include major roads.

Operational Impacts: Major benefits to the resilience and reliability of wastewater systems anticipated as well as potential benefits to reducing flood risk and positive effects on water quality within the environment, the local community and material assets, climate change risks and hazards. The following operational impacts were identified:

- Potential benefits biodiversity and to the condition of designated sites resulting from improvements to wastewater system and reduction in flood risk as well as the development of a nutrient budget to understand the risks and sources impacting Habitat sites, potential receptors include the Hastings Cliffs to Pett Beach SSSI.
- Potential major reduction in flood risk catchment wide in particular benefits to Reduction of flooding and increased sewer capacity and attenuation capacity will reduce the instances of pollution events. Potential for long-term positive effects on the chemical and ecological status of water environments.
- Likely benefits to flooding associated climate change risks and hazards.

- Potential major benefits to public health, safety and hygiene will likely result from measures to reduce flooding and keep wastewater within sewage systems prior to treatment.
- Potential major benefits to public health, safety and hygiene will likely result from measures to reduce flooding and keep wastewater within sewage systems prior to treatment. Benefits to South Hailsham, Polegate, Willingdon, South Hailsham, Polegate, Willingdon, Eastbourne, Hampden Park, Langney, Westham, Pevensey, Stone Cross, Meads, Old Town, North Hailsham, Hellingly, Upper/Lower Dicker, Muddles Green, Whitesmith, Chiddingly, Magham Down, Bexhill, Hastings, Crowhurst, Norman's Bay, St Leonards, Baldslow.

Table 15: Level 2 findings for Cuckmere and Pevensey Levels

River basin district catchment		SEA Topics and Objectives											
		Biodiversity flora & fauna	Soil, geology & land use	Water			Air	Climatic Factors		Landscape	Cultural Heritage	Population, Communities and Human Health	Material Assets
		1.1	2.1	3.1	3.2	3.3	4.1	5.1	5.2	6.1	7.1	8.1	8.2	9.1
Cuckmere and Pevensey Levels	Construction	-	-	o	-	o	-	-	o	-	o	-	-	-
	Operation	+	o	+	+++	+++	o	-	++	o	o	+++	o	o

See Figure 7 for scoring key

4.3.4. East Hampshire

Catchment wastewater systems: There are seven sewer catchments in East Hampshire. BRAVA identified very significant issues relating to Pollution Risk, Risk of Sewer Flooding in a 1 in 50 year storm, Storm Overflow performance, Risk of WTW Compliance Failure, Risk of flooding due to Hydraulic Overload, Surface Water Management, Nutrient Neutrality, Groundwater Pollution and Shellfish Waters for sewer catchments within this river basin catchment. In particular, very significant issues across multiple planning objectives were identified in Budds Farm Havant (BUDD), and Storm Overflow performance and Nutrient Neutrality were identified as very significant issues across several of the sewer catchments.

Catchment area summary: The East Hampshire river basin catchment is home to around 460,000 people. The largely rural upper catchment consists of rolling chalk downland with small villages and hamlets. In contrast, the flat, heavily urbanised coastal plain to the south contains the larger towns and cities of Portsmouth, Havant, Waterlooville, Fareham and Gosport and is one of the most densely populated areas in the UK. Designated sites within the catchment include two SACs (Butser Hill and Solent Maritime), three SPAs (Solent & Southampton Water, Portsmouth Harbour, and Chichester and Langstone Harbours) all three of which are also Ramsar sites. There are also two chalk streams in the catchment, Meon and Whitewool Stream, which combined cover 49km.

Investment Needs summary: A full list of the Investment needs identified for the East Hampshire river basin district catchment can be found in the Investment Plan. A summary of the investment needs is outlined below:

- Control / reduce surface water run-off: Surface water separation, to tackle flooding at Southsea, Northend, Tipner, Hayling Island, Portsmouth, Paulsgrove /Cosham, Havant, Waterlooville, Denmead (BUDD) and Gosport and Peel Common WTW (PEEL).

- Improve sewer network: Pipe rehabilitation programme in BUDD to reduce risk of groundwater pollution.
- Improve sewer network: Attenuate excess flows, including upsizing sewers (Fareham, Warsash, Botley) new sewers (Netley), new pumping stations (Hamble) and new storage capacity.
- Improve treatment capacity: works to increase treatment capacity at Budds Farm WTW and Peel Common WTW.
- Studies: Develop nutrient budget to understand risks and sources impacting the following habitat sites – Chichester Harbour, Langstone Harbour, Portsmouth Harbour and Solent and Dorset Coast.
- Studies: Drainage model improvements for BUDD, PEEL.
- Studies: Identify suitable locations for natural flood management and surface water separation.
- Studies: Investigate sources of nitrogen from wastewater with the aim to reduce nitrogen in Portsmouth Water, Southampton Water (PEEL)

Construction impacts: Construction activities from surface water separation solutions, sewer improvements, WTW capacity increases and studies have potential for minor adverse effects across a number of the SEA objectives:

- Potential for pollution effects associated with construction impacts to designated sites and sensitive receptors.
- There is potential for impacts to groundwater sources during construction including risk of pollution, potential receptors include zone 1 SPZ and nitrate vulnerable area located under Budds Farm Havant. Prior to the start of construction activities, potential impacts on WFD water bodies will need to be assessed. There may be a temporary increased risk of flooding during construction depending on location; there are areas of flood zone 2 and 3 within the Budds Farm Havant and Peel Common Catchments.
- Impacts to landscape and visual amenity are likely to be temporary during construction period, receptors include Chichester Harbour Area of Outstanding Natural Beauty (AONB).
- Likely temporary increase in emissions from construction and temporary impact on air quality. Can be mitigated by best practice construction techniques.
- Depending on the location of construction works, there is potential to impact on the visual setting of historic assets during construction, potential receptors include Registered Parks and Gardens, Scheduled monuments and listed buildings. Excavation required during construction works may have potential to impact buried archaeology if present.
- Prior to the start of construction impacts on the local community will need to be assessed, noise potential as well as disruption to traffic and public rights of way. Depending on the location of construction works potential receptors may include schools, universities, medical facilities, open access areas, green spaces and residential areas, potential to impact community and facilities, potential receptors within Southsea, North End and Tipner, Hayling Island, Portsmouth, Paulsgrove / Cosham, Havant, Waterlooville, Gosport and Denmead, Fareham, Gosport, Lee-on-the-Solent, Stubbington, Locks Heath, Netley, Bursledon, Hamble le Rice, Hedge End, Swanwick, Curdridge, Titchfield, Portchester.
- Likely temporary impacts during construction on roads and traffic from increased congestion and partial road closures; potential receptors include the A3 and the A3023.

Operational Impacts: Major benefits to the resilience and reliability of wastewater systems anticipated as well as potential benefits to reducing flood risk and positive effects on water quality within the environment, the local community and material assets, climate change risks and hazards. The following operational impacts were identified:

- Potential benefits biodiversity and to the condition of designated sites resulting from surface water removal/separation and natural flood management, potential receptors include: Chichester Harbour, Langstone Harbour, Portsmouth Harbour and Solent and Dorset Coast.
- Potential benefits to Bathing waters and Shellfish waters.
- Potential major reduction in flood risk catchment wide in particular benefits to Reduction of flooding and increased sewer capacity and attenuation capacity will reduce the instances of pollution events, in line with WFD objectives. Potential for long-term positive effects on the chemical and ecological status of water environments. Natural flood management may have positive impacts on water quality within the environment. Major positive effects to the resilience and reliability of the Budds Farm Havant and Peel Common wastewater systems.
- Likely benefits to flooding associated climate change risks and hazards.
- Potential major benefits to public health and communities will likely result from measures to reduce flooding and keep wastewater within sewage systems prior to treatment. Benefits to Residential areas including Southsea, North End and Tipner, Hayling Island, Portsmouth, Paulsgrove / Cosham, Havant, Waterlooville and Denmead, Fareham, Gosport, Lee-on-the-Solent, Stubbington, Locks Heath, Netley, Bursledon, Hamble le Rice, Hedge End, Swanwick, Curdridge, Titchfield, Portchester.
- Decisions to upgrade sewer assets are likely to be based on whole-life costs and replacing assets avoids constructing new assets and therefore additional embodied carbon, reducing material requirements in the longer term.

Table 16: Level 2 findings for East Hampshire

River basin district catchment		SEA Topics and Objectives												
		Biodiversity flora & fauna	Soil, geology & land use	Water			Air	Climatic Factors		Landscape	Cultural Heritage	Population, Communities and Human Health		Material Assets
		1.1	2.1	3.1	3.2	3.3	4.1	5.1	5.2	6.1	7.1	8.1	8.2	9.1
East Hampshire	Construction	-	-	o	-	o	-	-	o	-	o	-	-	-
	Operation	+	o	+	+++	+++	o	-	++	o	o	+++	o	o

See Figure 7 for scoring key

4.3.5. Isle of Wight

Catchment wastewater systems: There are 20 wastewater systems in Isle of Wight. BRAVA identified very significant issues relating to the majority of Planning Objectives In particular, very significant issues across

multiple planning objectives were identified in Sandown (SAND), and Storm Overflow performance and Nutrient Neutrality were identified as very significant issues across several of the sewer catchments.

Catchment area summary: The Isle of Wight is the largest island in England and home to around 142,000 people. Apart from the town of Newport which is located in the centre of the island, urban development lies mainly along the coast. The major coastal towns are Ryde, Cowes, Sandown, Shanklin, Yarmouth and Ventnor. A number of smaller villages are also present on the coast and in the rural countryside. Natura 2000 sites within the catchment include: SACs (Solent Maritime, Briddlesford Copses, Solent & Isle of Wight Lagoons, South Wight Maritime, Isle of Wight Downs), a Ramsar site (Solent & Southampton Water), and three MCZs (The Needles, Yarmouth to Cowes, and Bembridge).

Investment Needs summary: A full list of the Investment needs identified for the Isle of Wight river basin district catchment can be found in the Investment Plan. A summary of the investment needs is outlined below:

- Control / reduce surface water run-off: Surface water separation, particularly at storm overflows at Sandown WTW, Sandown, Newport, Cowes and Yarmouth.
- Improve sewer network: Attenuate excess flows in sewer network by upsizing sewers (Sandown, Newport, Yarmouth) and creating new sewers (Newport).
- Improve treatment quality: Works to increase capacity of Sandown WTW.

Construction impacts: Construction activities from surface water separation solutions, storm overflows and sewer capacity upgrades have potential for minor adverse effects across a number of the SEA objectives:

- Potential for disturbance effects from noise and air pollution associated with construction impacts to designated sites and sensitive receptors should these be within the vicinity of the construction of sewers and surface water separation.
- Options to increase size of sewers and construction of new sewers will likely result in permanent soil loss. Potential loss of grade 3 agricultural land classification.
- Prior to the start of construction activities, potential impacts on WFD water bodies will need to be assessed. The Sandown catchment is within a NVZ. There may be a temporary increased risk of flooding during construction depending on location; there are areas of flood zone 2 and 3 within the catchment North of Sandown WTW.
- Impacts to landscape and visual amenity are likely to be temporary during construction period, receptors include Isle of Wight AONB.
- Likely temporary increase in emissions from construction and temporary impact on air quality can be mitigated by best practice construction techniques.
- Depending on the location of construction works, there is potential to impact on the visual setting of historic assets during construction. Excavation required during construction works may have potential to impact buried archaeology if present.
- Prior to the start of construction impacts on the local community will need to be assessed, noise potential as well as disruption to traffic and public rights of way. Depending on the location of construction works potential receptors may include schools in proximity to Sandown WTW, open access areas, green spaces and residential areas.
- Likely temporary impacts during construction on roads and traffic from increased congestion and partial road closures.

