Draft Regional Plan

for consultation

November 2022

WReN

Water Resources North

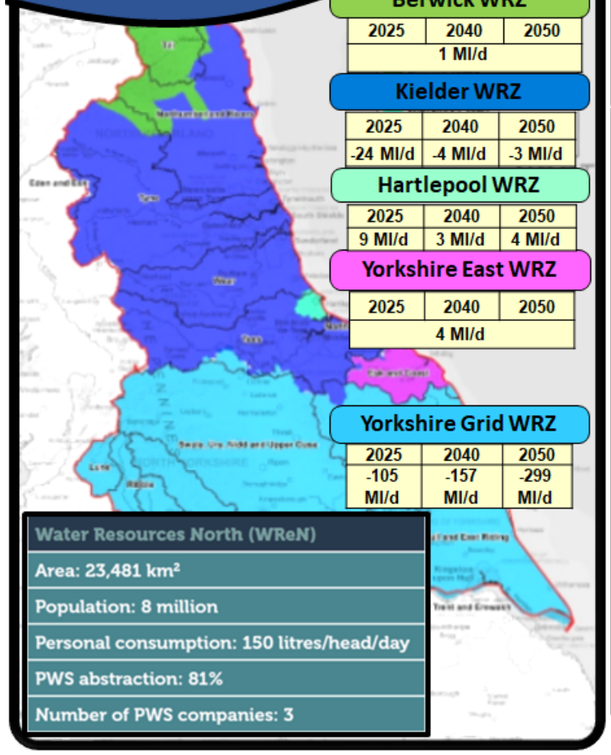
WATER RESOURCES NORTH: DRAFT REGIONAL PLAN ON PAGE

REGIONAL CHALLENGES

In the past our region has been viewed as having 'surplus' water resources. Indeed, our smaller zones (Berwick, Hartlepool and Yorkshire East) are still in surplus between 2025 and 2050.

However, the new resilience standard for severe droughts, updated climate change projections and increased demand are putting extra pressures on water resource systems in the Kielder and Yorkshire Grid zones.

Hence, before we account for the effect of demand and leakage intervention as well as drought measures, these zones are in deficit between 2025-2050.



Berwick WRZ

2025	2040	2050
1 Ml/d		

Kielder WRZ

2025	2040	2050
-24 Ml/d	-4 Ml/d	-3 Ml/d

Hartlepool WRZ

2025	2040	2050
9 Ml/d	3 Ml/d	4 Ml/d

Yorkshire East WRZ

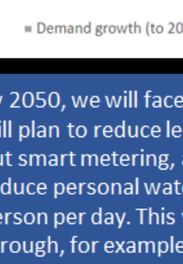
2025	2040	2050
4 Ml/d		

Yorkshire Grid WRZ

2025	2040	2050
-105 Ml/d	-157 Ml/d	-299 Ml/d

Water Resources North (WReN)
Area: 23,481 km²
Population: 8 million
Personal consumption: 150 litres/head/day
PWS abstraction: 81%
Number of PWS companies: 3

Key pressures contributing to additional supply deficits in 2050



Drought measures

Demand management measures to reduce personal consumption and leakage

Best value plan to address remaining deficits in the Grid zone

New surface water and groundwater abstractions, upgraded assets and a large water transfer from Kielder zone

OUR FUTURE NEEDS

By 2050, we will face deficits of over 300 Ml/d. To tackle these, we will plan to reduce leakage levels by 50% by 2050 . We will also roll out smart metering, and other water efficiency interventions to reduce personal water consumption to an average of 110 litres per person per day. This will also require support from Government through, for example, the introduction of white goods labelling.

These actions, together with the implementation of drought measures, are sufficient to address deficits in the Kielder zone. This means that there is no need to invest in further options to increase supplies in this zone.

However, for the Yorkshire Grid these measures do not completely eliminate the deficit. Water availability in the Grid will decrease steadily owing to climate change impacts. Moreover, from 2035, abstraction reductions to protect the water environment will be phased in and a current water transfer from Severn Trent may be terminated. This means that investment in supply options will also be required in order to address the deficit and maintain resilient public water supplies.

HOW WE CHOOSE OUR BEST VALUE PLAN

The options to secure additional supplies in the Yorkshire Grid zone have been chosen by looking at a variety of metrics to help us assess the benefits and drawbacks of each option. We have also engaged with customers to find out what kind of options they would support.

