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Environmental Report

Yorkshire Water's Water Resources Management Plan

Strategic Environmental Assessment

ED13785 | Issue number 3 | Date 28 September 2022

Customer:

Yorkshire Water

Customer reference:

Environmental Assessment of the WRMP

Contact:

Anne Fairhead
Ricardo Energy & Environment
Bright Building, First Floor
Manchester Science Park
Manchester, M15 6GZ
United Kingdom

T: +44 (0) 1235 753 488

E: Anne.Fairhead@ricardo.com

Author:

Katie Moran, Connor Fulham, Ben Sullivan, Mark Spence

Approved by:

Anne Fairhead

Date:

28/09/2022

Ref: ED13785

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Non-technical summary

Introduction

Every five years, water companies in England and Wales are required to produce an updated Water Resources Management Plan (WRMP). The WRMP sets out how water companies aim to balance supply and demand for water over the next 25 years, ensuring the efficient use of water and sustainable water supplies are available to meet customers' needs.

In preparing its WRMP, Yorkshire Water has considered the environmental and social impact assessment of each alternative options and has carried out a Strategic Environmental Assessment (SEA), as set out in this Environmental Report. The SEA and the WRMP have also been informed by Habitats Regulations Assessment (HRA) and a Water Framework Directive (WFD) compliance assessment. These assessments are recorded separately. Together, these assessments have formed an integral part of the decision-making process to determine the preferred WRMP.

Strategic environmental assessment screening

Water companies, as responsible authorities under the Environmental Assessment of Plan and Programmes Regulations 2004 (subsequently referred to as the SEA Regulations), must themselves determine if their WRMP falls within the scope of the SEA Regulations.

Government SEA guidance provides directions for determining whether an SEA is required for a WRMP. Application of this guidance indicated that the WRMP falls within the scope of the SEA Regulation, principally due to the risk that the plan may include schemes which will require environmental impact assessment, for example water pipelines, desalination plants or raising of reservoir dams.

Strategic environmental assessment and water resources management planning

In the context of water resource management planning, the SEA process can assist in the identification of potential environmental effects (adverse or beneficial) associated with alternative options being considered by a water company to balance supply and demand over the 25-year planning horizon. Knowledge of these effects helped to evaluate and identify a preferred plan of schemes for balancing supply and demand over this planning horizon, in particular contributing to the option and plan appraisal processes. The preferred plan forms the basis of this WRMP.

The WRMP process already requires a substantial element of environmental assessment and consideration. Certain environmental and social impacts are monetised and incorporated into the planning process by adding them to the capital and operating costs of schemes. SEA can add value to the appraisal process by promoting the consideration of a wider range of impacts that cannot be monetised. The SEA process also identified cumulative effects within Yorkshire Water's WRMP and with other policies, plans, programmes and projects.

There are five key stages of the SEA process:

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

In using the SEA to support decision-making, care must be taken to ensure that environmental and social impacts are not 'double-counted' in both the monetisation process and the SEA, as this may potentially skew the options and plan appraisal process.

The SEA provides information on the relative environmental performance of alternatives, and is intended to make the planning and decision-making process more transparent. The SEA can, therefore, be used to support the timing and implementation of water resource management planning options.

An SEA Scoping Report was issued in April 2020 to statutory consultees (the Environment Agency, Natural England and Historic England) giving them an opportunity to provide their views on the proposed scope and level of detail of this SEA Environmental Report. Issues raised by consultees at the scoping stage were considered throughout the SEA process.

Assessment methodology

The assessment has been 'objectives-led'. The SEA objectives have been derived from environmental objectives established in law, policy or other plans and programmes, and from a review of the baseline information. The SEA objectives have been categorised under the following topic areas: biodiversity flora & fauna, population & human health, material assets & resource use, water, soil geology & land use, air & climate, archaeology & cultural heritage and landscape & visual amenity. These are set out in **Table NTS 1**. The overall findings of the SEA describe the extent to which objectives for each topic are met by each of the water resources management plan options.

The outputs of the assessment are a completed, detailed appraisal framework table for each of the selected water resource management options, and a colour coded summary visualisation matrix (ranging from major beneficial impacts to major adverse impacts). This provides a comparative assessment of the residual environmental effects of implementing each water resources management plan option.

The appraisal tables provide an evaluation of impact scale, certainty, duration and permanence in compliance with criteria for determining the likely significance of effects specified in the SEA Regulations Part 2, Regulation 9(2a) and Schedule 1. The assessment assumes implementation of standard best practice in implementing the option, and any proposed mitigation measures incorporated into the option conceptual design and costs. This enables assessment of the significance of residual effects after mitigation, in-line with the Office of the Deputy Prime Minister (ODPM) Practical Guide and UKWIR SEA national guidance. The residual adverse and beneficial effects are identified separately to avoid mixing adverse and beneficial effects, in line with SEA best practice. This enables adverse and beneficial impacts to be independently assessed, maintaining transparency throughout the WRMP decision-making process.

A cumulative, or in-combination, assessment has also been undertaken which has been involved examining the potential impacts of the options included in the preferred plan in combination with each other, as well as in combination with other relevant plans and programmes.

Environmental Baseline

An essential part of the SEA process is to identify the current baseline conditions and their likely evolution in the absence of WRMP24. It is only with knowledge of baseline conditions that potential impacts of the WRMP24 and its schemes can be identified, monitored, and if necessary mitigated. However, it is important to note that the future baseline is not a 'do nothing' option with respect to water resources planning. There will be elements of Yorkshire Water's current WRMP (WRMP19) that will continue in absence of the new WRMP24 plan (e.g. increased water metering, continuing leakage reduction and water efficiency measures to implement Yorkshire Water policy), which will act to alter the future baseline.

This Environmental Report covers the full duration of the current WRMP, i.e. 2024/5 to 2049/50. The statutory process requires WRMPs to be produced every five years, as such, the schemes and programmes for balancing supply and demand for water will be reviewed again and subject to SEA in

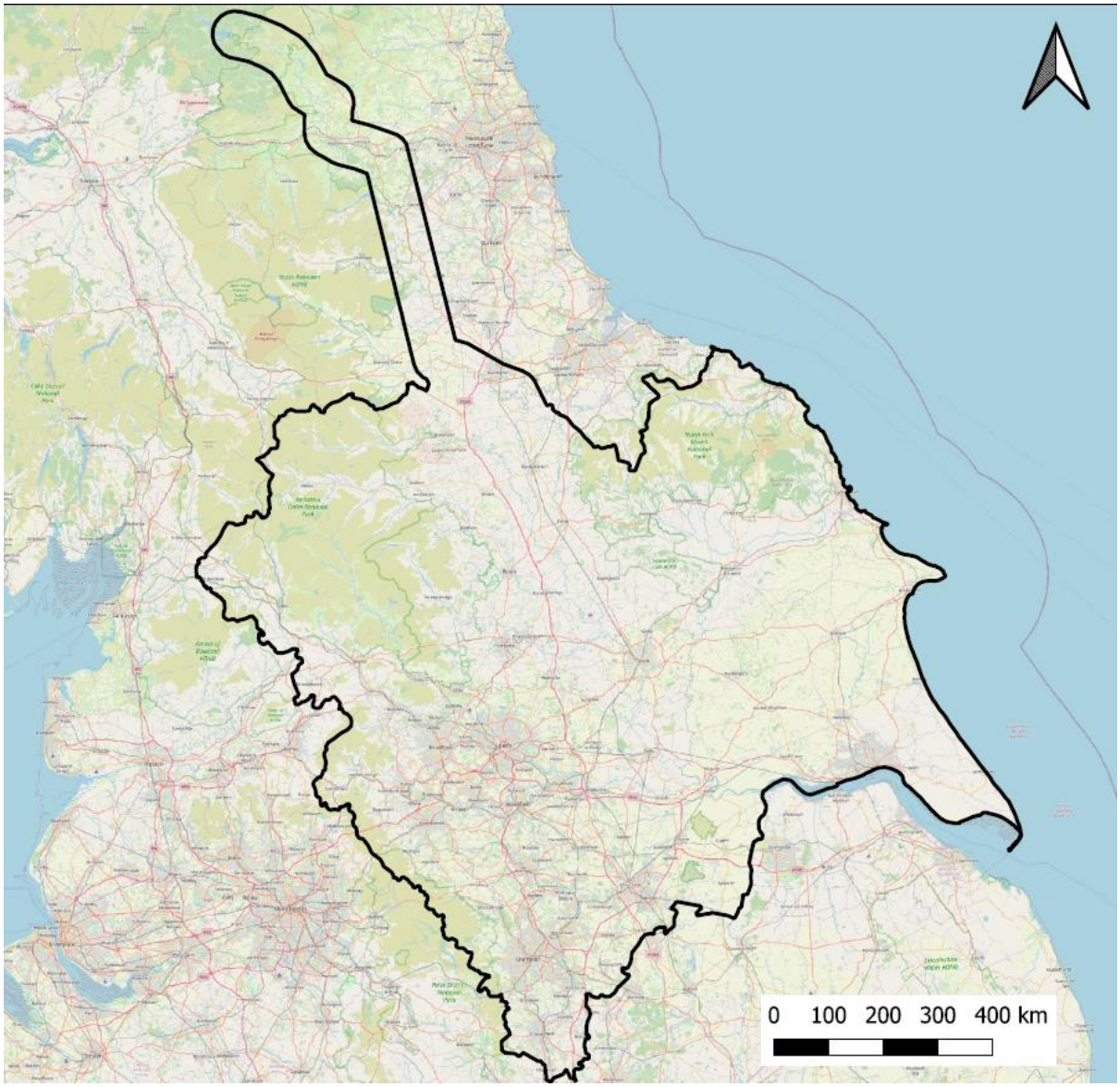
2028/29. Future WRMP cycles will revisit options beyond the current plan's period and the SEA will be updated at that time.

The best available projections for environmental and social characteristics have been considered and summarised, but there is significant uncertainty due to the substantial differences in the availability and temporal resolution of robust projections across the various SEA topic areas, which increases with time. A scenario approach has been adopted to test the sensitivity of the WRMP against the assessment of environmental and social effects based on known or likely changes. In this way, the resilience of options, programmes and the overall plan can be assessed and used to inform decision-making as well as future recommendations for monitoring of the effects of the plan to provide data for subsequent WRMPs and associated SEAs.

Baseline data have been drawn from a variety of sources, including the review of relevant plans, policies and programmes. The likely future trends in the environmental and social issues considered have been presented where information is available to do so. However, reliance on these data sets has in some cases meant that this information has become outdated. Whilst this is sufficient for the SEA process, local and/or site-specific data would be collected during the later EIA process where requested.

The SEA study area comprises the entirety of Yorkshire Water's supply area which is also considered to the natural catchment of the water company's operations (**Figure NTS 1**). The study area also includes an additional 10km wide 'corridor' of the Tyne and Tees to cover the potential development of river transfer and/or pipeline schemes to transfer water to the Yorkshire Water region. This corridor is within the Kielder SWZ which is included in the environmental baseline review. Therefore, the baseline information presented in this report may not identify specific, localised issues that are not reflective of the general trends of the region.

Figure NTS 1 SEA Study Area



The Yorkshire Water region has a varied landscape with the Pennines stretching to the west, the North York Moors in the north, and the low lying southern and eastern parts of the region. Annual average rainfall across the region varies. The highest rainfall is near the Pennines, whilst low lying areas average less than half the volume of rainfall each year, with little seasonal variation.

Urban areas in the west and the south of Yorkshire are principally supplies from reservoirs in the Pennines. Reservoirs located in the Pennines and the valleys of the River Don, Aire, Wharfe, Calder, Nidd and Colne provide the largest upland sources of water in the region. Yorkshire Water operates over 100 impounding reservoirs of which two are major pumped storage reservoirs. The total storage capacity of all the supply reservoirs amounts to some 160,000Ml.

In the eastern and northern parts of the region, river and groundwater abstractions, chiefly from the rivers of the North York Moors and the Yorkshire Wolds respectively, are the major water sources.

Key issues arising from the review of baseline conditions for each of the SEA topics are summarised in **Table NTS 1**. These key issues have been used to support the development of the SEA objectives.

Table NTS 1 Summary of key sustainability issues from the review of the baseline conditions

SEA Topic	Key issues
Biodiversity, Fauna and Flora	The need to protect or enhance the region's biodiversity, particularly protected sites designated for nature conservation. The need to avoid activities likely to cause irreversible damage to natural heritage. The need to take opportunities to improve and not reduce connectivity between fragmented habitats. The need to control the spread of Invasive Non-Native Species (INNS). The need to engage more people in biodiversity issues so that they personally value biodiversity and know what they can do to help, including through recognising the value of the ecosystem services.
Population and Human Health	The need to ensure water supplies remain affordable especially for deprived and vulnerable communities. The need to ensure continued improvements in levels of health across the region, particularly in urban areas and deprived areas. The need to ensure public awareness of drought conditions and importance of maintaining resilient, reliable public water supplies without the need for emergency drought measures. The need to ensure water quantity and quality is maintained for other users including tourists, recreational users and other users such as farmers. The need to ensure a balance between different aspects of the built and natural environment that will help to provide opportunities for local residents and tourists, including opportunities for access to recreation resources and the natural and historic environment. The need to accommodate an increasing population. The need to contribute towards maintaining sustainable growth in the region. Sites of Nature Conservation Importance, heritage assets, water resources, important landscapes and public rights of way contribute to recreation and tourism opportunities and subsequently health and well-being and the economy.
Material Assets and Resource Use	The need to minimise the consumption of resources, including water and energy. The need to reduce the total amount of waste produced in the region, from all sources, and to reduce the proportion of this waste sent to landfill. The need to continue to reduce leakage from the water supply system. Daily consumption of water is higher than the national average in the area and consequently there is a continued need to encourage more efficient water use. The need to support regional and national commitments to decarbonisation.
Water	The need to further improve the quality of the region's river, estuarine and coastal waters taking into account WFD status targets. The need to maintain the quantity and quality of groundwater resources taking into account WFD status targets.

SEA Topic	Key issues
	The need to improve the resilience, flexibility and sustainability of water resources in the region, particularly in light of potential climate change impacts on surface waters and groundwaters. The need to ensure sustainable abstraction to protect the water environment. The need to ensure that people understand the value of water. The need to reduce and manage flood risk.
Soil, Geology and Land-use	The need to protect geological features of importance and maintain and enhance soil function and health. The need to manage the land more holistically at the catchment level, benefitting landowners, other stakeholders, the environment and sustainability of natural resources (including water resources). The need to make use of previously developed land (brownfield land) and to reduce the prevalence of derelict land in the region.
Air and Climate	The need to reduce air pollutant and greenhouse gas emissions and limit air emissions to comply with air quality standards. The need to mitigate against climate change through the reduction in greenhouse gas emissions in order to contribute to risk reduction over the long term. The need to adapt to the impacts of climate change for example through, sustainable water resource management, water use efficiencies, specific aspects of natural ecosystems (e.g. connectivity) as well as accommodating potential opportunities of climate change.
Archaeology and Cultural Heritage	The need to conserve or enhance sites of archaeological importance and cultural heritage interest, particularly those which are sensitive to the water environment.
Landscape and Visual Amenity	The need to protect and improve the natural beauty of the region's National Parks, AONBs, and other areas of natural beauty. It is envisaged that landscape and designated sites will be maintained and enhanced for the enjoyment of the public.

Table NTS 2 summarises the future environmental baseline in the absence of WRMP24 based on available information.

Table NTS 2 Summary of future environmental baseline in the absence of WRMP24

SEA topic	Future Environmental Baseline
Biodiversity, Flora and Fauna	The Defra 25 Year Environment Plan[1] includes a commitment to restore restoring 75% terrestrial and freshwater protected sites to favourable condition and to create or restore 500,000 hectares of wildlife-rich habitat outside the protected site network, focusing on priority habitats as part of a wider set of land management changes providing extensive benefits. The 25 Year Plan also proposed an adoption of 'Biodiversity Net Gain' approach to development, an approach introduced into national planning policy in 2019 and which will be mandated by the upcoming Environment Bill. The 25-year Plan also includes a commitment to support land management at landscape and catchment level and to support the adoption of long-term sustainable land management practices to significantly expand wildlife habitat and provide opportunities for species and ecosystem recovery. Climate change is anticipated to have an impact on wildlife in the future by exacerbating existing pressures such as changes to the timing of seasonal activity, and water scarcity. It is acknowledged that there is a need to allow wildlife to adapt to the impacts of climate change. Climate may limit species' distributions indirectly though the impact of invasive species on native species along climatic gradients[2]. It will affect the abundance and diversity of natural enemies, competitors and species that constitute resources, as well as a species' ability to compete for resources or resist natural enemies.
Population and Human Health	Population is expected to grow at a rate between 8.2% and 16.5% across the region, with an increasing proportion of people at or above state pension age. Household projections show potential increases of between 19% and 31% across the region, with an increasing proportion of one person households[3]. In response to recent studies access to the recreational resources, green spaces and the historic environment will have greater importance in future planning[4]. The NPPF suggests a range of areas that should be taken into account, including the provision of appropriate facilities for recreation that preserve the openness of the green belt. The National Ecosystem Assessment and the Marmot Review, Fair Society, Healthy Lives, demonstrate the positive impact that nature has on mental and physical health and as a result the Government intends to establish a Green Infrastructure[5] Partnership with civil society to support the development of green infrastructure in England. Improvements to the quality of the water environment and certain potential climate change impacts will present opportunities for an expanding tourist industry in the region[6].

[1] https://www.gov.uk/government/publications/25-year-environment-plan
[2] Pateman & Hodgson (2015) Biodiversity Climate change impacts report card technical paper. Available from: http://www.nerc.ac.uk/research/partnerships/lwec/products/report-cards/biodiversity/papers/source06/
[3] ONS (2010) Housing Statistical Release - Household Projections 2008 to 2033, England.
[4] Defra (2011) The Natural Choice: securing the value of nature, The Natural Environment White Paper
[5] Green infrastructure is a term used to refer to the living network of green spaces, water and other environmental features in both urban and rural areas.
[6] Defra (2012) The UK Climate Change Risk Assessment 2012 Evidence Report.

SEA topic	Future Environmental Baseline
Material assets and resource use	The Government's National Infrastructure Strategy[7] (2020) outlines a legal commitment to decarbonise the economy by 2050, strategies to rebuild the economy following the COVID-19 pandemic and plans to 'level-up' UK cities and regional powerhouses. Plans for green-growth clusters in formerly industrial areas and investment via the Towns Fund could benefit the Yorkshire region in terms of the economy, industry, resource usage and the built environment. The UK Government plans to accelerate the deployment of green technology through private sector investment in the retrofitting of existing stock, carbon capture and low-carbon hydrogen. Yorkshire Water's current economic level of leakage target is to reduce its regional level of water leakage from to 297.1Ml/d. By 2018/19, the target leakage is reduced by 5Ml/d to 292.1Ml/d, with a further reduction to 287.1Ml/d in 2019/2020. Yorkshire Water's water resources plan for 2024 will include updated projections and targets for per capita water consumption, commercial demand for water and the social and economic level of leakage targets over the next 25 years.
Water	The Water Framework Directive set a target of aiming to achieve at least 'good status' in all waterbodies by 2015. However, provided that certain conditions are satisfied, in some cases the achievement of good status may be delayed up until 2027. The NPPF states that inappropriate development in areas at risk of flooding (in Flood Zone 1[8], Flood Zone 2[9], Flood Zone 3a[10] or Flood Zone 3b - the functional floodplain); should be avoided by directing development away from areas at highest risk. The NPPF requires that where development is necessary, it should be made safe without increasing flood risk elsewhere, as defined in the Technical Guidance to the NPPF[11]. The NPPF requires the application of a sequential, risk-based approach (operated through Strategic Flood Risk Assessment) to the location of development to avoid where possible flood risk to people and property and to manage any residual risk, taking account of the impacts of climate change. Following application of the Sequential Test, if it is not possible, consistent with wider sustainability objectives, for the development to be located in zones with a lower probability of flooding, the Exception Test can be applied if appropriate. This includes development for water- compatible uses (e.g. water transmission infrastructure and pumping stations) and essential infrastructure (e.g. water treatment works that need to remain operational in times of flood). The Government's 25-year Environment Plan looks to strengthen the relevant protections in the NPPF and, in addition, focus on using more natural flood management solutions, increase the uptake of sustainable drainage systems and improve resilience and recovery times of at-risk properties. The Environment Agency has produced 77 Catchment Flood Risk Plans (CFMPs) for England and Wales. Through the CFMPs, inland flood risk across all of England and Wales has been assessed for the first time. The CFMP considers all types of inland flooding, from rivers, ground water, surface water and tidal flooding. The role of CFMPs is to establish flood risk management policies which will deliver sustainable flood risk management for the long term. This is essential if for effective investment decisions for the future and to help prepare ourselves effectively for the impact of drought events as a result of

[7] HM Treasury Infrastructure UK (2020). National Infrastructure Strategy https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/938539/NIS_Report_Web_Accessible.pdf
[8] Low probability of river or sea flooding (<0.1%) which has critical drainage problems
[9] Medium probability of river (1%-0.1%) or sea flooding (0.5%-0.1%)
[10] High probability of river (>1%) or sea flooding (>0.5%)
[11] Ministry of Housing, Communities & Local Government (2014) Flood risk and coastal change. Accessed at https://www.gov.uk/guidance/flood-risk-and-coastal-change

SEA topic	Future Environmental Baseline
	climate change. The CFMPs will help target the areas that are at greatest risk and provide information on the likely future flood risk, which will help establish the future baseline. Yorkshire Water's 2019 Water Resource Management Plan[12] and its 2022 Drought Plan provide details on how water resources will be managed and secured for the future, including in response to the risks presented by climate change. The Water Resources Management Plan identifies that the Yorkshire Water region will remain in a water supply surplus until the mid-2030s. This reflects the current and forecast economic climate and associated impact on new development and water use. The UK Climate Change Risk Assessment (CCRA) 2017 Evidence Report[13] draws together and interprets the evidence gathered by CCRA regarding current and future threats and opportunities for the UK posed by the impacts of climate change up until 2100. Further details can be found in Section 1.4.2 of Appendix D.
Soil, Geology and Land Use	One of the core planning principles of the National Policy Planning Framework (NPPF) is to encourage the effective use of land by reusing land that has been previously developed (brownfield land), provided that it is not of high environmental value. The NPPF also places great importance with respect to Green Belt policy, the aim of which is to prevent urban sprawl by keeping land permanently open. Green Belt serves five purposes: to check the unrestricted sprawl of large built-up areas; to prevent neighbouring towns merging into one another; to assist in safeguarding the countryside from encroachment; to preserve the setting and special character of historic towns; and to assist in urban regeneration, by encouraging the recycling of derelict and other urban land. Although the NPPF promotes a presumption in favour of sustainable development, this does not apply where proposed developments may affect European or other designated sites covered by specific policies. The 25 Year Environment Plan (2018) runs alongside the Industrial Strategy (2017) and outlines the government's approach to safeguarding the environment and sustainable management of the economy. It introduces reforms to incentivised land management following Brexit. The plan details the Environmental Land Management scheme (ELMs), evolution of the Common Agricultural Policy (CAP). The ELMs include 3 new schemes designed to support the rural economy and the government's commitment to net zero emissions by 2050[14]. The first of these schemes, the Sustainable Farming Incentive, will pay farmers to manage their land in an environmentally sustainable way. The scheme designates standards based on a feature e.g. hedgerows or grassland, and contains a series of actions required to meet the criteria. The scheme is currently being piloted but is due to launch in 2022. The Local Nature Recovery Scheme is intended to encourage collaboration between farmers and will pay for actions that support nature recovery which meet local environmental priorities. The Local Nature Recovery Scheme is due to launch in 2024. Finally, the Landscape Recovery scheme support long-term projects to recover landscape and ecosystems. Examples of projects include the restoration of peatland and salt marshes, large-scale tree planting and the re-wilding of landscapes where appropriate. Again, this scheme is due to come online in 2024.
Air and Climate	Government and international targets indicate significant cuts in greenhouse gas emissions will take place by 2027. The UK met the first and second carbon budgets with headroom's of 36 and 384 MtCO2e respectively and is currently

[12] Yorkshire Water (2019), Water Resources Management Plan 2019-2035
[13] Defra (2016) The UK Climate Change Risk Assessment 2017 Evidence Report
[14] Defra (2021) Environmental Land Management scheme: overview

SEA topic	Future Environmental Baseline
	projected to meet the third carbon budget with a headroom of around 26 MtCO2e (until 2022)[15]. Objectives are being achieved for many air pollutants (lead, benzene, 1,3-butadiene and carbon monoxide (CO)). However, measurements show that long-term reducing trends for NO_2[16] and PM10[17] are flattening or even reversing at a number of locations, despite current policy measures. For example, emissions of PM10 and PM2.5 have been relatively stable since 2009. The Government's aim is to reduce emissions of PM2.5 against the 2005 baseline by 30% by 2020, and 46% by 2030, emissions of NO_2 against the 2005 baseline by 55% by 2020 and 73% by 2020 and to reduce emissions of sulphur dioxide against the 2005 baseline by 59% by 2020, increasing to 88% by 2030. Projections suggest with a high degree of certainty that objectives for PM10, NO_2 and O3[18] will not be achieved by 2020[19]. The CCRA considered more than 700 risks and selected 100 risks for detailed review. A selection of threats and opportunities identified under the 'medium scenario' are summarised in **Appendix D**. As well as reducing the carbon footprint, Yorkshire Water are investing in flood resilience measures such as building flood protection walls around treatment works and raising control panels for electrical equipment above flood levels. They are working in partnership with the government to make sure that critical national infrastructure is able to cope with future weather events. This includes working with local authorities, emergency services and others to test and improve joint emergency response plans. Together with leading academics and experts, Yorkshire Water is also working on research studies and innovative solutions like Sustainable Urban Drainage Systems (SUDs) and real time models of our river networks. These projects will help the company understand and manage the water cycle better so that it can maintain high levels of customer service in a way that is cost effective and which delivers multiple benefits for people, wildlife and the environment.
Archaeology and Cultural Heritage	Core planning principles in the NPPF include those aiming to protect heritage assets, including "conserve heritage assets in a manner appropriate to their significance, so that they can be enjoyed for their contribution to the quality of life of this and future generations"[20]. Recent and ongoing national economic difficulties may have a negative effect on removing heritage assets from the heritage at risk register. Climate change could have variable impacts on heritage assets in the future. Some types of assets and landscapes have already experienced and survived significant climatic changes in the past and may demonstrate considerable resilience in the face of future climate change. However, many more historic assets are potentially at risk from the direct impacts of future climate change[21].
Landscape and Visual Amenity	The NPPF highlights the different roles and character of different areas, promoting the vitality of our main urban areas, protecting the Green Belts around them, recognising the intrinsic character and beauty of the countryside and supporting thriving rural communities within it. The NPPF states that great weight should be given to conserving landscape and scenic beauty in National

[15] DECC (2020) Updated energy and emissions projections 2019
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/501292/eepReport2015_160205.pdf
[16] Nitrogen dioxide
[17] Particulates with a diameter of 10µm or less
[18] Ozone
[19] Defra (2019), Clean Air Strategy 2019
[20] CLG (2012) National Planning Policy Framework, Communities and Local Government.
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/6077/2116950.pdf
[21] English Heritage, now known as Historic England, (2010) Climate Change and the Historic Environment

SEA topic	Future Environmental Baseline
	Parks and AONBs, which have the highest status of protection. It identifies that planning permission should be refused for major developments in these designated areas except in exceptional circumstances and where it can be demonstrated they are in the public interest.

Findings of the assessments

The findings of the SEA are summarised below. **Table NTS 3** sets out the SEA topics and objectives which are identified in **Tables NTS 5, NTS 6** and **NTS 7**.

For each SEA objective, a residual effects assessment was determined against a significance matrix (**Table NTS 3**) which took into account the value / sensitivity of the receptor (e.g. air quality, river water quality, landscape value) and the magnitude of the assessed effect. This significance matrix comprised effects from 'major beneficial' to 'major adverse'. This colour coding was used to complete the columns for residual effects in the visual evaluation matrices summarised in **Tables NTS 5, NTS 6** and **NTS 7**.

Table NTS 3 SEA Topics and Objectives

Topic	Objective
Biodiversity, Flora and Fauna	1.1 To protect and enhance biodiversity, ecological functions, capacity, and habitat connectivity within Yorkshire Water's supply and source area
	1.2 To protect, conserve and enhance natural capital and the ecosystem services from natural capital that contribute to the economy.
	1.3 To avoid introducing or spreading INNS.
	1.4 To provide opportunities for habitat creation or restoration and a net benefit/gain for biodiversity
Population and Human Health	2.1 To protect and improve health and well-being and promote sustainable socio-economic development through provision of access to a resilient, high quality, sustainable and affordable supply of water over the long term
	2.2 To protect and enhance the water environment for other users, including recreation, tourism and navigation
Material assets and resource use	3.1 To reduce, and make more efficient, the domestic, industrial and commercial consumption of resources, minimise the generation of waste including leakage from the water supply system, encourage its re-use and eliminate waste sent to landfill
Water	4.1 To maintain or improve the quality of rivers, lakes, groundwater, estuarine and coastal waterbodies.
	4.2 To avoid adverse impact on surface and groundwater levels and flows, and ensure sustainable management of abstractions.
	4.3 To reduce and manage flood risk, taking climate change into account.
	4.4 To increase awareness of water sustainability and efficient use of water.

Topic	Objective
Soil, geology and land use	5.1 To protect and enhance geomorphology, and the quality and quantity of soils.
Air and climate	6.1 To maintain and improve air quality
	6.2 To minimise greenhouse gas emissions
	6.3 To adapt and improve resilience to the threats of climate change
Archaeology and cultural heritage	7.1 To conserve and enhance the historic environment, heritage assets and their settings and protect archaeologically important sites.
Landscape and visual amenity	8.1 To protect and enhance designated and undesignated landscapes, townscapes and the countryside

Table NTS 4 SEA Significance Matrix

Significance of Effect		Value/sensitivity of receptor		
		High	Medium	Low
Effect magnitude (includes scale of effect)	High	Major Beneficial / Major Adverse	Major Beneficial / **Major Adverse**	Moderate Beneficial / Moderate Adverse
	Medium	Major Beneficial / Major Adverse	Moderate Beneficial / Moderate Adverse	Minor Beneficial / Minor Adverse
	Low	Dependant on nature of impact/benefit	Minor Beneficial / Minor Adverse	Negligible

Significance levels identified in **Table NTS 4** are defined as follows.

- **Major –** Effects represent key factors in the decision-making process. They are generally associated with sites and features of international, national or regional importance. If adverse, such resources / features are generally those which cannot be replaced or relocated.
- **Moderate –** Effects are likely to be important considerations at a regional or district scale. If adverse, they are likely to be of potential concern.
- **Minor –** Effects are not likely to be decision-making issues. Nevertheless, the cumulative effect of such issues may lead to an increase in the overall effects of a particular area or on a particular resource.
- **Negligible –** Effects which are not perceptible, being within normal bounds of variation of the margin of forecasting error.

Customer management options

The SEA of customer management options (**Table NTS 5**), including Domestic customer audits and retrofit, metering domestic meter optants, metering on change of occupancy, household flow regulators and Housing Association targeted programmes.