Operational impacts: Major benefits to the resilience and reliability of wastewater systems anticipated as well as potential benefits to reducing flood risk and positive effects on water quality within the environment, the local community and material assets, climate change risks and hazards. The following operational impacts were identified:

- Potential benefits biodiversity and to the condition of designated sites resulting from improvements to wastewater system and reduction in flood risk and pollution. Potential positive effects on Bembridge Down SSSI, South Wight Maritime SAC and the Solent and Dorset Coast SPA.
- Potential major reduction in flood risk catchment wide in particular benefits to Reduction of flooding and increased sewer capacity and attenuation capacity will reduce the instances of pollution events, in line with WFD objectives.
- Likely benefits to flooding associated climate change risks and hazards.
- Potential major positive effects to public health, safety and hygiene will likely result from measures to reduce flooding and keep wastewater within sewage systems prior to treatment; potential to impact community and facilities within Newchurch, Alverstone, Brading, Bembridge, Nettlestone, Seaview, Ryde, Wootton, Havenstreet, Newport, Cowes, East Cowes, Gurnard, Northwood, Yarmouth, Freshwater, Totland.
- Decisions to upgrade sewer assets are likely to be based on whole-life costs and replacing assets avoids constructing new assets and therefore additional embodied carbon, reducing material requirements in the longer term.

Table 17: Level 2 findings for Isle of Wight

River basin district catchment		SEA Topics and Objectives												
		Biodiversity flora & fauna	Soil, geology & land use	Water			Air	Climatic Factors		Landscape	Cultural Heritage	Population, Communities and Human Health		Material Assets
		1.1	2.1	3.1	3.2	3.3	4.1	5.1	5.2	6.1	7.1	8.1	8.2	9.1
Isle of Wight	Construction	-	-	o	-	o	-	-	o	-	o	-	-	-
	Operation	+	o	+	+++	+++	o	-	++	o	o	+++	o	o

See Figure 7 for scoring key

4.3.6. Medway

Catchment wastewater systems: There are 77 wastewater systems in Medway. The BRAVA stage identified very significant issues relating to the majority of the Planning Objectives. The priority wastewater systems in this catchment are Gravesend (GRAV), Horsmondon (HORS), Motney Hill (MOTN), Paddock Wood (PAWD), Redgate Mill Crowborough (CRRM), Staplehurst (STAP), Tonbridge (TONB), Tunbridge Wells North (TUWN) and Tunbridge Wells South (TUWS).

Catchment area summary: The Medway river basin district catchment is largely rural, although it has some major towns such as Royal Tunbridge Wells, Tonbridge, Maidstone and the Medway towns of Rochester, Chatham, Gillingham and Gravesend. Nearly three quarters of the catchment is protected by the national landscape designations of the Kent Downs AONB and the High Weald AONB, and the Medway Swale Estuary is designated as a MCZ. There is also a chalk stream in the catchment, Holborough Springs, covering 1.5km.

Investment Needs summary: A full list of the Investment needs identified for the Medway river basin district catchment can be found in the Investment Plan. A summary of the investment needs is outlined below:

- Control / reduce surface water run-off: Surface water separation, to tackle flooding in all priority wastewater systems and at Paddock Wood WTW.
- Improve quality of wastewater: Customer education programmes in all priority wastewater systems.
- Improve sewer network: Enhanced maintenance (TUWS, MOTN, GRAV, HORS, STAP, TONB, PAWD).
- Improve sewer network: Pipe rehabilitation programme in all wastewater systems (except CRRM and STAP).
- Improve sewer network: Attenuate excess flows across all priority wastewater systems, with works including upsizing sewers, new sewers, new storage, uprate or new pumping stations.
- Improve treatment quality: Review permit and increase capacity for the WTW for TUWN, TUWS, TONB and MOTN and increase capacity of WTW at GRAV, HORS, PAWD and STAP.
- Studies: Develop nutrient budget to understand risks and sources impacting the following habitat sites – The Swale and Medway Estuary and Marshes.
- Studies: Drainage model improvements for TUWN, PAWD, STAP.

Construction impacts: Construction activities from increasing sewer capacities, construction of new surface water sewer, WTW capacity increase, construction of pumping stations and sewers have potential for minor adverse effects across a number of the SEA objectives:

- Potential for disturbance effects from noise and air pollution associated with construction impacts to designated sites and sensitive receptors should these be within the vicinity of the options construction.
- Options to increase size of sewers and construction of new sewers could result in permanent soil loss, outside of urban areas.
- There is potential for impacts to groundwater sources during construction including risk of pollution, potential receptors include SPZs located within Gravesend, Motney Hill, Tunbridge Wells North and Horsmonden.
- Depending on the location of construction works, there is potential to impact on the visual setting of historic assets during construction, potential receptors include Registered Parks and Gardens, Calverley Park and Calverley Grounds. Excavation required during construction works may have potential to impact buried archaeology if present.
- Prior to the start of construction impacts on the local community will need to be assessed, noise potential as well as disruption to traffic and public rights of way. Depending on the location of construction works potential receptors may include schools, medical facilities, open access areas, green spaces and residential areas, potential to impact community and facilities.

- Likely temporary increase in emissions from construction and temporary impact on air quality can be avoided by best practice construction techniques.
- Impacts to landscape and visual amenity are likely to be temporary during construction period, receptors include High Weald NCA.
- Likely temporary impacts during construction on roads and traffic from increased congestion and partial road closures; potential receptors include the A26 and the A264.

Operational Impacts: Major benefits to the resilience and reliability of wastewater systems anticipated as well as potential benefits to water quality within the environment, the local community and material assets, climate change risks and hazards. The following operational impacts were identified:

- Potential benefits biodiversity and to the condition of designated sites through nutrient budget assessment and surface water removal, potential receptors include: Medway Estuary and Marshes SSSI, South Thames Estuary and Marshes SSSI and the River Beult SSSI.
- Potential major reduction in flood risk catchment wide in particular benefits to residential areas. Reduction of flooding and increased sewer capacity and attenuation capacity will reduce the instances of pollution events, in line with WFD objectives. Potential for long-term positive effects on the chemical and ecological status of water environments.
- Likely benefits to flooding associated climate change risks and hazards.
- Benefits to Community and Public heath, resulting from reduced risk of flooding.
- Potential major benefits to public health, safety and hygiene will likely result from measures to reduce flooding and keep wastewater within sewage systems prior to treatment.
- Benefits to Residential areas including Tunbridge Wells, Bells Yew Green, Langton Green, Groombridge, Rusthall potential benefits for future developments, Gravesend, Cobham, Meopham, Northfleet, Green, Northfleet, Shorne, Southfleet, Vigo, Crowborough, Castle Hill, Mark Cross, Rotherfield, Stone Cross, Town Row, Hardfield, Castle Hill, Mark Cross, Colemans Hatch, Withyham, Eridge Green, Chatham, Bluebell Hill, St. Marys Island, Walderslade, Gillingham, Brompton, Gillingham, Business Park, Hempstead, Rainham, Rochester, Allhallows, Burham, Chattenden, Cliffe Woods, Cliffe, Cooling, Cuxton, Halling, High Halstow, Highham, Hoo, Lower Stoke, Medway City Estate, Middle Stoke, St. Marys Hoo, Strood, Upper Stoke, Wainscott, Wouldham, Rochester, Gillingham, Walderslade, Upchurch, Newington, Rainham, Hartlip, Bredhurst, Tonbridge, Staplehurst,.
- Decisions to upgrade sewer assets are likely to be based on whole-life costs and replacing assets avoids constructing new assets and therefore additional embodied carbon, reducing material requirements in the longer term.

Table 18: Level 2 findings for Medway

River basin district catchment		SEA Topics and Objectives												
		Biodiversity flora & fauna	Soil, geology & land use	Water			Air	Climatic Factors		Landscape	Cultural Heritage	Population, Communities and Human Health		Material Assets
		1.1	2.1	3.1	3.2	3.3	4.1	5.1	5.2	6.1	7.1	8.1	8.2	9.1
Medway	Construction	-	-	o	-	o	-	-	o	-	o	-	-	-
	Operation	+	o	+	+++	+++	o	-	++	o	o	+++	o	o

See Figure 7 for scoring key

4.3.7. New Forest

Catchment wastewater systems: There are 16 wastewater systems in New Forest. BRAVA identified very significant issues relating to the majority of Planning Objectives. In particular, very significant issues across multiple planning objectives were identified in Slowhill Copse Marchwood (SLOW), Brockenhurst (BROC), Ashlett Creek Fawley (ASHL), Lyndhurst (LYND) and Pennington (PENN).

Catchment area summary: Southern Water provides wastewater services to approximately 150,000 people living in the New Forest river basin district catchment. The catchment includes a number of settlements including New Milton, Lyndhurst, Brockenhurst, Lymington, Ashurst, Brockenhurst, Lyndhurst and Sway. Designated sites within the catchment include three SACs (The New Forest SAC, Solent & Isle of Wight Lagoons SAC and Solent Maritime SAC), two SPAs (Solent & Southampton Water SPA and New Forest SPA), two Ramsar sites (New Forest and Solent & Southampton Water).

Investment Needs summary: A full list of the Investment needs identified for the New Forest river basin district catchment can be found in the Investment Plan. A summary of the investment needs is outlined below:

- Control / reduce surface water run-off: Surface water separation to tackle flooding including Lymington (PENN), Ashurst (SLOW), Ashlett Creek Fawley (ASHL), Brockenhurst WTW and Lyndhurst WTW.
- Improve quality of wastewater: Customer education in SLOW wastewater system.
- Improve sewer network: Enhanced maintenance using proactive jetting in Central Totton, West Totton, Ashurst, Marchwood, Hythe (SLOW) and enhanced maintenance of wastewater pumping stations at Holly Lane Ashely and Peters Lane New Milton (PENN).
- Improve sewer network: Pipe rehabilitation programme at SLOW.
- Improve sewer network: Attenuate excess flows in sewer network by upsizing sewer (PENN, SLOW) and new storage tanks (PENN).
- Improve treatment quality: Works to increase capacity of Pennington WTW, Slowhill Copse WTW, Brockenhurst WTW.
- Study: Develop nutrient budget to understand risks and sources impacting the following habitat sites – Solent and Dorset Coast, Solent and Southampton Water, and Solent Maritime.
- Studies: Drainage model improvements for all priority wastewater systems.

- Studies: Identify suitable locations for natural flood management and surface water separation (SLOW).
- Studies: Shellfish Water study (ASHL).