This is key to devising a best value plan which should achieve a balance between being cost effective and bringing multiple benefits to the region.

DECISION MAKING METRICS

- PCC reduction
- Leakage reduction
- Biodiversity
- Natural Capital
- Financial cost
- Carbon
- Option deliverability
- Human social well-being
- Multi-abstractor benefit
- Flood risk management
- PWS Drought resilience
- Customer preferred option type

NEXT STEPS

We will need to undertake further work to fully understand and prioritise changes required to water abstraction in the long-term. The results of AMP7 and AMP8 WINEP investigations will serve as a guide to where actions needs to be taken to safeguard and improve waterbodies. We will continue to engage with stakeholders to understand long-term aspirations and trade-offs for priority catchments.

As part of our next steps, we will continue our engagement with non-PWS sectors to understand their evolving needs and incorporate this into our future plans. We will also continue to work closely with other regions on inter-regional transfers and alignment of plans.

SCENARIO TESTING

We tested our best value plan against a series of alternative futures. This allowed us to see how the plan would have to change if:

- Severn Trent continue their transfer to the Grid
- More abstraction reductions will be required for the environment
- We will only achieve 50% of the envisaged demand and leakage reductions, given the scale of the challenge

We have clear decision points in place to trigger the switch to an adaptive pathway, if required.

WE ARE NOW CONSULTING ON OUR DRAFT REGIONAL PLAN AND WELCOME YOUR VIEWS

Contents

1. What is a regional water resources plan?

Regional planning has been promoted by water companies and regulators to bring about greater coordination of water resources planning, not only for public water supply, but also for other sectors that abstract water. Regional planning allows the exploration of strategic regional and inter-regional solutions (in particular transfer options between regions) at a national scale to meet the challenges and water resources needs of the future.

In building our regional plan, we have considered the aims and objectives of the Water Resources National Framework (WRNF) as well as other policies and plans relevant to England. Our aim is to put forward a plan that supports the needs of our customers, the environment and, where tangible needs have been defined, other sectors. Our plan identifies opportunities to support the recovery of waterbodies, in line with River Basin Management Plan (RBMP) and Catchment Plan (CP) actions. We also aspire to achieve leakage and per capita consumption (PCC) targets, and have proactively sought to explore the potential of water transfers whilst ensuring drought resilience and the environment are protected in our own region.

1.1. Background to regional planning

The Environment Agency led the development of a Water Resources National Framework (WRNF)[1]. This was developed together with Ofwat, the Drinking Water Inspectorate and Defra, and approximately 40 representatives from the water industry, other water users and environmental NGOs. The WRNF was published in March 2020, and outlines what regional plans must deliver[2].

In summary, the WRNF states that a regional group must:

- Take account of the national framework and set out its potential contribution to the national need
- Be reflected in WRMPs
- Forecast supply and demand over at least 25 years and set out solutions to any deficits
- Be a single strategic plan with a preferred adaptive solution
- Take a multi-sector approach
- Look beyond regional boundaries and use technical approaches compatible with other regions
- Include enhanced environmental improvements and demand management
- Take a catchment-based approach
- Consider wider resilience benefits, including reducing flood risk, when developing options
- Be open to market mechanisms
- Take into account growth ambition
- Comply with SEA and HRA legislation

Appendix 1 shows how WReN is meeting these requirements.

Each regional group has been tasked with pulling together a regional plan. These regional plans, which include strategic and regional solutions, have been reflected into the more detailed set of water company Water Resources Management Plans (WRMPs) for the next round of company business plans (at Price Review 24, PR24). Individual company plans have taken account of the strategic picture from the regional plans.

Regional plans must also uphold aims which support the Government's 25-year environment plan[3], which pledged that 'we would be the first generation to leave the environment in a better condition than we found it'. Of particular relevance to water resources are the following objectives set out under the 25-year environment plan:

- Reducing the damaging abstraction of water from rivers and groundwater
- Reaching or exceeding objectives for rivers, lakes, coastal and ground waters that are

[1] Meeting our future water needs: a national framework for water resources, Environment Agency (March 2020)
[2] It is worth noting that since publication of the WRNF, practical experience in delivering against the framework has highlighted the need for further clarity on meeting some of the objectives (e.g. planning for sectors other than public water supply). A regulator led review will inform future planning rounds.
[3] A Green Future: Our 25 Year Plan to Improve the Environment, HM Government (January 2018)

specially protected, whether for biodiversity or drinking water as set out in River Basin Management Plans

- Supporting Ofwat's ambitions on leakage, minimising the amount of water lost through leakage year on year, with water companies expected to reduce leakage by at least an average of 15% from 2020 to 2025."