The customer management options are unlikely to have any major or moderate adverse effects on any of the SEA objectives. Minor adverse effects have been identified in relation to the air and climate objectives regarding reduction of air pollutant and greenhouse gas emissions. Most of the options will have an impact on air emissions through the increased number of vehicle journeys made to fit water meters, take meter readings or carry out audits.

Minor beneficial effects have been identified for the majority of the customer management options, in relation to sustainable and efficient use of water resources. There are a number of options that, in isolation, will result in negligible beneficial impacts for every SEA objective. C4, and C5, are likely to result in reductions in water savings of a magnitude considered to be of a moderate beneficial effect.

Leakage options

The SEA of leakage options are outlined in **Table NTS 6**. The leakage options are unlikely to have any major or moderate adverse effects on any of the SEA objectives. Three options are anticipated to have minor adverse effects on health and wellbeing of local populations, reduction in consumption of resources, improvement in air quality. These minor adverse effects are predominantly resulting from disturbances created from the physical maintenance activities of these options, which would result in temporary increases in noise and air pollution, disturbance to communities and changes in local views and settings.

Options L4, L5 and L6 are anticipated to have major benefits on population and human health, material assets and resource use, surface and ground water flows, efficient use of water and climate resilience due to the savings created by these leakage control options.

Resource management options

A wide variety of options have been assessed, shown in **Table NTS 7**, leading to a range of environmental effects being identified. These reflect the scale of abstraction and/or the location of the option in relation to sensitive environments (aquatic and terrestrial). As may be expected, the smaller scale options generally have the lower environmental effects, but differences do occur between such options due to their environmental setting. Many of the options have no greater than minor adverse effects. However, some options may have moderate or major adverse effects for some of the SEA objectives, as discussed below:

- Three schemes are anticipated to have major adverse effects against a total of five SEA objectives: DV6(vi), DV7a(vi), DV8(iv). All the Derwent Valley (DV) resource options, with the exception of DV3 and DV8(v), are anticipated to lead to major adverse impacts on biodiversity. Major adverse impacts for these options are also anticipated in relation to material assets and resource use, protection and enhancement of geology/soil quality, and minimisation of greenhouse gas emissions. However, these options are also anticipated to be associated with major to moderate beneficial effects on population and human health and climate change resilience due to the increase in available public water supply.
- The Ouse Raw Water Transfer (R2) option is anticipated to have two moderate adverse effects on biodiversity, and archaeology and cultural heritage due to the construction of the Ouse abstraction and new pipeline. However, two major beneficial effects were identified, related to population and human health and climate change resilience due to a yield of 60Ml/d, therefore maintaining the supply-demand balance. The River Ouse water treatment works extension (R1a) option may also lead to moderate adverse effects on biodiversity.
- The Grid network enhancement: New River Ouse WTW to York (R1c) option and associated pipelines option to North Yorkshire (R1d and R1f) have been identified as having a major adverse effect on biodiversity. The Grid network enhancement: New River Ouse WTW to North Yorkshire 3 Option (R1f) is also anticipated to result in moderate adverse effects for material assets and resource use, air and climate and archaeology and cultural heritage. R1g Grid network enhancement: New River Ouse WTW to York is not anticipated to result in any moderate or major adverse effects, but has the potential for moderate benefits to biodiversity given the opportunities for habitat enhancement and to climate reliance in relation to deployable output increases.

- All South Yorkshire Groundwater options (R6, R6b, R6c, R6d) are anticipated to result in significant adverse effects. R6 South Yorkshire Groundwater Option 1 has been identified as having a moderate adverse effect on water due to a potential impact on ground water balance and surface water flows. R6b South Yorkshire Groundwater Option 2, R6c South Yorkshire Groundwater Option 3, R6d South Yorkshire Groundwater Option 4 have potential to result in major adverse effect on biodiversity due to potential for construction phase impacts on a SSSI and other sensitive ecological receptors, as well as on archaeology and cultural heritage.
- The Sherwood Sandstone and Magnesian Limestone Boreholes Option 3 (R8c) is anticipated to lead to three moderate adverse effects; for population and human health, due to construction work being required in residential areas, and for cultural heritage, due to construction impacting upon the quality and settings of Scheduled Monuments and several Grade II Listed Buildings. R8f Sherwood Sandstone and Magnesian Limestone Boreholes Option 6 has been identified as having potential for a major adverse effect on biodiversity due to its proximity to designated sites as well as a moderate effect on archaeology and cultural heritage. Moderate benefits are however anticipated for population and human health due to the increase in supply of up to 20Ml/d. R8g Sherwood Sandstone Boreholes support to North Yorkshire is also expected to have moderate benefits for population and human health with an increased deployable output of 15Ml/d.
- The R13 East Yorkshire Groundwater Option 2 is associated with moderate adverse effects on biodiversity due to the potential for adverse temporary effects on nearby ancient woodland. Moderate adverse effects on groundwater are also associated with the option pending further investigation.
- The R29 Reservoir desilting option is assessed as having a major adverse effect on biodiversity and the quality of habitat in a number of nationally and internationally designated sites. If desilting requires extensive drawdown of the reservoirs, there will also likely be temporary moderate adverse effects on landscape and visual amenity given the setting of these reservoirs. Desilting works have the potential have a temporarily adverse effect on water quality both within the reservoir and in the downstream watercourses due to elevated turbidity in the compensation flow release water. Desilting would only occur following careful planning and further investigations, and that the list of reservoirs included in the option may decrease if unacceptable environmental impacts are identified. An increase of 11Ml/d in deployable output will likely lead to moderate beneficial effects on population and human health and adapting to climate change.
- Option R34 (Abstraction Option 1) has the potential for moderate adverse effects on population and human health, and archaeology and cultural heritage. A large proportion of the pipeline route will pass through heavily built areas, leading to temporary adverse effects from noise, dust and vibration and temporary adverse impacts on a range of recreational facilities and historical assets.
- The is also one possible moderate adverse effect for the River Aire Abstraction option 1 (R35), relating to archaeology and cultural heritage due to the proximity of the pipeline route potentially passing to a World Heritage Site (WHS). It will however provide a 10Ml/d yield on most days, contributing to moderate beneficial impacts.
- The construction phase of the R51 Supply Dales from the Tees – treated option is anticipated to result in adverse effects on material assets and resource use, and archaeology and cultural heritage given the scale and location of construction. However, given the provision of an additional 15Ml/d essential public water supplies will be maintained bringing moderate beneficial effects to population and human health, air and climate through increased resilience to climate change, and biodiversity through habitat enhancement.
- The East Yorkshire coast desalination (R61) and Tidal Abstraction Reservoir (R78) options have the potential for major adverse effects on biodiversity as it may impact on the Humber Estuary SAC/SPA/Ramsar. In addition, major adverse effects are associated with the significant amount of resource use and energy required to operate R61. However moderate benefits are anticipated for both options in relation to population and human health and climate resilience, associated with the maintenance of essential public water supply
- The Aire and Calder new WTW (R86) option may result in moderate adverse impacts on biodiversity and material assets and resource use during the construction phase, however given

the increase of up to 70Ml/d benefit to public water supply, moderate benefits have been identified for population and human health and climate resilience.

- Increased abstraction related to the Rebuild Northallerton WTW (R87) option has the potential to have a major adverse effect on surface water flows and moderate adverse effects on water quality during implementation.
- Assessment of Convert Wensleydale springs to boreholes (R89) has identified the potential for groundwater drawdown during operation to result in major adverse effects on flows in the associated surface water body, and for major adverse effects on groundwater quality.

Table NTS 5 Visual evaluation matrix summary for customer management options

Option	Impact	SEA Objective																
		1.1	1.2	1.3	1.4	2.1	2.2	3.1	4.1	4.2	4.3	4.4	5.1	6.1	6.2	6.3	7.1	8.1
C1a Domestic customer audits and retrofit	Adverse		None		None		None						None				None	None
	Beneficial				None		None						None				None	None
C1b Domestic customer audits and retrofit	Adverse		None		None		None						None				None	None
	Beneficial				None		None						None				None	None
C1c Domestic customer audits and retrofit	Adverse		None		None		None						None				None	None
	Beneficial				None		None						None				None	None
C1d Domestic customer audits and retrofit	Adverse		None		None		None						None				None	None
	Beneficial				None		None						None				None	None

Option	Impact	SEA Objective																
		1.1	1.2	1.3	1.4	2.1	2.2	3.1	4.1	4.2	4.3	4.4	5.1	6.1	6.2	6.3	7.1	8.1
C1e Domestic customer audits and retrofit	Adverse		None		None		None						None				None	None
	Beneficial				None		None						None				None	None
C2a-c Metering (domestic meter optants)	Adverse		None		None		None						None				None	None
	Beneficial				None		None						None				None	None
C4 Metering on change of occupancy	Adverse				None		None						None				None	None
	Beneficial				None		None						None				None	None
C5 Smart metering	Adverse				None		None						None				None	None
	Beneficial				None		None						None				None	None

Option	Impact	SEA Objective															
		1.1	1.2	1.3	1.4	2.1	2.2	3.1	4.1	4.2	4.3	4.4	5.1	6.1	6.2	6.3	7.1	8.1
C6a Commercial water user audits and retrofit	Adverse				None								None				None	None
	Beneficial				None								None				None	None
C6b Commercial water user audits and retrofit	Adverse				None								None				None	None
	Beneficial				None								None				None	None
C6c Commercial water user audits and retrofit	Adverse				None								None				None	None
	Beneficial				None								None				None	None
C6d Commercial water user audits and retrofit	Adverse				None								None				None	None
	Beneficial				None								None				None	None

Option	Impact	SEA Objective																
		1.1	1.2	1.3	1.4	2.1	2.2	3.1	4.1	4.2	4.3	4.4	5.1	6.1	6.2	6.3	7.1	8.1
C6e Commercial water user audits and retrofit	Adverse				None								None				None	None
	Beneficial				None								None				None	None
C7a-e Commercial water user audits and retrofit - customer pays	Adverse				None								None				None	None
	Beneficial				None								None				None	None
C15a Household Flow Regulator - Internal	Adverse				None		None						None				None	None
	Beneficial				None		None						None				None	None
C15b Household Flow Regulator – Internal	Adverse				None		None						None				None	None
	Beneficial				None		None						None				None	None

Option	Impact	SEA Objective																
		1.1	1.2	1.3	1.4	2.1	2.2	3.1	4.1	4.2	4.3	4.4	5.1	6.1	6.2	6.3	7.1	8.1
C15c Household Flow Regulator – Internal	Adverse				None		None						None				None	None
	Beneficial				None		None						None				None	None
C15d Household Flow Regulator – Internal	Adverse				None		None						None				None	None
	Beneficial				None		None						None				None	None
C15e Household Flow Regulator - Internal	Adverse				None		None						None				None	None
	Beneficial				None		None						None				None	None
C21a Housing Associations – targeted programme	Adverse		None		None		None						None				None	None
	Beneficial				None		None						None				None	None

Option	Impact	SEA Objective																
		1.1	1.2	1.3	1.4	2.1	2.2	3.1	4.1	4.2	4.3	4.4	5.1	6.1	6.2	6.3	7.1	8.1
C21b Housing Associations – targeted programme	Adverse		None		None		None						None				None	None
	Beneficial				None		None						None				None	None
C21c Housing Associations – targeted programme	Adverse		None		None		None						None				None	None
	Beneficial				None		None						None				None	None
C21d Housing Associations – targeted programme	Adverse		None		None		None						None				None	None
	Beneficial				None		None						None				None	None
C21e Housing Associations – targeted programme	Adverse		None		None		None						None				None	None
	Beneficial				None		None						None				None	None

Table NTS 6 Visual evaluation matrix summary for leakage options

Option	Impact	SEA Objective 1.1	1.2	1.3	1.4	2.1	2.2	3.1	4.1	4.2	4.3	4.4	5.1	6.1	6.2	6.3	7.1	8.1
L1 Active Leakage Control 14Ml/d	Adverse				None													
	Beneficial				None													
L2 Active Leakage Control 30Ml/d	Adverse				None													
	Beneficial				None													
L3 Active Leakage Control 46Ml/d	Adverse				None													
	Beneficial				None													
L4 Active Leakage Control 62Ml/d	Adverse				None													
	Beneficial				None													

Option	Impact	SEA Objective 1.1	1.2	1.3	1.4	2.1	2.2	3.1	4.1	4.2	4.3	4.4	5.1	6.1	6.2	6.3	7.1	8.1
L5 Active Leakage Control 78Ml/d	Adverse				None													
	Beneficial				None													
L6 Active Leakage Control 95Ml/d	Adverse				None													
	Beneficial				None													

Table NTS 7 Visual evaluation matrix summary for resource management options

Option	Impact	SEA Objective 1.1	1.2	1.3	1.4	2.1	2.2	3.1	4.1	4.2	4.3	4.4	5.1	6.1	6.2	6.3	7.1	8.1
DV3 - South Yorkshire Groundwater	Adverse				None							None						
	Beneficial											None						
DV6(iv) Import Tees to South Yorkshire Pipeline	Adverse				None							None						
	Beneficial											None						

Option	Impact	SEA Objective																
		1.1	1.2	1.3	1.4	2.1	2.2	3.1	4.1	4.2	4.3	4.4	5.1	6.1	6.2	6.3	7.1	8.1
DV6(v) Import Tees to South Yorkshire Pipeline	Adverse				None							None						
	Beneficial											None						
DV6(vi) Tees to South Yorkshire Pipeline	Adverse				None							None						
	Beneficial											None						
DV7a(iv) Tees to Ouse Pipeline Option 1	Adverse				None							None						
	Beneficial											None						
DV7a(v) Tees to Ouse Pipeline Option 2	Adverse				None							None						
	Beneficial											None						
DV7a(vi) - – Tees to York Pipeline Option 3	Adverse				None							None						

Option	Impact	SEA Objective																
		1.1	1.2	1.3	1.4	2.1	2.2	3.1	4.1	4.2	4.3	4.4	5.1	6.1	6.2	6.3	7.1	8.1
	Beneficial											None						
DV8 (iv) - York to South Yorkshire Pipeline	Adverse				None					None		None						
	Beneficial									None		None						
DV8 (v) - York WTW Capacity increase	Adverse				None							None						
	Beneficial											None						
E2 Yorkshire grid network to STW	Adverse											None						
	Beneficial											None						
R1a River Ouse water treatment works extension	Adverse				None							None						
	Beneficial											None						
R1c Grid network enhancement: New River Ouse WTW to York	Adverse				None							None						

Option	Impact	SEA Objective																
		1.1	1.2	1.3	1.4	2.1	2.2	3.1	4.1	4.2	4.3	4.4	5.1	6.1	6.2	6.3	7.1	8.1
	Beneficial											None						
R1d Grid network enhancement: New River Ouse WTW to North Yorkshire 1	Adverse				None					None		None						
	Beneficial									None		None						
R1e Grid network enhancement: New River Ouse WTW to North Yorkshire 2	Adverse				None					None		None						
	Beneficial									None		None						
R1f Grid network enhancement: New River Ouse WTW to North Yorkshire 3	Adverse				None					None		None						
	Beneficial									None		None						
R1g Grid network enhancement: New River Ouse WTW to York	Adverse				None					None		None						
	Beneficial									None		None						
R2 Ouse Raw Water Transfer	Adverse				None							None						

Option	Impact	SEA Objective																
		1.1	1.2	1.3	1.4	2.1	2.2	3.1	4.1	4.2	4.3	4.4	5.1	6.1	6.2	6.3	7.1	8.1
	Beneficial											None						
R3 Increased River Ouse pump storage capacity	Adverse				None							None						
	Beneficial											None						
R3a River Ouse licence transfer	Adverse				None		None											None
	Beneficial				None		None											None
R5 Aquifer Storage and Recovery Scheme 1	Adverse				None													
	Beneficial																	
R6 South Yorkshire Groundwater Option 1	Adverse				None							None						
	Beneficial											None						
R6b South Yorkshire Groundwater Option 2	Adverse				None							None						

Option	Impact	SEA Objective																
		1.1	1.2	1.3	1.4	2.1	2.2	3.1	4.1	4.2	4.3	4.4	5.1	6.1	6.2	6.3	7.1	8.1
	Beneficial	None										None						
R6c South Yorkshire Groundwater Option 3	Adverse				None							None						
	Beneficial	None										None						
R6d South Yorkshire Groundwater Option 4	Adverse				None							None						
	Beneficial	None										None						
R8b: Sherwood Sandstone and Magnesian Limestone Boreholes Option 2	Adverse				None							None						
	Beneficial											None						
R8c: Sherwood Sandstone and Magnesian Limestone Boreholes Option 3	Adverse				None							None						
	Beneficial											None						
R8f Sherwood Sandstone and Magnesian	Adverse				None							None						

Option	Impact	SEA Objective																
		1.1	1.2	1.3	1.4	2.1	2.2	3.1	4.1	4.2	4.3	4.4	5.1	6.1	6.2	6.3	7.1	8.1
Limestone Boreholes Option 6	Beneficial											None						
R8g Sherwood Sandstone Boreholes support to North Yorkshire	Adverse				None							None						
	Beneficial											None						
R12 East Yorkshire Groundwater Option 1	Adverse				None													
	Beneficial																	
R13 East Yorkshire Groundwater Option 2	Adverse				None							None						
	Beneficial											None						
R17 Reuse abandoned third party Groundwater source Option 2	Adverse				None													
	Beneficial																	
R18 Reuse abandoned third party Groundwater source Option 3	Adverse				None													

Option	Impact	SEA Objective																
		1.1	1.2	1.3	1.4	2.1	2.2	3.1	4.1	4.2	4.3	4.4	5.1	6.1	6.2	6.3	7.1	8.1
	Beneficial																	
R19 Reuse abandoned third party Groundwater source Option 4	Adverse				None													
	Beneficial																	
R29 Reservoir De-silting	Adverse				None													
	Beneficial				None													
R31a Additional bankside storage on the River Ouse	Adverse				None							None						
	Beneficial											None						
R34 River Calder Abstraction Option 1	Adverse				None							None						
	Beneficial											None						
R35 River Aire Abstraction Option 1	Adverse				None							None						

Option	Impact	SEA Objective																
		1.1	1.2	1.3	1.4	2.1	2.2	3.1	4.1	4.2	4.3	4.4	5.1	6.1	6.2	6.3	7.1	8.1
	Beneficial											None						
R37b(ii) River Aire abstraction Option 4	Adverse											None						
	Beneficial											None						
R51 Dales from the Tees - treated	Adverse				None													
	Beneficial																	
R58 Transfer from UU Option 3	Adverse		None		None													
	Beneficial		None		None													
R59 Transfer from UU Option 4	Adverse				None													
	Beneficial																	
R61 East Yorkshire coast desalination	Adverse				None							None						

Option	Impact	SEA Objective																
		1.1	1.2	1.3	1.4	2.1	2.2	3.1	4.1	4.2	4.3	4.4	5.1	6.1	6.2	6.3	7.1	8.1
	Beneficial											None						
R78 Tidal Abstraction Reservoir	Adverse				None													
	Beneficial																	
R85 Recommission Kirklees WTW	Adverse				None						None	None	None					
	Beneficial				None						None	None	None					
R86 Aire and Calder new WTW	Adverse											None						
	Beneficial											None						
R87 Rebuild Northallerton WTW	Adverse										None	None	None					
	Beneficial				None						None	None	None					
R88 Increase storage at an existing WTW in North Yorkshire	Adverse				None							None						

Option	Impact	SEA Objective																
		1.1	1.2	1.3	1.4	2.1	2.2	3.1	4.1	4.2	4.3	4.4	5.1	6.1	6.2	6.3	7.1	8.1
	Beneficial											None						
R89 Convert Wensleydale springs to boreholes	Adverse				None						None	None	None					
	Beneficial				None						None	None	None					
R90 North Yorkshire annual license increase	Adverse				None		None					None	None	None				None
	Beneficial				None		None					None	None	None				None

Key:

- Major adverse
- Moderate adverse
- Minor adverse
- Negligible adverse
- None — Not applicable
- Major beneficial
- Moderate beneficial
- Minor beneficial
- Negligible beneficial

Formulation of the preferred plan

The aim of the WRMP is to find the 'best value' programme of supply and/or demand options (the 'preferred plan') to restore and maintain a supply-demand balance in those WRZs for which a supply deficit has been forecast. The selection process is facilitated through programme appraisal modelling tools, which are designed to produce an optimised programme taking account of whole life cost and environmental considerations.

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

The preferred plan has been selected in accordance with Yorkshire Water's goal to use demand management and leakage reduction measures to meet the predicted supply-demand deficit as far as possible. This is also in line with guidance from Ofwat and Defra, and preferences expressed by Yorkshire Water customers. Whilst the WRMP optimisation model delivers a least cost solution, this does not consider regulatory and customer preferences or any wider resilience benefits from alternative solutions. The WRMP24 has been developed in parallel to the Water Resources North (WReN) Regional Plan and the objectives of both plans are aligned.

Preferred plan

The draft WRMP24 preferred plan is set out in **Table NTS 8**. The plan includes two demand management options: L6 Active leakage control 95Ml/d and C5 Smart metering and water efficiency. The plan aligns with the previous WRMP19 plan to implement significant leakage reduction over the long term and includes a target to achieve 50% reduction of compared with 2017/18 leakage by 2050. The demand measures within the preferred plan also include customer demand management measures to further reduce water consumption per person/per property within Yorkshire Water's supply area. The C5 Smart metering and water efficiency option is assessed as resulting in moderate beneficial effects relation to sustainable and efficient use of water resources. The SEA findings also conclude that C5 Smart metering and water efficiency will result in minor beneficial effects across a range of other SEA objectives. The L6 Active leakage control 95Ml/d option is assessed as resulting in major beneficial effects across five SEA objectives in relation to human health and wellbeing, sustainable and efficient use of water resources and climate change resilience. Minor adverse effects have been identified in relation to the air and climate SEA objectives regarding use of material resources, air pollutant and greenhouse gas emissions.

However given the scale of the supply-demand balance deficit it has been necessary to also include a range of supply side measures within the draft WRMP24. Major adverse impacts for options DV7a(vi) Tees to York Pipeline Option 3 and DV8(iv) York to South Yorkshire Pipeline within the preferred plan are anticipated in relation to biodiversity, material assets and resource use, protection and enhancement of geology/soil quality, and minimisation of greenhouse gas emissions. However these options are also anticipated to be associated with major to moderate beneficial effects on population and human health and climate change resilience due to the increase in available public water supply. The construction phases of an additional four resource options within the preferred plan are anticipated to result in moderate adverse effects on biodiversity in relation to scheme construction and minor adverse effects across a number of SEA objectives including for population and human health and cultural heritage. The remaining six supply side options in the preferred plan are assessed resulting in negligible to minor adverse effects only across all SEA objectives. The majority of resource options provide opportunities to result in biodiversity enhancement (habitat creation/restoration), provide beneficial effects on population and human health and in relation to climate change resilience.

The HRA of the WRMP preferred plan has concluded that following inclusion of appropriate mitigation measures during the construction phase of relevant schemes that no adverse effects on the integrity of

any European site are anticipated. Further details are provided within the HRA report which accompanies this Environmental Report[22].

The WFD compliance assessment has informed SEA findings against the water topic objectives, and has identified uncertain impacts associated with multiple WFD water bodies in relation to four schemes within the preferred plan: R8b Sherwood Sandstone and Magnesian Limestone Boreholes Option 2, R8g Sherwood Sandstone Boreholes support to North Yorkshire, R13 East Yorkshire Groundwater Option 2, and DV7a(vi) Tees to York Pipeline Option 3. Further investigations will need to be carried out to confirm these impacts before the schemes could be implemented. East Yorkshire Groundwater Option 2 will be within any constraints imposed following Water Industry National Environment Programme (WINEP) investigations. Further details are provided within the WFD compliance assessment report which accompanies this Environmental Report[23].

Implementation of the four options above, as well as options R37b(ii) River Aire Abstraction Option 4 and DV3 South Yorkshire Groundwater, will be dependent on meeting Environment Agency licensing requirements.

Implementation of this plan will result in no deficit in the 25-year period of the WRMP.

Table NTS 8 Draft WRMP24 preferred plan

Category	Option Reference	Scheme	Benefit (Ml/d) on full implementation	First Year of Benefit
Customer management	C5	Smart metering	31	2025
Leakage	L6	Active leakage control 95 Ml/d	95	2025
Resource	DV3	South Yorkshire groundwater	5	2027
Resource	DV7a(vi)	Tees - York Pipeline Option 3	140	2049
Resource	DV8(iv)	York to South Yorkshire pipeline	N/A – 50Ml/d capacity required to transfer new source of supply to South Yorkshire	2035
Resource	DV8(v)	York WTW capacity increase	50	2029
Resource	R3a	River Ouse licence transfer	0.3 (15 maximum)	2027

[22] Ricardo Energy & Environment (2022) Habitats Regulation Assessment of the Draft WRMP24. Report prepared for Yorkshire Water Services, September 2022.
[23] Ricardo Energy & Environment (2022) Water Framework Directive Regulations Compliance Assessment of the Draft WRMP24. Report prepared for Yorkshire Water Services, September 2022.

Category	Option Reference	Scheme	Benefit (Ml/d) on full implementation	First Year of Benefit
Resource	R8b	Sherwood Sandstone and Magnesian Limestone Boreholes Option 2	5	2027
Resource	R8g	Sherwood Sandstone Boreholes support to North Yorkshire	15	2028
Resource	R13	East Yorkshire Groundwater Option 2	6 (8 maximum)	2025
Resource	R31a	Additional bankside storage on the River Ouse	11	2066
Resource	R37b(ii)	River Aire Abstraction Option 4	34	2025
Resource	R85	Recommission Kirklees WTW	8	2068

A visual summary of SEA findings for each of the schemes included in the preferred plan is provided in **Table NTS 9**.

Table NTS 9 Visual summary for options in the preferred plan

Option	Impact	SEA Objective																
		1.1	1.2	1.3	1.4	2.1	2.2	3.1	4.1	4.2	4.3	4.4	5.1	6.1	6.2	6.3	7.1	8.1
C5 Smart Metering and Water Efficiency	Adverse				None		None						None				None	None
	Beneficial				None		None						None				None	None
L6 Active Leakage Control 95Ml/d	Adverse				None													
	Beneficial				None													
DV3 - South Yorkshire Groundwater	Adverse				None							None						
	Beneficial											None						
DV7a(vi) - Tees - York Pipeline Option 1	Adverse				None							None						
	Beneficial											None						
DV8 (iv) - York to South Yorkshire Pipeline	Adverse				None					None		None						
	Beneficial									None		None						

Option	Impact	SEA Objective																
		1.1	1.2	1.3	1.4	2.1	2.2	3.1	4.1	4.2	4.3	4.4	5.1	6.1	6.2	6.3	7.1	8.1
DV8 (v) - York WTW Capacity increase	Adverse				None							None						
	Beneficial											None						
R3a River Ouse licence transfer	Adverse				None		None											None
	Beneficial				None		None											None
R8b: Sherwood Sandstone and Magnesian Limestone Boreholes Option 2	Adverse				None							None						
	Beneficial											None						
R8g Sherwood Sandstone Boreholes support to North Yorkshire	Adverse				None							None						
	Beneficial											None						
R13 East Yorkshire Groundwater Option 2	Adverse				None							None						
	Beneficial											None						

Option	Impact	SEA Objective																
		1.1	1.2	1.3	1.4	2.1	2.2	3.1	4.1	4.2	4.3	4.4	5.1	6.1	6.2	6.3	7.1	8.1
R31a Additional bankside storage on the River Ouse	Adverse				None							None						
	Beneficial											None						
R37b(ii) River Aire Abstraction Option 4	Adverse											None						
	Beneficial											None						
R85 Recommission Kirklees WTW	Adverse				None						None	None	N/A					
	Beneficial				None						None	None	None					

Key:

- Major adverse
- Moderate adverse
- Minor adverse
- Negligible adverse
- None — Not applicable
- Major beneficial
- Moderate beneficial
- Minor beneficial
- Negligible beneficial

Cumulative impact assessment

A cumulative assessment of the preferred plan was undertaken to consider whether the preferred plan options, when constructed or operated together, led to additional effects on each of the SEA topics.

The first year of benefit for R31a within the preferred plan is identified as 2066 (see **Table NTS 8**) and this scheme is estimated to be associated with an approximately 4-year construction phase. Both the DV8(iv) and DV8(v) schemes are also estimated to associate with a four-year construction period are identified as operational in 2035 and 2029 respectively, and therefore the construction phases will not coincide with that of R31a. The DV7a(vi) scheme is identified as operational in 2049 within the preferred plan (see **Table NTS 8**) with an approximately 15-year construction phase. Therefore no cumulative effects are anticipated.

On the basis of current information the construction phases of the DV8(v) scheme are estimated to run for four years and is not currently expected to overlap with that of the DV7a(vi) and DV8(iv) schemes and therefore no cumulative effects are anticipated.

The DV7a(vi) and DV8(iv) schemes are likely to have overlapping construction phases and there is therefore potential for cumulative impacts between two schemes related to construction impacts on biodiversity (Objective 1.1, Objective 1.3), population and human health (Objective 2.1), material assets and resource use (Objective 3.1), air quality (Objective 6.1), archaeology and cultural heritage (Objective 7.1), and landscape and visual amenity (Objective 8.1). Construction measures that need to be incorporated into the scheme design and/or planning to avoid or mitigate potential effects will be agreed during the detailed design and planning stage should these schemes be progressed. The DV7a(vi) scheme will cover a large geographical area (pipeline construction from the River Tees to Ouse) as will the DV8(iv) scheme (Ouse to South Yorkshire) and therefore until detailed construction plans are available it is not possible to identify if works in proximity to sensitive receptors will coincide. However, any such cumulative impacts would be expected to be minor, as most of these activities would be localised and small in scale, and could be effectively mitigated through careful project management and best practice construction methods

There is no potential for cumulative adverse effects during operation of the schemes included in the preferred plan as there are no water bodies that are impacted by more than one option. There would be benefits associated with implementation of each option in parallel, i.e. increasing the overall volume of water savings made or water provided for supply.

Mitigation

Consideration of mitigation measures has been an integral part of the SEA process. The assessment has assumed the implementation of standard best practice mitigation measures and identified any additional measures as shown in the option SEA matrices (see **Appendix E**). The significance of effects identified in the matrices relates to residual effects after mitigation.

Certain assumptions have been made regarding this:

- Where suitable mitigation measures are known and identified, these have been taken into account and reported, such that the resultant residual impact has been determined.
- In line with recommendations made in the UKWIR SEA Guidance, the SEA appraisals have assumed the implementation of reasonable mitigation, such as the use of best practice construction methods.

Mitigation of both construction and operation components for each option are presented in **Table NTS 10**. The detail of this mitigation needs to be considered during the planning phases of each of the individual measures if and when they are taken forward for implementation. This should then be consolidated into a Construction Environmental Management Plan (CEMP) for the scheme, noting that all works should be carried out in accordance with relevant Construction Design Management (CDM) Regulations 2015. In other cases, best practice design requires consideration of mitigation measures at an early stage along with consultation with potentially affected parties. In this way, effective mitigation plans can be developed to minimise many of the residual adverse effects currently identified in the SEA appraisals.