Construction impacts: Construction activities from increasing capacity of WTW, surface water separation solutions have potential for minor adverse effects across a number of the SEA objectives:

- Potential for pollution effects associated with construction impacts to designated sites and sensitive receptors should the solutions to the investment needs require land or have indirect consequences on protected habitats.
- There is potential for impacts to groundwater sources during construction including risk of pollution, receptors include South West Hants Barton Group, potential receptors include SPZ (Lymmington). Prior to the start of construction activities. There may be a temporary increased risk of flooding during construction depending on location; there are areas of flood zone 2 and 3 within the catchment including Brokenhurst and Lymmington.
- Impacts to landscape and visual amenity are likely to be temporary during construction period, receptors include New Forest National Park.
- Likely temporary increase in emissions from construction and temporary impact on air quality can be avoided by best practice construction techniques.
- Depending on the location of construction works, there is potential to impact on the visual setting of historic assets during construction. Excavation required during construction works may have potential to impact buried archaeology if present.
- Prior to the start of construction impacts on the local community will need to be assessed, noise potential as well as disruption to traffic and public rights of way. Depending on the location of construction works potential receptors may include schools, open access areas, green spaces and residential areas, potential to impact community and facilities, and residential properties.
- Likely temporary impacts during construction on roads and traffic from increased congestion and partial road closures; potential receptors include major roads.
- Decisions to upgrade sewer assets are likely to be based on whole-life costs and replacing assets avoids constructing new assets and therefore additional embodied carbon, reducing material requirements in the longer term.

Operational impacts: Major benefits to the resilience and reliability of wastewater systems anticipated as well as potential benefits to reducing flood risk and positive effects on water quality within the environment, the local community and material assets, climate change risks and hazards. The following operational impacts were identified:

- Potential benefits biodiversity and to the condition of designated sites resulting from surface water removal/separation and natural flood management, potential receptors include: Solent and Dorset Coast, Solent and Southampton Water, and Solent Maritime.
- Potential benefits to Bathing waters and Shellfish waters.
- Potential major reduction in flood risk catchment wide in particular benefits to Reduction of flooding and increased sewer capacity and attenuation capacity will reduce the instances of pollution events, in line with WFD objectives. Potential for long-term positive effects on the chemical and ecological status of water environments.
- Likely benefits to flooding associated climate change risks and hazards.

- Benefits to Community and Public heath, resulting from reduced risk of flooding with potential benefits to within Lymington, New Milton, Barton on Sea, Everton, Hordle, Milford on Sea, Bashley, Bowling Green, Brockenhurst, Marchwood, Hythe, Totton, Ashurst, Cadnam, Copythorne, Newbridge, Dibden Purlieu, Ashlett, Fawley, Calshot, Blackfield, Holbury, Hardley.
- Potential major benefits to public health, safety and hygiene will likely result from measures to reduce flooding and keep wastewater within sewage systems prior to treatment.
- Potential benefits to Shellfish Waters and Bathing Waters.
- Decisions to upgrade sewer assets are likely to be based on whole-life costs and replacing assets avoids constructing new assets and therefore additional embodied carbon, reducing material requirements in the longer term.

Table 19: Level 2 findings for New Forest

River basin district catchment		SEA Topics and Objectives												
		Biodiversity flora & fauna	Soil, geology & land use	Water			Air	Climatic Factors		Landscape	Cultural Heritage	Population, Communities and Human Health		Material Assets
		1.1	2.1	3.1	3.2	3.3	4.1	5.1	5.2	6.1	7.1	8.1	8.2	9.1
New Forest	Construction	-	-	o	-	o	-	-	o	-	o	-	-	-
	Operation	+	o	+	+++	+++	o	-	++	o	o	+++	o	o

See Figure 7 for scoring key

4.3.8. North Kent

Catchment wastewater systems: There are five wastewater systems within North Kent: Sittingbourne (SITT), Queenborough (QUEE), Faversham (FAVE), Eastchurch (EAST) and Teynham (TEYN). BRAVA identified the following issues: Very significant Pollution risk in Queenborough, Faversham and Eastchurch. Very significant issues relating to Storm Overflow performance were identified within Sittingbourne, Queenborough, Faversham and Eastchurch. Very significant issues with Nutrient Neutrality were identified in all wastewater systems. Very significant issues with internal Sewer flooding risk were identified within Faversham and Teynham. Queenborough has very significant risk of sewer collapse, sewer flooding in a 1 in 50 year storm and Risk of flooding from Hydraulic Overload.

Catchment area summary: Approximately 155,000 people live in the river basin catchment. It is predominately a rural area but there are a number of important urban centres, including Sittingbourne, Faversham, Sheerness and Minster. Designated sites within the catchment include; The Swale (SSSI, SAC, RAMSAR), Medway Estuary and Marshes (SSSI, SAC, RAMSAR) and The Swale Estuary (MCZ).

Investment Needs summary: A full list of the Investment needs identified for the North Kent river basin district catchment can be found in the Investment Plan. A summary of the investment needs is outlined below:

- Control / reduce surface water run-off: Surface water separation to tackle flooding in Faversham (FAVE), Queenborough, Minster, Sheerness (QUEE) and Sittingbourne (SITT).
- Improve quality of wastewater: Customer education programmes in all priority wastewater systems.
- Improve sewer network: Enhanced maintenance using proactive jetting in all priority wastewater systems and enhanced maintenance of wastewater pumping stations in FAVE.
- Improve sewer network: Pipe rehabilitation programme in FAVE, QUEE (Minster and Sheerness) and SITT (to protect Source Protection Zone).
- Improve sewer network: Attenuate excess flows in sewer network by upsizing sewers in all priority wastewater systems, new sewers in SITT, new storage in FAVE and QUEE and new / uprated pumping stations in SITT (Swale Way, A249).
- Improve treatment quality: Review permit and increase capacity at Sittingbourne WTW and Queenborough WTW.
- Wastewater transfer: Transfer some flows from Drove Road WPS direct to Queenborough WTW (QUEE).
- Studies: Develop nutrient budget to understand risks and sources impacting the following habitat sites – The Swale and Medway Estuary and Marshes.
- Studies: Drainage model improvements for all priority wastewater systems.
- Studies: Shellfish Water studies for Swale Central (FAVE and SITT) and Swale East (FAVE).
- Studies: Understand the impact of wastewater discharges and measure to achieve 'Good Ecological Status' in the Sarre Penn and River Wantsum.

Construction impacts: Construction activities from sewer capacity upgrades, capacity upgrades to WTW and implementation of SuDs and construction of rainfall storage and separation have potential for minor adverse effects across a number of the SEA objectives:

- Potential for disturbance effects from noise and air pollution associated with construction impacts to designated sites and sensitive receptors should these be within the vicinity of the options construction.
- Options to increase size of sewers and construction of new sewers will likely result in permanent soil loss where these occur in areas not already developed.
- There is potential for impacts to groundwater sources during construction. A large area to the south of Sittingbourne WTW is located within a SPZ. There may also be a temporary increased risk of flooding during construction. Prior to the start of construction activities, potential impacts on local water bodies will need to be assessed. Most of the North of the RBD catchment is within flood zone 2 and 3 potentially affecting construction within Queensborough, Faversham and Sittingbourne.
- Likely temporary increase in emissions from construction and temporary impact on air quality can be avoided by best practice construction.
- Impacts to landscape and visual amenity are likely to be temporary during construction period with the exception of SuDs. Receptors include North Kent Plain (encompassing Sittingbourne and Faversham) and North Downs AONB (in proximity to Faversham).
- Prior to the start of construction impacts on the local community will need to be assessed, noise potential as well as disruption to traffic and public rights of way. Potential receptors include schools, medical facilities, open access areas, green spaces, residential areas.

- Likely temporary impacts during construction on roads and traffic from increased congestion to partial closures in particular the B2231 during works at Queensborough and the A2 during works in Faversham and Sittingbourne and the A249.

Operational impacts: Major benefits to the resilience and reliability of wastewater systems anticipated as well as potential benefits to water quality within the environment, the local community and material assets, climate change risks and hazards. The following operational impacts were identified:

- Potential for long-term positive effects on the chemical and ecological status of water environments including the Sarre Penn and Wantsum water body, plus The Swale and Medway Estuary and Marshes.
- Potential major reduction in flood risk catchment wide.
- Likely benefits to flooding associated climate change risks and hazards, in particular, benefits to the Queenborough wastewater system.
- Reduction in the risk of pollution. Increased sewer capacity and attenuation capacity will reduce the instances of pollution events.
- Potential major benefits to public health, safety and hygiene will likely result from measures to reduce flooding and keep waste water within sewage systems prior to treatment.
- Potential benefits to Faversham Creek and Shellfish Waters.

Table 20: Level 2 findings for North Kent

River basin district catchment		SEA Topics and Objectives												
		Biodiversity flora & fauna	Soil, geology & land use	Water			Air	Climatic Factors		Landscape	Cultural Heritage	Population, Communities and Human Health		Material Assets
		1.1	2.1	3.1	3.2	3.3	4.1	5.1	5.2	6.1	7.1	8.1	8.2	9.1
North Kent	Construction	-	-	o	-	o	-	-	o	-	o	-	-	-
	Operation	+	o	+	+++	+++	o	-	++	o	o	+++	o	-

See Figure 7 for scoring key

4.3.9. Rother

Catchment wastewater systems: There are 56 wastewater systems in the Rother river basin district catchment. BRAVA identified very significant issues relating to the majority of Planning Objectives. In particular, very significant issues across multiple planning objectives were identified in Rye (RYEW) and Fairlight (FAIR), and Pollution Risk, Storm Overflow performance and Nutrient Neutrality were identified as very significant issues across several of the sewer catchments.

Catchment area summary: Around 100,000 people live in the Rother river basin district catchment. There are several towns within the catchment including Rye, Tenterden, Hythe, Dymchurch, Lydd, Robertsbridge and New Romney, and many villages scattered across the area. Designated sites within the catchment include Folkestone to Etchinghill Escarpment (SSSI, SAC), Dungeness (SSSI, SAC, SPA, Ramsar, NNR), Romney Marsh and Rye Bay (SSSI, SPA, Ramsar) and Dover to Folkestone (MCZ).

Investment Needs summary: A full list of the Investment needs identified for the Rother river basin district catchment can be found in the Investment Plan. A summary of the investment needs is outlined below:

- Control / reduce surface water run-off: Attenuation measures including roof drainage and permeable car parks at Rye Primary School and Rye College (RYE).
- Improve quality of wastewater: Customer education in RYE and FAIR wastewater systems.
- Improve sewer network: Enhanced maintenance using proactive jetting in RYE, FAIR.
- Improve sewer network: Enhanced maintenance of wastewater pumping stations in RYE.
- Improve sewer network: Pipe rehabilitation programme at Old Town (RYE) and Lower Waites Lane (FAIR).
- Improve sewer network: Attenuate excess flows in sewer network by upsizing sewer and storage tanks (RYE).
- Improve treatment quality: Works to increase capacity of Rye WTW.
- Studies: Develop nutrient budget to understand risks and sources impacting the following habitat sites – Dungeness, Romney Marsh and Rye Bay.