We have used the WRNF expectations, the objectives of the 25-year environment plan and those from other regulators and stakeholders, to help shape our approach to our regional plan. We have also strived to incorporate, where appropriate, guidance and policies that have been published more recently.

1.2. Purpose of this document

This *Draft Regional Plan* builds on the *Emerging Regional Plan for consultation* document published in January 2021. It takes account of feedback from consultation on the emerging plan. It also incorporates further work to reconcile and align inter-regional transfer options with the plans of other regional groups, and a full revision of the underpinning planning data and appraisals in line with water company draft Water Resources Management Plan 2024 (WRMP24) submissions.

The document follows a nationally agreed overarching structure and provides additional context on the current and forecast future resource position, which has been updated for water company draft WRMP24 submissions, which are published for consultation in parallel with this regional plan in autumn 2022. The document is complemented by supporting appendices and explains the key drivers of change in the supply-demand position, particularly where driven by new policy and methodological considerations.

Beyond staking out a baseline position (**Section 4**), this document summarises our approach to developing an adaptive, best-value plan at region level (**Section 5**), in the context of the decision-making[4] approaches and supporting metrics. It also summarises the salient choice or decision areas for our plan (**Section 6**), the resulting indicative solutions to meet deficits, and the outcomes of scenario and stress tests (**Section 7**).

In addition, it explains how we have represented environmental destination and accounted for non-public water supply needs as well as customer and stakeholder priorities as we have built our future plans.

1.3. Other guidance and interfacing planning processes

The regional planning process exists in a complex landscape of other plans, legislation and guidance, which we have considered as part of regional plan development, where appropriate.

Water Resources Management Plans (WRMPs) and Water Resources Planning Guidelines (WRPG)[5]

The Environment Agency and Natural Resources Wales publish the Water Resources Planning Guidelines (WRPG) to provide water companies with guidance on how they can ensure that their WRMPs comply with statutory requirements and government policies. Although the regional planning process is currently a non-statutory one, we have ensured that our regional plan follows the principles outlined within the WRPG as far as is relevant to a high-level strategic plan (noting that the regional plan is necessarily less detailed than company WRMPs).

Water Industry Price Review process (PR24)

Water companies in England and Wales are regulated in five-year periods known as Asset Management Periods (AMPs), and each AMP is informed by a Price Review (PR) process. The next Price Review is PR24, and water companies will submit their business plan proposals for PR24 to regulators in late 2023. The Final Determination for PR24 is anticipated in late 2024. This will set water companies' performance and investment targets, as well as customer bills, for the AMP8 period, between 2025 and 2030.

It is important to recognise, therefore, that the public water supply component of the WReN Regional Plan, which is reflected in company WRMPs, is a part of the broader PR24 process which includes all other aspects of water company planning across both clean and wastewater services. It is possible, therefore, that some aspects of the Regional Plan may change, at least in the nearer term (first five years), depending on decisions made at PR24 and the impact that those decisions could have on company WRMPs (and hence the Regional Plan).

[4] This term is used interchangeably with 'options appraisal' in industry methodologies published by the organisation UKWIR.

[5] Water resources planning guideline - GOV.UK (www.gov.uk), UK Government, 2021

UK Net Zero commitment

The UK has a legally binding target to reach net zero emissions by 2050, and in October 2021 the Government published its Net Zero Strategy[6]. This set out policies and proposals for decarbonising all sectors of the UK economy by 2050. In support of this, the water industry has also proposed an ambitious plan to achieve net zero operational emissions by an earlier date of 2030[7]. WReN companies are playing their role within this alongside the water companies of other regions.

The following aspects are considered to have particular relevance to water resources planning:

- The importance of decarbonising the UK's electricity system and in particular the role that hydrogen may be able to play in this. Water demand in the energy sector including hydrogen is a major theme when considering sectors beyond public water supply although there remains considerable uncertainty in relation to the timing and geographical location of this demand (see **Section 4.6**).
- An emphasis on sustainable use of resources – including water – and the role of the circular economy.
- The importance of energy efficiency, including standards and regulation for energy efficient homes. Whilst the Net Zero Strategy is specifically focussed on energy, we would reflect that standards and regulation also have a role to play in delivering water efficiency and, indeed, efficient use of (hot) water can play an important part in reducing overall household energy use.