The CEMP should include further measures to minimise, or where possible, eliminate, adverse effects on various receptors. Mitigation measures employed to reduce the potential adverse effects on sensitive receptors are categorised under each SEA Objective. Mitigation measures are set out in detail in Section 8.3. Examples of mitigation measures are detailed below:

Biodiversity

- where supporting habitat will be directly lost as a result of open cut pipeline installation, the habitat must be reinstated, or trenchless/ directional drilling pipeline installation methods should be alternatively used

Population and human health

- plan construction traffic movements to avoid routes with sensitive receptors and avoid peak traffic hours

Soils, geology and land use

- agricultural soils will be managed, preserved, retained and reinstated in accordance with Department for Environment, Food and Rural Affairs (Defra)

The SEA process has identified potential residual impacts of the WRMP preferred plan after mitigation measures have been taken into consideration. **Table NTS 10** summaries the residual effects attributable to the preferred plan for the Yorkshire Water WRMP24.

Table NTS 10 Residual adverse impacts of options within the preferred plan for the WRMP24

Ref	Option	Construction	Operation
C5	Smart Metering and Water Efficiency	No significant effects	No significant effects
C15a	Household Flow Regulators A	No significant effects	No significant effects
DV3	South Yorkshire Groundwater	No significant effects	No significant effects
DV7a(vi)	Tees to York Pipeline Option 3	Biodiversity, flora and fauna; Population and human health; Material assets and resource use; Soil, geology and land use; Air and climate; Archaeology and cultural heritage; and, Landscape and visual amenity	No significant effects
DV8(iv)	York to South Yorkshire Pipeline	Biodiversity, flora and fauna; Population and human health; Material assets and resource use; Soil, geology and land use; Air and climate; Archaeology and cultural heritage; and, Landscape and visual amenity	No significant effects
DV8(v)	York WTW Capacity increase	Biodiversity, flora and fauna	No significant effects
L6	Active Leakage Control 95 Ml/d	No significant effects	No significant effects
R3a	Increased River Ouse pump storage capacity	No significant effects	No significant effects

Ref	Option	Construction	Operation
R8b	Sherwood Sandstone and Magnesian Limestone Boreholes Option 2	No significant effects	No significant effects
R8g	Sherwood Sandstone Boreholes support to North Yorkshire	No significant effects	No significant effects
R13	East Yorkshire Groundwater Option 2	Biodiversity, flora and fauna Water quality	No significant effects
R31a	Additional bankside storage on the River Ouse	Biodiversity, flora and fauna	No significant effects
R37b(ii)	River Aire Abstraction Option 4	Biodiversity, flora and fauna	No significant effects
R85	Recommission Kirklees WTW	No significant effects	No significant effects

Potential water resource impacts that could arise due to future, as yet, unknown new abstractions from common sources would be assessed and considered by the Environment Agency as informed by detailed environmental assessment work as part of the abstraction licensing and water resources planning processes.

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

Monitoring

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

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

Table NTS 11 lists the potential impacts that may arise from implementation of the WRMP preferred plan and which require monitoring in accordance with the SEA Regulations.

Key monitoring parameters at the strategic WRMP level will be those relating to the abstraction of water and the effects that this may have on waterbodies and their functions as habitats (see **Table NTS 11**). There are also direct potential impacts on humans, the built environment, terrestrial habitats, the atmosphere, landscape and heritage assets, which may arise from construction activities and/or option operation (see **Table NTS 11**). These parameters should, therefore, be included within the monitoring programme where it is practicable to do so. Extensive primary data collection is neither feasible nor appropriate for this programme level of monitoring, and use should be made where possible of existing datasets and monitoring regimes.

Site-specific monitoring requirements for the resource options included in the preferred plan will be developed during the planning process closer to the time of implementation.

Table NTS 11 Proposed SEA monitoring parameters - strategic WRMP monitoring

Impacted receptor/topic	Proposed strategic indicators
Biodiversity	Condition of protected sites, biological monitoring (e.g. macroinvertebrates, macrophytes, fisheries, bird surveys), INNS presence
Water resources, water quality	River flows, river levels, lake and reservoir levels. Groundwater levels. Surface and ground water quality (including proportion of surface water and groundwater bodies at 'Good; WFD status)
Flood risk	Number of properties that experience internal flooding from public sewers.
Soils, geology and land use	Area of previously undeveloped land used during construction
Climate Factors	Net greenhouse gas emissions per million litres (Ml) of treated water (kg CO_2 equivalent emissions per Ml) for Yorkshire Water supply area Energy use used in the operation of options. Renewable energy generated or purchased by Yorkshire Water.
Transport	Transport fleet fuel consumption, emissions and business mileage, as monitored by Yorkshire Water
Nuisance/ Community/ Local Economy	Scheme level community disruption of capital works would be monitored through an Environmental Monitoring Plan if required. Number of nuisance-related complaints (e.g. noise, dust) logged with Yorkshire Water and Local Authority EHOs. Pollution and flooding incidents Responses gauged through Yorkshire Water customer satisfaction surveys. Community investment, employee volunteering and match funding by Yorkshire Water.
Waste and resource use	Leakage Water saved through demand management / water efficiency measures. Amount of recycled / re-used materials. Proportion of waste sent to landfill. Chemical usage in water treatment.
Air Quality	Scheme related issues of capital works would be monitored through an Environmental Monitoring plan if required. Changes in air quality are monitored by the Automatic Urban and Rural Network[24] administered by Bureau Veritas, and this data would be available if required to inform a baseline

[24] Accessed at http://www.bv-aurnsiteinfo.co.uk/

Impacted receptor/topic	Proposed strategic indicators
Cultural Heritage	Loss / damage or discovery / protection of cultural, historic and industrial heritage features. Condition of buried archaeology would be monitored during construction e.g. through appropriate archaeological investigations and watching briefs as required. Consultation with relevant stakeholders to ensure impacts are minimised, e.g. to water level dependent assets. Historic England monitor parameters such as Listed Buildings and Scheduled Monuments, in order to maintain a 'Heritage at risk' register.
Landscape	Loss or damage to landscape character and features of designated sites.

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

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

Consultation

The SEA Regulations require consultation at the scoping stage and on the assessments documented in the Environmental Report. Scoping with the statutory consultation bodies defined by the SEA Regulations (the Environment Agency, Natural England and Historic England) is mandatory at both stages. Consultation with the public is only mandatory at the Environmental Report stage.

The Environmental Report is now being published for consultation. It also provides a useful reference point for consultees wishing to express their views on Yorkshire Water's draft WRMP.

On adoption of the final WRMP, after approval by Defra, Yorkshire Water will publish an SEA Post-Adoption Statement setting out how the SEA and any views expressed by the consultation bodies or the public have influenced the final WRMP.

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Appendices

1 Introduction

SEA is a statutory requirement under the Environmental Assessment of Plans and Programmes Regulations 2004 ('the SEA Regulations') requiring the assessment of effects of certain plans and programmes on the environment. The objective of SEA is to:

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

The SEA Regulations requires preparation of an Environmental Report in which the likely significant effects on the environment of implementing the plan or programme, and reasonable alternatives taking into account the objectives and geographical scope of the plan or programme, are identified, described and evaluated.

The SEA Regulations require certain plans and programmes to undergo environmental assessment, and likely significant effects on the following issues must be addressed:

> *"…biodiversity, population, human health, fauna, flora, soil, water, air, climatic factors, material assets, cultural heritage including architectural and archaeological heritage, landscape and interrelationships."*

These 'SEA topics' guide the structure of this Environmental Report (e.g. the baseline review in Section 4). Issues such as noise and transport are addressed within the SEA topics where relevant, e.g. within the population and human health, and air and climate topics.

1.1.1 Information requirements

Schedule 2 of the SEA Regulations requires the following specific information to be included within the Environmental Report:

- An outline of the contents and main objectives of the plan or programme, and of its relationship with other relevant plans and programmes. (see Section 3).
- The relevant aspects of the current state of the environment and the likely evolution thereof without implementation of the plan or programme (see Section 4).
- The environmental characteristics of areas likely to be significantly affected (see Section 3).
- Any existing environmental problems which are relevant to the plan or programme including, in particular, those relating to any areas of a particular environmental importance, such as areas designated pursuant to Directives 79/409/EEC (the 'Birds Directive') and 92/43/EEC (the 'Habitats Directive') (see Sections 1.4 and 1.5).
- The environmental protection objectives, established at international, (European) Community or Member State level, which are relevant to the plan or programme and the way those objectives and any environmental considerations have been taken into account during its preparation" (see Section 5).

1.1.2 The Environmental Report

SEA incorporates the following generic stages as set out in the UK Government Practical Guide[25]:

- Stage A: Setting the context, identifying objectives, problems and opportunities, and establishing the environmental baseline (scoping).
- Stage B: Developing and refining options and assessing effects (impact assessment).

[25] Office of the Deputy Prime Minister (2005). A Practical Guide to the Strategic Environmental Assessment Directive.

- Stage C: Preparing the Environmental Report (recording results).
- Stage D: Consulting on the Draft Plan and the Environmental Report (seeking consensus).
- Stage E: Monitoring the significant effects of the plan or programme on the environment (verification).

This Environmental Report documents stages B and C of the SEA being undertaken by Yorkshire Water to establish the environmental effects of the regional water resources planning for Yorkshire and the North East of England. The purpose and scope of the WRMP is explained in more detail in Section 1.2.

The requirements of the Environmental Report are set out in Regulation 12 of the SEA Regulations. According to Regulation 12(2) the Environmental Report shall

> *'identify, describe and evaluate the likely significant effects on the environment of-*
>
> *a) implementing the plan or programme; and*
>
> *b) reasonable alternatives taking into account the objectives and the geographical scope of the plan or programme.*

Schedule 2 of the SEA Regulations lists specific items of information which should be included in the Environmental Report. The Practical Guide provides a Quality Assurance checklist to help ensure that the requirements of the SEA Directive are met throughout the entire process.

1.1.3 SEA approach

The UK Government has produced generic SEA guidance[25] that sets out the stages of the SEA process. This, along with specific guidance for undertaking SEA, Water Framework Directive (WFD) compliance assessments and Habitats Regulations Assessment (HRA) of WRMPs[26], is being used to inform the SEA of Yorkshire Water's WRMP. The 2021 Final Water Resources Planning Guideline[27] (WRPG) also provides guidance on the role of SEA within the water resources management planning process. This includes supplementary guidelines on Best Value Planning and Environment and Social Decision Making, which contains a number of requirements and recommendations for the scope of WRMP environmental assessment, in particular in relation to SEA, Biodiversity Net Gain (BNG) and Natural Capital Assessment (NCA).

SEA incorporates the following generic stages:

- Stage A: Setting the context, identifying objectives, problems and opportunities, and establishing the environmental baseline (scoping)
- Stage B: Developing and refining options and assessing effects (impact assessment)
- Stage C: Preparing the Environmental Report (recording results)
- Stage D: Consulting on the Draft Plan and the Environmental Report (seeking consensus)
- Stage E: Monitoring the significant effects of the plan or programme on the environment (verification)

Table 1.1 is an extract from the ODPM Practical Guide[25] that sets out the main stages of the SEA process and the purpose of each task within the process. This Environmental Report documents stages B and C of the SEA process. Specific guidance on the application of the SEA process to WRMPs is provided by UKWIR[26].

[26] UKWIR (2021) Environmental Assessment Guidance for Water Resources Management Plans and Drought Plans. Report Ref 21/WR/02/15.
[27] Environment Agency and Natural Resources Wales (2021) Final Water Resources Planning Guideline

Table 1.1 SEA Stages and Tasks

SEA Stages and Tasks	Purpose
Stage A: Setting the context and objectives, establishing the baseline and deciding on the scope	
Task A1. Identifying other relevant plans, programmes and environmental protection objectives	To establish how the plan or programme is affected by outside factors to suggest ideas for how any constraints can be addressed, and to help identify SEA objectives.
Task A2. Collecting baseline information	To provide an evidence base for environmental problems, prediction of effects, and monitoring; to help in the development of SEA objectives.
Task A3. Identifying environmental problems	To help focus the SEA and streamline the subsequent stages, including baseline information analysis, setting of the SEA objectives, prediction of effects and monitoring.
Task A4. Developing SEA Objectives	To provide a means by which the environmental performance of the plan or programme and alternatives can be assessed.
Task A5. Consulting on the scope of the SEA	To ensure the SEA covers the likely significant environmental effects of the plan or programme.
Stage B: Developing and refining alternatives and assessing effects	
Task B1. Testing the plan or programme objectives against SEA objectives	To identify potential synergies or inconsistencies between the objectives of the plan or programme and the SEA objectives and help in developing alternatives.
Task B2. Developing strategic alternatives	To develop and refine strategic alternatives.
Task B3. Predicting the effects of the plan or programme, including alternatives	To predict the significant environmental effects of the plan or programme and its alternatives.
Task B4. Evaluating the effects of the plan or programme, including alternatives	To evaluate the predicted effects of the plan or programme and its alternatives and assist in the refinement of the plan or programme.
Task B5. Mitigating adverse effects	To ensure that adverse effects are identified and potential mitigation measures are considered.
Task B6. Proposing measures to monitor the environmental effects of plan or programme implementation	To detail the means by which the environmental performance of the plan or programme can be assessed.
Stage C: Preparing the Environmental Report	
Task C1. Preparing the environmental report	To present the predicted environmental effects of the plan or programme, including alternatives, in a form suitable for public consultation and use by decision-makers.
Stage D: Consulting on the Draft Plan or programme and the Environmental Report	
Task D1. Consulting the public and consultation bodies on the draft plan or programme and the Environmental Report	To give the public and the consultation bodies an opportunity to express their opinions on the findings of the Environmental Report and to use

SEA Stages and Tasks	Purpose
	it as a reference point in commenting on the plan or programme. To gather more information through the opinions and concerns of the public
Task D2. Assessing significant changes	To ensure that the environmental implications of any significant changes to the draft plan or programme at this stage are assessed and taken into account.
Task D3. Making decisions and providing information	To provide information on how the Environmental Report and consultees opinions were taken into account in deciding the final form of the plan or programme to be adopted.
Stage E: Monitoring the significant effects of the plan or programme on the environment	
Task E1. Developing aims and methods for monitoring	To track the environmental effects of the plan or programme to show whether they are as predicted; to help identify adverse effects.
Task E2. Responding to adverse effects	To prepare for appropriate responses where adverse effects are identified.

1.1.4 Purpose of the Environmental Report

This Environmental Report documents stages B and C (see **Table 1.1**) of the SEA being undertaken by Yorkshire Water to establish the environmental effects of meeting its obligation for the long-term reliable supply of water to its customers, as identified in the company's WRMP. The purpose and scope of the WRMP is explained in more detail in Section 2.

An SEA Scoping Report was produced and issued to external stakeholders as listed in the SEA Regulations in April 2020. The basis and approach for the SEA was developed through the scoping process and refined as a result of consultation with Environment Agency, Natural England and English Heritage. This consultation was undertaken in accordance with Regulation 12(5) of the SEA Regulations. Stakeholder feedback was collated and summarised so key issues could be addressed and any changes to the approach considered (see **Appendix A**).

The requirements of the Environmental Report are set out in Regulation 12 of the SEA Regulations. According to Regulation 12(2) the Environmental Report shall

> *'identify, describe and evaluate the likely significant effects on the environment of-*
>
> > *a) implementing the plan or programme; and*
> >
> > *b) reasonable alternatives taking into account the objectives and the geographical scope of the plan or programme.*

Schedule 2 of the SEA Regulations lists specific items of information which should be included in the Environmental Report. The Practical Guide provides a Quality Assurance checklist to help ensure that the requirements of the SEA Directive are met throughout the entire process. Compliance against this checklist is set out in **Appendix B**.

This Environmental Report identifies the baseline information for options under consideration for Yorkshire Water's WRMP (a 'feasible list' of options), as well as identifying their environmental effects (beneficial or adverse). It also identifies the potential mitigation and enhancement measures and suggests monitoring that could be undertaken to track the environmental effects of the WRMP once implemented.

1.1.5 Role of SEA in WRMP decision-making

The aim of the WRMP is to find the 'best value' programme of supply and/or distribution options to restore and maintain a supply-demand balance in those WRZs for which a supply deficit has been forecast. The selection process has been facilitated through programme appraisal modelling tools, which have been designed to produce an optimised programme taking account of whole life cost environmental considerations.

The WRMP follows a 'twin track' approach to addressing the supply-demand deficit, with implementation of distribution management and leakage reduction measures to further reduce water consumption per person/per property within Yorkshire Water's supply area. These distribution management and leakage reduction measures compliment options that deliver new water resources.

The WRMP process already requires a substantial element of environmental assessment and consideration. Certain environmental and social impacts are monetised and incorporated into the planning process by adding them to the capital and operating costs of schemes, as documented in the WRMP report. SEA adds value to the appraisal process by promoting the consideration of a wider range of impacts than cannot be monetised. SEA also incorporates results from HRA screening and WFD compliance assessments, ensuring the WRMP options and preferred plan consider potential impacts on protected habitats and water bodies.

1.1.6 The difference between SEA and EIA

The SEA was informed by quantitative data within the boundaries of the SEA process, however, will not provide the level of detail in these assessments typical of the environmental impact assessment (EIA) process. This is consistent with national guidance on SEA and EIA. Where required, detailed EIAs will be produced to minimise environmental impacts and support the planning process for individual schemes at a later date.

The SEA and EIA processes have similarities, however the aim and approach to these processes are significantly different. While not exhaustive, **Table 1.2** provides a brief overview of the differences between these processes.

One of the key differences is that SEA aims to identify potential environmental concerns associated with plans and programmes at a strategic level, while EIA provides a detailed assessment of impacts at the project level. The aims and approach of the SEA process provide a guide for the content of this SEA Environmental Report. The environmental data that will be used in this assessment comprises that which is readily available from existing sources, and no primary research or survey work has been carried out to inform the SEA. Therefore, there may be additional environmental issues that could influence individual WRMP options during a detailed EIA process.

Table 1.2 Key differences between SEA and EIA

Topic	SEA	EIA
Aim	To provide for a high level of protection of the environment and to contribute to the integration of environmental considerations into the preparations and adoption of **plans and programmes** with a view of promoting sustainable development.	To ensure that planning decisions are made with full knowledge of a **project**'s likely significant environmental effects, and that any negative effects are prevented, reduced or offset, while positive effects are enhanced.
Approach	Pro-active approach to development plans and programmes	Reactive approach to project-level development proposal
Impact assessment	Assesses impacts at a strategic level, with regard to environmental objectives. More qualitative assessment.	Identifies specific impacts on the environment. More quantitative assessment.
Alternatives	Considers broad range of potential alternatives	Considers limited number of feasible alternatives
Assessment outcome	Provides information to be taken account of in the decision, but **does not determine it**. A	**In determining** the project application, the competent authority is required to have

Topic	SEA	EIA
	post-adoption statement must be produced outlining changes made to the plan or programme as a result of the SEA, responses to consultations, and the reasons for choosing the plan in light of other reasonable alternatives dealt with.	regard to the Environmental Statement, as well as to other material considerations.

1.2 SEA screening for Yorkshire Water's Water Resources Management Plan

As stated in the WRPG, water companies need to demonstrate that they have investigated whether a SEA is required of its WRMP. As responsible authorities under the SEA Regulations, water companies must themselves determine if its WRMP falls within the scope of the SEA Directive.

The UKWIR Guidance, from which **Figure 1.1** is adapted, provides directions as to how the requirement for SEA should be determined for WRMPs. The boxes and arrows highlighted in green on **Figure 1.1** describe the provisions and route through the flow chart applicable to Yorkshire Water's WRMP, and demonstrate that the WRMP falls within the scope of the SEA Directive. Notably, it is possible that the WRMP will include schemes that will require EIA (Box 3 in **Figure 1.1**).

Acknowledging that the WRMP process intrinsically includes some consideration of environmental and social effects, SEA can add value to the process. It promotes consideration of a wider range of effects than cannot be monetised; it contributes to the development and assessment of alternative solutions; and it provides a mechanism for consideration of potential cumulative effects within the WRMP, and with other plans and programmes. Additionally, it facilitates consultation and includes consideration of Habitats Regulations[28] and WFD[29] implications for the WRMP (as explained further in Sections 1.4 and 1.5 below).

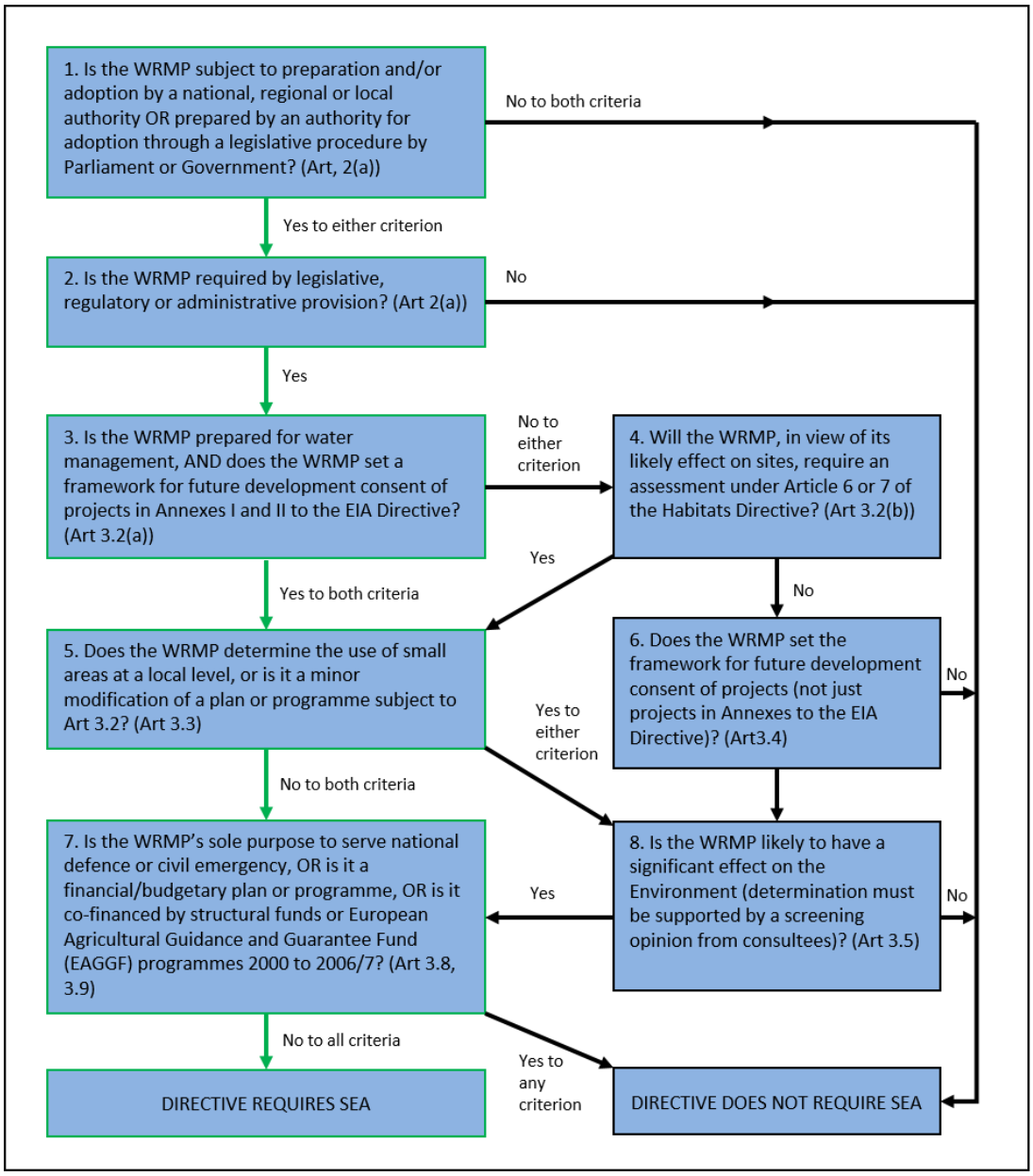
1.3 SEA and water resources management planning

In the context of water resource management planning, SEA can assist in the identification of the potential environmental effects (adverse and beneficial) of the options available to ensure long-term resilient water supplies to Yorkshire Water's customers. Knowledge of these effects can help to identify a preferred plan of options for each water resource zone (WRZ)[30] that make up Yorkshire Water's supply area to ensure a balance is maintained between available water supplies and demand for water. The SEA informs the consideration of each option and the programme appraisal process, as well as development of the overall WRMP. The SEA can identify cumulative effects between different environmental and social aspects of a particular option, programme or plan, as well as between alternative options and programmes. SEA also helps to identify potential cumulative effects of the WRMP with other plans, programmes and projects.

The WRMP process, as set out by guidance[27,26,31] already requires a substantial element of environmental assessment and consideration. Certain environmental and social effects are monetised and incorporated into the planning process by adding them to the capital and operating costs. The SEA process requires further environmental assessment and consideration of assessment outcomes. Care must be taken to ensure that environmental and social effects are not 'double-counted' as monetised and SEA assessed effects, potentially skewing the options and programme appraisal process.

[28] The Conservation of Habitats and Species Regulations 2010 (as amended)
[29] Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy
[30] UK Water Industry Research/Environment Agency define a WRZ as: 'The largest possible zone in which all resources, including external transfers, can be shared, and hence, the zone in which all customers will experience the same risk of supply failure from a resource shortfall.'
[31] Environment Agency (2021) Water resources planning guideline supplementary guidance – Environment and society in decision-making, External guidance: 18643. November 2021.

Figure 1.1 SEA screening process



Source: Office of the Deputy Prime Minister (2005). A Practical Guide to the Strategic Environmental Assessment Directive.

1.4 Habitats Regulations Assessment

As a competent authority, Yorkshire Water must also ensure that its WRMP meets the requirements of the Habitats Regulations prior to implementation. If the WRMP (i.e. one or more schemes within it) may cause a likely significant effect on one or more European sites[32], either alone or in-combination with other schemes, plans or projects, the WRMP must be subject to Appropriate Assessment. In accordance with the Habitats Regulations, Yorkshire Water is undertaking a HRA of its WRMP in parallel to the SEA. The process has four potential stages:

1. Screening stage: identifies likely impacts, alone or in-combination with other projects or plans, and considers whether these impacts are likely to be significant. Screening has been carried out at the option level to assess whether any feasible options will result in likely significant effects on a European site.
2. Appropriate Assessment stage: where screening identifies the potential for likely significant effects, an Appropriate Assessment of the impacts of an option, programme or the whole WRMP (either alone or in combination with other plans and projects) is required such that a conclusion can be made as to whether there will be impacts on site integrity, taking into account potential alternative solutions and mitigation measures.
3. Assessment of alternative solutions: where alternative solutions are identified; and consideration of their impacts are given in comparison to those in the WRMP.
4. Assessment where no alternatives exist and adverse impacts remain, which provides an assessment of imperative reasons of overriding public interest and compensatory measures required.

Stages 3 and 4 are only invoked if an option were to be included in the preferred programme that may cause likely significant effects on a European site.

The findings from the HRA have informed the SEA at each stage of the assessment process, in particular the SEA topics of 'biodiversity, flora and fauna' and 'water'. **Figure 1.2** (adapted from the UKWIR guidance[26]) illustrates how the SEA and HRA processes are aligned with the WRMP development process.

It should be noted that revision of the WRMP is being undertaken in parallel with preparation of the SEA and HRA, and the results of these latter two assessments will feed into the revision of the WRMP in an iterative process.

[32] European sites are taken to include Special Areas of Conservation (SACs), candidate SACs, Special Protection Areas (SPAs), potential SPAs, Ramsar and proposed Ramsar sites, and sites identified as compensatory habitat for any of the aforementioned designations

Figure 1.2 SEA and HRA aligned with the WRMP Process (adapted from the UKWIR Guidance)

1.5 Water Framework Directive Assessment

The WFD compliance assessment's purpose is to ensure the WRMP both helps to avoid the deterioration and contribute to the improvement of the status of water bodies, including rivers, lakes, groundwater and estuarine and coastal waters.

A robust, practical approach has been used to deliver a proportionate WFD compliance assessment that complies with statutory requirements and regulatory guidelines. The approach has been primarily based on that set out in the updated UKWIR Guidance[33].

A sequential 4-stage process for undertaking WFD compliance assessments has been applied through the development of the WRMP. The sequential four steps are as follows:

1. WFD compliance assessment screening: involves a preliminary assessment of each option and identifies whether there may be any risk of deterioration in WFD status. This is based on expert judgement. Where a risk is identified, the option is subject to the WFD compliance assessment.

2. WFD compliance assessment: This involves assessment of the likely changes to hydro-morphology and water quality occurring as a result of the construction or operation of the option and the possible risks to WFD status. In addition, the potential effects on WFD protected areas are assessed. .

3. Option level WFD compliance assessment: This involves summarising WFD compliance assessments of each of the options on the feasible list (from Steps 1 and 2).

4. Preferred plan WFD compliance statement: This involves a statement of the compliance of the preferred plan against each of the WFD compliance objectives (set out below). This involves assessment of the set of options within the programme, both alone and in combination with other options within the programme. The assessment is also used to identify where multiple options potentially impact on the same WFD waterbody, and potentially downstream waterbodies where appropriate.

Findings from the WFD compliance assessment have been integrated into assessments of relevant SEA topics.

1.6 Consultation

The SEA Regulations require consultation at the scoping stage and on the assessments documented in the Environmental Report. Scoping with the statutory consultation bodies defined by the SEA Regulations (the Environment Agency, Natural England and Historic England) is mandatory at both stages. Consultation with the public is only mandatory at the Environmental Report stage.

Scoping consultation comments received from statutory consultees and Yorkshire Water's response to those comments are set out in **Appendix A**, along with the consequent actions. The assessment stage was undertaken according to the scope and approach agreed through consultation on the Scoping Report.

The Environmental Report is now being published for consultation. It also provides a useful reference point for consultees wishing to express their views on Yorkshire Water's draft WRMP.

On adoption of the final WRMP, after approval by Defra, Yorkshire Water will publish an SEA Post-Adoption Statement setting out how the SEA and any views expressed by the consultation bodies or the public have influenced the final WRMP.

1.7 Structure of the Environmental Report

This Environmental Report is the output of Stages B and C of the SEA process and documents the findings throughout the SEA process as described in Section 1.1. It has been prepared to facilitate

[33] UKWIR (2021) Environmental Assessment Guidance for Water Resources Management Plans and Drought Plans. Report Ref 21/WR/02/15.

consultation on the SEA process and outcomes (Stage D). The Environmental Report is structured as follows:

This Section (**Section 1**) of the report describes the requirement for, purpose and process of the SEA, and its context in relation to the WRMP.