Construction impacts: Construction activities from upsizing sections of local sewers, construction of storm tanks, upsizing of existing sewer network, increase in capacity upgrades to WTW, Surface water removal/diversion have potential for minor adverse effects across a number of the SEA objectives:

- Potential for disturbance effects from noise and air pollution associated with construction impacts to designated sites and sensitive receptors should these be within the vicinity of the options construction.
- Options to increase size of sewers and construction of new sewers will likely result in permanent soil loss, potential receptors include areas of Grade 2 agricultural land around Rye.
- There is potential for impacts to groundwater sources during construction including risk of pollution, potential receptors include nitrate vulnerable areas; located under St Margaret's terrace CSO, Source Protection Zones; located at Brede, Fairlight, Lydd on Sea to Dungeness, Newington, Matfield, Etchingham, Bewl water. Prior to the start of construction activities, potential impacts on WFD water bodies will need to be assessed. There may be a temporary increased risk of flooding during construction; land within flood zones 2 and 3 is confined to areas adjacent to waterbodies within both Rye and Fairlight wastewater systems.
- Prior to the start of construction impacts on the local community will need to be assessed, noise potential as well as disruption to traffic and public rights of way. Potential receptors include those in Rye Old Town and at Rye Primary School and Rye College. Depending on the location of construction works there is potential for impacts to users of local facilities where works are taking place e.g attenuation measures in schools by retrofitting and redirecting roof drainage to rain gardens and soakaways and where car parks to be converted to permeable areas.
- Likely temporary increase in emissions from construction and temporary impact on air quality can be avoided by best practice construction techniques.
- Impacts to landscape and visual amenity are likely to be temporary during construction period, receptors include Romney Marshes NCA, High Weald AONB High Weald NCA.
- Likely temporary impacts during construction on roads and traffic from increased congestion and partial road closures in particular the A259 during works at Rye WTW.

Operational impacts: Major benefits to the resilience and reliability of wastewater systems anticipated as well as potential benefits to water quality within the environment, the local community and material assets, climate change risks and hazards. The following operational impacts were identified:

- Potential benefits biodiversity and to the condition of designated sites through nutrient budget assessment and surface water removal, potential receptors include: Dungeness, Romney Marsh and Rye Bay.
- Potential major reduction in flood risk catchment wide and a reduction in the risk of pollution catchment wide. Increased sewer capacity and attenuation capacity will reduce the instances of pollution events, in line with WFD objectives.
- Likely benefits to flooding associated climate change risks and hazards.
- Potential major benefits to public health, safety and hygiene will likely result from measures to reduce flooding and keep wastewater within sewage systems prior to treatment.
- Potential benefits to fishing tourism as water quality within the catchment
- Decisions to upgrade sewer assets are likely to be based on whole-life costs and replacing assets avoids constructing new assets and therefore additional embodied carbon, reducing material requirements in the longer term.

Table 21: Level 2 findings for Rother

River basin district catchment		SEA Topics and Objectives												
		Biodiversity flora & fauna	Soil, geology & land use	Water			Air	Climatic Factors		Landscape	Cultural Heritage	Population, Communities and Human Health		Material Assets
		1.1	2.1	3.1	3.2	3.3	4.1	5.1	5.2	6.1	7.1	8.1	8.2	9.1
Rother	Construction	-	-	o	-	o	-	-	o	-	o	-	-	-
	Operation	+	o	+	+++	+++	o	-	++	o	o	+++	o	o

See Figure 7 for scoring key

4.3.10. Stour

Catchment wastewater systems: There are 21 wastewater systems in Stour river basin district catchment. BRAVA identified very significant issues relating to the majority of Planning Objectives In particular, very significant issues across multiple planning objectives were identified in Swalecliffe (SWAL) and Weatherlees Hill (WEAT), and Risk of Sewer Flooding in a 1 in 50 year storm, Good Ecological Status/Potential and Nutrient Neutrality were identified as very significant issues across several of the sewer catchments. Other priority wastewater systems include Chartham (CGAR), Herne Bay (HERN), Canterbury (CANT), Broomfield Bank (BROO), Westbere (WBER), Dambridge Wingham (DAMB), and Margate and Broadstairs (WEHB).

Catchment area summary: Around 590,000 people live in the River Stour river basin district catchment. It includes some large urban areas such as the historic cathedral city of Canterbury, the ferry port of Dover, the expanding town of Ashford, the coastal resorts of Herne Bay, Whitstable, Margate, Broadstairs and Ramsgate as well as the historic Cinque Port of Sandwich. There are also eight chalk streams in the catchment covering 87km and Natura 2000 sites including The Swale Estuary MCZ, Outer Thames Estuary

SPA, Thanet Coast MCZ, Thanet Coast & Sandwich Bay RAMSAR, Stodmarsh SAC and Blean Complex SAC.

Investment Needs summary: A full list of the Investment needs identified for the Stour river basin district catchment can be found in the Investment Plan. A summary of the investment needs is outlined below:

- Control / reduce surface water run-off: Surface water separation to tackle flooding including surface water pollution on New Thanet Way A299 (HERN), Ramsgate and Deal (WEAT), Margate and Broadstairs (WEHB), Ash, Wingham, Aylesham (DAMB); Whitstable (SWAL), Canterbury and Canterbury WTW (CANT).
- Improve quality of wastewater: Customer education programmes (most priority wastewater systems).
- Improve sewer network: Enhanced maintenance using proactive jetting and enhanced maintenance of wastewater pumping stations covering the majority of priority wastewater systems.
- Improve sewer network: Pipe rehabilitation programme at CANT, CHAR, DAMB, HERN, SWAL, WEAT and WEHB.
- Improve sewer network: Attenuate excess flows in sewer network by upsizing sewers and new storage in CANT, HERN, SWAL, WEAT and WEHB, with new sewers in CANT, HERN, SWAL and WEHB and new pumping stations in CANT and WEAT.
- Improve treatment quality: Review permit and increase capacity for the WTW for CANT, DAMB, SWAL, WBER and WEAT.
- Studies: Develop nutrient budget to understand risks and sources impacting the following habitat sites – The Swale, Medway Estuary and Marshes, Thanet Coast and Sandwich Bay.
- Studies: Drainage model improvements for CHAR, SWAL, WBER, WEAT and WEHB
- Studies: Shellfish Water studies for Swale East (HERN).
- Studies: Understand the impact of wastewater discharges and measure to achieve 'Good Ecological Status' in the Sarre Penn and River Wantsum.

Construction impacts: Construction activities from surface water separation solutions potential for minor adverse effects have potential for minor adverse effects across a number of the SEA objectives:

Potential for disturbance effects from noise and air pollution associated with construction impacts to designated sites and sensitive receptors should these be within the vicinity of the options construction.

- Options to increase size of sewers and construction of new sewers could result in permanent soil loss, in some locations
- There is potential for impacts to groundwater sources during construction including risk of pollution, potential receptors include Source Protection Zones located within Weatherlees Hill, Chartham, Westbere and Dambridge Wigham.
- There may be a temporary increased risk of flooding during construction depending on location; there are areas of flood zone 2 and 3 within catchments and potential impacts to coastal water body during construction of new storm discharge outfalls.
- Impacts to landscape and visual amenity are likely to be temporary during construction period, receptors include North Kent Plain NCA.
- Likely temporary increase in emissions from construction and temporary impact on air quality. Can be mitigated by best practice construction techniques.
- Depending on the location of construction works, there is potential to impact on the visual setting of historic assets during construction. Excavation required during construction works may have potential to impact buried archaeology if present.

- Prior to the start of construction impacts on the local community will need to be assessed, noise potential as well as disruption to traffic and public rights of way. Depending on the location of construction works potential receptors may include schools, open access areas, green spaces and residential areas.
- Likely temporary impacts during construction on roads and traffic from increased congestion and partial road closures; potential receptors include: A299, A2990. Decisions to upgrade sewer assets are likely to be based on whole-life costs and replacing assets avoids constructing new assets and therefore additional embodied carbon, reducing material requirements in the longer term.

Operational impacts: Major benefits to the resilience and reliability of wastewater systems anticipated as well as potential benefits to reducing flood risk and positive effects on water quality within the environment, the local community and material assets, climate change risks and hazards. The following operational impacts were identified:

- Potential benefits biodiversity and to the condition of designated sites resulting from improvements to wastewater system and reduction in flood risk and pollution. Potential positive effects on The Swale, Medway Estuary and Marshes, Thanet Coast and Sandwich Bay.
- Potential major reduction in flood risk catchment wide in particular benefits to Reduction of flooding and increased sewer capacity and attenuation capacity will reduce the instances of pollution events, in line with WFD objectives.
- Likely benefits to flooding associated climate change risks and hazards.
- Potential major benefits to public health, safety and hygiene will likely result from measures to reduce flooding and keep wastewater within sewage systems prior to treatment, potential to impact community and facilities within Swalecliffe, Whitstable, Chestfield, Clapham Hill, Seasalter, Yorkletts, Radfall, Ramsgate, Manston, Cliffs End, Sandwich, Woodnesborough, Worth, Deal, Kingsdown, St Margaret's at Cliffe, Martin, Chartham, Bagham, Shalmsford Street, Chartham Hatch, Canterbury, Sturry, Fordwich, Thanington, Blean, Pean Hill, Harbledown, Westbere, Upstreet, Chislet, Hoath, Maypole, Ford, Highstead, Boyden Gate, Wingham, Ash, Staple, Aylesham, Chillenden, Nonington, Eythorne, Preston, Goodnestone, Adisham, Margate, Broadstairs, Birchington, Westgate-on-Sea, Lydden.
- Likely positive effects on Bathing Waters and Shellfish Waters.
- Decisions to upgrade sewer assets are likely to be based on whole-life costs and replacing assets avoids constructing new assets and therefore additional embodied carbon, reducing material requirements in the longer term.

Table 22: Level 2 findings for Stour

River basin district catchment		SEA Topics and Objectives												
		Biodiversity flora & fauna	Soil, geology & land use	Water			Air	Climatic Factors		Landscape	Cultural Heritage	Population, Communities and Human Health		Material Assets
		1.1	2.1	3.1	3.2	3.3	4.1	5.1	5.2	6.1	7.1	8.1	8.2	9.1
Stour	Construction	-	-	o	-	o	-	-	o	-	o	-	-	-
	Operation	+	o	+	+++	+++	o	-	++	o	o	+++	o	o

See Figure 7 for scoring key

4.3.11. Test and Itchen

Wastewater systems catchment: There are 31 wastewater systems in Test and Itchen. The BRAVA stage identified very significant issues relating to the majority of Planning Objectives. In particular, very significant issues across multiple planning objectives were identified in Woolston (WOOL) and Barton Stacey (BAST), and Nutrient Neutrality was identified as a very significant issue across several of the sewer catchments. Other priority wastewater systems are Portswood (PORT), , Fullerton (FULL), Harestock (HARE), Chickenhall Eastleigh (CHEA), Kings Somborne (KISO), Millbrook (MILL), Stockbridge (STOC), Morestead Road Winchester (MORE) Romsey (ROMS) and Whitchurch (WHIT).

Catchment area summary: The Test and Itchen river basin district catchment has a population of approximately 800,000 people. The main urban locations are Andover and Romsey in the northern reaches, Totton and Eastleigh along the coastal stretch, and the cities of Winchester and Southampton. Natura 2000 sites within the catchment include three SACs ('Mottisfont Bats', 'Emer Bog' and 'River Itchen'). There are also 11 chalk streams in the catchment.