River Basin Management Plans (RBMPs)

River Basin Management Plans (RBMPs) look at the challenges that our water environment faces and provide a framework for protecting and enhancing the water environment. Clearly, this includes considering how abstractions from all sectors impact on the water environment, and RBMPs also provide a framework for the protection of sensitive habitats in England and Wales[8]. Since the publication of our emerging regional plan, the Environment Agency has also completed consultation upon the draft RBMPs[9]. Our regional plan considers how we can support delivery of actions in the RBMPs that are relevant to our region – the Humber and Northumbria River Basin Districts – in particular where the RBMPs include actions related to water abstraction.

Abstraction licensing strategies (CAMS)

The Environment Agency regulates the abstraction of water from the environment via a permitting system, and through existing licences and granting of new licences. This is done through a process called the catchment abstraction management strategy (CAMS) process and via abstraction licensing strategies. Licensing strategies are published on a catchment basis[10], and it is important that these strategies are taken into account when considering the amount of water that may be available in a particular catchment both now and into the future.

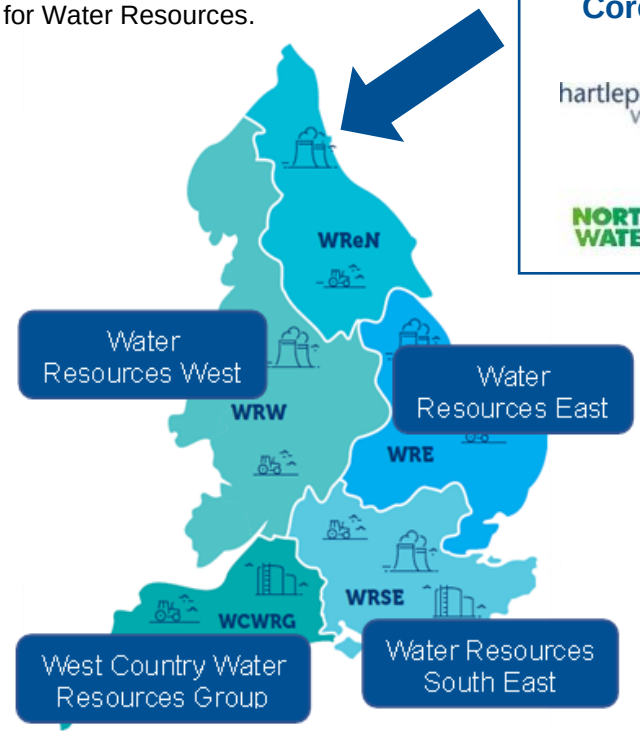
[6] https://www.gov.uk/government/publications/net-zero-strategy
[7] Water UK, Net Zero 2030 Routemap - Water UK – Net Zero 2030 Routemap
[8] Due to be published in Final form in December 2022.
[9] https://consult.environment-agency.gov.uk/environment-and-business/draft-river-basin-management-plans/
[10] https://www.gov.uk/government/collections/water-abstraction-licensing-strategies-cams-process

2. Who we are - Region at a glance

Our region is highly diverse, including significant population centres in Yorkshire, Teesside, Wearside and Tyneside, as well as widespread rural communities and significant expanses of environmentally important landscapes. Our major rivers include the Rivers Ouse, Tees, Wear and Tyne. The Ouse, with its tributaries, drains the vast majority of Yorkshire into the Humber. The natural and varied geography of our region influences the climate, with rainfall ranging from in excess of 1000mm per annum in the Pennine hills to some of the driest places in the country on the east coast. We have been working with regulators, stakeholders, customers and other regions to develop our regional plan, and help secure resilient supplies for the nation as a whole.

2.1. Introduction to WReN

Water Resources North (WReN) is one of five regional water resources groups working under the National Framework for Water Resources.