The remainder of the report is structured as follows:

- **Section 2** – describes Yorkshire Water's supply system and its approach to water resources management planning; describes how Yorkshire Water will develop its plan to provide reliable and resilient water supplies to its customers over the long-term planning horizon.
- **Section 3** – policy context; identifies key messages and environmental protection and social objectives from a review of relevant policies and plans.
- **Section 4** – environmental baseline review; draws out the key environmental and social issues that Yorkshire Water intends considered in the SEA. Identifies the current and future baseline conditions within the area of potential influence of the WRMP. Also included is a discussion of limitations identified in the data and the reasoning behind any assumptions made. The baseline review is structured in accordance with the SEA topics identified in Section 1.2. These topics comprise and are presented in full in **Appendix D**:
  - Biodiversity, flora and fauna.
  - Population and human health.
  - Material assets and resource use.
  - Water.
  - Soil, geology and land use.
  - Air and climate.
  - Archaeology and cultural heritage.
  - Landscape and visual amenity.
- **Section 5** – Describes the methodological framework and processes that have been used to undertake the SEA of the individual options and assess any potential cumulative effects of options included in Yorkshire Water's WRMP. Assessment of individual water resource options presents the potential impacts of the various options against the SEA framework. Full details are provided in **Appendix E**.
- **Section 6** – Provides a summary of the Habitats Regulations Assessment
- **Section 7** – Provides an assessment of options and cumulative effects assessment, discussing the potential in-combination impacts of individual options (intra-zone and inter-zone) and with other relevant programmes, plans and projects.
- **Section 8** – SEA and programme appraisal highlights the role of SEA in programme and WRMP decision making and looks at SEA of alternative programmes**.** Outlines the SEA of the WRMP in a wider context, providing a cumulative effects assessment of the WRMP preferred plan and its impact with other plans, programmes and projects
- **Section 9** – Mitigation and enhancement, discusses measures envisaged to prevent, reduce and offset any significant adverse effects of implementing the WRMP
- **Section 10** – Monitoring to track the environmental effects against the assessments, to help identify any adverse impacts and trigger deployment of any mitigation measures where necessary.

2 Planning

2.1 Introduction

This section provides a brief overview of the water resource management planning process, the Yorkshire Water supply system and Yorkshire Water's WRMP24. Full details can be found in the WRMP published alongside this Environmental Report.

Water resource management planning is undertaken by all water companies in England and Wales in order to ensure a long-term, sustainable balance between water supply availability and the demand for water from water company customers. It is the process of working out how much water customers will need over a 25-year planning period (assessing demand) and how best to provide it (assessing options to manage distribution and/or provide additional water supply). Companies are required to prepare a WRMP every 5 years. It also forms a component part of the company business plan submitted every five years by each water company to Ofwat (the water industry economic regulator) as part of the regulatory periodic price review process. The next periodic price review will take place in 2024 – this will be the eighth price review for the water industry since it was privatised in 1989. Engagement with regulators, licensed water suppliers, other water companies, customers and stakeholders is key to the WRMP process, and formal consultation was undertaken on the draft WRMP alongside this Environmental Report.

In developing its draft WRMP, Yorkshire Water has examined the supply/demand balance for each of its water resources zone (WRZ)[34] and determined how any deficits between demand and available supply should be addressed over the 25-year planning period 2025 to 2050. Section 2.3 provides an overview of the Yorkshire Water supply system and WRZs.

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

- Population growth
- Climate change
- Potential reductions to water abstraction from sources identified as having a detrimental impact on the environment ('sustainability reductions')
- Raw water quality deterioration.

2.2 Regional Planning

Water Resources North (WReN)[35] is one of five regional water resources groups working under the National Framework for Water Resources (the 'National Framework')[36]. WReN is designed to oversee water resources planning for Yorkshire and the North East of England. It is formed of three water companies operating in the north east of England, including Yorkshire Water, Northumbrian Water and Hartlepool Water (part of Anglian Water).

WReN are working with water companies and their customers, other water dependent sectors of the economy such as the agriculture and power sectors, and environmental groups and regulators. WReN's aim is to develop a long-term plan for managing water resources in the region, which will be published for consultation in early 2022. Where the Regional Plan impacts on public water supply it will be reflected in the individual water companies' WRMPs.

The Yorkshire Water draft WRMP24 has been developed in parallel to the WReN Regional Plan and the Regional Plan objectives have been considered in WRMP decision making in formulating the WRMP best value plan. The final solution of the draft WRMP (the 'preferred plan') is aligned with the WReN Regional Plan solution.

[34] UKWIR/Environment Agency define a WRZ as: 'The largest possible zone in which all resources, including external transfers, can be shared, and hence, the zone in which all customers will experience the same risk of supply failure from a resource shortfall.

[35] https://www.waterresourcesnorth.org/

[36] https://www.gov.uk/government/publications/meeting-our-future-water-needs-a-national-framework-for-water-resources

2.3 Yorkshire Water's supply and resource system

Yorkshire Water's supply area is geographically bounded in the west and north by the Pennine Hills and the North York Moors respectively. The southern and eastern parts of the company' supply region are low lying and bounded by the North Sea to the East and the Yorkshire / Lincolnshire border to the south. Annual average rainfall in the region is highest in the Pennine areas whilst low lying areas average less than half as much rainfall each year and with little seasonal variation.

Urban areas in the west and south of Yorkshire are principally supplied from reservoirs in the Pennines. Reservoirs located in the Pennines and the valleys of the River Don, Aire, Wharfe, Calder, Nidd and Colne provide the largest upland sources of water in the region. Yorkshire Water operates over 100 impounding reservoirs of which two are major pumped storage reservoirs. The total storage capacity of all the supply reservoirs amounts to some 160,000 million litres (Ml).

In the eastern and northern parts of the region, river and groundwater abstractions, chiefly from the rivers of the North York Moors and the Yorkshire Wolds respectively, are the major water sources.

Approximately 45% of the water supplied by Yorkshire Water is from reservoirs, 30% from rivers and 25% from boreholes (see **Figure 2.1**). This varies from year to year depending on weather conditions. Yorkshire Water has an agreement with Severn Trent Water to abstract up to 21,550 Ml per year from the Derwent Valley Reservoirs in Derbyshire for supply to parts of Sheffield, dependent on the control lines in the reservoirs. The majority of the company's water resources are connected together by a regional grid network. This enables highly effective conjunctive use of different water resources, which mitigates risk and allows optimal planning, source operation and resilient sources of supply both in drought and during floods.

The Yorkshire Water region is currently divided into two water resource zones for planning purposes (see **Figure 2.2**). Each zone represents a group of customers who receive the same level of service for water supply reliability from either groundwater or surface water sources. The Grid Surface Water Zone (SWZ) represents a highly integrated surface and groundwater zone that is dominated by the operation of lowland rivers and Pennine reservoirs (see **Figure 2.1**). The East SWZ is supplied by a river abstraction and springs in the Whitby Area.

Figure 2.1 Yorkshire Water Grid System

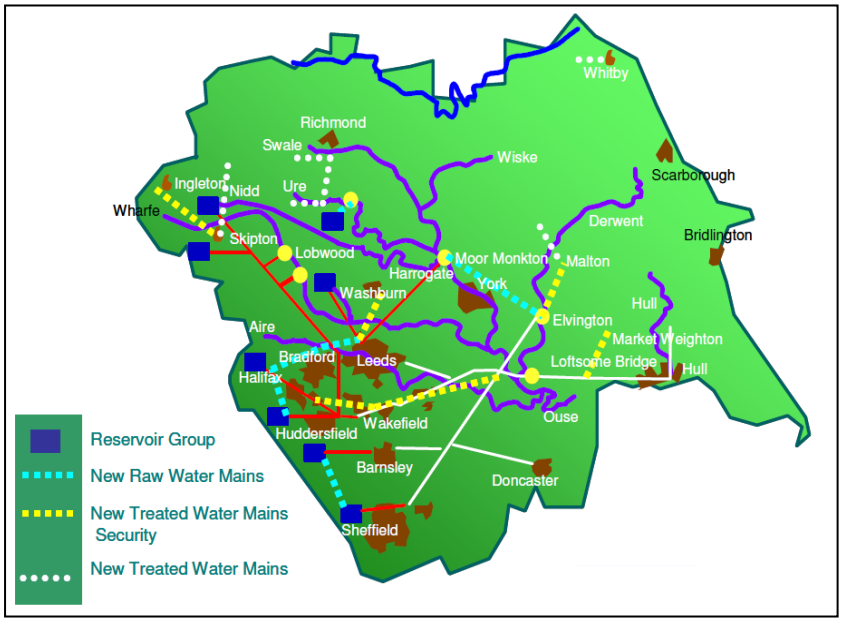
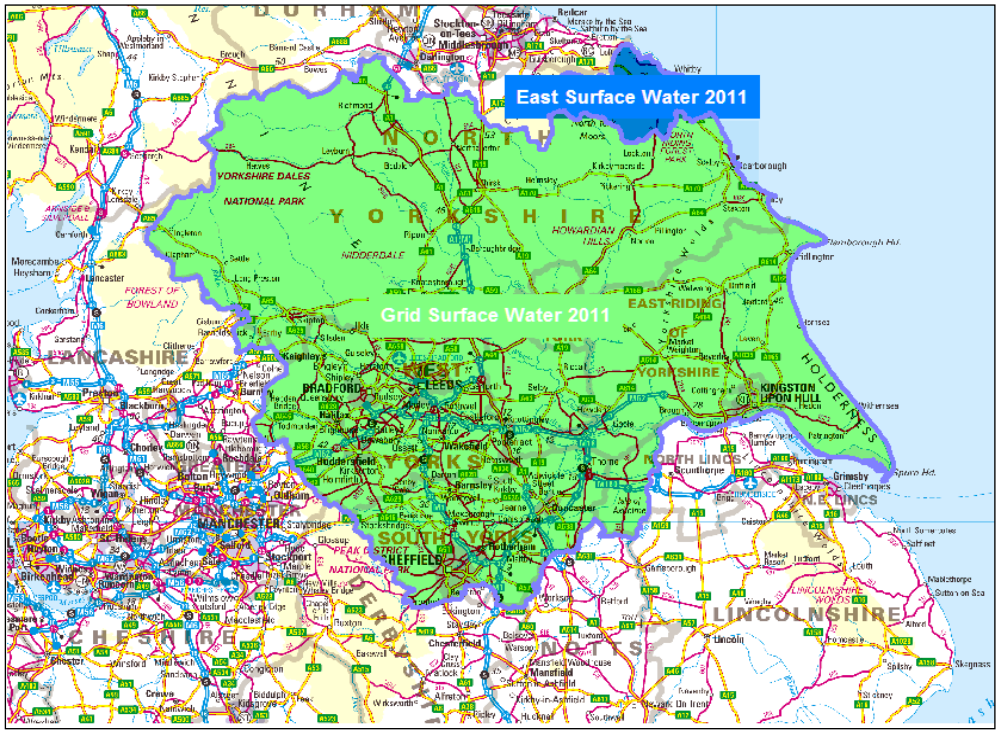


Figure 2.2 Yorkshire Water's Water Resource Zones



2.4 Yorkshire Water's water resource management plan 2024

In line with regulatory requirements, Yorkshire Water has prepared a WRMP that is published alongside this Environmental Report. In developing its plan, there are several key future challenges faced by Yorkshire Water in providing a reliable and sustainable water supply over the next 25 years. These include potential effects of climate change, risks of raw water quality deterioration and measures to improve the environment by modifying the operation of some of its water sources ('sustainability reductions') to help achieve good ecological status or potential under the Water Framework Directive.

As a result of these various pressures, actions will be required to ensure that sustainable and secure supplies to customers continue to be maintained over the 25-year planning horizon. Full details are provided in the WRMP.

The spatial scope of the options considered for the WRMP extent beyond the boundaries of the supply area shown in **Figure 2.2**, as discussed further in later sections of this Environmental Report. The temporal scope of the plan covers a planning period of 25 years between 2024/25 and 2049/50. However, as WRMPs are required to be updated every five years, the schemes and programmes for balancing supply and distribution will be reviewed and subject to SEA, HRA and WFD assessment again during the period 2029-30.

2.4.1 Yorkshire Water's feasible list of WRMP options

Yorkshire Water investigated an unconstrained list of potential options to balance future supply and demand. Unconstrained options include all options that could technically be used to meet the deficit. To identify which of the options included in the unconstrained list should be investigated further, Yorkshire Water reviewed the technical, environmental, carbon and social attributes of each option at a high level. The technical attributes considered were yield increase / demand decrease, construction / delivery costs; time to implement; asset life of infrastructure; and resilience benefits. This resulted in a sub-set of the unconstrained list of options, which is referred to as the "feasible" list. A number of options were constrained out during this process, hence numbering of options in the feasible list is not sequential. Options on the 'feasible' list were grouped according to the following four categories:

- Customer management options
- Leakage management options

- Resource management options

The individual options in each group are documented in **Table 2.1**. For each option, baseline information was collated to permit SEA, WFD and HRA assessments to be completed, focussing on:

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

Table 2.1 Draft WRMP24 feasible list of options

Reference	Scheme
Customer management	
C1a - C1e	Domestic customer audits and retrofit
C2a to C2c	Metering (domestic meter optants)
C4	Metering on change of occupancy
C5	Smart metering
C6a to C6e	Commercial water user audits and retrofit
C7a - C7e	Commercial water user audits and retrofit - customer pays
C15a to C15e	Household flow regulator - internal 15,000 to 75,000 properties over 25 years
C21a to C21e	Housing Associations - targeted programme Housing
Leakage management	
L1	Active leakage control 14 Ml/d
L2	Active leakage control 30 Ml/d
L3	Active leakage control 46 Ml/d
L4	Active leakage control 63 Ml/d
L5	Active leakage control 79 Ml/d
L6	Active leakage control 95 Ml/d
Resource management	
DV3	South Yorkshire groundwater
DV6(iv)	Tees to South Yorkshire Pipeline Option 1
DV6(v)	Tees to South Yorkshire Pipeline Option 2
DV6(vi)	Tees to South Yorkshire Pipeline Option 3
DV7a(iv)	Tees to Ouse Pipeline Option 1
DV7a(v)	Tees to Ouse Pipeline Option 2
DV7a(vi)	Tees to York Pipeline Option 3
DV8(iv)	York WTW to South Yorkshire pipeline
DV8(v)	York WTW capacity increase

Reference	Scheme
R1a	River Ouse water treatment works extension
R1c	Grid network enhancement: New River Ouse WTW to York
R1d	Grid network enhancement: New River Ouse WTW to North Yorkshire 1
R1e	Grid network enhancement: New River Ouse WTW to North Yorkshire 2
R1f	Grid network enhancement: New River Ouse WTW to North Yorkshire 3
R1g	Grid network enhancement: New River Ouse WTW to York
R2	Ouse Raw Water Transfer
R3	Increased River Ouse pump storage capacity
R3a	River Ouse licence transfer
R5	Aquifer Storage and Recovery Scheme 1
R6	South Yorkshire Groundwater Option 1
R6b	South Yorkshire Groundwater Option 2
R6c	South Yorkshire Groundwater Option 3
R6d	South Yorkshire Groundwater Option 4
R8b	Sherwood Sandstone and Magnesian Limestone Boreholes Option 2
R8c	Sherwood Sandstone and Magnesian Limestone Boreholes Option 3
R8f	Sherwood Sandstone and Magnesian Limestone Boreholes Option 6
R8g	Sherwood Sandstone Boreholes support to North Yorkshire
R8h	New groundwater (Sherwood Sandstone) supply to existing North Yorkshire WTW
R12	East Yorkshire Groundwater Option 1
R13	East Yorkshire Groundwater Option 2
R17	Reuse abandoned third party groundwater source Option 2
R18	GW source Option 3
R19	GW source Option 4
R29	Reservoir De-silting
R31a	Additional bankside storage on the River Ouse
R34	River Calder Abstraction Option 1
R35	River Aire Abstraction Option 1
R37b(ii)	River Aire Abstraction Option 4
R49	Supply Dales from the Tees - raw Option 1
R51	Supply Dales from the Tees - treated
R58	Transfer from UU Option 3
R59	Transfer from UU Option 4
R61	Yorkshire coast desalination
R78	Tidal Abstraction Reservoir

Reference	Scheme
R85	Recommission Kirklees WTW
R86	Aire and Calder new WTW
R87	Rebuild Northallerton WTW
R88	Increase storage at an existing WTW in North Yorkshire
R89	Convert Wensleydale springs to boreholes
R90	North Yorkshire annual licence increase
Export	
E2	Yorkshire grid network to Severn Trent Water

3 Policy Context

3.1 Introduction

Schedule 2 of the SEA Regulations requires the following specific information to be included within the Environmental Report:

> *'An outline of the contents and main objectives of the plan or programme, and of its relationship with other relevant plans and programmes.'*
>
> *'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.'*

In accordance with the Regulations, a review of relevant plans and programmes is presented in Section 3.2. A summary of their key objectives is presented in **Table 3.1**. These objectives were originally identified in the WRMP24 SEA Scoping Report[37].

3.2 Review of plans, policies and programmes

A summary of key messages derived from the review is presented below in **Table 3.1**. The review identifies how Yorkshire Water's WRMP might be influenced by other plans, policies, programmes and other objectives which the WRMP should consider. This information has helped to identify and inform the scope of the assessment, in particular the objectives for the SEA process.

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

The review and the key messages derived from it are documented in **Appendix C**. Alongside the current and future baseline information reviewed in Section 4, the key messages have been used to develop proposed objectives for the SEA (see Section 5).

[37] Yorkshire Water (2020) WRMP24 SEA Scoping Report. Report produced by Ricardo Energy & Environment, April 2020.

Table 3.1 Key policy messages and objectives derived from the review of the plans, policies and programmes

SEA Topic	Key Messages and Objectives
Biodiversity, flora and fauna	Conservation and enhancement of the natural environment and of biodiversity, particularly internationally and nationally designated sites and priority habitats and species (NERC act Section 41 for England), whilst taking into account future climate change. Promote a catchment-wide approach to water use to ensure better protection of biodiversity. To achieve favourable condition for priority habitats and species in particular designated sites. Avoidance of activities likely to cause irreversible damage to natural heritage. Support well-functioning ecosystems, respect environmental limits and capacities, and maintain / enhance coherent ecological networks, including provision for fish passage and connectivity for migratory/mobile species. Strengthen the connections between people and nature and realise the value of biodiversity. Protection, conservation and enhancement of natural capital. Ecosystem services from natural capital contributes to the economy and therefore should be protected and, where possible, enhanced. Avoidance of activities likely to cause the spread of Invasive Non-Native Species (INNS) A need to protect the green infrastructure network.
Population and human health	Water resources play an important role in supporting the health and recreational needs of local communities and businesses. To ensure all communities have a clean, safe and attractive environment in which people can take pride. To ensure secure, safe, reliable, dependable, sustainable and affordable supplies of water are provided for all communities. Access to high quality open spaces and opportunities for sport and recreation can make an important contribution to the health and well-being of communities. Promotion of healthy communities and protection from risks to health and wellbeing. Promotion of a sustainable economy supported by access to essential utility and infrastructure services.
Material assets and resource use	Promote sustainable production and consumption whilst seeking to reduce the amount of waste generated by using materials, energy and water more efficiently. Consider issues of water demand, water supply and water quality in the natural environment and ensure a sustainable use of water resources.

SEA Topic	Key Messages and Objectives
	Contribute to a resource efficient, green and competitive low carbon economy. Maintain a reliable public water supply and ensure there is enough water for human uses, whilst seeking to maintain a healthy water environment. Minimise the production of waste, ensure waste management is in line with the 'waste hierarchy', and eliminate waste sent to landfill. Promote the sustainable management of natural resources.
Water	Promote sustainable water resource management, including a reduction in water consumption. Maintain and improve water quality and water resources (surface waters, groundwater and bathing water). Meet protected area targets related to water quality and flow in the Water Framework Directive. Expand the scope of water quality protection measures to all waters, surface waters and groundwater. Improve the quality of the water environment and the ecology which it supports, and continue to provide high levels of drinking water quality. Ensure appropriate management of abstractions and protect flow and level variability across the full range of regimes from low to high conditions. Prevent deterioration of water body status. Balance the abstraction of water for supply with the other functions and services the water environment performs or provides. Steer new development to areas with the lowest probability of flooding and manage any residual flood risk, taking account of the impacts of climate change. Promote measures to enable and sustain long term improvement in water efficiency. Promote a catchment-based approach to the management and work with local stakeholders to deliver catchment-based solutions to water quantity and quantity. Develop a resilient and flexible water management approach to cope with changing climate, population and economic conditions. Reduce flood risk to people, residential and non-residential properties, community facilities and key transport links, as well as designated nature conservation sites and heritage assets and landscapes of value. Reduce risk of flooding by changing operation of reservoirs.

SEA Topic	Key Messages and Objectives
Soil, geology and land use	Protect and enhance the quality and diversity of geology (including geological SSSIs) and soils, including geomorphology and geomorphological processes which can be lost or damaged by insensitive development. Ensure that soils will be protected and managed to optimise the varied functions that soils perform for society (e.g. supporting agriculture and forestry, protecting cultural heritage, supporting biodiversity, as a platform for construction), in keeping with the principles of sustainable development. Promote catchment-wide approach to land management by relevant stakeholders, in order to benefit natural resources, reduce pollution and develop resilience to climate change. Promote mixed use developments, and encourage multiple benefits from the use of land in urban and rural areas, recognising that some open land can perform many functions. Encourage the effective use of land by reusing land that has been previously developed (brownfield land), provided that it is not of high environmental value.
Air and climate	Reduce greenhouse gas emissions. Targets include: reduce the UK's greenhouse gas emissions by at least 80% (relative to 1990 levels) by 2050. Reduce the effects of air pollution on ecosystems. Improve overall air quality. Minimise energy consumption, support the use of sustainable/renewable energy and improve resilience to climate change. Build in adaption to climate change to future planning and consider the level of urgency of associated risks of climate change impacts accordingly. Need for adaptive measures to respond to likely climate change impacts on water supply and demand. Achieve and sustain compliance with and contribute towards national objectives for pollutants, taking into account the presence of Air Quality Management Areas and the cumulative impacts on air quality from individual sites in local areas. Minimise energy consumption, support the use of sustainable/renewable energy and improve resilience to climate change.

SEA Topic	Key Messages and Objectives
Archaeology and cultural heritage	Built development in the vicinity of historic buildings and Scheduled Monuments could have implications for the setting and/or built fabric and cause damage to any archaeological deposits present on the site. Ensure active management of the Region's environmental and cultural assets. Ensure effects resulting from changes to water level (surface or sub-surface) on all historical and cultural assets are avoided. Consider effects on important wetland areas with potential for paleo-environmental deposits. Promote the conservation and enhancement of the historic environment, including the promotion of heritage and landscape as central to the culture of the region and conserve and enhance distinctive characteristics of landscape and settlements. Conserve and enhance the historic environment, heritage assets and their settings.
Landscape and visual amenity	Protection and enhancement of landscape (including designated landscapes, landscape character, distinctiveness and the countryside) Abstraction and low river flows could negatively affect landscape and visual amenity. Enhance the value of the countryside by protecting the natural environment for this and future generations. Improve access to valued areas of landscape character in sustainable ways to enhance its enjoyment and value by visitors and stakeholders.

4 Environmental Baseline Review

4.1 Introduction

Schedule 2 of the SEA Regulations requires the following specific baseline information to be included within the Environmental Report:

> *'the relevant aspects of the current state of the environment and the likely evolution thereof without implementation of the plan or programme'*
>
> *'the environmental characteristics of areas likely to be significantly affected'*
>
> *'any existing environmental problems which are relevant to the plan or programme including, in particular, those relating to any areas of a particular environmental importance, such as areas designated pursuant to Council Directive 79/409/EEC on the conservation of wild birds and the* [92/43/EEC] *Habitats Directive.'*

An essential part of the SEA process is to identify the current baseline conditions and their likely evolution in the absence of the WRMP. It is only with knowledge of baseline conditions that potential impacts of the WRMP and its schemes can be identified, monitored, and if necessary mitigated. However, it is important to note that the future baseline is not a 'do nothing' option with respect to water resources planning. There will be elements of Yorkshire Water's current WRMP (published in 2019) that will continue in the absence of the new 2024 plan (e.g. increased water metering, continuing leakage reduction and water efficiency measures to implement Yorkshire Water policy), which will act to alter the future baseline.

Baseline data have been drawn from a variety of sources, including a number of the plans, policies and programmes reviewed and summarised earlier in **Table 3.1** and **Appendix C**.

The baseline data are presented in **Appendix D**. The likely future trends in the environmental and social issues considered (where information is available to do so) are also summarised. The key issues arising from the review of baseline conditions (and of relevant plans, programmes and policies) are summarised in Section 3.5.

4.2 Spatial extent of the SEA

The SEA study area comprises the entirety of Yorkshire Water's supply area in addition to a 10 km wide "corridor" of the Tyne and Tees to cover the potential development of pipeline schemes to transfer water to the Yorkshire Water region. This corridor is within the Kielder SWZ which is included in the environmental baseline review. Work is continuing to review potential options for water transfer from other regions: should these options be considered feasible, the Environmental Report will include discussion of relevant baseline environmental information pertaining to these options as appropriate.

4.3 Temporal scope of the SEA

The temporal scope of the WRMP must cover a minimum statutory planning period of 25 years. This Environmental Report therefore covers the full duration of the current WRMP, i.e. 2024/25-2049/50. However, as the statutory process requires WRMPs to be produced every five years, the schemes and programmes for balancing supply and demand for water will be reviewed again and subject to SEA in 2028-29. Future WRMP cycles will revisit options beyond the current plan's period and the SEA will be updated at that time.

In **Appendix D**, the current environmental and social baseline for the SEA geographical area under consideration is described together with the likely future changes to this baseline as currently understood. Over the long-term planning horizon of the WRMP, there is uncertainty as to how the future baseline will evolve. Consequently, it is sensible to adopt a scenario approach to test the sensitivity of the WRMP against the central assessment of environmental and social effects based on the known or likely changes to the baseline conditions. In this way, the resilience of the WRMP options, programmes

and the overall plan can be assessed and used to inform decision-making as well as recommendations for future monitoring to provide data for subsequent WRMPs and the associated SEA.

In considering this approach to the future environmental and social baseline, it is important to recognise that WRMP options for implementation beyond 2029 will be further assessed by Yorkshire Water through the next statutory WRMP due to be published in 2029; this will also be subject to SEA. This process is currently assumed to be repeated every subsequent five years. This regular statutory update and review will ensure that actual changes to the baseline and updated forward projections can be taken into account in subsequent WRMPs and SEAs.

4.4 Limitations of the data and assumptions made

The principal limitations surround the future social and environmental baseline where there are substantial differences in the availability and temporal resolution of robust projections across the various SEA topic areas: for example, whilst the WRMP incorporates planning up to 80 years ahead and climate change estimates extend to a similar horizon, regional population and housing forecasts rarely go beyond a 40 year horizon and forecasts of how the natural environment may change are very limited.

The study area for the SEA is relatively large and covers a number of different geographical and political regions, which makes establishing a baseline at the sub-regional level challenging. There are also challenges around extrapolating information from data collated at differing spatial resolutions. Spatial data have been obtained for most of the SEA topics, and the baseline is presented graphically as mapped information where appropriate. In some instances, reporting cycles mean that available information is dated.

SEA is a high-level assessment aimed at highlighting potential environmental concerns. The environmental data to be used in this assessment is based on that which is readily available from existing sources, e.g. statutory organisations. No primary research or survey work has been carried out specifically to inform the SEA and therefore it is possible that at the individual option level, there may be additional environmental issues that could have an influence on a WRMP option. At a later stage during the implementation of WRMP options, major schemes that have the potential to give rise to likely significant environmental effects would be subject to EIA.

The baseline information presented in this Environmental Report may not identify specific, localised issues that are reflective of the general trends of the region. For example, this may include locally important sites for recreation or any localised differences in environmental quality.

Data have generally been sourced from national or regional bodies where information is collected for the Yorkshire region using consistent methods. This allows for a more effective comparison between the regional and national averages; however, reliance on these data sets has in some cases meant that information is a number of years old.

4.5 Overview

The Yorkshire Water region has a varied landscape with the Pennines stretching to the west, the North York Moors in in north, and the low lying southern and eastern parts of the region. Annual average rainfall across the region varies. The highest rainfall is near the Pennines, whilst low lying areas average less than half that volume of rainfall each year, with little seasonal variation.

Urban areas in the west and south of Yorkshire are principally supplied from reservoirs in the Pennines. Reservoirs located in the Pennines and the valleys of the River Don, Aire, Wharfe, Calder, Nidd and Colne provide the largest upland sources of water in the region. Yorkshire Water operates over 100 impounding reservoirs of which two are major pumped storage reservoirs. The total shortage capacity of all the supply reservoirs amounts to some 160,000Ml.

4.6 Key issues

The baseline was set out in the Scoping Report and has been updated based on feedback provided through consultation. The baseline is detailed further in **Appendix D**. Key issues arising from the review

of baseline conditions for each of the SEA topics are summarised in **Table 4.1**. These key issues have been used to support the development of the SEA Objectives in Section 5.

Table 4.1 Summary of key issues

SEA Topic	Key issues
Biodiversity, Fauna and Flora	The need to protect or enhance the region's biodiversity, particularly protected sites designated for nature conservation. The need to avoid activities likely to cause irreversible damage to natural heritage. The need to take opportunities to improve and not reduce connectivity between fragmented habitats. The need to control the spread of Invasive Non-Native Species (INNS). The need to engage more people in biodiversity issues so that they personally value biodiversity and know what they can do to help, including through recognising the value of the ecosystem services.
Population and Human Health	The need to ensure water supplies remain affordable especially for deprived and vulnerable communities. The need to ensure continued improvements in levels of health across the region, particularly in urban areas and deprived areas. The need to ensure public awareness of drought conditions and importance of maintaining resilient, reliable public water supplies without the need for emergency drought measures. The need to ensure water quantity and quality is maintained for other users including tourists, recreational users and other users such as farmers. The need to ensure a balance between different aspects of the built and natural environment that will help to provide opportunities for local residents and tourists, including opportunities for access to recreation resources and the natural and historic environment. The need to accommodate an increasing population. The need to contribute towards maintaining sustainable growth in the region. Sites of Nature Conservation Importance, heritage assets, water resources, important landscapes and public rights of way contribute to recreation and tourism opportunities and subsequently health and well-being and the economy.
Material Assets and Resource Use	The need to minimise the consumption of resources, including water and energy. The need to reduce the total amount of waste produced in the region, from all sources, and to reduce the proportion of this waste sent to landfill. The need to continue to reduce leakage from the water supply system. Daily consumption of water is higher than the national average in the area and consequently there is a continued need to encourage more efficient water use. The need to support regional and national commitments to decarbonisation.
Water	The need to further improve the quality of the region's river, estuarine and coastal waters taking into account WFD status targets. The need to maintain the quantity and quality of groundwater resources taking into account WFD status targets.

SEA Topic	Key issues
	The need to improve the resilience, flexibility and sustainability of water resources in the region, particularly in light of potential climate change impacts on surface waters and groundwaters. The need to ensure sustainable abstraction to protect the water environment. The need to ensure that people understand the value of water. The need to reduce and manage flood risk.
Soil, Geology and Land-use	The need to protect geological features of importance and maintain and enhance soil function and health. The need to manage the land more holistically at the catchment level, benefitting landowners, other stakeholders, the environment and sustainability of natural resources (including water resources). The need to make use of previously developed land (brownfield land) and to reduce the prevalence of derelict land in the region.
Air and Climate	The need to reduce air pollutant and greenhouse gas emissions and limit air emissions to comply with air quality standards. The need to mitigate against climate change through the reduction in greenhouse gas emissions in order to contribute to risk reduction over the long term. The need to adapt to the impacts of climate change for example through, sustainable water resource management, water use efficiencies, specific aspects of natural ecosystems (e.g. connectivity) as well as accommodating potential opportunities of climate change.
Archaeology and Cultural Heritage	The need to conserve or enhance sites of archaeological importance and cultural heritage interest, particularly those which are sensitive to the water environment.
Landscape and Visual Amenity	The need to protect and improve the natural beauty of the region's National Parks, AONBs, and other areas of natural beauty. It is envisaged that landscape and designated sites will be maintained and enhanced for the enjoyment of the public.