Investment Needs summary: A full list of the Investment needs identified for the Test and Itchen river basin district catchment can be found in the Investment Plan. A summary of the investment needs is outlined below:

- Control / reduce surface water run-off: Surface water separation to tackle flooding in Andover (BAST), new development at King's Somborne (KISO), Winchester (MORE), Romsey (ROMS) and Southampton (MILL/POOD/WOOL) as well at Chickenhall Eastleigh WTW, Millbrook WTW, Portswood WTW and Woolston WTW.
- Improve quality of wastewater: Customer education programmes (most priority wastewater systems).
- Improve sewer network: Enhanced maintenance using proactive jetting and enhanced maintenance of wastewater pumping stations covering the majority of priority wastewater systems.
- Improve sewer network: Pipe rehabilitation programme at BAST, CHEA, FULL, HARE, POOD and WOOL.
- Improve sewer network: Attenuate excess flows in sewer network by upsizing sewers, new sewers and new storage in MORE and POOD and uprated/new pumping stations in MORE. New storage capacity in WOOL.
- Improve treatment quality: Works to increase capacity of Barton Stacey WTW, Chickenhall Eastleigh WTW, Fullerton WTW, Harestock WTW, Millbrook WTW, Morestead WTW, Portswood WTW, Romsey WTW, Stockbridge WTW, Whitchurch WTW
- Studies: Develop nutrient budget to understand risks and sources impacting the following habitat sites – Solent and Dorset Coast, Solent and Southampton Water, Solent Maritime, and River Itchen.
- Studies: Drainage model improvements for CHEA, KISO, HARE, MILL, MORE, POOD, ROMS, STOC and WHIT.
- Studies: Identify suitable locations for natural flood management and surface water separation – River Itchen (CHEA and MORE), North Baddersley, Mayfield Park (MILL), north of the catchment in POOD and across MILL.

Construction impacts: Construction activities from surface water separation solutions, construction of new sewers, offline and online storage and increasing the capacity of WTW, have potential for minor adverse effects across a number of the SEA objectives:

Potential for disturbance effects from noise and air pollution associated with construction impacts to designated sites and sensitive receptors should these be within the vicinity of the construction of sewers and surface water separation.

- Prior to the start of construction activities, potential impacts on WFD water bodies will need to be assessed, particularly where Nitrate Vulnerable Zones are present. There may be a temporary increased risk of flooding during construction depending on location.
- Impacts to landscape and visual amenity are likely to be minor and temporary during construction period.
- Likely temporary increase in emissions from construction and temporary impact on air quality. Can be mitigated by best practice construction techniques.
- Depending on the location of construction works, there is potential to impact on the visual setting of historic assets during construction, potential receptors include Registered Parks and Gardens, Scheduled monuments and listed buildings. Excavation required during construction works may have potential to impact buried archaeology if present.
- Prior to the start of construction impacts on the local community will need to be assessed, noise potential as well as disruption to traffic and public rights of way. Depending on the location of construction works potential receptors may include recreational grounds, schools and colleges, open access areas, green spaces and residential areas, and community facilities.
- Likely temporary impacts during construction on roads and traffic from increased congestion and partial road closures

Operational impacts: Major benefits to the resilience and reliability of wastewater systems anticipated as well as potential benefits to reducing flood risk and positive effects on water quality within the environment, the local community and material assets, climate change risks and hazards. The following operational impacts were identified:

- Potential benefits biodiversity and to the condition of designated sites resulting from improvements to wastewater system and reduction in flood risk and pollution. Potential positive effects on Solent and Dorset Coast, Solent and Southampton Water, Solent Maritime, and River Itchen.
- Potential major reduction in flood risk catchment wide in particular benefits to Reduction of flooding and increased sewer capacity and attenuation capacity will reduce the instances of pollution events, in line with WFD objectives.
- Likely benefits to flooding associated climate change risks and hazards.
- Potential major positive effects to public health, safety and hygiene will likely result from measures to reduce flooding and keep wastewater within sewage systems prior to treatment.
- Potential benefits to Shellfish Waters and public bathing waters.
- Decisions to upgrade sewer assets are likely to be based on whole-life costs and replacing assets avoids constructing new assets and therefore additional embodied carbon, reducing material requirements in the longer term.

Table 23: Level 2 findings for Test and Itchen

River basin district catchment		SEA Topics and Objectives												
		Biodiversity flora & fauna	Soil, geology & land use	Water			Air	Climatic Factors		Landscape	Cultural Heritage	Population, Communities and Human Health		Material Assets
		1.1	2.1	3.1	3.2	3.3	4.1	5.1	5.2	6.1	7.1	8.1	8.2	9.1
Test and Itchen	Construction	-	-	o	-	o	-	-	o	-	o	-	-	-
	Operation	+	o	+	+++	+++	o	-	++	o	o	+++	o	o

See Figure 7 for scoring key

4.3.12. Summary

The proposals in the DWMP, in the form of the investment needs for each of the river basin catchments have been assessed against the SEA objectives. The range and mix of options (different types of investment needs, based on the generic options) to deliver the planning objectives are largely similar for each catchment. Details on the scale and location of the proposed investment needs and the construction methods (amount of disturbance) are will also remain as an unknown in advance of implementing the DWMP. Therefore, the results for the river basin district catchments are similar, with the main findings being:

Construction activities could result in potential for minor adverse effects on SEA objectives for biodiversity, soil, water, air, landscape, the local community and material assets

Operational activities could result in major beneficial effects on SEA objectives for water (protecting and enhancing the water environment and resilience and reliability of wastewater systems) and for Population, communities and human health (reduction in flooding of properties and premises). In addition, beneficial effects on SEA objectives are also expected for biodiversity, water (reducing flood risk) and climatic factors (managing climate change risks) and the local community.

The scale of the benefit depends on the size and type of the scheme. The results could also vary as the design of the intervention is known, for example, by incorporating specific aims to improve the landscape or enhance recreation opportunities, which would lead to benefits for these SEA objectives.

Many of the potential impacts can be mitigated. Example mitigation measures are set out in Section 6.

These conclusions are applicable to the DWMP (Level 1).

4.4. Findings – Level 1: DWMP Regional Plan

The DWMP Regional Plan is summarised in Section 2. The DWMP sets out the long-term plan for drainage and wastewater management. The DWMP is principally structured around the 14 Planning Objectives (see Figure 3). Each of the Planning Objectives is underpinned by the Investment Needs required to achieve the required level of performance. The Investment Needs for each of the 11 river basin catchments are identified.

The Planning Objectives set out the ambition for the DWMP. The SEA Scoping Report included a compatibility matrix, comparing Planning Objectives and SEA Objectives.

The findings of the SEA process for each river basin district catchment (Level 2) therefore represent the findings that are applicable to Level 1, DWMP:

Construction activities could result in potential for minor adverse effects on SEA objectives for biodiversity, soil, water, air, landscape, the local community and material assets.

Operational activities could result in major beneficial effects on SEA objectives for water (protecting and enhancing the water environment and resilience and reliability of wastewater systems) and for Population, communities and human health (reduction in flooding of properties and premises). In addition, beneficial effects on SEA objectives are also expected for biodiversity, water (reducing flood risk) and climatic factors (managing climate change risks) and the local community.

The scale of the benefit depends on the size of the scheme. The results could also vary as the design of the intervention is known, for example, by incorporating specific aims to improve the landscape or enhance recreation opportunities, which would lead to benefits for these SEA objectives.

5. Findings of other assessments

5.1. Overview

The SEA Scoping Report identified a number of other environmental assessments that could be undertaken to support the SEA, where applicable. This section provides an update on which of those assessments are considered applicable, and progress on the assessments that are being taken forward.

5.2. Water Framework Directive

The Water Framework Directive (WFD) (as transposed to national regulations) requires all waterbodies (both surface and groundwater) to achieve 'good status or potential'.

The WFD Article 4.1 sets out a number of environmental objectives:

- Prevention of deterioration in status of surface waters and groundwater
- Achievement of objectives and standards for Protected Areas
- Aims to achieve good status for all water bodies by 2015. Where this is not possible and subject to the criteria set out in the Directive, aim to achieve good status by 2021 or 2027 or set a less stringent objective
- Aims to achieve good ecological potential and good surface water chemical status for heavily modified water bodies and artificial water bodies
- Reversal of any significant and sustained upward trends in pollutant concentrations in groundwater
- Cessation of discharges of priority hazardous substances into surface waters
- Progressively reduce the pollution of groundwater and prevent or limit the entry of pollutants.

The DWMP Planning Objectives (see Figure 3) set the ambition for Southern Water's performance and the inclusion of a specific Planning Objective relating to the WFD (PO9: Achieve Good Ecological Status / Good Ecological Potential, GES/GEP) places the ambition to implement "*necessary measures to prevent deterioration of the status of all water bodies"* as a key objective for the DWMP.

The ecological status of a stream, river, lake, estuary, lagoon or coastal water is an index of the quality of the water itself and the variety and quantity of plant and animal species it supports. By comparing the observed ecological status against the theoretical status it would have in a completely natural state, unaffected by human activity, one of five status classifications can be assigned to a waterbody: High, Good, Moderate, Poor and Bad. Good (ecological status) (GES) is the target condition for all waterbodies.

GEP applies to all "artificial" or "Heavily Modified" waterbodies. These will include waterbodies that have been modified for flood protection, navigation, recreation or water storage. It is accepted that, through the physical modifications made, GES can never be achieved for the HMWBs so the target is to achieve GEP - the best ecological condition possible under these alternative uses and conditions.

There are many potential sources of risk that affect the status of waterbodies. These include drainage and wastewater systems as well as other sources such as road and agricultural run-off. It is Southern Water's intention to facilitate all waterbodies in the region attaining GES / GEP, by removing Southern Water's activities as a reason for a waterbody not achieving good ecological status or potential.

For the first cycle of the DMWP, Southern Water have focused on waterbodies where the EA has confirmed that one of the reasons for not achieving GES or GEP is due to Southern Water operations. Investment Needs have been identified that will improve the water quality towards achieving GES / GEP for these waterbodies.

Work to look at the condition and potential changes to WFD status was undertaken by Southern Water to inform the DWMP; this found that overall the DWMP will have positive impact on waterbodies[8]. The findings include:

- Southern Water has identified the physical connection between wastewater systems and waterbodies, and the current impact on achieving GES / GEP;
- Screening the generic options / Investment Needs has identified those interventions where there may be a risk of deterioration in WFD status. Most interventions are to reduce pollution, spills to the environment or to improve wastewater treatment – all of which will contribute to improving GES / GEP; and
- The inclusion of planning objectives and risk assessment on GES /GEP ensures that all options in the DWMP are assessed to identify where there may be a risk in deterioration to ensure that the option makes a positive contribution towards GES/GEP.

The overall impact of the DWMP, and the long term approach set out in the plan, will support the achievement of WFD objectives, and directly result in more waterbodies achieving GES/GEP as a result of Southern Water's investment.

As Investment Needs progress through to solution development, there may be a requirement to undertake specific WFD assessment, where waterbodies may be affected.