Water Resources North

Core members and funders

hartlepool water
YorkshireWater
NORTHUMBRIAN WATER living water

Stakeholders

Energy UK
NFU
uniper
RSPB
sse
The Rivers Trust
NATURAL ENGLAND
Environment Agency
Canal & River Trust
Ofwat

Area of 23,481 km²
Major rivers include the Rivers Ouse, Tees, Wear and Tyne

5 water resource zones
Grid (YW), Kielder (NWL), East (YW), Berwick (NWL) and Hartlepool (HW)

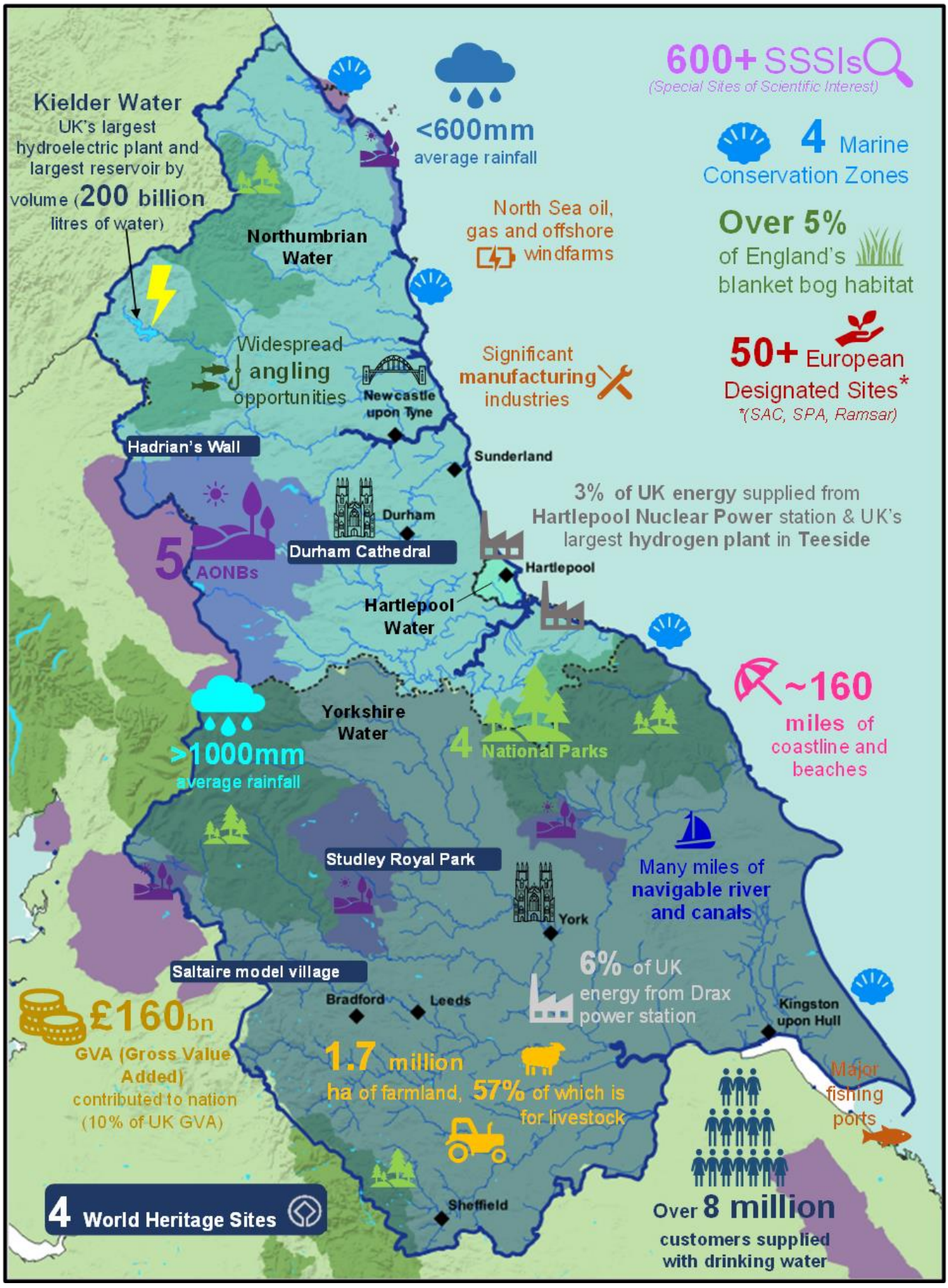
8 million people
98% population served by just Grid and Kielder

Working with stakeholders to help facilitate sustainable growth across Yorkshire, the Humber and the North East whilst also protecting and enhancing our valuable natural environment.