5 Assessment Methodology

This section outlines the SEA objectives and assessment framework that has been used to identify the environmental and social effects of the options identified in Yorkshire Water's WRMP24. The objectives and assessment methodology have been updated from WRMP19 to reflect current best practice and changes to key messages in the plans, policies and programmes that were considered when undertaking the SEA (summarised in **Appendix C**). It differs from the WRMP19 methodology in the sense of the baseline changing since then also.

5.1 SEA Objectives

The effects assessment of the options will be 'objectives-led': establishing assessment objectives is a recognised way of considering the environmental and social effects of a plan and comparing the effects of alternatives. SEA objectives are often derived from environmental and social objectives established in law, policy or other plans and programmes, or from a review of baseline information and environmental problems based on the SEA topics.

Assessment objectives have been developed based on:

- The key policy messages, social and environmental protection objectives identified in the review of policies, other plans and programmes (see Section 3). It is important that the assessment takes these objectives into account as this will help it to highlight any area where the WRMP may help or hinder the achievement of the objectives of other plans (e.g. at local, national and international level).
- The current state of the environment in the area under consideration for the SEA (see Section 4) and the key environmental issues identified.

Draft SEA objectives are set out in **Table 5.1** alongside the key messages identified from the review of policies, plans and programmes and the key issues highlighted from the review of baseline information. The following sections describe how Yorkshire Water will use these SEA objectives in the assessment of the environmental effects of the options, programmes and the WRMP. These SEA objectives are intended to reflect changes that contribute to sustainability. By assessing each option against the objectives, it is more apparent where there might be adverse effects and where options could be developed to provide beneficial effects.

As well as the overall SEA objectives, a number of key questions have been developed for each SEA topic. These key questions will prompt the assessment and ensure it considers all the relevant aspects. The assessment of each option, programme and WRMP required the following information:

- Details of the options involved: main components, location and/or population affected, and likelihood and predicted frequency of deployment;
- Construction (where applicable) and operational implementation;
- Amount of water provided or volume of water saved (taking uncertainty into account);
- Key elements of the condition of baseline environment where known, such as location of designated sites, priority habitats and species, landscape areas or heritage assets, etc.

Table 5.1 SEA Objectives and Assessment Approach

SEA topic	PPP Key Messages	Baseline Key Issues	SEA Objectives	Indicator Questions
Biodiversity, flora and fauna	• Conservation and enhancement of the natural environment and of biodiversity, particularly internationally and nationally designated sites and NERC act priority habitats and species , whilst taking into account future climate change. • Promote a catchment-wide approach to water use to ensure better protection of biodiversity. • To achieve favourable condition for priority habitats and species in particular designated sites. • Avoidance of activities likely to cause irreversible damage to natural heritage. • Support well-functioning ecosystems, respect environmental limits and capacities, and maintain/enhance coherent ecological networks, including provision for fish passage and connectivity for migratory/mobile species. • Strengthen the connections between people and nature and realise the value of biodiversity. • Protection, conservation and enhancement of natural capital. Ecosystem services from natural capital contributes to the economy	• The need to protect or enhance the region's biodiversity, particularly protected sites designated for nature conservation. • The need to avoid activities likely to cause irreversible damage to natural heritage. • The need to take opportunities to improve connectivity between fragmented habitats. • The need to control the spread of Invasive Non-Native Species (INNS). • The need to engage more people in biodiversity issues so that they personally value biodiversity and know what they can do to help, including through recognising the value of the ecosystem services.	• To protect and enhance biodiversity, ecological functions, capacity, and habitat connectivity within Yorkshire Water's supply and source area. • To provide opportunities for habitat creation or restoration and a net benefit/gain for biodiversity. • To protect, conserve and enhance natural capital and the ecosystem services from natural capital that contribute to the economy. • To avoid introducing or spreading INNS. • To provide opportunities for habitat creation or restoration and a net benefit/gain for biodiversity (ha)	• Will it avoid damage to aquatic, transitional and terrestrial species and habitats including fish populations (particularly migratory fish)? • Will it enhance aquatic, transitional and terrestrial species and habitats? • Will it protect the most important sites for nature conservation? • Will it affect HRA compliance? • Is the option likely to affect ancient woodland? • Will the option affect a priority habitat on the priority habitat inventory? • Are there any opportunities for habitat creation or restoration and a net benefit/gain for biodiversity? • Will the option contribute to the loss or gain in habitat connectivity? • Will it ensure the sustainable management of natural habitats, taking into account climate change adaptability? • Will it affect WFD compliance e.g. good ecological potential / status?

SEA topic	PPP Key Messages	Baseline Key Issues	SEA Objectives	Indicator Questions
	and therefore should be protected and, where possible, enhanced. • Avoidance of activities likely to cause the spread of Invasive Non-Native Species (INNS) • A need to protect the green infrastructure network.			• Does it protect, conserve and enhance biodiversity natural capital and the ecosystem services the natural capital provides? • Is there a possibility for INNS to be spread/ introduced? • Is there an opportunity to improve biodiversity value through removal of INNS?
Population and human health	• Water resources play an important role in supporting the health and recreational needs of local communities. • To ensure all communities have a clean, safe and attractive environment in which people can take pride. • To ensure secure, safe, reliable, sustainable and affordable supplies of water are provided. • Access to high quality open spaces and opportunities for sport and recreation can make an important contribution to the health and well-being of communities. • Promotion of healthy communities and protection from risks to health and wellbeing. • Promotion of a sustainable economy supported by universal access to essential utility and infrastructure services.	• The need to ensure water supplies remain affordable especially for deprived or vulnerable communities • The need to ensure continued improvements in levels of health across the region, particularly in urban areas and deprived areas. • The need to ensure public awareness of drought conditions and importance of maintaining security of supply without the need for emergency drought measures. • The need to ensure water quantity and quality is maintained for other users including tourists, recreational users and other users such as farmers. • The need to ensure a balance between different aspects of the built and natural environment that will help to provide opportunities local residents and tourists, including opportunities for access to recreation	• To protect and improve health and well-being and promote sustainable socio-economic development through provision of access to a resilient, high quality, sustainable and affordable supply of water over the long term • To protect and enhance the water environment for other users including recreation tourism and navigation.	• Will it help to ensure access to a resilient and secure supply of drinking water? • Will it help to promote healthy communities and protect from risks to health and wellbeing? • Will it assist in provision of essential infrastructure and services to support health and well-being and a sustainable economy? • Will it avoid negative effects on human health or quality of life, e.g. through noise, air quality or transport impacts? Will it protect or enhance opportunities for recreation, tourist activities and navigation? • Will it avoid the disruption to the availability and quality of recreational facilities including greenspace (ha)?

SEA topic	PPP Key Messages	Baseline Key Issues	SEA Objectives	Indicator Questions
		resources and the natural and historic environment. • The need to accommodate an increasing population. • Sites of nature conservation importance, heritage assets, water resources, important landscapes and public rights of way contribute to recreation and tourism opportunities and subsequently health and well-being and the economy.		• Will it help to ensure access to a resilient and secure supply of drinking water by reducing the impact of unplanned outages through asset capacity enhancement and/or increased supply system reinforcements (Ml/d)? • Will the option affect Public Rights of Way? • Will the option have an effect on active lifestyles, such as impacts on active travel through disruption to pedestrian and cycle routes? Does the option improve access to the natural environment for recreation, including those living within deprived areas?
Material assets and resource use	• Promote sustainable management of natural resources, sustainable production and consumption whilst seeking to reduce the amount of waste generated by using materials, energy and water more efficiently. • Consider issues of water demand, water supply and water quality in the natural environment and ensure a sustainable use of water resources. • Contribute to a resource efficient, green and competitive low carbon economy. Maintain a reliable public water supply and ensure there is enough water for human uses, as	• The need to minimise the consumption of resources, including water and energy • The need to reduce the total amount of waste produced in the region, from all sources, and to reduce the proportion of this waste sent to landfill. • Need to reduce leakage from the water supply system. • Daily consumption of water resources is higher than the national average in the area and there is a need to encourage more efficient use.	• To reduce, and make more efficient, the domestic, industrial and commercial consumption of resources, minimise the generation of waste including leakage from the water supply system, encourage its re-use and eliminate waste sent to landfill.	• Will it minimise the demand for water and/or increase efficiency in water use through achieving reduced leakage from the water supply system (Ml/d)? • Will it minimise the use of energy and promote energy efficiency? • Will it minimise waste, and increase the proportion sent to reuse or recycling? • Will it make use of existing infrastructure? • Will it help to encourage sustainable design or use of

SEA topic	PPP Key Messages	Baseline Key Issues	SEA Objectives	Indicator Questions
	well as providing an improved water environment. • Minimise the production of waste, ensure waste management is in line with the 'waste hierarchy', and eliminate waste sent to landfill. • Promote the sustainable management of natural resources.			sustainable materials (e.g. supplied from local resources)? • Will the option affect major built assets and infrastructure, including transport infrastructure? • Will it minimise process wastage, and increase the proportion of recycled treated effluent, grey water and surface water used as a potable substitute (Ml/yr)?
Water	• Maintain and improve water quality (surface waters and groundwater). • Improve the quality of the water environment and the ecology which it supports, and continue to provide high levels of drinking water quality. • Expand the scope of water protection to all waters, surface waters and groundwater. • Ensure appropriate management of abstraction and protect flow and level variability across the full range of regimes from low to high conditions. • Develop a resilient and flexible water management approach to cope with changing climate, population and economic conditions. • Balance the abstraction of water for supply with the other functions and	• The need to further improve the quality of the region's river, estuarine and coastal waters taking into account WFD status targets. • The need to maintain the quantity and quality of groundwater resources taking into account WFD status targets. • The need to improve the resilience, flexibility and sustainability of water resources in the region, particularly in light of potential climate change impacts on surface waters and groundwaters. • The need to ensure sustainable abstraction. • The need to ensure that people understand the value of water. • The need to reduce and manage flood risk.	• To maintain or improve the quality of rivers, lakes, groundwater, estuarine and coastal waterbodies. • To avoid adverse impact on surface and groundwater levels and flows, and ensure sustainable management of abstractions. • To reduce and manage flood risk, taking climate change into account. • To increase awareness of water sustainability and efficient use of water.	• Will it avoid contamination of groundwater? • Will it help to minimise risks associated with unsustainable abstraction of ground and surface waters? • Will it abstract from a water resource with resource availability (with reference to CAMS status and WFD considerations)? • Is the option likely to contribute to or conflict with the achievement of WFD objectives? • Will it alter the flow or level regime or residence time of surface waters or groundwaters? • Will it enable flexible control over the level of abstraction at short notice in response to

SEA topic	PPP Key Messages	Baseline Key Issues	SEA Objectives	Indicator Questions
	services the water environment performs or provides. • Encourage more efficient use of water and promote awareness of water sustainability. • Steer new development to areas with the lowest probability of flooding and manage any residual flood risk, taking account of the impacts of climate change. • Promote a catchment-based approach to the management and work with local stakeholders to deliver catchment-based solutions to water quantity and quantity. • Develop a resilient and flexible water management approach to cope with changing climate, population and economic conditions. • Reduce flood risk to people, residential and non-residential properties, community facilities and key transport links, as well as designated nature conservation sites and heritage assets and landscapes of value. • Reduce risk of flooding from reservoirs.			changing environmental conditions? • Will it avoid reducing flood plain storage, or provide opportunities to improve flood risk management? • Will it enable a sustainable use of water resources that balances demand for water with environmental protection? • Will it contribute towards improving the awareness of water sustainability and its true value? • Will it encourage efficient water use (Per Capita Consumption)? • Will the option protect and enhance the environmental resilience of the water environment to climate change, flood risk and drought?
Soil, geology and land use	• Protect and enhance the quality and diversity of geology (including geological SSSIs) and soils, including geomorphology and geomorphological processes which	• The need to protect geological features of importance and maintain and enhance soil function and health. • The need to manage the land more holistically at the catchment level,	• To protect and enhance geology, geomorphology, and the quality and quantity of soils.	• Will it avoid damage to and protect geologically important sites? • Will it avoid damaging the quality of agricultural land?

SEA topic	PPP Key Messages	Baseline Key Issues	SEA Objectives	Indicator Questions
	can be lost or damaged by insensitive development. • Ensure that soils will be protected and managed to optimise the varied functions that soils perform for society (e.g. supporting agriculture and forestry, protecting cultural heritage, supporting biodiversity, as a platform for construction), in keeping with the principles of sustainable development. • Promote catchment-wide approach to land management by relevant stakeholders, in order to benefit natural resources, reduce pollution and develop resilience to climate change. • Promote mixed use developments, and encourage multiple benefits from the use of land in urban and rural areas, recognising that some open land can perform many functions. • Encourage the effective use of land by reusing land that has been previously developed (brownfield land), provided that it is not of high environmental value.	benefitting landowners, other stakeholders, the environment and sustainability of natural resources (including water resources). • The need to make use of previously developed land (brownfield land) and to reduce the prevalence of derelict land in the region.		• Will it protect, maintain and enhance soil function and health? • Will it ensure efficient use of land (e.g. make use of previously developed land)? • Will it contribute towards a catchment-wide approach to land management? • Will it ensure the restoration of land-based and marine habitats including grassland, woodland, wetland, moorlands, heathlands, and floodplains (ha)? • Will it avoid contributing to coastal erosion through restoration of coastal margins (ha)?
Air and climate	• Reduce greenhouse gas emissions. Targets include: reduce the UK's greenhouse gas emissions by at least 80% (relative to 1990 levels) by 2050.	• The need to reduce air pollutant and greenhouse emissions and limit air emissions to comply with air quality standards. • The need to mitigate against climate change through the reduction in	• To maintain and improve air quality. • To minimise greenhouse gas emissions. • To adapt and improve resilience to	• Will it reduce or minimise air pollutant emissions? • Will it increase emissions to air in an area sensitive to emissions (e.g. in proximity to an AQMA or sensitive habitat)?

SEA topic	PPP Key Messages	Baseline Key Issues	SEA Objectives	Indicator Questions
	• Reduce the effects of air pollution on ecosystems. • Improve overall air quality. • Minimise energy consumption, support the use of sustainable/renewable energy and improve resilience to climate change. • Build in adaption to climate change to future planning and consider the level of urgency of associated risks of climate change impacts accordingly. • Need for adaptive measures to respond to likely climate change impacts on water supply and demand. • Sustain compliance with and contribute towards EU limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and the cumulative impacts on air quality from individual sites in local areas. • Minimise energy consumption, support the use of sustainable / renewable energy and improve resilience to climate change.	greenhouse gas emissions in order to contribute to risk reduction over the long term. • The need to adapt to the impacts of climate change for example through, sustainable water resource management, specific aspects of natural ecosystems (e.g. connectivity) as well as accommodating potential opportunities of climate change.	the threats of climate change.	• Will it reduce or minimise transport or energy requirements, and associated air and greenhouse gas emissions? • Is there potential for the option to incorporate climate mitigation measures to reduce its carbon footprint, such as lower embodied carbon or incorporating renewable energy? • Is the option vulnerable to climate change effects? • Will it reduce vulnerability to risks associated with climate change effects (e.g. reduce the adverse effects of droughts and floods)?
Archaeology and cultural heritage	• Built development in the vicinity of historic buildings could have implications for the setting and/or built fabric and cause damage to	• The need to conserve or enhance sites of archaeological importance and cultural heritage interest, particularly those which are sensitive to the water environment.	• To conserve and enhance the historic environment, heritage assets and their settings, and	• Will it avoid damage to and protect the historic environment, heritage assets and their settings, places and spaces that enhance local distinctiveness?

SEA topic	PPP Key Messages	Baseline Key Issues	SEA Objectives	Indicator Questions
	any archaeological deposits present on the site. • Ensure active management of the Region's environmental and cultural assets. • Ensure effects resulting from changes to water level (surface or sub-surface) on all water dependent historical and cultural assets are avoided. Consider effects on important wetland areas with potential for paleo-environmental deposits. • Promote the conservation and enhancement of the historic environment, including the promotion of heritage and landscape as central to the culture of the region and conserve and enhance distinctive characteristics of landscape and settlements. • Conserve heritage assets in a manner appropriate to their significance, so that they can be enjoyed for their contribution to the quality of life of this and future generations.		protect archaeologically important sites.	• Will abstraction alter the hydrological setting of water-dependent assets? • Will it improve access, value, understanding or enjoyment of heritage assets and culturally/historically important assets in the region?
Landscape and visual amenity	• Protection and enhancement of landscape (including designated landscapes, landscape character, distinctiveness and the countryside).	• The need to protect and improve the natural beauty of the region's AONBs and other areas of natural beauty.	• To protect and enhance designated and undesignated landscape, townscape and the countryside.	• Will it avoid adverse impacts and enhance designated landscapes? • Will the option affect visual amenity? • Will it improve access to valued areas of landscape character,

SEA topic	PPP Key Messages	Baseline Key Issues	SEA Objectives	Indicator Questions
	• Abstraction and low river flows could negatively affect landscape and visual amenity. • Enhance the value of the countryside by protecting the natural environment for this and future generations. • Improve access to valued areas of landscape character in sustainable ways to enhance its enjoyment and value by visitors and stakeholders.			e.g. the countryside and open space? • Will the option create or improve green infrastructure which contributes to access to the landscape? • Will it help to protect and improve non-designated areas of natural beauty and distinctiveness (e.g. woodlands) and avoid the loss of landscape features and local distinctiveness?

5.1.1 Interactions between objectives

Schedule 2, paragraph 6 of the SEA Regulations requires that the inter-relationship between the issues referred to between SEA topics shall be explored. The matrix in **Table 5.2** identifies potential interactions between the proposed SEA objectives. In most cases the interactions are identified as compatible, or no interactions occur. Exceptions comprise:

- Potential incompatibility between objectives 2.1 and 4.4, as efforts to increase water efficiency could exacerbate inequalities by disproportionately impacting low income or vulnerable communities.
- Potential mixed interactions between objectives 4.2, 6.3 and 8.1, as actions to improve water resource management and climate change resilience (e.g. water management infrastructure) could be considered to enhance or detract from landscape quality.

Table 5.2 SEA objective interaction matrix

	SEA objective	1.1	1.2	1.3	1.4	2.1	2.2	3.1	4.1	4.2	4.3	4.4	5.1	6.1	6.2	6.3	7.1	8.1
1.1	To protect and enhance biodiversity, ecological functions, capacity, and habitat connectivity within Yorkshire Water's supply and source area.																	
1.2	To protect, conserve and enhance natural capital and the ecosystem services from natural capital that contribute to the economy.	■																
1.3	To avoid introducing or spreading INNS.	■	■															
1.4	To provide opportunities for habitat creation or restoration and a net benefit/gain for biodiversity	■	■	■														
2.1	To protect and improve health and well-being and promote sustainable socio-economic development through provision of access to a resilient, high quality, sustainable and affordable supply of water over the long term.	■	■		■													
2.2	To protect and enhance the water environment for other users, including recreation, tourism and navigation.	■	■	■	■	■												
3.1	To reduce, and make more efficient, the domestic, industrial and commercial consumption of resources, minimise the generation of waste, encourage its re-use and eliminate waste sent to landfill.		■			■	■											
4.1	To maintain or improve the quality of rivers, lakes, groundwater, estuarine and coastal waterbodies	■	■	■	■	■	■											
4.2	To avoid adverse impact on surface and groundwater levels and flows, and ensure sustainable management of abstractions.	■	■	■	■	■	■		■									
4.3	To reduce and manage flood risk, taking climate change into account.	■	■		■		■											
4.4	To increase awareness of water sustainability and efficient use of water.	■	■		■	■	■	■		■								
5.1	To protect and enhance geology, geomorphology, and the quality and quantity of soils.	■	■		■				■	■	■							
6.1	To maintain and improve air quality.	■	■		■	■	■	■		■			■					
6.2	To minimise greenhouse gas emissions.	■	■		■	■	■	■		■			■	■				
6.3	To adapt and improve resilience to the threats of climate change.	■	■		■	■	■	■	■	■	■			■	■			
7.1	To conserve and enhance the historic environment, heritage assets and their settings and protect archaeologically important sites.	■				■	■			■	■			■		■		
8.1	To protect and enhance designated and undesignated landscapes, townscapes and the countryside.	■	■		■	■	■		■	■	■		■			■	■	

■ Compatible
■ Incompatible
■ Mixed
No direct interaction

5.2 Assessment framework

5.2.1 Primary assessment

An appraisal framework was used to assess each of the potential WRMP measures against the SEA objectives. The appraisal framework has been applied to test the performance of each of the alternative measures against the SEA objectives. The assessment will be used to inform the selection and phasing of measures for inclusion in Yorkshire Water's draft WRMP24.

An example appraisal framework table is given in **Table 5.3**.The appraisal framework is structured as follows:

- The first and second columns set out the SEA topics and objectives.
- The scale of the effect, which might relate to either geographical scale or the size of the population affected, is identified in the third column on a scale of small, medium to large.
- The impact evaluation includes consideration of the nature of the impact, certainty of effect, duration and permanence (fourth, fifth and sixth columns of **Table 5.3)** in compliance with criteria for determining the likely significance of effects specified in the SEA Directive Article 3(5) and Annex II, and the SEA Regulations Part 2, Regulation 9(2a) and Schedule 1. With respect to duration of temporary effects, short-term impacts are defined as those that last for up to six months, medium term impacts are those that extend for six months to two years whilst longer term temporary impacts are assessed as those that extend to two to five years. A 'significant long term' temporary impact category is used for those temporary effects that continue beyond five years in duration.
- The seventh column identifies the magnitude of the effect on a scale of low, medium and high.
- The value/sensitivity of the receptor(s) is identified in the eighth column on a scale of low, medium and high.
- The ninth column will be populated during the assessment with a commentary and evaluation of the impact of each alternative measure on the objectives for each topic, with reference to the indicator questions set out in column three. The assessment will assume the implementation of standard best practice in implementing the measures and any defined mitigation measures (which will be set out) so that the significance of effects relates to the residual effects after mitigation in line with the ODPM Practical Guide and UKWIR SEA national guidance. The mitigation measures for any identified adverse effects will be identified within the appraisal framework.
- The residual adverse and beneficial effects (after application of best practice approaches and any appropriate mitigation measures) are identified in the tenth and eleventh columns respectively. These were identified separately so as to avoid mixing adverse and beneficial effects. The commentary in column nine, combined with the magnitude (column seven) and value/sensitivity (column eight) informs the residual adverse or beneficial effects.

Table 5.3 Example of a SEA appraisal framework to be completed for each potential WRMP option

.

Topic	SEA objective	Scale of effect: geographical &/or population affected (Small/ Medium/ Large)	Certainty of effect (Low/ Medium/ High)	Duration of effect (short/ medium /long term)	Permanence of effect (permanent/ temporary)	Magnitude of effect (Low/ Medium/ High)	Value/ sensitivity of receptor (Low/ Medium/ High)	Potential residual effect on sensitive receptors (assuming good practice construction methods)	Residual Adverse Effect (likely to remain after reasonable mitigation)	Residual Beneficial Effect (likely to remain after reasonable mitigation)
Biodiversity, fauna and flora	1.1 To protect and enhance biodiversity, ecological functions, capacity, and habitat connectivity within the WReN region.									
	1.2 To provide opportunities for habitat creation or restoration and a net benefit/gain for biodiversity.									
	1.3 To protect, conserve and enhance natural capital and the ecosystem services from natural capital that contribute to the economy.									
	1.4 To avoid introducing or spreading INNS.									

The SEA appraisal framework was used to capture the assessment for each option (one table completed per option), alternative WRZ programmes and the WRMP as a whole.

Varying levels of uncertainty are inherent within the assessment process. The assessment minimised uncertainty through the application of expert judgement. The level of uncertainty of the option assessment for each SEA objective was reported in the appraisal framework. Where there was significant uncertainty which precludes an effects assessment category being assigned for a particular option and SEA objective, an "uncertain" residual effects assessment label was able to be applied to that specific SEA objective, although for the draft WRMP24 assessment this has not been required.

The assessment of the options and the overall WRMP were carried out using the effects assessment matrix shown in **Figure 5.1**, taking account of the scale, duration and permanence of the effect. The definitions for the effect significance are explained beneath **Figure 5.1**.

The effects assessment took account of any proposed mitigation measures that were incorporated into the option conceptual design and costs, i.e. it was the residual effects after the application of mitigation that were assessed.

The resulting significance of effects was considered in the prioritisation of options and programmes of options. Where major adverse residual effects were predicted, measures envisaged to prevent, reduce and as fully as possible offset these effects on the environment (as a result of implementing the WRMP) are outlined in the Environmental Report where appropriate. These are in addition to any mitigation that has already been included in the conceptual design and costs of each alternative option. Mitigation may include additional provisions within the WRMP itself and/or measures to be applied during the WRMP implementation stage. It may also include proposals for changing other plans and programmes to address significant cumulative residual effects. Yorkshire Water will consider how any remaining significant residual effects identified are to be monitored to identify any unforeseen adverse effects and to enable appropriate remedial action to be taken.

Figure 5.1 Significance matrix used to assess effects of each WRMP option on each SEA objective

Significance of Effect		Value/sensitivity of receptor		
		High	Medium	Low
Effect magnitude (includes scale of effect)	High	Major Beneficial / Major Adverse	Major Beneficial / **Major Adverse**	Moderate Beneficial / Moderate Adverse
	Medium	Major Beneficial / Major Adverse	Moderate Beneficial / Moderate Adverse	Minor Beneficial / Minor Adverse
	Low	Dependant on nature of impact/benefit	Minor Beneficial / Minor Adverse	Negligible

5.2.1.1 General Significance Definitions

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

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

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

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

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

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

All options have been assessed to the same level of detail, in line with the SEA legislative requirements, national SEA guidance and the UKWIR SEA guidance. The level of detail for the environmental assessment of each option is consistent with the strategic nature of SEA. This is a high-level, strategic assessment, carried out without the detailed information which would be support an EIA. In the event that new options are introduced at a later stage (which may have less detailed information available) every endeavour will be made to ensure that the assessment is undertaken to a similar standard.

The analysis used a detailed suite of environmental and social datasets that are available at a consistent quality across the geographical footprint of all the options under consideration. The HRA[39] and WFD[40] assessments also informed the assessment at each key stage, with any adverse implications for Habitats Regulations or WFD compliance flagged during option assessments and used inform decision-making at the programme appraisal stage.

The assessment includes some quantitative analysis of environmental and social effects. The WRMP decision making methodology also includes metrics which relate to environmental and social aspects. These metrics are incorporated in a multi criteria analysis (MCA) approach to producing a best value plan. Where there is a clear overlap between the decision-making metrics and the SEA objectives, the SEA outputs have provided the data for measuring the metric[38].

Each feasible option is also assessed against the natural, social, human and financial and manufactured capitals. The natural, social and human capitals overlap with the SEA objectives. The approach of combining the SEA with the capitals creates a risk that the costs and benefits could be double counted at both an option and plan level and the Supplementary Guidance 'Environment and society in decision making'[31] recognises it is not possible to avoid this completely. At the end of the option appraisal process, an assessment will be made of the environmental and social impacts of the preferred plan to identify if any double counting could be a factor.

The assessment also considers effects on sites designated at a national and local level. The assessment of effects on SSSIs took account of conservation objectives established by Natural England, and SSSI Impact Risk Zone (IRZ) datasets. Effects on other designated sites set out in the WRPG have also been assessed, comprising National Nature Reserves, Local Nature Reserves, Marine Conservation Zones, Scheduled Ancient Monuments, World Heritage Sites, National Parks and Areas of Outstanding Natural Beauty. Information on Local Wildlife Sites has been included in the assessment where data are available, however detailed assessment of impacts on Local Wildlife Sites would occur during project-level EIA preparation.

5.2.2 Secondary, cumulative and synergistic environmental effects

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

- Secondary or indirect effects are effects that are not a direct result of the plan, (e.g. an abstraction that changes local groundwater levels and thus affects the ecology of a nearby wetland).
- Cumulative effects arise, for instance, where several nearby groundwater sources each have insignificant effects but together have a measurable effect on river flows; or where several

[38] WReN (2022) Emerging Regional Plan for Informal Consultation (January 2022) – Appendix 4 Objective and metric development.

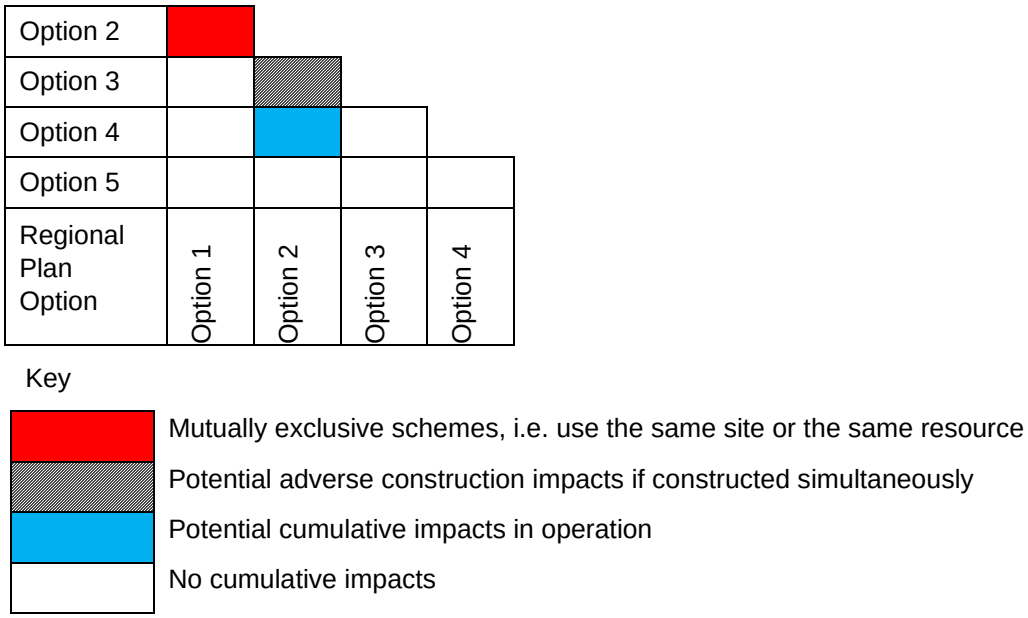
individual effects of a water resource zone programme (e.g. traffic disruption) have a combined effect.

- Synergistic effects interact to produce a total effect greater than the sum of the individual effects. Synergistic effects often happen as habitats, resources or human communities get close to capacity. For instance, a wildlife habitat can become progressively fragmented with limited effects on a particular species until the last fragmentation makes the areas too small to support the species at all.

The term 'cumulative effects' is being adopted as the collective term to include secondary, cumulative and synergistic effects (as suggested by the Practical Guide). The SEA of the WRMP includes cumulative effects assessment at each of the assessment levels as described in the following sections (option-level, programme-level and overall WRMP). It should be noted that some options may be mutually exclusive (i.e. only one of these options can be developed) and this will also be identified in the SEA as part of the option-level assessment. For the programme level and WRMP level assessment, cumulative effects will include consideration of other plans, programmes and projects in the context of spatial and/or temporal proximity.