5.3. Habitats Regulations Assessment

An indicative habitats regulation assessment report has been completed.

The indicative HRA report provides a preliminary review of the investment needs for 61 wastewater systems against their potential to affect the UK National Network of designated protect sites comprising RAMSAR. SACs, SPAs and MCZs. Any candidate SACs, proposed SPAs, proposed MCZs and proposed RAMSAR sites were included in the review though none were present in the Southern Water area at the time of the assessment. The review is based on the investment needs that are set out in the investment plan that accompany the DWMP. It is important to note that the level of detail available for the investment needs would need to be developed into more detailed design proposals to undertake an assessment that would meet the full requirements of a formal habitat regulation assessment.

The indicative HRA report concludes that the majority of the investment needs are unlikely to result in a significant effect on the features of designated sites, with common best practice mitigation measures in place. There are either those (i) proposed in locations with no links to designated sites or (ii) those that do not involve construction of new or expanded assets. The remaining investment needs include construction activities which may have potential to result in temporary or permanent changes. Further details from future detailed design stages are required to define suitable mitigation measures to avoid any likely significant effects on the features of designated sites.

The location of the interventions required to deliver the investment need, the scale of work required, detailed timings of work and construction methods are not known at this time. This information is not intended to be developed prior to publication of the final DWMP. Given the nature of the investment needs are associated

[8] https://www.southernwater.co.uk/media/4552/brava-methodology_good-ecological-status.pdf

with existing wastewater systems and represent standard utility works, it is likely to be achievable to adapt proposals or design suitable mitigation to avoid likely significant effects on designated sites.

The information in the indicative HRA report provides a good basis for understanding issues to be considered early in the investment planning and design process (Southern Water's Risk and Value process) for individual future schemes and potential in-combination effects. The mitigation section identifies that, as projects come forward, the need for project-level HRA will need to be reviewed and determined. This will require ongoing collaboration with Natural England.

5.4. Invasive non-native species risk assessment (INNS)

The invasive non-native species (INNS) risks associated with the Drainage and Wastewater Management Plan (DWMP) have been considered at a strategic level for the DWMP generic options.

The following risks were considered:

- The potential for an option to create pathways for the transfer of INNS between distinct, previously unconnected locations.
- The potential for an option to increase the risk of INNS transfer between locations already connected.
- The potential for an option to change environmental conditions such that the impact or threat of current or future invasions is increased.

Source (demand) measures: the INNS risk magnitude is considered to be low. If INNS are already present within the spatial bounds of an option, the implementation of source (demand) measures would be unlikely to create new pathways for the transfer of INNS to previously unconnected locations or to increase the risk of INNS spread along existing pathways. However, measures to control or reduce surface water run-off may change hydrological conditions with the consequence of increasing the impact or threat of current or future invasions. Conversely, there is also the potential that hydrological changes would reduce the risk of invasions.

Pathway (supply) measures: the INNS risk magnitude is considered to be low. Proposed measures could introduce new INNS pathways or increase the risk of spread via existing pathways (e.g., through the transfer of wastewater). However, transferred INNS are unlikely to become established at their new location as the purpose of wastewater transfer would be for treatment. The proposed pathway (supply) measures are considered unlikely to instigate changes in environmental conditions that could increase the risk of current or future invasions. The greatest INNS risk associated with pathway (supply) measures may be the movement of personnel and equipment between potentially infested sites during the construction phase.

Receptor measures: the INNS risk is considered to be low. There is the potential to create new pathways of INNS spread (e.g., through the use of biosolids to improve agricultural land); however, it is considered unlikely that transferred INNS would become established. Other proposed receptor measures are considered unlikely to create new pathways of spread or to increase the risk of INNS transfer along existing pathways. Additionally, there would be no mechanism for possible changes in environmental conditions to increase the current or future threat of INNS invasion. Proposed river enhancement measures may improve the resilience of ecosystems to INNS.

The overall INNS risk associated with the DWMP measures is considered to be low. However, this assessment was based on information on the generic options. As the Investment Needs progress through to site-specific solutions, site-specific risk assessments will be required to quantify the INNS risk posed by the proposed measures and to identify appropriate biosecurity measures.

A biosecurity strategy should be implemented to mitigate the INNS risk posed by the DWMP measures during both the construction phase and operation phase. Potential generic biosecurity measures are provided in Table 24.

Table 24: Description of the biosecurity measures

Biosecurity Option	Description
Staff training	Construction personnel and Southern Water site operatives trained to understand the risk of INNS to the environment, how to identify INNS and how to report and/or manage them if they are discovered on site.
Reference material	Construction personnel and site operatives provided with reference material (e.g., posters in communal areas, leaflets, or plant identification app) to aid with the identification of INNS.
INNS reporting system	Reporting system developed within Southern Water to record instances of INNS at assets and other associated sites.
Protocol to remove INNS	Standardised protocol developed for the removal of INNS from assets and other associated sites. To be reviewed regularly and updated in line with best practice and emerging research.
Check Clean Dry (CCD) protocol	CCD protocol enforced at Southern Water assets for site operatives and other visitors. Applicable to all PPE, clothing, equipment, machinery and vehicles prior to removal from site. Cleaning methods vary greatly in their efficacy. One of the most effective against INNS is the use of high-pressure, hot water. The use of cold and/or static water is less effective. Incorporation of a disinfectant such as Virkon Aquatic® into CCD protocol would help prevent the spread of pathogens. All clothing and equipment allowed to dry completely to ensure that any INNS remaining after cleaning are rendered nonviable. Drying room or other designated area provided to allow PPE and operational equipment to be stored and dried at the same location. Installation of signage at washdown and drying areas to outline the CCD protocol.
Site-specific equipment	Provision of site-specific operational equipment and vehicles to reduce the inter-site movement of INNS.
Treatment of wastewater and biosolids	Treatment of wastewater and biosolids prior to their discharge to the environment to remove INNS. The most effective approach would be to incorporate a number of different treatment options to target a wide range of INNS. Treatment may include filtration, chlorination, chemical treatment (e.g., coagulation and flocculation) and exposure to UV lighting.

5.5. Natural Capital Assessment

A Natural Capital (NC) assessment is based on how changes to land use affect stocks of natural capital. A baseline of the stocks (the different categories of land use) and indicators is then compared pre-construction and post-construction, to identify the change in natural capital stocks. Southern Water has a Natural and Social Capital framework. The framework is used to integrate consideration of natural and capital impacts and indicators into the decision-making process for project delivery; the Risk and Value (R&V) process. It is anticipated that this process and framework will be applied to those Investment Needs as they are delivered through the business plans (for example PR24). This approach will enable assessment of natural capital at

an appropriate stage, i.e. where the options for the location of interventions are known, which is not the case at the DWMP stage.

5.6. Biodiversity Net Gain Assessment

Biodiversity net gain or net loss relates to how development would change the amount of habitat supporting biodiversity, primarily through a change in land use. Delivering biodiversity net gain in development proposals is a requirement of the Environment Act 2021. The land affected by the solutions / investment needs set out in the DWMP are not yet known. Therefore, it is not possible to assess biodiversity gain or loss at this stage. The requirements of the Environment Act 2021 to deliver biodiversity net gain will apply to relevant solutions / investment needs as they are progressed through the appropriate consenting routes.

6. Findings from cumulative and in-combination effects assessment

6.1. Overview

By undertaking assessments for each river basin catchment (Level 2), the majority of potential cumulative impacts are inherently considered in the assessment. There may be issues where impacts within a river basin catchment could extend beyond the river basin catchment boundary. In this case the receptor will be identified and potential arising from the DWMP will be assessed. This situation could also occur where impacts may affect designated habitat sites or waterbodies that are inter-connected to wider systems.

The assessment of in-combination effects looks at the interaction of the DWMP with other plans, policies or programmes, with the aim of identifying those environmental and social receptors that could be affected by the interaction of the DWMP with other plans and projects.

6.2. Review and plans and programmes

The following plans have been reviewed to identify in-combination effects:

- Southern Water's Water Resource Management Plan 2020-2070 (2019) and Draft Water Resource Management Plan 24 (2022);
- Southern Water's Draft Drought Plan 2022 (2021) (including Section 20 Agreement);
- Water Resource South East Regional Plan (draft best value regional plan) (2022);
- River Basin Management Plans (RBMPs) Defra and the Environment Agency;
    - South East river basin district RBMP (current 2015, draft 2022);
    - Thames river basin district RBMP (current 2015, draft 2022).
- Flood Risk Management Plan, the Environment Agency:
    - South East River Basin (current 2009, draft 2021);
    - Thames River Basin (current 2009, draft 2021);
- Drainage and Wastewater Management Plans
    - Thames Water (draft, 2022);
    - Wessex Water (draft, 2022).

In addition, the effects of Strategic Resource Options (SROs) have been considered where these provide additional information beyond that already available in the Water Resource South East (WRSE) Regional Plan.

- Water for Life – Hampshire SRO
- Thames to Southern Transfer SRO
- West Country North SRO
- West Country South – Southern Water Transfer SRO

The above plans and SROs are in various stages of development, with Southern Water's Water Resource Management Plan (for the PR24 period) and the final versions of neighbouring Drainage and Wastewater Plans. Therefore, any assessment of cumulative and in-combination effects should remain under review.

Individual local authority development plans (e.g. Local Development Frameworks) have not been considered in detail at this stage. The first reason is that a general allowance for growth has been included in the development of the DWMP, therefore additional capacity and demand issues generated by future residential, commercial and industrial development have been factored into the identification and rating of risks identified by the DWMP. The proposed Investment Needs therefore account for planned growth. The second reason is that the site-specific information on where the solutions to meet the Investment Needs is not yet known. Therefore, it is considered disproportionate to review approximately 50 local development plans across the Southern Water area in detail. In the following section on mitigation, it is recommended that as Investment Needs are brought forward through the design process, that each one considers the interactions with local authority development plans and associated planning applications, in order to identify further cumulative / in-combination effects.

6.3. Assessment of cumulative and in-combination effects

An overview of the potential for cumulative effects for the SWS DWMP programme and with other plans and programmes is presented in Table 25 against the SEA topics and objectives.