A matrix such as the example provided in **Figure 5.2** will be used to help consider interactions between options. In assessing these effects, consideration will be given to other factors which may affect the receiving environment in the short, medium and long term.

Figure 5.2 Cumulative Effects Assessment Matrix



5.2.2.1 Programme and WRMP level cumulative effects assessment

To meet the requirements of the SEA Regulations, cumulative effects between the preferred plan have been assessed, as have those of the WRMP with other relevant plans, programmes or projects, including Yorkshire Water's Drought Plan, the WReN Regional Plan and neighbouring water companies' WRMPs and Drought Plans.

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

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

The following cumulative assessments have therefore been completed:

- An assessment of cumulative effects of options that could potentially be implemented at the same time. Mutually exclusive options (e.g. those that draw upon the same resource or use the same site) have been identified.
- Assessment of cumulative effects of the Yorkshire Water WRMP with the Yorkshire Water Drought Plan, the WReN Regional Plan, other water company Drought Plans and WRMPs, Environment Agency Drought Plans and other relevant water management plans. The potential for a neighbouring company implementing options under its WRMP simultaneously has been considered. Neighbouring water companies will be included as consultees to the WRMP and associated SEA Environmental Report in order to identify any trans-boundary issues.
- Assessment of potential cumulative effects of the Yorkshire Water WRMP with any other identified relevant programmes, plans and strategic projects that may be in place / implemented during the period of the WRMP.

5.2.3 Considerations of reasonable alternatives

A wide range of reasonable alternative options were considered for the WRMP through the SEA, comprising different supply-side and demand-side options. In determining the preferred programme of options, Yorkshire Water will use the findings of the option-level SEA to inform the programme appraisal modelling which will identify a short-list of alternative programmes for each water resource zone. These alternatives will be assessed through the programme-level SEA to inform decisions on the preferred programme.

5.3 Limitations of the study

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

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

6 Assessment of options

Options appraisal is an overarching term for the identification and assessment of options under consideration for the WRMP. Through this process, options which are found to have unacceptable adverse effects have been identified through the SEA options assessment to inform the programme appraisal modelling. The findings of the HRA and WFD compliance assessments informed the SEA assessment.

The assessment of each of the WRMP options has been undertaken in accordance with the methodology set out in Section 5. Appraisal framework tables have been completed for each individual option and are provided in **Appendix E**. A summary of the likely significant effects for each option is provided in this section and is presented as a colour-coded visual evaluation matrix.

6.1 Customer management options

Table 6.1 provides a summary of the SEA evaluation for each customer management option in the WRMP. The detailed appraisal framework tables for each option are provided in **Appendix E**.

The customer management options are unlikely to have any major or moderate adverse effects on any of the SEA objectives. Minor adverse effects have been identified in relation to the air and climate objectives regarding reduction of air pollutant and greenhouse gas emissions. Most of the options will have an impact on air emissions through the increased number of vehicle journeys made to fit water meters, take meter readings or carry out audits.

Minor beneficial effects have been identified for the majority of the customer management options, in relation to sustainable and efficient use of water resources. There are a number of options that, in isolation, will result in negligible beneficial impacts for every SEA objective. C4, and C5, are likely to result in reductions in water savings of a magnitude considered to be of a moderate beneficial effect.

Table 6.1 Visual evaluation matrix summary for customer management options

Option	Impact	SEA Objective 1.1	1.2	1.3	1.4	2.1	2.2	3.1	4.1	4.2	4.3	4.4	5.1	6.1	6.2	6.3	7.1	8.1	Summary Commentary
C1a Domestic customer audits and retrofit	Adverse		None		None		None						None				None	None	Two minor adverse effects have been identified on air and greenhouse gas (GHG) emissions as a result of increased number of vehicle journeys made to deliver water audits and fit appropriate water efficient devices.
	Beneficial				None		None						None				None	None	The scheme would have minor beneficial effects with respect to water efficiency.
C1b Domestic customer audits and retrofit	Adverse		None		None		None						None				None	None	Two minor adverse effects have been identified on air and GHG emissions as a result of increased number of vehicle journeys made to deliver water audits and fit appropriate water efficient devices.
	Beneficial				None		None						None				None	None	The scheme would have minor beneficial effects with respect to water efficiency.
C1c Domestic customer audits and retrofit	Adverse		None		None		None						None				None	None	Two minor adverse effects have been identified on air and GHG emissions as a result of increased number of vehicle journeys made to deliver water audits and fit appropriate water efficient devices.
	Beneficial				None		None						None				None	None	The scheme would have minor beneficial effects with respect to water efficiency.
C1d Domestic customer audits and retrofit	Adverse		None		None		None						None				None	None	Two minor adverse effects have been identified on air and GHG emissions as a result of increased number of vehicle journeys made to deliver water audits and fit appropriate water efficient devices.
	Beneficial				None		None						None				None	None	The scheme would have minor beneficial effects with respect to water efficiency.
C1e Domestic customer audits and retrofit	Adverse		None		None		None						None				None	None	Two minor adverse effects have been identified on air and GHG emissions as a result of increased number of vehicle journeys made to deliver water audits and fit appropriate water efficient devices.
	Beneficial				None		None						None				None	None	The scheme would have minor beneficial effects with respect to water efficiency.
C2a-c Metering (domestic meter optants)	Adverse		None		None		None						None				None	None	Two minor adverse effects have been identified on air and GHG emissions as a result of increased number of vehicle journeys made to deliver water audits and fit appropriate water efficient devices.
	Beneficial				None		None						None				None	None	The scheme would have minor beneficial effects with respect to water efficiency and air and climate.
C4 Metering on change of occupancy	Adverse				None		None						None				None	None	Two minor adverse effects have been identified on air and GHG emissions as a result of increased number of vehicle journeys made to deliver water audits and fit appropriate water efficient devices.
	Beneficial				None		None						None				None	None	Three moderate beneficial effects have been identified for population and human health, water and air and climate. Five minor benefits are also anticipated.

Option	Impact	SEA Objective																Summary Commentary
		1.1	1.2	1.3	1.4	2.1	2.2	3.1	4.1	4.2	4.3	4.4	5.1	6.1	6.2	6.3	7.1	8.1	
C5 Smart metering	Adverse				None		None						None				None	None	Two minor adverse effects have been identified on air and GHG emissions as a result of increased number of vehicle journeys made to deliver water audits and fit appropriate water efficient devices.
	Beneficial				None		None						None				None	None	Three moderate beneficial effects have been identified for population and human health, water and air and climate. Five minor benefits are also anticipated.
C6a Commercial water user audits and retrofit	Adverse				None								None				None	None	Two minor adverse effects have been identified on air and GHG emissions as a result of increased number of vehicle journeys made to deliver audits and install appropriate water saving retrofit devices in individual commercial properties.
	Beneficial				None								None				None	None	The scheme would have seven minor beneficial effects with respect to biodiversity, flora and fauna, population and human health, material assets and resource use, water and air and climate.
C6b Commercial water user audits and retrofit	Adverse				None								None				None	None	Two minor adverse effects have been identified on air and GHG emissions as a result of increased number of vehicle journeys made to deliver audits and install appropriate water saving retrofit devices in individual commercial properties.
	Beneficial				None								None				None	None	The scheme would have seven minor beneficial effects with respect to biodiversity, flora and fauna, population and human health, material assets and resource use, water and air and climate.
C6c Commercial water user audits and retrofit	Adverse				None								None				None	None	Two minor adverse effects have been identified on air and GHG emissions as a result of increased number of vehicle journeys made to deliver audits and install appropriate water saving retrofit devices in individual commercial properties.
	Beneficial				None								None				None	None	The scheme would have seven minor beneficial effects with respect to biodiversity, flora and fauna, population and human health, material assets and resource use, water and air and climate.
C6d Commercial water user audits and retrofit	Adverse				None								None				None	None	Two minor adverse effects have been identified on air and GHG emissions as a result of increased number of vehicle journeys made to deliver audits and install appropriate water saving retrofit devices in individual commercial properties.
	Beneficial				None								None				None	None	The scheme would have seven minor beneficial effects with respect to biodiversity, flora and fauna, population and human health, material assets and resource use, water and air and climate.
C6e Commercial water user audits and retrofit	Adverse				None								None				None	None	Two minor adverse effects have been identified on air and GHG emissions as a result of increased number of vehicle journeys made to deliver audits and install appropriate water saving retrofit devices in individual commercial properties.
	Beneficial				None								None				None	None	The scheme would have seven minor beneficial effects with respect to biodiversity, flora and fauna, population and human health, material assets and resource use, water and air and climate.
C7a-e Commercial water user audits and retrofit - customer pays	Adverse				None								None				None	None	Two minor adverse effects have been identified on air and GHG emissions as a result of increased number of vehicle journeys made to deliver audits and install appropriate water saving retrofit devices in individual commercial properties.
	Beneficial				None								None				None	None	Seven minor beneficial effects have been identified for biodiversity, population and human health, material assets and resource use, water and air and climate.
C15a Household Flow	Adverse				None		None						None				None	None	Two minor adverse effects have been identified on air and GHG emissions as a result of increased number of vehicle journeys made to fit the devices at properties.

Option	Impact	SEA Objective 1.1	1.2	1.3	1.4	2.1	2.2	3.1	4.1	4.2	4.3	4.4	5.1	6.1	6.2	6.3	7.1	8.1	Summary Commentary
Regulator - Internal	Beneficial				None		None						None				None	None	Negligible beneficial effects have been identified with respect to population and human health, material assets and resource use, water and air and climate.
C15b Household Flow Regulator – Internal	Adverse				None		None						None				None	None	Two minor adverse effects have been identified on air and GHG emissions as a result of increased number of vehicle journeys made to fit the devices at properties.
	Beneficial				None		None						None				None	None	Negligible beneficial effects have been identified with respect to population and human health, material assets and resource use, water and air and climate.
C15c Household Flow Regulator – Internal	Adverse				None		None						None				None	None	Two minor adverse effects have been identified on air and GHG emissions as a result of increased number of vehicle journeys made to fit the devices at properties.
	Beneficial				None		None						None				None	None	Negligible beneficial effects have been identified with respect to population and human health, material assets and resource use, water and air and climate.
C15d Household Flow Regulator – Internal	Adverse				None		None						None				None	None	Two minor adverse effects have been identified on air and GHG emissions as a result of increased number of vehicle journeys made to fit the devices at properties.
	Beneficial				None		None						None				None	None	Negligible beneficial effects have been identified with respect to population and human health, material assets and resource use, water and air and climate.
C15e Household Flow Regulator - Internal	Adverse				None		None						None				None	None	Two minor adverse effects have been identified on air and GHG emissions as a result of increased number of vehicle journeys made to fit the devices at properties.
	Beneficial				None		None						None				None	None	Negligible beneficial effects have been identified with respect to population and human health, material assets and resource use, water and air and climate.
C21a Housing Associations – targeted programme	Adverse		None		None		None						None				None	None	Two minor adverse effects have been identified on air and GHG emissions as a result of increased number of vehicle journeys made to deliver water audits and fit appropriate water efficient devices.
	Beneficial				None		None						None				None	None	The scheme would have minor beneficial effects with respect to water efficiency.
C21b Housing Associations – targeted programme	Adverse		None		None		None						None				None	None	Two minor adverse effects have been identified on air and GHG emissions as a result of increased number of vehicle journeys made to deliver water audits and fit appropriate water efficient devices.
	Beneficial				None		None						None				None	None	The scheme would have minor beneficial effects with respect to water efficiency.
C21c Housing Associations – targeted programme	Adverse		None		None		None						None				None	None	Two minor adverse effects have been identified on air and GHG emissions as a result of increased number of vehicle journeys made to deliver water audits and fit appropriate water efficient devices.
	Beneficial				None		None						None				None	None	The scheme would have minor beneficial effects with respect to water efficiency.

Option	Impact	SEA Objective 1.1	1.2	1.3	1.4	2.1	2.2	3.1	4.1	4.2	4.3	4.4	5.1	6.1	6.2	6.3	7.1	8.1	Summary Commentary
C21d Housing Associations – targeted programme	Adverse		None		None		None						None				None	None	Two minor adverse effects have been identified on air and GHG emissions as a result of increased number of vehicle journeys made to deliver water audits and fit appropriate water efficient devices.
	Beneficial				None		None						None				None	None	The scheme would have minor beneficial effects with respect to water efficiency.
C21e Housing Associations – targeted programme	Adverse		None		None		None						None				None	None	Two minor adverse effects have been identified on air and GHG emissions as a result of increased number of vehicle journeys made to deliver water audits and fit appropriate water efficient devices.
	Beneficial				None		None						None				None	None	The scheme would have minor beneficial effects with respect to water efficiency.

Note: See Section 5.2 for description of SEA objectives.

Key:

- Major adverse
- Moderate adverse
- Minor adverse
- Negligible adverse
- None — Not applicable
- Major beneficial
- Moderate beneficial
- Minor beneficial
- Negligible beneficial

6.2 Leakage options

Table 6.2 provides a summary of the SEA evaluation for each of the leakage management options in the WRMP. The detailed appraisal framework tables for each option are provided in **Appendix E**.

The leakage options are unlikely to have any major or moderate adverse effects on any of the SEA objectives. Three options are anticipated to have minor adverse effects on health and wellbeing of local populations, reduction in consumption of resources, improvement in air quality. These minor adverse effects are predominantly resulting from disturbances created from the physical maintenance activities of these options, which would result in temporary increases in noise and air pollution, disturbance to communities and changes in local views and settings.

Options L4, L5 and L6 are anticipated to have major benefits on population and human health, material assets and resource use, surface and ground water flows, efficient use of water and climate resilience due to the savings created by these leakage control options.

Table 6.2 Visual evaluation matric summary for leakage options

Option	Impact	SEA Objective 1.1	1.2	1.3	1.4	2.1	2.2	3.1	4.1	4.2	4.3	4.4	5.1	6.1	6.2	6.3	7.1	8.1	Summary Commentary
L1 Active Leakage Control 14Ml/d	Adverse				None														No adverse effects have been identified.
	Beneficial				None														Five minor beneficial effects are anticipated for population and human health, material assets and resource use, water and air and climate.
L2 Active Leakage Control 30Ml/d	Adverse				None														No adverse effects have been identified.
	Beneficial				None														Five moderate beneficial effects are anticipated for population and human health, material assets and resource use, water and air and climate.
L3 Active Leakage Control 46Ml/d	Adverse				None														No adverse effects have been identified.
	Beneficial				None														Five moderate beneficial effects are anticipated for population and human health, material assets and resource use, water and air and climate.
L4 Active Leakage Control 62Ml/d	Adverse				None														Three minor adverse effects have been identified for population and human health, material assets and resource use, air and climate.
	Beneficial				None														Due to the amount of savings created by this leakage control option (65Ml/d), five major benefits are anticipated for population and human health, material assets and resource use, water and air and climate. Two minor benefits have also been identified for biodiversity and water.
L5 Active Leakage Control 78Ml/d	Adverse				None														Three minor adverse effects have been identified for population and human health, material assets and resource use, air and climate.
	Beneficial				None														Due to the amount of savings created by this leakage control option (78Ml/d), five major benefits are anticipated for population and human health, material assets and resource use, water and air and climate. Two minor benefits have also been identified for biodiversity and water.
L6 Active Leakage Control 95Ml/d	Adverse				None														Three minor adverse effects have been identified for population and human health, material assets and resource use, air and climate.
	Beneficial				None														Due to the amount of savings created by this leakage control option (78Ml/d), five major benefits are anticipated for population and human health, material assets and resource use, water and air and climate. Two minor benefits have also been identified for biodiversity and water.

Note: See Section 5.2 for description of SEA objectives.

Key:

- Major adverse
- Moderate adverse
- Minor adverse
- Negligible adverse
- None — Not applicable
- Major beneficial
- Moderate beneficial
- Minor beneficial
- Negligible beneficial

6.3 Resource management options

A wide variety of options have been assessed, leading to a range of environmental effects being identified. These reflect the scale of abstraction and/or the location of the option in relation to sensitive environments (aquatic and terrestrial). As may be expected, the smaller scale options generally have the lower environmental effects, but differences do occur between such options due to their environmental setting. Many of the options have no greater than minor adverse effects. However, some options may have moderate or major adverse effects for some of the SEA objectives, as discussed in the following paragraphs.

Table 6.3 provides a summary of the SEA evaluation for each of the resource management options in the WRMP. The detailed appraisal framework tables for each option are provided in **Appendix E**.

All resource management options are anticipated to result in adverse impacts to SEA objectives apart from R90. Nineteen options are anticipated to cause major adverse impacts to SEA objectives.

Three schemes are anticipated to have major adverse effects against a total of five SEA objectives: DV6(vi), DV7a(vi), DV8(iv). All the Derwent Valley (DV) resource options, with the exception of DV3 and DV8(v), are anticipated to lead to major adverse impacts on biodiversity. Major adverse impacts for these options are also anticipated in relation to material assets and resource use, protection and enhancement of geology/soil quality, and minimisation of greenhouse gas emissions. However, these options are also anticipated to be associated with major to moderate beneficial effects on population and human health and climate change resilience due to the increase in available public water supply.

The Ouse Raw Water Transfer (R2) option is anticipated to have two moderate adverse effects on biodiversity, and archaeology and cultural heritage due to the construction of the Ouse abstraction and new pipeline. However, two major beneficial effects were identified, related to population and human health and climate change resilience due to a yield of 60Ml/d, therefore maintaining the supply-demand balance. The River Ouse water treatment works extension (R1a) option may also lead to moderate adverse effects on biodiversity.

The Grid network enhancement: New River Ouse WTW to York (R1c) option and associated pipelines option to North Yorkshire (R1d and R1f) have been identified as having a major adverse effect on biodiversity. The Grid network enhancement: New River Ouse WTW to North Yorkshire 3 Option (R1f) is also anticipated to result in moderate adverse effects for material assets and resource use, air and climate and archaeology and cultural heritage. R1g Grid network enhancement: New River Ouse WTW to York is not anticipated to result in any moderate or major adverse effects, but has the potential for moderate benefits to biodiversity given the opportunities for habitat enhancement and to climate reliance in relation to deployable output increases.

All South Yorkshire Groundwater options (R6, R6b, R6c, R6d) are anticipated to result in significant adverse effects. R6 South Yorkshire Groundwater Option 1 has been identified as having a moderate adverse effect on water due to a potential impact on ground water balance and surface water flows. R6b South Yorkshire Groundwater Option 2, R6c South Yorkshire Groundwater Option 3, R6d South Yorkshire Groundwater Option 4 have potential to result in major adverse effect on biodiversity due to potential for construction phase impacts on a SSSI and other sensitive ecological receptors, as well as on archaeology and cultural heritage.

The Sherwood Sandstone and Magnesian Limestone Boreholes Option 3 (R8c) is anticipated to lead to three moderate adverse effects; for population and human health, due to construction work being required in residential areas, and for cultural heritage, due to construction impacting upon the quality and settings of Scheduled Monuments and several Grade II Listed Buildings. R8f Sherwood Sandstone and Magnesian Limestone Boreholes Option 6 has been identified as having potential for a major adverse effect on biodiversity due to its proximity to designated sites as well as a moderate effect on archaeology and cultural heritage. Moderate benefits are however anticipated for population and human health due to the increase in supply of up to 20Ml/d. R8g Sherwood Sandstone Boreholes support to North Yorkshire is also expected to have moderate benefits for population and human health with an increased deployable output of 15Ml/d.

The R13 East Yorkshire Groundwater Option 2 is associated with moderate adverse effects on biodiversity due to the potential for adverse temporary effects on nearby ancient woodland. Moderate adverse effects on groundwater are also associated with the option pending further investigation.

The R29 Reservoir desilting option is assessed as having a major adverse effect on biodiversity and the quality of habitat in a number of nationally and internationally designated sites. If desilting requires extensive drawdown of the reservoirs, there will also likely be temporary moderate adverse effects on landscape and visual amenity given the setting of these reservoirs. Desilting works have the potential to temporarily cause adverse effect on water quality both within the reservoir and in the downstream watercourses due to elevated turbidity in the compensation flow release water. Desilting would only occur following careful planning and further investigations, and that the list of reservoirs included in the option may decrease if unacceptable environmental impacts are identified. An increase of 11Ml/d in deployable output will likely lead to moderate beneficial effects on population and human health and adapting to climate change.

Option R34 (Abstraction Option 1) has the potential for moderate adverse effects on population and human health, and archaeology and cultural heritage. A large proportion of the pipeline route will pass through heavily built areas, leading to temporary adverse effects from noise, dust and vibration and temporary adverse impacts on a range of recreational facilities and historical assets.

The is also one possible moderate adverse effect for the River Aire Abstraction option 1 (R35), relating to archaeology and cultural heritage due to the proximity of the pipeline route potentially passing to a World Heritage Site (WHS). It will however provide a 10Ml/d yield on most days, contributing to moderate beneficial impacts.

The construction phase of the R51 Supply Dales from the Tees – treated option is anticipated to result in adverse effects on material assets and resource use, and archaeology and cultural heritage given the scale and location of construction. However, given the provision of an additional 15Ml/d essential public water supplies will be maintained bringing moderate beneficial effects to population and human health, air and climate through increased resilience to climate change, and biodiversity through habitat enhancement.

The East Yorkshire coast desalination (R61) and Tidal Abstraction Reservoir (R78) options have the potential for major adverse effects on biodiversity as it may impact on the Humber Estuary SAC/SPA/Ramsar. In addition, major adverse effects are associated with the significant amount of resource use and energy required to operate R61. However moderate benefits are anticipated for both options in relation to population and human health and climate resilience, associated with the maintenance of essential public water supply

The Aire and Calder new WTW (R86) option may result in moderate adverse impacts on biodiversity and material assets and resource use during the construction phase, however given the increase of up to 70Ml/d benefit to public water supply, moderate benefits have been identified for population and human health and climate resilience.

Increased abstraction related to the Rebuild Northallerton WTW (R87) option has the potential to have a major adverse effect on surface water flows and moderate adverse effects on water quality during implementation.

Assessment of Convert Wensleydale springs to boreholes (R89) has identified the potential for groundwater drawdown during operation to result in major adverse effects on flows in the associated surface water body, and for major adverse effects on groundwater quality.

Table 6.3 Visual evaluation matric summary for resource management option

Option	Impact	SEA Objective																	Summary Commentary
		1.1	1.2	1.3	1.4	2.1	2.2	3.1	4.1	4.2	4.3	4.4	5.1	6.1	6.2	6.3	7.1	8.1	
DV3 - South Yorkshire GW	Adverse				None							None							Minor negative effects are anticipated for population and human health due to construction works taking place in close proximity to residential dwellings; material assets due to materials being required for construction; air quality and greenhouse gases due to emissions arising from construction. Minor negative effects on landscape are anticipated due to construction work being required in a greenbelt.
	Beneficial											None							Minor positive effects are anticipated on community health and resilience to climate change due to an increase in potable water supply in the region. Minor beneficial effects are also anticipated on opportunities for biodiversity enhancements.
DV6(iv) Import Tees to South Yorkshire Pipeline	Adverse				None							None							Major adverse effects associated with pipeline construction are anticipated on biodiversity, flora and fauna, resource use, soils and geology, air quality, greenhouse gas (GHG) emissions and landscape and visual amenity. Seven moderate adverse effects were identified for population and human health, water, and cultural heritage.
	Beneficial											None							Moderate beneficial effects on human health and wellbeing associated with the provision of an additional supply to maintain public water supplies. Moderate beneficial effects are also anticipated for resilience to climate change.
DV6(v) Import Tees to South Yorkshire Pipeline	Adverse				None							None							Four major adverse effects are anticipated with regard to biodiversity, flora and fauna, resource use, soils and geology, air quality, GHG emissions and landscape and visual amenity, due to pipeline construction. Seven moderate adverse effects were identified for population and human health, water, and cultural heritage.
	Beneficial											None							Major beneficial effects on human health and wellbeing associated with the provision of an additional supply to maintain public water supplies. Major beneficial effects are also anticipated for resilience to climate change. Moderate beneficial effects are also anticipated on opportunities for biodiversity enhancements
DV6(vi) Import Tees to South Yorkshire Pipeline	Adverse				None							None							Four major adverse effects are anticipated with regard to biodiversity, flora and fauna, resource use, soils and geology, air quality, GHG emissions and landscape and visual amenity, due to pipeline construction. Six moderate adverse effects were identified for population and human health, water, and cultural heritage
	Beneficial											None							Major beneficial effects on human health and wellbeing associated with the provision of an additional supply to maintain public water supplies. Major beneficial effects are also anticipated for resilience to climate change. Moderate beneficial effects are also anticipated on opportunities for biodiversity enhancements
DV7a(iv) Tees to Ouse Pipeline Option 1	Adverse				None							None							Four major adverse effects are anticipated with regard to biodiversity, flora and fauna, resource use, soils and geology and GHG emissions, due to pipeline construction. Five moderate adverse effects were identified for population and human health, air quality, cultural heritage and landscape and visual amenity.
	Beneficial											None							Moderate beneficial effects on human health and wellbeing associated with the provision of an additional supply to maintain public water supplies. Moderate beneficial effects are also anticipated for resilience to climate change. Moderate beneficial effects are also anticipated on opportunities for biodiversity enhancements
DV7a(v) Tees to Ouse Pipeline Option 2	Adverse				None							None							Four major adverse effects are anticipated with regard to biodiversity, flora and fauna, resource use, soils and geology and GHG emissions, due to pipeline construction. Five moderate adverse effects were identified for population and human health, air quality, cultural heritage and landscape and visual amenity.
	Beneficial											None							Major beneficial effects on human health and wellbeing associated with the provision of an additional supply to maintain public water supplies. Major beneficial effects are also anticipated for resilience to climate change. Moderate beneficial effects are also anticipated on opportunities for biodiversity enhancements
DV7a vi) - – Tees to York Pipeline Option 3	Adverse				None							None							Five major adverse effects are anticipated with regard to biodiversity, flora and fauna, resource use, soils and geology and GHG emissions, due to pipeline construction. Five moderate adverse effects were identified for population and human health, air quality, cultural heritage and landscape and visual amenity.
	Beneficial											None							Major beneficial effects on human health and wellbeing associated with the provision of an additional supply to maintain public water supplies. Major beneficial effects are also anticipated for resilience to climate change. Moderate beneficial effects are also anticipated on opportunities for biodiversity enhancements
DV8(iv) - York to South Yorkshire Pipeline	Adverse				None					None		None							Five major adverse impacts are anticipated on Biodiversity, material assets and resource, soil, geology and land-use, and air and climate due to the scheme land-take, size and construction impacts.
	Beneficial									None		None							Major beneficial effects are anticipated on opportunities for biodiversity enhancements.

Option	Impact	SEA Objective																	Summary Commentary
		1.1	1.2	1.3	1.4	2.1	2.2	3.1	4.1	4.2	4.3	4.4	5.1	6.1	6.2	6.3	7.1	8.1	
DV8(v) - York WTW Capacity increase	Adverse				None							None							One moderate adverse impact is anticipated with regard to biodiversity as a result of direct effects on internationally designated sites in close proximity to the scheme. The scale of the construction scheme is likely to create minor adverse impacts through construction activity.
	Beneficial											None							Moderate beneficial effects on human health and wellbeing associated with the provision of an additional supply to maintain public water supplies. Moderate beneficial effects are also anticipated for resilience to climate change. Minor beneficial effects are also anticipated on opportunities for biodiversity enhancements
E2 Yorkshire grid network to STW	Adverse											None							Moderate negative effects are anticipated on soil and land use is anticipated, as the proposed pipeline intersects a permitted and an historic landfill site; on community health, due to construction works in a densely populated area, recreation, due to the proximity of the construction to Rother Valley Country Park, and air quality, as construction works will be required within the Sheffield Citywide AQMA. Minor negative effects are anticipated for natural capital assets, as construction may affect tranquillity, material assets, as the construction will require novel materials, flood risk, as there will be construction works required in Flood Zones 2 and 3, greenhouse gas emissions, heritage, as the construction would be within 1km of a number of heritage assets, and landscape, due to construction within areas of the South and West Yorkshire Greenbelt.
	Beneficial											None							Moderate positive effects are anticipated for community health and resilience to climate, due to an increase of 20-25Ml/d into the potable water supply for the region. Moderate beneficial effects are also anticipated on opportunities for biodiversity enhancements
R1a River Ouse water treatment works extension	Adverse				None							None							Moderate adverse effects on biodiversity are identified as were nine minor adverse effects on the biodiversity, flora and fauna; population and human health; material assets and resource use; water; air and climate; and landscape and visual amenity topics.
	Beneficial											None							The scheme would have moderate beneficial effects with regard to provision of water supplies for population and human health; and resilience to the threat of climate change.
R1c Grid network enhancement: New River Ouse WTW to York	Adverse				None							None							One major adverse effect was identified for Biodiversity due to the construction on land functionally supportive for designated sites. Two moderate adverse effects have also been identified for population & human health and landscape. Minor effects were identified on biodiversity, archaeology, air and climate, and soil, geology and land use.
	Beneficial											None							Moderate positive effects are anticipated for community health and resilience to climate, due to an increase supply of up to 60Ml/d. Moderate beneficial effects are also anticipated on opportunities for biodiversity enhancements
R1d Grid network enhancement: New River Ouse WTW to North Yorkshire 1	Adverse				None					None		None							One major adverse effect was identified for Biodiversity due to the construction on land functionally supportive for designated sites. Two moderate adverse effects have also been identified for material assets and resource us and air & climate. Minor effects were identified on biodiversity, archaeology, air and climate, and soil, geology and land use.
	Beneficial									None		None							Moderate positive effects are anticipated for community health and resilience to climate, due to an increase supply of up to 15Ml/d. Moderate beneficial effects are also anticipated on opportunities for biodiversity enhancements
R1e Grid network enhancement: New River Ouse WTW to North Yorkshire 2	Adverse				None					None		None							Two moderate adverse effects were identified for biodiversity and air and climate. Minor effects are also anticipated for biodiversity, population and human health, material assets and resource use, soil, geology and land use, air and climate, Archaeology and cultural heritage and landscape.
	Beneficial									None		None							Minor positive effects were identified for community health and resilience to climate due to the increase of up to 5Ml/d deployable output. Minor benefits are also anticipated for biodiversity for enhancement opportunities.
R1f Grid network enhancement: New River Ouse WTW to North Yorkshire 3	Adverse				None					None		None							One major adverse effect was identified for Biodiversity due to the construction on land functionally supportive for designated sites. Three moderate adverse effects have also been identified for material assets and resource use, air & climate and archaeology and cultural heritage. Minor effects were identified on biodiversity, archaeology, air and climate, and soil, geology and land use.
	Beneficial									None		None							Minor positive effects were identified for community health and resilience to climate due to the increase of up to 10Ml/d deployable output. Moderate benefits are anticipated for opportunities for compensatory planting and habitat enhancement.