Table 25: General Commentary on the Potential for Cumulative and In-combination Effects

SEA Topic and SEA Objective		Potential for Cumulative effects with the DWMP Programme?	Potential for In-combination effects with other plans and programmes?
Biodiversity, Flora and Fauna	1.1. Protect and enhance Biodiversity, Flora and Fauna	There is potential for cumulative adverse effects during construction designated sites where measures are being constructed around the same period and within close proximity to one another. There is potential for cumulative beneficial effects during operation on the condition of designated sites resulting from improvements to the wastewater system and a reduction in pollution.	There is potential for in-combination adverse effects during construction, where different projects are being implemented at the same time or several projects in series, affecting designated sites. There is potential for in-combination benefits where cumulative beneficial effects where plan outcomes directly result in improvements (e.g. increased protection or net gain) or indirect benefits through reductions in pollution events that could affect biodiversity. The significance of effects will depend on the nature, location and timing of the DWMP Investment Need and solution.
Soil and Geology	2.1. Protect and enhance Soil and Geology	Many of the proposed measures involve work affecting existing assets, a large number of which are in highways. However, there remains some potential for cumulative adverse effects during construction such as permanent soil loss where measures are being constructed around the same period and within close proximity to one another.	There is some potential for adverse in-combination effects, during construction. There is potential for in-combination benefits, particularly where plan outcomes result in better management of natural systems. The significance of effects will depend on the nature, location and timing of the DWMP Investment Need and solution.
Water	3.1. Increase resilience and reduce flood risk	It is not anticipated there will be cumulative effects from flood risk during the construction phase. There is potential for cumulative beneficial effects during operation of the schemes by reducing flooding and increasing	There is potential for in-combination benefits where the outcomes of other plans are focused on better catchment management and improving water quality and seeking to reduce flood risk.

		sewer capacity and attenuation capacity to increase resilience and reduce the instances of pollution events.	Plans aiming at better management of the water environment, including avoiding pollution events and better management of water resources (to avoid additional pressure on the natural environment), complement the DWMP. Measure to manage river basins and flood risk are expected to manage the source of water entering wastewater systems and therefore support DWMP measures to improve reliability and resilience of wastewater services. The significance of effects will depend on the nature, location and timing of the DWMP Investment Need and solution.
	3.2. Protect and enhance the quality of the water environment	There is potential for localised cumulative adverse effects during construction where measures are being constructed around the same period and within close proximity to one another.	
	3.3. Deliver reliable and resilient wastewater services	There is potential for cumulative beneficial effects during operation resulting from measures to reduce flooding and keep wastewater within sewage systems prior to treatment.	
Air	4.1. Reduce and minimise air emissions	There is potential for localised cumulative adverse effects during construction where measures are being constructed around the same period and within close proximity to one another.	There us potential for localised in-combination adverse effects during construction where measures are being constructed around the same period and within close proximity to one another. The significance of effects will depend on the nature, location and timing of the DWMP Investment Need and solution.
Climatic Factors	5.1. Reduce embodied and operational carbon emissions	There is potential for cumulative adverse effects during construction where measures are being constructed around the same period and within close proximity to one another.	It is anticipated that measures to reduce embodied carbon during construction will be identified, and net-zero and nature-based solutions can be considered across all plans. It is anticipated that, as well as DWMPs, the recent draft plans have been informed by climate change projections and their operational objectives align. The significance of effects will depend on the nature, location
	5.2. Reduce vulnerability to climate change risks and hazards	There is potential for cumulative beneficial effects resulting from measures that reduce flooding associated climate change risks and hazards.	

			and timing of the DWMP Investment Need and solution.
Landscape	6.1. Conserve, protect and enhance landscape, townscape and seascape character and visual amenity	There is potential for cumulative adverse effects during construction where measures are being constructed around the same period and within close proximity to one another this could affect landscape designations such as AONBs National Parks. No instances of this have been identified in the assessment.	There is potential for in-combination effects during construction. However, the majority of DWMP are localised and therefore likely to be issues relating to temporary changes to visual amenity which could combine with other plan activity, such as implementation of development plans. The significance of effects will depend on the nature, location and timing of the DWMP Investment Need and solution.
Cultural Heritage	7.1. Conserve, protect and enhance the historic environment, including archaeology	There is potential for cumulative adverse effects on the setting of the historic environment during construction where measures are being constructed around the same period and within close proximity to one another. No instances of this have been identified There is also potential for cumulative adverse effects on archaeology. This depends on the extent to which archaeology is present; no cumulative effects on known archaeology have been identified in the assessment.	There is potential for in-combination effects during construction. It is anticipated that as each plan is implemented, knowledge gained will be shared with regulators such as the local authority and Historic England, and this information can inform project-level assessments. The significance of effects will depend on the nature, location and timing of the DWMP Investment Need and solution.
Population, Communities and Human Health	8.1. Supporting communities and economic growth	There is potential for adverse cumulative effects on the local community where measures are being constructed around the same period and within close proximity to one another. There is potential for beneficial cumulative effects on the local community where a number of measures are implemented to resolve wastewater issues for communities.	There is potential for in-combination effects during construction. However, the majority of DWMP are localised and therefore likely to be issues relating to temporary changes to amenity affecting communities which could combine with other plan activity, such as implementation of development plans.

	8.2. Maintain and enhance tourism and recreation	There is potential for cumulative effects on tourism and recreation where measures are being constructed around the same period and within close proximity to one another. No cumulative effects on tourism and recreation receptors have been identified in the assessment.	There is potential for beneficial effects during operation. Many of the plans aim to support communities by improving the resilience of water supply, avoiding issues that result in overwhelming the wastewater network (and sewer flooding), avoiding pollution incidents that adversely impact on the local environment, and improving the quality of terrestrial, riverine and marine ecosystems and assets that support tourism and recreation. The significance of effects will depend on the nature, location and timing of the DWMP Investment Need and solution.
Material Assets	9.1. Minimise resource use and waste production	There is potential for cumulative effects where measures are being constructed around the same period and within close proximity to one another as all the measures will use materials and generate waste, including excavated materials.	There is potential for in-combination effects during operation, should measures in the DWMP and other plans be coordinated to reduce resources and seek opportunities (e.g. nature-based solutions, circular economy principles for managing resources). The significance of effects will depend on the nature, location and timing of the DWMP Investment Need and solution.

Where the potential for cumulative and/or in-combination effects has been identified, this is likely to require additional assessment at a subsequent stage in the design and development of the DWMP Investment Needs as site-specific solutions are progressed. In the following section on mitigation, it is recommended that as these site-specific solutions are progressed, each one considers the interactions with any specific projects identified in these plans and programmes, in order to identify cumulative / in-combination effects.

7. Mitigation and Monitoring

7.1. Overview

Key stages of the SEA process include mitigating adverse effects and proposing measures to monitor the environmental effects of implementing a plan or programme, as well as monitoring the significant effects of the plan or programme on the environment. The sections below describe how these tasks will be addressed, as applicable, and how Southern Water intends to ensure that monitoring of potential effects is carried out and the appropriate mitigation measures are implemented for any adverse effects identified.

7.2. Mitigation

Mitigation measures will be identified to reduce the impact of a significant effect, or to prevent the significant effect from occurring.

The majority of the preferred options within the DWMP are based on interventions that are part of regular activities for Southern Water, such as rehabilitating sewers, servicing combined sewer overflows and improvements at wastewater treatment works. Therefore, protocols and procedures for these activities are already in place, drawing on experience of doing this work every day and working in partnership with contractors to provide a good service to customers and respecting local communities. These protocols and procedures are expected to remain in place, alongside the responsible operation of wastewater assets. The implementation of these reasonable measures are assumed when assessing impacts, and are not repeated here.

Table 26 identifies some example mitigation measures relevant to the DWMP, for each of the SEA Objectives, focusing on those areas that would reduce negative impacts or enhance positive impacts.

Table 26: Example mitigation measures

SEA Objective	Example mitigation measures
General	As Investment Needs are developed into specific solutions, the need for specific project-level environmental assessments will be identified, depending on consenting routes and potential for effects. These assessments may include: • Environmental Impact Assessment • Habitats Regulation Assessment • Water Framework Directive Assessments for individual solutions emerging from the DWMP should consider (a) the cumulative effect of other proposed solutions in the DWMP; (b) the in-combination effect of other water company investments in the area; (c) the in-combination of effect with other projects (resulting from relevant plans, including local authority development plans and subsequent planning applications); and (d) in-combination effects on sensitive receptors, such as designated sites and waterbodies. Opportunities for ongoing engagement with regulators, local planning authorities, partner organisations and other stakeholders will help realise benefits and avoid adverse impacts.
Biodiversity, Flora and Fauna	• Where location of interventions is not yet known, solution design should avoid designated sites and be informed by any pathways that could affect designated sites. • As the location of interventions becomes known, ensure that impacts on designated sites and other designations / high value receptors (such as Sites of Special Scientific Interest (SSSIs) and Marine Conservation Areas (MCAs) are considered.

SEA Objective	Example mitigation measures
	• Implement best practice construction methods to minimise disturbance effects (including physical and noise disturbance) and habitat loss. Habitat is to be reinstated on completion, or if unavoidable, compensatory habitat to be considered to replace damaged or lost habitat. • Identify opportunities to restore habitat, specifically priority habitat. • Undertake ecology surveys in advance of design. • Consider applicable requirements to deliver Biodiversity Net Gain early in the design process. • Consider the potential for increasing risks associated with the spread of Invasive Non-Native species • Consider the adaptation and resilience of wildlife (in particular water dependent protected habitats and species) in response to climate change, for example, enabling wildlife to move upstream or inland.
Soil and Geology	• Where location of interventions is not yet known, solution design should avoid historic and authorised landfill sites • Solution design should identify high grade agricultural land and consult soil health maps to inform the location of interventions. • Implement best practice construction techniques when working within or within close proximity to historic or authorised landfill sites to prevent potential disturbance of contaminants. • Implement pollution prevention and control measures to reduce likelihood of contamination of the soil and wider terrestrial environment during construction. • Reinstate disturbed ground, returning it to its original state, following construction.
Cultural Heritage	• Identify the potential for buried, waterlogged archaeological and palaeoenvironmental remains of significant interest and fragility that can be associated with river valleys, floodplains, estuaries, coastal and wetland areas. • Identify areas of archaeological importance and the potential for unrecorded archaeology. • Depending on the presence of archaeology, further survey work and an Archaeological Watching Brief may be required. • Implement best practice construction methods to minimise effects on the setting of nearby historic assets.
Water	• Identify existing designations, such as Source Protection Zones, Flood Zones, Nitrate Vulnerable Zones early in the design stage. • Implement measures to reduce the potential effects of flooding on the construction phase. • Implement pollution prevention and control measures to reduce likelihood of contamination of the water environment during construction. • Utilise directional drilling and pipejack crossings where possible.
Air	• Identify areas where Air Quality Management Areas (AQMAs) are nearby and consider this in the plans for construction traffic movements • Where tankering by road is employed, use low emission or electric vehicles on designated routes and at times aimed at avoiding impacts on local communities • Implement best practice construction methods, such as switch off policies and damping, to reduce effects on air quality. • Odour management for expanded and new WTW

SEA Objective	Example mitigation measures
Climatic Factors	• Consider materials with lower embodied carbon and optimise the infrastructure design. • Investigate use of renewable or 'clean' energy sources for any options which have high energy demands (e.g. pumping transfer flows)
Landscape	• Implement best practice construction methods, such as screening, to minimise visual disturbance and also implement screening to reduce visual effects of above ground permanent infrastructure. • Reinstate land to original state following the construction phase.
Population, Communities and Human Health	• Implement best practice construction methods, such as noise and vibration reduction, selection of appropriate working hours, to reduce effects on the local community. • Implement traffic management measures to reduce the impacts of traffic congestion on communities. • Consider appropriate diversions where public rights of way are affected during construction. • Avoid routing tankers carrying wastewater through rural communities and consider the timing of journeys to avoid peak travel periods
Material Assets	• Implement sustainable design measures to reduce resource use and waste. • Source materials locally where possible. • Utilise directional drilling where possible to minimise disruption to built assets and infrastructure. • Implement a Construction Traffic Management Plan (CTMP) to minimise traffic related disruption during the construction phase.

7.3. Monitoring

Monitoring is required to track the environmental effects to show whether they are as predicted, to help identify any negative impacts and trigger any further mitigation measures. The SEA Regulations require the responsible authority to:

'monitor the significant environmental effects of the implementation of each plan or programme with the purpose of identifying unforeseen adverse effects at an early stage and being able to undertake appropriate remedial action.'

A number of existing systems are in place to monitor the effectiveness of the function of wastewater systems, with many of these a regulatory requirement for reporting to Ofwat. The DWMP is based on a number of Planning Objectives, which measurable indicators. The DWMP investment plan is based on achieving band reductions to improve performance. The Investment Needs in the DWMP comprise a range of preferred solutions, to be implemented in the short, medium and long term and therefore the actual impact of the plan is subject to some uncertainties.

Monitoring of the impact from implementation of any of the preferred solutions included in the DWMP will be focused on those measures where significant environmental or social effects have been identified in the SEA and HRA reports.

Southern Water will need to take a broad view of the findings of their ongoing monitoring processes to identify whether any unforeseen environmental and social effects arise from implementation of the DWMP. Where these are identified, SWS may be required to put in place specific monitoring arrangements and will consider how best to mitigate or avoid the adverse consequences.

The natural, built and human receptors potentially impacted by the development and operation of the options included in the DWMP strategies and possible indicators of effects are set out in Table 27. These proposed indicators would form the core component of a monitoring programme to assess whether the identified effects in the SEA are occurring as anticipated, or whether it is giving rise to greater or lesser effects (adverse or beneficial). In turn, the monitoring may identify changes to the mitigation measures necessary to minimise adverse effects and/or modifications to scheme design or operation to further augment beneficial effects.

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

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

Southern Water have an established framework for reporting performance criteria[9]. This provides a common set of criteria, covering performance across a number of environmental and social issues that are influenced by the DWMP and other Southern Water plans such as Water Resource Management Plan.

Table 27: SEA monitoring indicators for DWMP

Impacted receptor	Monitoring indicators	Source(s) of Information
Water resources, water quality, biodiversity	Proportion of surface waters and groundwater waterbodies at 'Good' WFD status	Natural England
	Specific species and habitats surveys	SWS/Natural England
	Condition of European Sites and SSSIs according to Natural England condition assessments	Natural England
	Progress against the Southern Water biodiversity action plan	SWS
	Progress against Southern Water Reporting Criteria[9] e.g. Water quality compliance; External sewer flooding; Sewer collapses; Pollution incidents; Treatment works compliance; River water quality; Delivery of water industry national environment programme requirements; Maintain bathing waters at excellent; Improve the number of bathing waters to at least Good; Improve the bathing waters at Excellent quality	SWS
Climate factors	Net greenhouse gas emissions per Ml (million litres) of treated water (kg CO2 equivalent emissions per Ml) reported annually by Southern Water Progress against Southern Water Reporting Criteria e.g. Renewable generation	SWS
Transport	Transport fleet fuel consumption, emissions and mileage, as monitored routinely by Southern Water	SWS
Community amenity	Scheme level community disruption due to construction works / during operation (where applicable) would be monitored through an Environmental Management Plan agreed as part of the planning permission process	SWS/Local Authority Environmental Health Officers

[9] Southern Water Reporting Criteria available at: https://www.southernwater.co.uk/media/4902/reporting_criteria_2020_21.pdf

Impacted receptor	Monitoring indicators	Source(s) of Information
	Progress against Southern Water Reporting Criteria[9] e.g. Internal sewer flooding	SWS
	Responses gauged through customer surveys and reported in Southern Water's annual performance processes Progress against Southern Water Reporting Criteria e.g. Customer experience (C-Mex) and Customer satisfaction (D-MeX)	SWS
Air quality	Scheme-specific monitoring during construction works / during operation (where applicable) would be monitored through an Environmental Management Plan agreed as part of the planning permission process	SWS/Local planning Authorities
	Changes in air quality as monitored by the Defra Automatic Urban and Rural Network, including using this data to establish the baseline conditions	Defra
Landscape and visual amenity	Baseline, construction phase and operational phase Landscape and Visual Impact Assessments or equivalent assessment techniques of sensitive landscapes and visual amenity at receptors identified through environmental assessments undertaken through the consenting processs. Assessments to be carried out in consultation with appropriate bodies, such as the National Park Planning Authorities, relevant AONB committees and Natural England. These surveys will aid planning and evaluation of the success of proposed mitigation measures to reduce adverse effects on landscape and visual amenity.	SWS/ National Park Authorities/ AONB Management Bodies/ Natural England
Cultural heritage	Presence and condition of buried, waterlogged archaeological and paleaeoenvironmental remains would be monitored during construction works as part of a watching brief and associate response measures as set out in the Environmental Management Plan agreed as part of the planning permission process	SWS

Impacted receptor	Monitoring indicators	Source(s) of Information
	Consultation with Historic England, heritage asset owners and other relevant stakeholders to ensure adverse impacts are minimised and opportunities sought for heritage discovery and/or maintenance.	Historic England
	Reference to Historic England's monitoring of heritage assets such as Listed Buildings and Scheduled Monuments, Registered Battlefields, Registered Parks and Gardens, in particular the 'Heritage at risk' register.	Historic England

8. Conclusions and next steps

8.1. Conclusion

A Strategic Environmental Assessment has been undertaken to support the development of the Southern Water's Drainage and Wastewater Management Plan. DWMPs are not currently a statutory obligation for companies and undertaking SEA is considered best practice.

SEA works to inform the decision-making process through the identification and assessment of significant and cumulative effects a plan or programme may have on the environment. The SEA process is conducted at a strategic level and enables consultation on the potential effects of a plan with stakeholders.

The DWMP (Level 1) is supported by the Investment Plan that set out the Investment Needs to achieve the Planning Objectives for the river basin catchments (Level 2). The Investment Needs are also collated to show the preferred options for investment in a selected number of priority wastewater systems (Level 3).

For the SEA, the assessment was undertaken in three stages, which align with the levels of the DWMP: Level 3: Wastewater systems; Level 2: River basin district catchments; Level 1: DWMP Regional Plan.

Level 3 wastewater systems: In terms of influencing the applicable SEA objectives were identified at an early stage. Priority environmental and social constraints were identified for the SEA objectives and this information helped to inform the development of options. In addition, each of the generic options (from which the Level 3 wastewater systems Investment Needs were derived) was subject to review against the SEA objectives to identify beneficial and adverse effects.

When considering the generic options, the following option types have the potential to deliver significant beneficial effects:

- Source: Control / reduce surface water run-off – SEA objectives benefitting are Water (increasing resilience and reducing flood risk, enhance quality of the water environment, reliable wastewater service); Population, Communities and Health (reduced property flooding); Biodiversity (enhancing habitats). The level of opportunity will be dependent on the actual solution, with nature-based solutions generally offering the greatest opportunity for benefits.
- Pathway: Improve sewer network – SEA objectives benefitting are Water (deliver reliable wastewater services, increase resilience and reduce flood risk and protect the water environment) and Population, Communities and Health (avoid property flooding).
- Pathway: Improve treatment quality – SEA objectives benefitting are Water (enhance quality of the water environment, reliable wastewater service and reduce flood risk) and Population, Communities and Health (avoid property flooding). Depending on the scale and location, there could be significant benefits for biodiversity.

When implementing the generic options, it is the construction phase that is most likely to give rise to adverse effects, although the scale of construction is likely to need to be large to generate significant effects (e.g. construction of a new wastewater treatment works). Adverse effects in operation include increased use of materials and energy, generating carbon emissions.

Level 2: River basin district catchments. The assessment focused on the collated Investment Needs for each of the wastewater systems within the river basin catchment. The Investment Needs focus on the location of the risks and problems, rather than where the investment / intervention will be located (i.e. the solution may be located some distance from the problem). Therefore, there remains a large degree of uncertainty in how the Investment Needs will impact on environmental and social receptors in the 11 river basin district catchments.

The range and mix of investment needs (based on the generic options) to deliver the planning objectives are largely similar for each catchment. Details on the scale and location of the proposed investment needs and the construction methods (amount of disturbance) will also remain as an unknown in advance of implementing the DWMP. Therefore, the results for the river basin district catchments are similar, with the main findings being:

- Construction activities could result in potential for minor adverse effects on SEA objectives for biodiversity, soil, water, air, landscape, the local community and material assets.
- Operational activities could result in major beneficial effects on SEA objectives for water (protecting and enhancing the water environment and resilience and reliability of wastewater systems) and for Population, communities and human health (reduction in flooding of properties and premises). In addition, beneficial effects on SEA objectives are also expected for biodiversity, water (reducing flood risk) and climatic factors (managing climate change risks) and the local community.
- The scale of the benefit depends on the size and type of the scheme. The results could also vary as the design of the intervention progresses, for example, by incorporating specific aims to improve the landscape or enhance recreation opportunities, which would lead to benefits for these SEA objectives.
- Many of the potential impacts can be mitigated. The construction activity to deliver the majority of the investment needs are likely to be standard practice for utility works, including working on existing assets.

Level 1: DWMP. The conclusions set out above for Level 2 are also applicable to the company-wide draft DWMP (Level 1). The assessment at Level 1 is supported by the findings from the cumulative assessment:

- The cumulative assessment identified that the construction phase could result in potential for adverse effects where a number of Investment Needs are implemented in the same location at the same time or where in the same location one after another. Applicable SEA objectives are biodiversity, soil, water, air, landscape, population and communities, and material assets.
- The cumulative assessment identified that the operational phase could result in potential for beneficial effects There is potential for beneficial cumulative effects on the local community where a number of measures are implemented to resolve wastewater issues for a particular community. There is potential for cumulative beneficial effects during operation of the schemes by reducing flooding and improving wastewater systems to increase resilience (including resilience to climate change) and reduce the instances of pollution events. Applicable SEA objectives are water, population and communities, and climatic factors.

8.2. Next steps

The SEA, along with the findings of the other assessments, have been used to help inform the development of the DWMP. In summary, the application of these processes has:

- Informed dialogue with stakeholder organisations as to the options to be included in the DWMP.
- Identified a number of environmental and social benefits and risks associated with the DWMP.

The DWMP sets the strategy for the next 25 years. The final DWMP will inform the preparation of Southern Water's Business Plan (PR24), which sets out the investment plan for the next five years (2024-2029). As the Business Plan is implemented, the Investment Needs from the DWMP will be taken forward for design and development.

As part of this process, Investment Needs may be subject to further assessment to understand and manage its potential environmental and social impacts. These assessments, which may include HRA and EIA, will take account of the issues discussed in this Environmental Report but will also be informed by the greater detail available as the work progresses about construction techniques, building materials, agreed locations and routes. It is anticipated that ongoing engagement with regulators and stakeholders will inform the development of those Investment Needs being taken forward.

Appendices:

See the separate files for the following appendices

A. SEA Environmental Report checklist

B. Plans, Policies and Programmes

C. Environmental Baseline

D. Environmental Baseline maps

E. SEA Consultation

F. Issues and Opportunities

G. Compatibility Matrix

H. Assessment criteria