Option	Impact	SEA Objective																	Summary Commentary
		1.1	1.2	1.3	1.4	2.1	2.2	3.1	4.1	4.2	4.3	4.4	5.1	6.1	6.2	6.3	7.1	8.1	
R1g Grid network enhancement: New River Ouse WTW to York	Adverse				None					None		None							Minor adverse effects have been identified for biodiversity, population and human health, material assets and resource use, archaeology, air and climate, and soil, geology and land use.
	Beneficial									None		None							Moderate positive effects are anticipated for community health and resilience to climate, due to an increase supply of up to 30Ml/d. Minor beneficial effects are also anticipated on opportunities for biodiversity enhancements
R2 Ouse Raw Water Transfer	Adverse				None							None							Two moderate adverse effects were identified – for biodiversity and archaeology and cultural heritage. Eight minor adverse effects were identified, including those relating to population and human health, material assets, water quality and water levels/flows, soil and land use, and air quality.
	Beneficial											None							Two major beneficial effects were identified, related to population and human health and an increase in deployable output as a result of the scheme of 60Ml/d (maintaining the supply-demand balance), and climate change adaptation. The scheme also provides the potential for minor beneficial effects on biodiversity enhancements.
R3 Increased River Ouse pump storage capacity	Adverse				None							None							One moderate adverse effect was identified relating to archaeology and cultural heritage. Six minor adverse effects were regarding biodiversity, population and human health, material assets, water, soil and land use, and GHG emissions.
	Beneficial											None							The scheme also provides the potential for moderate beneficial effects on biodiversity enhancements. Two minor beneficial effects were identified relating to climate change adaptation and population and human health due to the increase of 10Ml/d into the regional potable water supply.
R3a River Ouse licence transfer	Adverse				None		None											None	Minor adverse effects on biodiversity are identified in relation to uncertainty in the HRA around the impacts on the Humber estuary. A HRA Stage 2 Appropriate Assessment would be required should this scheme be selected in the preferred programme.
	Beneficial				None		None											None	Two minor beneficial effects were identified relating to climate change adaptation and population and human health, both regarding the increased output into the regional water supply.
R5 Aquifer Storage and Recovery Scheme 1	Adverse				None														Eleven minor adverse effects were identified, including those relating to biodiversity, population/human health, material assets, water, soil and land use, air and GHG emissions, archaeology and landscape amenity.
	Beneficial																		Three minor beneficial effects were identified relating to population/human health, material assets/resource and climate change resilience.
R6 South Yorkshire Groundwater Option 1	Adverse				None							None							The construction and operation of this scheme is not associated with any major European sites. However, the scheme may have one moderate adverse effect on water flows. Several minor negative effects on population and human health, resource use, water quality, soils and geology, GHG emissions, and landscape and visual amenity.
	Beneficial											None							Three minor beneficial effects were identified for population and human health (supply of a resilient water supply), climate change resilience and resource efficiency.
R6b South Yorkshire Groundwater Option 2	Adverse				None							None							Major adverse effects have been identified for biodiversity due to proximity to designated sites. Major adverse effects have also been identified for archaeology and cultural heritage as a result of the pipeline route passing through a scheduled monument. One moderate effect has also been identified for biodiversity due to the impact of construction on natural capital and ecosystem services.
	Beneficial	None										None							Moderate positive effects are anticipated for community health and resilience to climate, due to an increase supply of up to 20Ml/d. Moderate beneficial effects are also anticipated on opportunities for biodiversity enhancements
R6c South Yorkshire Groundwater Option 3	Adverse				None							None							Major adverse effects have been identified for biodiversity due to proximity to designated sites. Major adverse effects have also been identified for archaeology and cultural heritage as a result of the pipeline route passing through a scheduled monument. One moderate effect has also been identified for biodiversity due to the impact of construction on natural capital and ecosystem services.

Option	Impact	SEA Objective																	Summary Commentary
		1.1	1.2	1.3	1.4	2.1	2.2	3.1	4.1	4.2	4.3	4.4	5.1	6.1	6.2	6.3	7.1	8.1	
	Beneficial	None										None							Minor positive effects are anticipated for community health and resilience to climate, due to an increase supply of up to 10Ml/d. Moderate beneficial effects are also anticipated on opportunities for biodiversity enhancements
R6d South Yorkshire Groundwater Option 4	Adverse				None							None							Major adverse effects have been identified for biodiversity due to proximity to designated sites. Major adverse effects have also been identified for archaeology and cultural heritage as a result of the pipeline route passing through a scheduled monument. One moderate effect has also been identified for biodiversity due to the impact of construction on natural capital and ecosystem services.
	Beneficial	None										None							Moderate positive effects are anticipated for community health and resilience to climate, due to an increase supply of up to 20Ml/d. Moderate beneficial effects are also anticipated on opportunities for biodiversity enhancements
R8b: Sherwood Sandstone and Magnesian Limestone Boreholes Option 2	Adverse				None							None							Eleven minor adverse effects were identified, including those relating to biodiversity, population/human health, material assets, water, soil and land use, air and GHG emissions, archaeology and landscape amenity, including minor adverse effects were determined for biodiversity as the construction works would be within proximity of one SSSI and rural populations.
	Beneficial											None							Minor beneficial effects are anticipated for population health and climate change resilience, both associated with additional water supplies being available. The scheme also provides the potential for minor beneficial effects on biodiversity die to the potential for biodiversity enhancements associated with the scheme.
R8c: Sherwood Sandstone and Magnesian Limestone Boreholes Option 3	Adverse				None							None							Three moderate adverse effects were identified – for population and human health, water quality, and archaeology and cultural heritage. Eight minor adverse effects were identified, including those relating to population and human health, material assets, water quality and water levels/flows, soil and land use, and air quality.
	Beneficial											None							Minor beneficial effects are anticipated on community wellbeing and on climate resilience due to an increased potable water supply for the region. It also provides the potential for minor beneficial effects on biodiversity enhancement.
R8f Sherwood Sandstone and Magnesian Limestone Boreholes Option 6	Adverse				None							None							One major adverse effect was identified for biodiversity due to the proximity of the proposed pipeline to designated sites. A moderate effect is anticipated for archaeology.
	Beneficial											None							Minor positive effects are anticipated for community health and resilience to climate, due to an increase supply of up to 20Ml/d. Moderate beneficial effects are also anticipated on opportunities for biodiversity enhancements
R8g Sherwood Sandstone Boreholes support to North Yorkshire	Adverse				None							None							Twelve minor adverse effects were identified, including those relating to biodiversity, population/human health, material assets, water, soil and land use, air and GHG emissions, archaeology and landscape amenity, including minor adverse effects were determined for biodiversity as the construction works would be within proximity of one SSSI and rural populations.
	Beneficial											None							Minor positive effects are anticipated for community health and resilience to climate, due to an increase supply of up to 15Ml/d. Moderate beneficial effects are also anticipated on opportunities for biodiversity enhancements
R12 East Yorkshire Groundwater Option 1	Adverse				None														Eight minor adverse impacts have been identified relating to biodiversity, population and human health, material assets, water quality and quantity, air & climate and landscape.
	Beneficial																		Two minor beneficial effects have been identified relating to population and human health, and climate change adaptation.
R13 East Yorkshire Groundwater Option 2	Adverse				None							None							Two moderate adverse effects were identified for biodiversity and water levels and flows. Six minor adverse effects were identified for population and human health, water quality, flood risk, and air and greenhouse gas emissions.
	Beneficial											None							Two minor beneficial effects were identified for population and human health, and climate change adaptation.

Option	Impact	SEA Objective																	Summary Commentary
		1.1	1.2	1.3	1.4	2.1	2.2	3.1	4.1	4.2	4.3	4.4	5.1	6.1	6.2	6.3	7.1	8.1	
R17 Reuse abandoned third party Groundwater source Option 2	Adverse				None														One moderate adverse effect is anticipated for archaeology and cultural heritage due to the proximity to heritage assets. Eight minor benefits have been identified for biodiversity, population and human health, water, soil, geology and land use, air and climate and landscape.
	Beneficial																		Two minor beneficial effects have been identified relating to biodiversity enhancements and population and human health.
R18 Reuse abandoned third party Groundwater source Option 3	Adverse				None														Seven minor adverse effects have been identified for population and human health, water, air and climate and archaeology and cultural heritage.
	Beneficial																		One minor beneficial effect is anticipated for biodiversity for the opportunity for compensatory planting and habitat enhancement.
R19 Reuse abandoned third party Groundwater source Option 4	Adverse				None														Six minor adverse effects are anticipated for material assets and resource use, water, air and climate and archaeology and cultural heritage.
	Beneficial																		One minor beneficial effect is anticipated for biodiversity for the opportunity for compensatory planting and habitat enhancement.
R29 Reservoir De-silting	Adverse				None														One major adverse effect was identified for biodiversity, and a moderate adverse effect were identified for landscape and visual amenity. Seven minor adverse effects relating to population and human health, material assets, water quality, air quality and greenhouse gas emissions, and archaeology/cultural heritage.
	Beneficial				None														Three minor beneficial effects were identified relating to population and human health (increase in deployable output/water supply) and climate change resilience, use of existing infrastructure.
R31a Additional bankside storage on the River Ouse	Adverse				None							None							One moderate adverse effect has been identified for biodiversity due to proximity to designated sites. Fiver other minor adverse effects are anticipated for population and human health, material assets and resource use, soil, geology and land use, air and climate and archaeology and cultural heritage.
	Beneficial											None							Minor positive effects are anticipated for community health and resilience to climate, due to an increase of 4300Ml of storage. Minor beneficial effects are also anticipated on opportunities for biodiversity enhancements.
R34 River Calder Abstraction Option 1	Adverse				None							None							Two moderate adverse effects were identified relating to population and human health and archaeology and cultural heritage. Nine minor adverse effects were identified, including those relating to biodiversity, flora and fauna, material assets, water, air and GHG emissions and landscape and visual amenity.
	Beneficial											None							Two minor beneficial effects were identified with regards to population and human health and climate change resilience.
R35 River Aire Abstraction Option 1	Adverse				None							None							One moderate adverse effect was identified relating to archaeology and cultural heritage. Ten minor adverse effects were identified, including those relating to biodiversity, population & human health, material assets, water, soil and land use, air and GHG emissions and landscape/visual amenity.
	Beneficial											None							The scheme provides the potential for moderate beneficial effects on habitat restoration due to the requirement of compensatory habitat. Three minor beneficial effects were identified relating to population and human health, air and climate and material assets and resource use.
R37b(ii) River Aire abstraction Option 4	Adverse											None							Moderate adverse effects are anticipated on biodiversity due to the abstraction influencing flows affecting downstream designations. Eleven minor adverse effects are anticipated.
	Beneficial											None							Moderate positive effects are anticipated for community health and resilience to climate, due to an increase of 10-50Ml/d deployable output. Minor beneficial effects are also anticipated on opportunities for biodiversity enhancements.

Option	Impact	SEA Objective																Summary Commentary
		1.1	1.2	1.3	1.4	2.1	2.2	3.1	4.1	4.2	4.3	4.4	5.1	6.1	6.2	6.3	7.1	8.1	
R51 Dales from the Tees - treated	Adverse				None														Two moderate adverse impacts are anticipated with regard to resource use and archaeology and cultural heritage due to pipeline construction. Minor adverse impacts were identified for biodiversity, population and human health, water, soils and geology, air quality and GHG emissions and landscape and visual.
	Beneficial																		Moderate beneficial effects on human health and wellbeing associated with the provision of an additional 15 Ml/d which would help to maintain essential public water supplies and therefore help maintain public health and well-being. Moderate beneficial effects on improving resilience to climate change as the scheme would negate the need for Leighton Reservoir North Area Reservoir 1 water to be treated at Thornton Steward the WTW and would provide resilience to the Dales area. The scheme also provides the potential for moderate beneficial effects on biodiversity enhancement.
R58 Transfer from UU Option 3	Adverse		None		None														Two minor adverse effects have been identified for population and human health and archaeology and cultural heritage.
	Beneficial		None		None														Three minor beneficial effects are anticipated for population and human health, material assets and resource use and air and climate.
R59 Transfer from UU Option 4	Adverse				None														Moderate adverse effects are anticipated for material assets and resource use and landscape. Minor effects have also been identified for biodiversity, population and human health, water, soil, geology and land use, air and climate and archaeology and cultural heritage.
	Beneficial																		Moderate benefits have been identified for biodiversity given the opportunities for habitat enhancement. Three minor beneficial effects are anticipated for population and human health, material assets and resource use and air and climate.
R61 East Yorkshire coast desalination	Adverse				None							None							Three major adverse effects are anticipated with regards to biodiversity, flora and fauna, material assets and resource use and GHG emissions. Two moderate adverse impact on natural capital enhancement and air emissions. Minor adverse impacts were identified for biodiversity, population and human health, water, soils and geology, air quality, archaeology and cultural heritage, and landscape and visual.
	Beneficial											None							Moderate beneficial effects on human health and wellbeing and climate change resilience associated with maintenance of essential public water supplies. A minor beneficial effect on surface and groundwater levels, as operation of the desalination plant should reduce reliance on these assets. It also provides the potential for minor beneficial effects on habitat restoration due to the requirement of compensatory habitat.
R78 Tidal Abstraction Reservoir	Adverse				None														One major adverse effect has been identified for biodiversity due to the proximity to designated sites and associated impacts on species populations. Four moderate effects are anticipated for biodiversity, population and human health, material assets and resource use and soil, geology and land use.
	Beneficial																		Moderate beneficial effects on human health and wellbeing and climate change resilience associated with maintenance of essential public water supplies. It also provides the potential for minor beneficial effects on habitat restoration due to the requirement of compensatory habitat.
R85 Recommission Kirklees WTW	Adverse				None						None	None	None						Five minor adverse effects are anticipated for population and human health, material assets and resource use, air and climate and landscape.
	Beneficial				None						None	None	None						Two minor beneficial effects have been identified for population and human health and climate resilience.
R86 Aire and Calder new WTW	Adverse											None							Moderate adverse effects are anticipated on biodiversity and material assets and resource use. Eleven minor adverse effects have also been identified for biodiversity, population and human health, water, air and climate, archaeology and cultural heritage and landscape.
	Beneficial											None							Moderate positive effects are anticipated for community health and resilience to climate, due to an increase of 70Ml/d deployable output. Moderate beneficial effects are also anticipated on opportunities for biodiversity enhancements.
R87 Rebuild Northallerton WTW	Adverse										None	None	None						Major adverse effects have been identified for surface and groundwater due to the increased abstraction. Moderate adverse effects are also anticipated for water quality as a result of option implementation.

Option	Impact	SEA Objective																	Summary Commentary
		1.1	1.2	1.3	1.4	2.1	2.2	3.1	4.1	4.2	4.3	4.4	5.1	6.1	6.2	6.3	7.1	8.1	
	Beneficial				None						None	None	None						Two minor beneficial effects have been identified for population and human health and climate resilience.
R88 Increase storage at an existing WTW in North Yorkshire	Adverse				None							None							Four minor adverse effects are anticipated for population and human health, material assets and resource use, soil, geology and land use and air and climate.
	Beneficial											None							Minor positive effects are anticipated for community health and resilience to climate, due to an increase of 48Ml/d deployable output. Minor beneficial effects are also anticipated on opportunities for biodiversity enhancements.
R89 Convert Wensleydale springs to boreholes	Adverse				None						None	None	None						Two major adverse effects are anticipated for water quality and surface and groundwater levels and flows. One moderate adverse impact is also anticipated for biodiversity.
	Beneficial				None						None	None	None						No beneficial effects have been identified.
R90 North Yorkshire annual license increase	Adverse				None		None					None	None	None				None	No adverse effects have been identified.
	Beneficial				None		None					None	None	None				None	Two minor beneficial impacts have been identified for air and climate.

Note: See Section 5.2 for description of SEA objectives.

Key:

	Major adverse
	Moderate adverse
	Minor adverse
	Negligible adverse
None	Not applicable

	Major beneficial
	Moderate beneficial
	Minor beneficial
	Negligible beneficial

7 Assessment of the Yorkshire Water WRMP 2024

7.1 The preferred plan

Whilst the initial primary criterion in selecting a programme of schemes to meet the supply-demand deficit over the planning period is whole-life cost (including any monetised values for environmental and social costs), the Environment Agency's Water Resources Planning Guidelines (WRPG) and other WRMP guidance requires that other criteria should also be considered, including non-monetised environmental and social impacts, climate change and other risks and uncertainties.

The aim of the WRMP is to find the 'best value' programme of supply and/or demand options (the 'preferred plan') to restore and maintain a supply-demand balance in those WRZs for which a supply deficit has been forecast. The selection process is facilitated through programme appraisal modelling tools, which are designed to produce an optimised programme taking account of whole life cost and environmental considerations.

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

The preferred plan has been selected in accordance with Yorkshire Water's goal to use demand management and leakage reduction measures to meet the predicted supply-demand deficit as far as possible. This is also in line with guidance from Ofwat and Defra, and preferences expressed by Yorkshire Water customers. Whilst the WRMP optimisation model delivers a least cost solution, this does not consider regulatory and customer preferences or any wider resilience benefits from alternative solutions. The WRMP24 has been developed in parallel to the Water Resources North (WReN) Regional Plan and the objectives of both plans are aligned.

The draft WRMP24 preferred plan is set out in **Table 7.1**. The plan includes two demand management options: L6 Active leakage control 95Ml/d and C5 Smart metering and water efficiency. The plan aligns with the previous WRMP19 plan to implement significant leakage reduction over the long term and includes a target to achieve 50% reduction of compared with 2017/18 leakage by 2050. The demand measures within the preferred plan also include customer demand management measures to further reduce water consumption per person/per property within Yorkshire Water's supply area. The C5 Smart metering and water efficiency option is assessed as resulting in moderate beneficial effects relation to sustainable and efficient use of water resources. The SEA findings also conclude that C5 Smart metering and water efficiency will result in minor beneficial effects across a range of other SEA objectives. The L6 Active leakage control 95Ml/d option is assessed as resulting in major beneficial effects across five SEA objectives in relation to human health and wellbeing, sustainable and efficient use of water resources and climate change resilience. Minor adverse effects have been identified in relation to the air and climate SEA objectives regarding use of material resources, air pollutant and greenhouse gas emissions.

However given the scale of the supply-demand balance deficit it has been necessary to also include a range of supply side measures within the draft WRMP24. Major adverse impacts for options DV7a(vi) Tees to York Pipeline Option 3 and DV8 (iv) York to South Yorkshire Pipeline within the preferred plan are anticipated in relation to biodiversity, material assets and resource use, protection and enhancement of geology/soil quality, and minimisation of greenhouse gas emissions. However these options are also anticipated to be associated with major to moderate beneficial effects on population and human health and climate change resilience due to the increase in available public water supply. The construction phases of an additional four resource options within the preferred plan are anticipated to result in moderate adverse effects on biodiversity in relation to scheme construction and minor adverse effects across a number of SEA objectives including for population and human health and cultural heritage. The remaining six supply side options in the preferred plan are assessed resulting in negligible to minor adverse effects only across all SEA objectives. The majority of resource options provide opportunities to result in biodiversity enhancement (habitat creation/restoration), provide beneficial effects on population and human health and in relation to climate change resilience.

The HRA of the WRMP preferred plan has concluded that following inclusion of appropriate mitigation measures during the construction phase of relevant schemes that no adverse effects on the integrity of any European site are anticipated. Further details are provided within the HRA report which accompanies this Environmental Report[39].

The WFD compliance assessment has informed SEA findings against the water topic objectives, and has identified uncertain impacts associated with multiple WFD water bodies in relation to four schemes within the preferred plan: R8b Sherwood Sandstone and Magnesian Limestone Boreholes Option 2, R8g Sherwood Sandstone Boreholes support to North Yorkshire, R13 East Yorkshire Groundwater Option 2, and DV7a(vi) Tees to York Pipeline Option 3. Further investigations will need to be carried out to confirm these impacts before the schemes could be implemented. East Yorkshire Groundwater Option 2 will be within any constraints imposed following Water Industry National Environment Programme (WINEP) investigations. Further details are provided within the WFD compliance assessment report which accompanies this Environmental Report[40].

Implementation of the four options above, as well as options R37b(ii) River Aire Abstraction Option 4 and DV3 South Yorkshire GW, will be dependent on meeting Environment Agency licensing requirements.

Implementation of this plan will result in no deficit in the 25-year period of the WRMP.

A visual summary of SEA findings for each of the schemes included in the preferred plan is provided in **Table 7.2**.

Table 7.1 Draft WRMP24 preferred plan

Category	Option Reference	Scheme	Benefit (Ml/d) on full implementation	First Year of Benefit
Customer management	C5	Smart metering	31	2025/26
Leakage	L6	Active leakage control 95 Ml/d	95	2025/26
Resource	DV3	South Yorkshire groundwater	5	2027/28
Resource	DV7a(vi)	Tees - York Pipeline Option 3	140	2049/50
Resource	DV8(iv)	York WTW to South Yorkshire pipeline	N/A – 50Ml/d capacity required to transfer new source of supply to South Yorkshire	2035/36
Resource	DV8(v)	York WTW capacity increase	50	2029/30
Resource	R3a	River Ouse licence transfer	0.3 (15 maximum)	2027/28

[39] Ricardo Energy & Environment (2022) Habitats Regulation Assessment of the Draft WRMP24. Report prepared for Yorkshire Water Services, September 2022.

[40] Ricardo Energy & Environment (2022) Water Framework Directive Regulations Compliance Assessment of the Draft WRMP24. Report prepared for Yorkshire Water Services, September 2022.

Category	Option Reference	Scheme	Benefit (Ml/d) on full implementation	First Year of Benefit
Resource	R8b	Sherwood Sandstone and Magnesian Limestone Boreholes Option 2	5	2027/28
Resource	R8g	Sherwood Sandstone Boreholes support to North Yorkshire	15	2028/29
Resource	R13	East Yorkshire Groundwater Option 2	6 (8 maximum)	2025/26
Resource	R31a	Additional bankside storage on the River Ouse	11	2066/67
Resource	R37b(ii)	River Aire Abstraction Option 4	34	2025/26
Resource	R85	Recommission Kirklees WTW	8	2068/69

Table 7.2 Visual evaluation matrix summary for options in the draft WRMP24 preferred plan

Option	Impact	SEA Objective															
		1.1	1.2	1.3	1.4	2.1	2.2	3.1	4.1	4.2	4.3	4.4	5.1	6.1	6.2	6.3	7.1	8.1
C5 Smart Metering and Water Efficiency	Adverse				None		None						None				None	None
	Beneficial				None		None						None				None	None
L6 Active Leakage Control 95Ml/d	Adverse				None													
	Beneficial				None													
DV3 - South Yorkshire Groundwater	Adverse				None							None						
	Beneficial											None						
DV7a(vi) - Tees - York Pipeline Option 1	Adverse				None							None						
	Beneficial											None						
DV8 (iv) - York to South Yorkshire Pipeline	Adverse				None					None		None						
	Beneficial									None		None						

Option	Impact	SEA Objective																
		1.1	1.2	1.3	1.4	2.1	2.2	3.1	4.1	4.2	4.3	4.4	5.1	6.1	6.2	6.3	7.1	8.1
DV8 (v) - York WTW Capacity increase	Adverse				None							None						
	Beneficial											None						
R3a River Ouse licence transfer	Adverse				None		None											None
	Beneficial				None		None											None
R8b: Sherwood Sandstone and Magnesian Limestone Boreholes Option 2	Adverse				None							None						
	Beneficial											None						
R8g Sherwood Sandstone Boreholes support to North Yorkshire	Adverse				None							None						
	Beneficial											None						
R13 East Yorkshire Groundwater Option 2	Adverse				None							None						
	Beneficial											None						

Option	Impact	SEA Objective																
		1.1	1.2	1.3	1.4	2.1	2.2	3.1	4.1	4.2	4.3	4.4	5.1	6.1	6.2	6.3	7.1	8.1
R31a Additional bankside storage on the River Ouse	Adverse				None							None						
	Beneficial											None						
R37b(ii) River Aire Abstraction Option 4	Adverse											None						
	Beneficial											None						
R85 Recommission Kirklees WTW	Adverse				None						None	None	N/A					
	Beneficial				None						None	None	None					

Note: See Section 5.2 for description of SEA objectives.

Key:

	Major adverse		Major beneficial
	Moderate adverse		Moderate beneficial
	Minor adverse		Minor beneficial
	Negligible adverse		Negligible beneficial
None	Not applicable		

7.2 Alternative plans

7.2.1 Least cost solution

A key step in the process Yorkshire Water have taken to determine the best value (preferred) plan was to utilise the Decision-Making Framework (DMF) 'optimisation model' to create a least cost solution for the Grid SWZ that optimised based on cost (financial capital) alone. Further details of this solution can be found in the draft WRMP.

A visual summary of SEA findings for each of the schemes included in the least cost solution is provided in **Table 7.3**.

There are some major and moderate adverse impacts as well as several minor adverse impacts associated with the resource schemes. DV7a (vi) York Pipeline Option 1 and DV8 (iv) York to South Yorkshire Pipeline options have major adverse impacts across a number of SEA objectives, including biodiversity, and in addition both R8f Sherwood Sandstone and Magnesian Limestone Boreholes Option 6 and R29 Reservoir De-silting have major adverse impacts in relation to the biodiversity SEA objective. The WFD compliance assessment has identified uncertain impacts associated with multiple WFD water bodies in relation to four schemes within the least cost solution plan.

7.2.2 Adaptive pathways

The development of the WRMP24 utilises the most up to date information available to Yorkshire Water, although the plan is still based on estimates and incorporates known risks to provide an appropriate level of flexibility. Known risks, include the loss of the existing Severn Trent Water import and licence reductions to meet environmental destination objectives, can be linked to key dates that trigger an alternative pathway. To ensure Yorkshire Water are prepared for diverting to an alternative plan the draft WRMP therefore includes decision points in advance of the pathway diverging.

The enhanced environmental destination pathway follows the preferred plan with the addition of a new abstraction from the Humber Estuary Tidal Abstraction Reservoir (option R78) from 2068 to address a supply deficit should licence reductions be required.

A visual summary of SEA findings for each of the schemes included in the enhanced environmental destination pathway is provided in **Table 7.4**.

The R61 East Yorkshire coast desalination option represents an alternative abstraction from the Humber Estuary. Significant further investigation is required in relation to both these schemes. The HRA has identified likely significant effects at Stage 1 screening and a Stage 2 appropriate assessment of both schemes will need to be undertaken when further scheme details are available as these options are developed.

The Ofwat Core pathway represents the minimum interventions required to ensure the future risks are mitigated and Yorkshire Water's supply system is resilient to future drought events.

A visual summary of SEA findings for each of the schemes included in the Ofwat Core pathway is provided in **Table 7.5.**

A number of resource options with significant environmental effects would not be required within this alternative future scenario, including the R31a Additional bankside storage on the River Ouse, DV7a(vi) York Pipeline Option 1 and DV8(iv) York WTW to South Yorkshire Pipeline options which are associated with major adverse impacts for options. Options with moderate adverse effects during the construction phase remain in the Ofwat Core pathway as do several with uncertainty within the WFD compliance assessment.

Table 7.3 Visual evaluation matrix summary for options in the least cost solution

Option	Impact	SEA Objective															
		1.1	1.2	1.3	1.4	2.1	2.2	3.1	4.1	4.2	4.3	4.4	5.1	6.1	6.2	6.3	7.1	8.1
C15a Household Flow Regulators	Adverse				None		None						None				None	None
	Beneficial				None		None						None				None	None
L6 Active Leakage Control 95Ml/d	Adverse				None													
	Beneficial				None													
DV3 - South Yorkshire Groundwater	Adverse				None							None						
	Beneficial											None						
DV7a(vi) - Tees to York Pipeline Option 1	Adverse				None							None						
	Beneficial											None						
DV8 (iv) - Tees -York to South Yorkshire Pipeline	Adverse				None					None		None						
	Beneficial									None		None						

Option	Impact	SEA Objective															
		1.1	1.2	1.3	1.4	2.1	2.2	3.1	4.1	4.2	4.3	4.4	5.1	6.1	6.2	6.3	7.1	8.1
DV8 (v) - York WTW capacity increase	Adverse				None							None						
	Beneficial											None						
R5 Aquifer Storage and Recovery Scheme 1	Adverse				None													
	Beneficial																	
R8b: Sherwood Sandstone and Magnesian Limestone Boreholes Option 2	Adverse				None							None						
	Beneficial											None						
R8c: Sherwood Sandstone and Magnesian Limestone Boreholes Option 3	Adverse				None							None						
	Beneficial											None						
R8f Sherwood Sandstone and Magnesian Limestone Boreholes Option 6	Adverse				None							None						
	Beneficial											None						
R8g Sherwood Sandstone Boreholes support to North Yorkshire	Adverse				None							None						

Option	Impact	SEA Objective															
		1.1	1.2	1.3	1.4	2.1	2.2	3.1	4.1	4.2	4.3	4.4	5.1	6.1	6.2	6.3	7.1	8.1
	Beneficial											None						
R13 East Yorkshire Groundwater Option 2	Adverse				None							None						
	Beneficial											None						
R29 Reservoir De-silting	Adverse				None													
	Beneficial				None													
R31a Additional bankside storage on the River Ouse	Adverse				None							None						
	Beneficial											None						
R51 Dales from the Tees - treated	Adverse				None													
	Beneficial																	
R86 Aire and Calder new WTW	Adverse											None						

Option	Impact	SEA Objective															
		1.1	1.2	1.3	1.4	2.1	2.2	3.1	4.1	4.2	4.3	4.4	5.1	6.1	6.2	6.3	7.1	8.1
	Beneficial											None						

Table 7.4 Visual evaluation matrix summary for options in the enhanced environmental destination pathway

Option	Impact	SEA Objective																
		1.1	1.2	1.3	1.4	2.1	2.2	3.1	4.1	4.2	4.3	4.4	5.1	6.1	6.2	6.3	7.1	8.1
C5 Smart Metering and Water Efficiency	Adverse				None		None						None				None	None
	Beneficial				None		None						None				None	None
L6 Active Leakage Control 95Ml/d	Adverse				None													
	Beneficial				None													
DV3 - South Yorkshire Groundwater	Adverse				None							None						
	Beneficial											None						
DV7a(vi) - Tees to York Pipeline Option 1	Adverse				None							None						
	Beneficial											None						
DV8 (iv) - York to South Yorkshire Pipeline	Adverse				None					None		None						
	Beneficial									None		None						

Option	Impact	SEA Objective															
		1.1	1.2	1.3	1.4	2.1	2.2	3.1	4.1	4.2	4.3	4.4	5.1	6.1	6.2	6.3	7.1	8.1
DV8 (v) - York WTW Capacity increase	Adverse				None							None						
	Beneficial											None						
R3a River Ouse licence transfer	Adverse				None		None											None
	Beneficial				None		None											None
R8b: Sherwood Sandstone and Magnesian Limestone Boreholes Option 2	Adverse				None							None						
	Beneficial											None						
R8g Sherwood Sandstone Boreholes support to North Yorkshire	Adverse				None							None						
	Beneficial											None						
R13 East Yorkshire Groundwater Option 2	Adverse				None							None						
	Beneficial											None						

Option	Impact	SEA Objective																
		1.1	1.2	1.3	1.4	2.1	2.2	3.1	4.1	4.2	4.3	4.4	5.1	6.1	6.2	6.3	7.1	8.1
R31a Additional bankside storage on the River Ouse	Adverse				None							None						
	Beneficial											None						
R37b(ii) River Aire Abstraction Option 4	Adverse											None						
	Beneficial											None						
R78 Tidal Abstraction Reservoir	Adverse				None													
	Beneficial																	
R85 Recommission Kirklees WTW	Adverse				None						None	None	N/A					
	Beneficial				None						None	None	None					

Table 7.5 Visual evaluation matrix summary for options in the Ofwat Core pathway

Option	Impact	SEA Objective																
		1.1	1.2	1.3	1.4	2.1	2.2	3.1	4.1	4.2	4.3	4.4	5.1	6.1	6.2	6.3	7.1	8.1
C5 Smart Metering and Water Efficiency	Adverse				None		None						None				None	None
	Beneficial				None		None						None				None	None
L6 Active Leakage Control 95Ml/d	Adverse				None													
	Beneficial				None													
DV3 - South Yorkshire Groundwater	Adverse				None							None						
	Beneficial											None						
DV8 (v) - York WTW Capacity increase	Adverse				None							None						
	Beneficial											None						
R3a River Ouse licence transfer	Adverse				None		None											None
	Beneficial				None		None											None

Option	Impact	SEA Objective															
		1.1	1.2	1.3	1.4	2.1	2.2	3.1	4.1	4.2	4.3	4.4	5.1	6.1	6.2	6.3	7.1	8.1
R8b: Sherwood Sandstone and Magnesian Limestone Boreholes Option 2	Adverse				None							None						
	Beneficial											None						
R8g Sherwood Sandstone Boreholes support to North Yorkshire	Adverse				None							None						
	Beneficial											None						
R13 East Yorkshire Groundwater Option 2	Adverse				None							None						
	Beneficial											None						
R37b(ii) River Aire Abstraction Option 4	Adverse											None						
	Beneficial											None						
R85 Recommission Kirklees WTW	Adverse				None						None	None	N/A					
	Beneficial				None						None	None	None					

7.3 Option-level cumulative assessment

A cumulative assessment of the preferred plan was undertaken to consider whether the preferred plan options, when constructed or operated together, led to additional effects on each of the SEA topics. The cumulative assessment presented in this section has been carried out in line with the methodology described in Section 5 based upon the preferred plan of options discussed and presented in Section 8.1 and presented in **Table 7.1**.

Table 7.6 provides a summary of the outcomes of the cumulative assessment for the preferred plan. There are potential cumulative impacts between the following options which would require construction in the vicinity of Elvington WTW York WTW should these schemes have overlapping construction phases:

The first year of benefit for R31a within the preferred plan is identified as 2066 (see **Table 7.1**) and this scheme is estimated to be associated with an approximately 4-year construction phase. Both the DV8(iv) and DV8(v) schemes are also estimated to associate with a four-year construction period are identified as operational in 2035 and 2029 respectively, and therefore the construction phases will not coincide with that of R31a. The DV7a(vi) scheme is identified as operational in 2049 within the preferred plan (see **Table 7.1**) with an approximately 15-year construction phase. Therefore no cumulative effects are anticipated.

On the basis of current information the construction phases of the DV8(v) scheme is estimated to run for four years and is not currently expected to overlap with that of the DV7a(vi) and DV8(iv) schemes and therefore no cumulative effects are anticipated.

The DV7a(vi) and DV8(iv) schemes are likely to have overlapping construction phases and there is therefore potential for cumulative impacts between two schemes related to construction impacts on biodiversity (Objective 1.1, Objective 1.3), population and human health (Objective 2.1), material assets and resource use (Objective 3.1), air quality (Objective 6.1), archaeology and cultural heritage (Objective 7.1), and landscape and visual amenity (Objective 8.1). Construction measures that need to be incorporated into the scheme design and/or planning to avoid or mitigate potential effects will be agreed during the detailed design and planning stage should these schemes be progressed. The DV7a(vi) scheme will cover a large geographical area (pipeline construction from the River Tees to Ouse) as will the DV8(iv) scheme (Ouse to South Yorkshire) and therefore until detailed construction plans are available it is not possible to identify if works in proximity to sensitive receptors will coincide. However, any such cumulative impacts would be expected to be minor, as most of these activities would be localised and small in scale, and could be effectively mitigated through careful project management and best practice construction methods

There is no potential for cumulative adverse effects during operation of the schemes included in the preferred plan as there are no water bodies that are impacted by more than one option. There would be benefits associated with implementation of each option in parallel, i.e. increasing the overall volume of water savings made or water provided for supply.

Table 7.6 Cumulative impacts matrix for the draft WRMP24 preferred plan

C5	Smart Metering and Water Efficiency													
L6	Active Leakage Control 95 Ml/d	None												
DV3	South Yorkshire Groundwater	None	None											
DV7avi)	Tees to York Pipeline Option 1	None	None											
DV8(iv)	York to South Yorkshire Pipeline	None	None											
DV8(v)	York WTW Capacity increase	None	None											
R3a	River Ouse licence transfer	None	None											
R8b	Sherwood Sandstone and Magnesian Limestone Boreholes option 2	None	None											
R8g	Sherwood Sandstone Boreholes support to North Yorkshire	None	None											
R13	East Yorkshire Groundwater Option 2	None	None											
R31a	Additional bankside storage on the River Ouse	None	None											
R37b(ii)	River Aire Abstraction Option 4	None	None											
R85	Recommission Kirklees WTW	None	None											
		C5	L6	DV3	DV7a(vi)	DV8(iv)	DV8(v)	R3a	R8b	R8g	R13	R31a	R37b(ii)	R85

Key

- Mutually exclusive schemes, i.e. use the same site or the same resource
- Potential adverse construction impacts if constructed simultaneously
- Potential cumulative impacts in operation
- None — No cumulative impacts

7.4 Programme-level cumulative assessment

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

- Yorkshire Water's Drought Plan
- Neighbouring water companies' drought plans
- Neighbouring water companies' WRMPs (these are to be assessed when published
- Environment Agency Drought Plans
- Canal and River Trust Management Plans
- Local Development Frameworks
- National Policy Statements and National/Regional Infrastructure Plans
- Major Projects

7.4.1 Yorkshire Water's Drought Plan

Yorkshire Water published its Final Drought Plan in 2022. The Drought Plan provides a comprehensive statement of the actions that Yorkshire Water will consider implementing during drought conditions in order to protect essential water supplies for customers and to minimise environmental impact. Yorkshire Water's Drought Plan 2022 comprises a total of 63 drought options (58 supply side options (including 49 supply side standard options and 9 long-term supply-side options) and 5 demand options). The Plan includes a range of drought management actions (linked to drought triggers), that can be broadly categorised as:

- Demand Side Options (including: publicity campaigns; emergency drought orders; leakage detection; temporary-use bans.
- Supply Side Options (including: abstraction increases; reduced regulated flows; water transfers
- Drought Permits and orders

There are options in the WRMP24 preferred plan that also appear in the Yorkshire Water Drought Plan 2022 i.e. East Yorkshire Groundwater Option 2 (R13) and R37b(ii) River Aire Abstraction Option 4, or are similar schemes which would utilise the same proposed source i.e. R3a River Ouse licence transfer, DV8(v) York WTW Capacity increase and DV7a(vi) Tees - York Pipeline Option 1. No cumulative impacts will arise as they will be mutually exclusive - either the scheme will be developed as a permanent scheme under the WRMP and therefore no longer a Drought Plan option; or it will be a temporary scheme available, if required, in a drought prior to it becoming a permanent scheme in later years under the WRMP.

The Yorkshire Water Drought Plan 2022 also includes a demand side management option for increased leakage detection and repair activity. Simultaneous implementation of the WRMP leakage management schemes could lead to cumulative adverse impacts with leak detection and repair activity associated with the Drought Plan, however, any such impacts are likely to be no more than minor.

7.4.2 Neighbouring water companies' WRMPs and Drought Plans

The draft WRMPs and drought plans from the following water companies have been considered for potential cumulative effects with the draft WRMP24 preferred plan and alternative pathways.

- Severn Trent Water
- United Utilities Water
- Northumbrian Water
- Anglian Water Services.

This section is contingent on access to the other draft WRMPs and their assessments which are all running concurrently to Yorkshire Water. Currently, without sight of the draft WRMPs for other water companies, it is not possible to make a definitive cumulative assessment against other water companies' draft plans and this assessment will require updating when all plans are available.

On the basis of information currently available the following potential cumulative effects are identified as requiring further consideration:

- An additional flow reduction in the River Ouse associated with Option R3a River Ouse licence transfer, included in the draft WRMP24 preferred plan, would lead to a 4% reduction in flows at the lowest hands off flow (HoF) value (400Ml/d) and a 1% reduction in flows the second lowest HoF (650Ml/d) compared to baseline conditions. This flow reduction is considered negligible[40]. However there remains potential for cumulative effects on the downstream Humber Estuary in combination with schemes in the Severn Trent Water draft WRMP which may affect flow in the River Derwent and River Trent. Any reduction in freshwater flows could potentially affect qualifying interests for which the Humber Estuary is designated. While no cumulative effects are anticipated, on the basis of impacts associated with individual schemes, an assessment of the impact on pass forward flow to the estuary will be required when confirmation of proposed schemes in the draft plans are available.
- The Humber Estuary Tidal Abstraction Reservoir (option R78) is included in the enhanced environmental destination pathway and is identified as being required in 2068. Further investigations are required on this scheme and on an alternative scheme on the Humber Estuary, the R61 East Yorkshire coast desalination option. There is potential for cumulative effects with the Anglian Water WRMP24 should that plan contain options impacting the Humber estuary (e.g. potential de-salination schemes), and any future investigations would need to consider these potential effects.

The Northumbrian Water draft WRMP24 includes demand management options and one export option, the 'Yorkshire 140Ml/d Tees Export' option. This export option is the same as the option included in Yorkshire Water's preferred plan DV7a(vi) Tees to York Pipeline Option 3 and therefore no cumulative effects are identified between the two plans.

It is not anticipated that the United Utilities' draft WRMP24 preferred plan will include any options which are in close geographical proximity or hydrological connectivity with the supply-side options in Yorkshire Water's preferred plan. This will need to be reviewed when all draft plans are available.

7.4.3 National/Regional Infrastructure Plans

7.4.3.1 National Policy Statements (NPSs)

The Planning Act 2008 introduced a procedure to streamline the decision-making process for NSIPs. Under the Act, a developer wishing to construct a Nationally Significant Infrastructure Projects (NSIP) must first apply to the Secretary of State for development consent.

The National Policy Statements comprise the government's objectives for the development of nationally significant infrastructure in a particular sector and state, including[41]:

- How this will contribute to sustainable development.
- How these objectives have been integrated with other government policies.
- How actual and projected capacity and demand have been taken into account.
- Consideration of relevant issues in relation to safety or technology.
- Circumstances where it would be particularly important to address the adverse impacts of development.
- Specific locations, where appropriate, in order to provide a clear framework for investment and planning decisions.

National Policy Statements (NPSs) establish the need for specific types of infrastructure and provide planning guidance for promoters of NSIPs, and the basis for the examination by the Examining Authority

[41] Planning Inspectorate (2022) National Infrastructure Planning. Available at: https://infrastructure.planninginspectorate.gov.uk/legislation-and-advice/national-policy-statements/

and decisions by the Secretary of State on development consent order applications. A number of NPSs have been published which set out the definition, and in some cases the location, of NSIPs.

It is not expected that the draft WRMP24 will have any cumulative effects with any NPSs due to the non-site specific nature of NPSs. One NPS, Nuclear Power NPS (EN-6) does outline potential suitable sites for new nuclear power station development, however none of the sites are located within the YW supply area. No significant cumulative effects are therefore anticipated.

Two NSIPs are set out in the Waste Water Treatment NPS; however, both of these are located in London and are not expected to have any effect on water resource management within the YW draft WRMP24 area. Similarly, the Airports NPS concerns runway capacity in the South East of England only.

The government consulted on an NPS for water resources between 2018 and 2019. This NPS sets out the need and government's policies for the development of nationally significant infrastructure projects relevant to water resources in England. Implementation of the draft WRMP24 is likely to be compatible with those objectives of the NPS for improving water supply resilience.

7.4.3.2 Nationally Significant Infrastructure Projects (NSIPs)

All NSIPs are listed on the Planning Inspectorate website[42]. At the time of writing, 35 projects located within the Yorkshire and Humber region were at various stages. These are detailed in **Table 7.7**.

Table 7.7 NSIPs in the Yorkshire and Humber Region

Project	Developer	Stage
Little Crow Solar Park	INRG SOLAR (Little Crow) Ltd	Decided
Able Marine Energy Park Material Change 2	Able Humber Ports Ltd	Decided
South Humber Bank Energy Centre	EP Waste Management Limited	Decided
Thorpe Marsh Gas Pipeline	Thorpe Marsh Power Limited	Decided
A63 Castle Street Improvement-Hull	Highways England	Decided
Hornsea Offshore Wind Farm (Zone 4) - Project One	SMart Wind Ltd	Decided
Ferrybridge Multifuel 2 (FM2) Power Station	Multifuel Energy Ltd	Decided
Drax Re-power	Drax Power Limited	Decided
Dogger Bank Creyke Beck	Forewind	Decided
Dogger Bank Teesside A / Sofia Offshore Wind Farm (formerly Dogger Bank Teesside B) - Project previously known as Dogger Bank Teesside A&B	Forewind Ltd	Decided
North Killingholme Power Project	C.GEN Killingholme Ltd	Decided
Knottingley Power Project	Knottingley Power Limited	Decided
A160 - A180 Port of Immingham Improvement	Highways Agency	Decided
Hornsea Offshore Wind Farm (Zone 4) - Project Two	SMart Wind Limited	Decided
Yorkshire and Humber CCS Cross Country Pipeline	National Grid Carbon Limited	Decided
River Humber Gas Pipeline Replacement Project	National Grid	Decided
Able Marine Energy Park	Able Humber Ports Ltd	Decided
North Doncaster Rail Chord (near Shaftholme)	Network Rail	Decided
White Rose Carbon Capture and Storage Project	Capture Power Limited	Decided
Eggborough CCGT	Eggborough Power Limited	Decided
Keadby 3 Carbon Capture Power Station	Keadby Generation Limited	Decision

[42] https://infrastructure.planninginspectorate.gov.uk/projects/

Project	Developer	Stage
East Yorkshire Solar Farm	East Yorkshire Solar Farm Limited	Pre Application
Immingham Green Energy Terminal	Associated British Ports	Pre Application
Humber Low Carbon Pipelines	National Grid Carbon (NGC)	Pre Application
Dogger Bank South Offshore Wind Farms	RWE Renewables UK Dogger Bank South (West) Ltd and RWE Renewables UK Dogger Bank South (East) Ltd	Pre Application
Helios Renewable Energy Project	Enso Green Holdings D Limited	Pre Application
V Net Zero Pipeline	Chrysaor Production (UK) Limited	Pre Application
Immingham Eastern Ro-Ro Terminal	Associated British Ports	Pre Application
Continental Link Multi-Purpose Interconnector	National Grid Ventures	Pre Application
Able Marine Energy Park Material Change 1	Able Humber Ports Ltd	Pre Application
Yorkshire GREEN	National Grid Electricity Transmission (NGET)	Pre Application
Ferrybridge D Combined Cycle Gas Turbine (CCGT) Power Station Project	SSE Generation Limited	Pre Application
Drax Bioenergy with Carbon Capture and Storage Project	Drax Power Limited	Pre Examination
North Lincolnshire Green Energy Park	North Lincolnshire Green Energy Park Limited	Pre Examination
Hornsea Project Four Offshore Wind Farm	Orsted Hornsea Project Four Limited	Recommendation

Four NSIPs have been identified as having potential for cumulative effects with one option as part of the preferred plan. Option R13 (East Yorkshire Groundwater Option 2) is situated within a zone of influence with the four NSIP which are:

- Helios Renewable Energy Project (Pre-Application)
- Drax Bioenergy with Carbon Capture and Storage Project (Pre-Examination)
- Drax Re-Power (Decided)
- White Rose Carbon Capture and Storage Project (Decided)

The Helios Renewable Energy Project is approximately 6km from the proposed R13 East Yorkshire Groundwater Option 2 construction location. This NSIP is currently in the Pre-Application stage with expected submission in 2023. There is potential for cumulative effects during construction due to construction traffic, however this is considered uncertain given insufficient planning details for this project.

The remaining three NSIPs within the zone of influence of R13 East Yorkshire Groundwater Option 2, are set to be constructed within the Drax Power Station Site. Although there may be some overlap in construction timeline, given the location, cumulative effects have been identified as small scale.

No other NSIPs have been identified to be within the zone of influence of any other options within the Yorkshire Water preferred plan.

The water demands of all of these NSIPs should be considered in their applications for development consent and if significant demand is forecast, this should be considered by Yorkshire Water during monitoring of the WRMP and in the five year review.

No cumulative operational effects have been identified at this stage.

7.4.4 Local Plans

Potential cumulative effects with Local Plans have been assessed based on plans available in September 2022. Local Plans are relatively high-level policy documents and, whilst they identify potential areas for future development and zones for particular activities, the certainty of developments, the precise spatial location and their timing make it difficult to identify any specific potential cumulative effects; they would only arise if the timing of the infrastructure required by the WRMP scheme was to coincide.

The 13 preferred plan options are located across the vast Yorkshire Water supply area, thus falling within a large number of Local Authority areas. Uncertainties still remain for a number of the preferred plan options with their exact location and construction start date remaining unconfirmed. At the time of writing, it is not possible to identify all possible potential cumulative effects associated with local plans.

It is anticipated that any negative impacts could be effectively mitigated through appropriate scheduling of all the construction required so as to avoid any concurrent works.

8 Mitigation and enhancement

8.1 Overview

Key stages of the SEA process comprise Task B5: Mitigating adverse effects and Task B6: Proposing measures to monitor the environmental effects of plan or programme implementation. The sections below describe how these tasks have been addressed and how Yorkshire Water intends to ensure that mitigation measures are implemented for any adverse effects that are identified and the means by which the environmental performance of the WRMP can be assessed.

8.2 Mitigation measures

Consideration of mitigation measures has been an integral part of the SEA process. The assessment has assumed the implementation of standard best practice mitigation measures and identified any additional measures as shown in the option SEA matrices (see **Appendix E**). The significance of effects identified in the matrices relates to residual effects after mitigation.

Certain assumptions have been made regarding this:

- Where suitable mitigation measures are known and identified, these have been taken into account and reported, such that the resultant residual impact has been determined.
- In line with recommendations made in the UKWIR SEA Guidance, the SEA appraisals have assumed the implementation of reasonable mitigation, such as the use of best practice construction methods.

8.3 Residual effects

The potential effects of the draft WRMP24 are described in the sections above. The SEA process has identified potential residual impacts of the WRMP preferred plan after mitigation measures have been taken into consideration. Proposals to attenuate the residual negative impacts of the preferred plan are set out below.

Table 8.1 summarises the residual effects attributable to the preferred plan for the Yorkshire Water WRMP2024. Mitigation of both construction and operation components for each option are presented.

The detail of this mitigation needs to be considered during the planning phases of each of the individual measures if and when they are taken forward for implementation. This should then be consolidated into a Construction Environmental Management Plan (CEMP) for the scheme, noting that all works should be carried out in accordance with relevant Construction Design Management (CDM) Regulations 2015. In other cases, best practice design requires consideration of mitigation measures at an early stage along with consultation with potentially affected parties. In this way, effective mitigation plans can be developed to minimise many of the residual adverse effects currently identified in the SEA appraisals.

Table 8.1 Residual adverse impacts of options within the preferred plan for the draft WRMP24

Reference	Option	Construction	Operation
C5	Smart Metering and Water Efficiency	No significant effects	No significant effects
C15a	Household Flow Regulators A	No significant effects	No significant effects
DV3	South Yorkshire Groundwater	No significant effects	No significant effects
DV7a(vi)	Tees to York Pipeline Option 3	Biodiversity, flora and fauna; Population and human health; Material assets and resource use; Soil, geology and land use; Air and climate; Archaeology and cultural heritage;	No significant effects

Reference	Option	Construction	Operation
		and, Landscape and visual amenity	
DV8(iv)	York to South Yorkshire Pipeline	Biodiversity, flora and fauna; Population and human health; Material assets and resource use; Soil, geology and land use; Air and climate; Archaeology and cultural heritage; and, Landscape and visual amenity	No significant effects
DV8(v)	York WTW Capacity increase	Biodiversity, flora and fauna	No significant effects
L6	Active Leakage Control 95 Ml/d	No significant effects	No significant effects
R3a	Increased River Ouse pump storage capacity	No significant effects	No significant effects
R8b	Sherwood Sandstone and Magnesian Limestone Boreholes Option 2	No significant effects	No significant effects
R8g	Sherwood Sandstone Boreholes support to North Yorkshire	No significant effects	No significant effects
R13	East Yorkshire Groundwater Option 2	Biodiversity, flora and fauna Water quality	No significant effects
R31a	Additional bankside storage on the River Ouse	Biodiversity, flora and fauna	No significant effects
R37b(ii)	River Aire Abstraction Option 4	Biodiversity, flora and fauna	No significant effects
R85	Recommission Kirklees WTW	No significant effects	No significant effects

There are general best-practice procedures and measures which can be applied to all options proposed in Yorkshire Water's WRMP2024. The following guidance outlines the current industry best-practices in dealing with potential construction-related impacts, specifically site-derived pollutants (e.g. fuel, concrete and silt), and should be implemented as minimum standard in addition to any scheme-specific measures which have been identified through option level investigations:

- DEFRA's Pollution prevention for businesses (https://www.gov.uk/guidance/pollution-prevention-for-businesses);
- Venables R. et al. (2000) Environmental Handbook for Building and Civil Engineering Projects. 2nd Edition. Construction Industry Research and Information Association (CIRIA), London.

The documents above highlight procedures and measures designed to prevent adverse effects on a range of receptors (e.g. European sites) occurring as a result of construction activities. There is also the possibility for the pollution of water courses via surface run off and additional attention should be made when dealing with such contaminants. In these instances, works should be conducted in adherence to the guidance outlined above. For example, all vehicles and any chemical/ oil storage will be fully bunded to prevent any accidental pollution of groundwater or watercourses. Pollution Incident Control Management Plans may also be developed to limit adverse effects arising from pollution events.

In addition to the above, the CEMP should include further measures to minimise, or where possible, eliminate, adverse effects on various receptors. These are outlined below for each SEA topic.

Adverse effects on biodiversity are largely as a result of potential effects on specific species. Most mitigation measures specific to a particular species may only be determined at the option level following appropriate monitoring. Mitigation measures designed to minimise adverse effects on biodiversity receptors during the construction phase should be outlined in the CEMP. Examples of these measures are detailed below, for example:

- where supporting habitat will be directly lost as a result of open cut pipeline installation, the habitat must be reinstated, or trenchless/ directional drilling pipeline installation methods should be alternatively used;
- a programme of works should be established as early as possible to enable any investigations, surveys and mitigation to be established and give sufficient time for consultation with relevant bodies. The programme should take into account any seasonal constraints to avoid adverse effects on sensitive receptors (e.g. breeding birds);
- the site layout must be planned so that machinery and dust causing activities are located away from receptors, as far as is possible;
- consideration of the timing of construction e.g. night-time working to avoid effects on nocturnal species
- the use of lighting will ensure that potential 'displacement' effects on nocturnal animals, particularly designated bat species, are avoided;
- Construction Environmental Management Plan will be implemented with risk assessment for pollution incidents and introduction/ spread of INNS and a response plan if either occurred.
- measures to reduce noise impacts on species (e.g. birds) and residential receptors including; acoustic housing of generators, acoustic cladding surrounding construction site, appropriate siting of plant machinery and silencers or mufflers fitted to machinery where possible.
- measures to reduce adverse effects as a result of dust and air emissions including ensuring vehicles switched off when stationary, ensuring an adequate water supply for appropriate mitigation and covering vehicles entering and leaving sites to prevent escape of materials during transport.
- installation of pipe-caps to prevent species entering and becoming trapped in any laid pipe-work outside of working hours.
- utilise an Ecological Clerk of Works where required
- scheme design should aim to minimise the environmental effects by 'designing to avoid' potential habitat features that may be important e.g. those used by species that are European site interest features when outside the site boundary (e.g. linear features such as hedges or stream corridors; large areas of scrub or woodland; mature trees; etc.) through scheme-specific routing studies;

Additional mitigation measures employed to reduce the potential adverse effects on sensitive receptors can be categorised under the following:

- Population and human health
    - avoid works near to the most sensitive health receptors, where possible;
    - plan construction traffic movements to avoid routes with sensitive receptors and avoid peak traffic hours;
- Material assets and resource use
    - Production of a waste management plan which details what waste will be generated by the scheme as well as highlight opportunities for reuse or recycling of materials.
    - Minimise waste generation and adopt the waste hierarchy process
- Water
    - Compliance with Pollution Prevention Guidelines, as detailed above
    - Installation of temporary drainage measures (e.g. swales and silt fences) to reduce sediment loads
    -

- Soils, geology and land-use
  - Agricultural soils will be managed, preserved, retained and reinstated in accordance with Department for Environment, Food and Rural Affairs (Defra)
- Air quality
  - Ensure vehicles entering and leaving sites are securely covered to prevent escape of materials during transport
  - Planning site layout so that machinery and dust causing activities are located away from receptors, as far as is possible;
  - Ensure all vehicles switch off engines when stationary - no idling vehicles;
  - Ensuring an adequate water supply for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate;
  - Reuse and recycle waste to reduce dust from waste materials;
  - Ensure water suppression is used during demolition, excavation and other earth-moving operations;
  - Any demolition or concrete breakout to be undertaken in suitable weather conditions i.e. avoiding windy conditions.
- Climate change
  - utilise on-site renewable energy where possible
  - sustainable design of any new infrastructure to maximise energy efficiency
  - company fleets to utilise low emission or electric vehicles
  - use of low emission plant machinery
  - offsetting residual carbon emissions
- Archaeology and cultural heritage
  - careful consideration being given to the presence of heritage assets when finalising proposals for pipeline routing;
  - new above-ground infrastructure should be screened, where possible and informed by informed by a heritage appraisal/assessment, to minimise effects on the settings of heritage assets;
  - where required, archaeological investigations should be carried out prior to commencing construction and the findings will inform detailed mitigation, which will be agreed with the relevant authorities.
- Landscape and visual amenity
  - Landscape and visual assessments to inform landscape mitigation plans
  - Avoid unnecessary tree and vegetation removal
  - High quality design and considerate positioning of new infrastructure
  - Where lighting is required, this should be low level and directed away from sensitive receptors/areas

8.4 Mitigation of cumulative impacts with other plans and programmes

Section 7 explains the potential cumulative impacts with other plans. Potential water resource impacts that could arise due to future, as yet, unknown new abstractions from common sources would be assessed and considered by the Environment Agency as informed by detailed environmental assessment work as part of the abstraction licensing and water resources planning processes.

Liaison with local planning authorities will also be essential to assess any required mitigation measures from any identified cumulative effects on development plans and projects as discussed in Section 7.

9 Monitoring proposals

9.1 Overview

A key stage of the SEA process with regard to monitoring is Stage E: Monitoring the significant effects of the plan or programme on the environment. The sections below describe how these tasks have been addressed and how Yorkshire Water proposes to monitor the effects of implementation of the WRMP.

9.2 Monitoring Requirements

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

Monitoring for options identified in the preferred plan is set out in Section 9.3. These monitoring recommendations are based on the current understanding of the scheme design. As options are brought forward for development, further monitoring requirements may be set out in planning applications, borehole drilling and pump test consents, or in Yorkshire Water voluntary best-practice monitoring plans accompanying scheme development. This will be discussed with relevant key regulatory bodies and stakeholders. In practice, close dialogue should occur between Yorkshire Water, Environment Agency, Natural England and any affected third parties to agree the appropriate scale and duration of such scheme-specific monitoring activities proportionate to the assessed environmental risks.

9.3 Proposed Monitoring

Table 9.1 lists the potential impacts that may arise from implementation of the WRMP preferred plan and which require monitoring in accordance with the SEA Regulations.

Key monitoring parameters at the strategic WRMP level will be those relating to the abstraction of water and the effects that this may have on waterbodies and their functions as habitats (see **Table 9.1**). There are also direct potential impacts on humans, the built environment, terrestrial habitats, the atmosphere, landscape and heritage assets, which may arise from construction activities and/or option operation (see **Table 9.1**). These parameters should, therefore, be included within the monitoring programme where it is practicable to do so. Extensive primary data collection is neither feasible nor appropriate for this programme level of monitoring, and use should be made where possible of existing datasets and monitoring regimes.

Site-specific monitoring requirements for the resource options included in the preferred plan will be developed during the planning process closer to the time of implementation.

Table 9.1 Proposed SEA monitoring parameters – strategic WRMP monitoring

Impacted receptor/topic	Proposed strategic indicators
Biodiversity	Condition of protected sites, biological monitoring (e.g. macroinvertebrates, macrophytes, fisheries, bird surveys), INNS presence
Water resources, water quality	River flows, river levels, lake and reservoir levels. Groundwater levels. Surface and ground water quality (including proportion of surface water and groundwater bodies at 'Good; WFD status)
Flood risk	Number of properties that experience internal flooding from public sewers.
Soils, geology and land use	Area of previously undeveloped land used during construction

Impacted receptor/topic	Proposed strategic indicators
Climate Factors	Net greenhouse gas emissions per million litres (Ml) of treated water (kg CO_2 equivalent emissions per Ml) for Yorkshire Water supply area Energy use used in the operation of options. Renewable energy generated or purchased by Yorkshire Water.
Transport	Transport fleet fuel consumption, emissions and business mileage, as monitored by Yorkshire Water
Nuisance/ Community/ Local Economy	Scheme level community disruption of capital works would be monitored through an Environmental Monitoring Plan if required. Number of nuisance-related complaints (e.g. noise, dust) logged with Yorkshire Water and Local Authority EHOs. Pollution and flooding incidents Responses gauged through Yorkshire Water customer satisfaction surveys. Community investment, employee volunteering and match funding by Yorkshire Water.
Waste and resource use	Leakage Water saved through demand management / water efficiency measures. Amount of recycled / re-used materials. Proportion of waste sent to landfill. Chemical usage in water treatment.
Air Quality	Scheme related issues of capital works would be monitored through an Environmental Monitoring plan if required. Changes in air quality are monitored by the Automatic Urban and Rural Network[43] administered by Bureau Veritas, and this data would be available if required to inform a baseline
Cultural Heritage	Loss / damage or discovery / protection of cultural, historic and industrial heritage features. Condition of buried archaeology would be monitored during construction e.g. through appropriate archaeological investigations and watching briefs as required. Consultation with relevant stakeholders to ensure impacts are minimised, e.g. to water level dependent assets. Historic England monitor parameters such as Listed Buildings and Scheduled Monuments, in order to maintain a 'Heritage at risk' register.
Landscape	Loss or damage to landscape character and features of designated sites.

[43] Accessed at http://www.bv-aurnsiteinfo.co.uk/

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

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

Appendices

Appendix A Statutory consultee responses to the SEA Scoping Report
Appendix B Quality assurance checklist
Appendix C Review of policies, plans and programmes
Appendix D Environmental baseline review
Appendix E Option assessment matrices

T: +44 (0) 1235 753000
E: enquiry@ricardo.com
W: ee.ricardo.com