Our aim is that the region has a sustainable, long-term plan for water resources that protects our region's resilience (public water supply, environment, and multi-sectoral water supply) in the face of challenges such as climate change and population growth and changing demands for water use as our industrial and agricultural sectors evolve. We are working with other regions to help secure resilient water supplies for the country as a whole.

Although our core members and funders are Yorkshire Water (YW), Northumbrian Water (NWL) and Hartlepool Water (HW), other stakeholders who have an interest in water resources in our region are working with us and are actively involved in the regional planning process. This includes sectors other than public water supply who make beneficial use of the water in our environment, such as agriculture, industry and energy. The importance of water to our region's environment, ecology and biodiversity will also play a key role in shaping our future plans. **Figure 2-1** presents a picture of the key characteristic of our region.

Figure 2-1 Characteristics of the WReN region



2.2. Catchments and zones in the WReN region

Our region is highly diverse and home to over 8 million water company customers across 23,500 km^2, from the Peak District south of Sheffield up to the border with Scotland. The five water resource zones (WRZs) in the WReN region are shown in Figure 2-2 along with the main Water Framework Directive (WFD) surface water management catchments in the region. The Northumbrian Industrial WRZ from previous WRMPs is now included as part of Kielder WRZ.

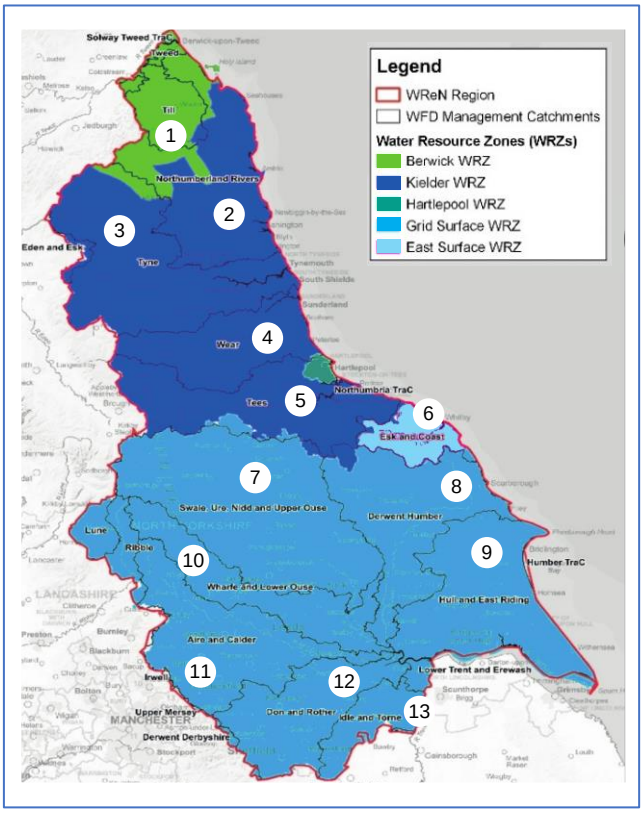


Figure 2-2 Mapping of water resource zones and WFD management catchments in the WReN region

Key to management catchments

1	Till/Tweed	8	Derwent Humber
2	Northumberland Rivers	9	Hull and East Riding
3	Tyne	10	Wharfe and Lower Ouse
4	Wear	11	Aire and Calder
5	Tees	12	Don and Rother
6	Esk and Coast	13	Idle and Torne
7	Swale, Ure, Nidd & Upper Ouse		

These catchments experience a number of combined pressures. The degree and significance of these pressures varies between catchments but includes issues such as future lack of water availability, WFD concerns (notably modifications and water quality), growth in abstraction demand and risk of abstraction reductions. Flooding is also a major issue in many of these catchments.

2.3. WReN planning objectives

Options identified as feasible for meeting our future water resources needs were taken through an options appraisal process using a multi-criteria approach to produce a best value plan (**Section 5.5).** The decision-making methodology for the options appraisal expands on the traditional Economics of Balancing Supply and Demand (EBSD) approach for WRMPs to include other criteria in addition to cost and this required the development of bespoke WReN objectives and metrics. A best value plan was then created which may not be optimum for each individual objective but is the most optimal plan when all objectives are considered collectively.

The objectives were initially identified using the Water Resources National Framework and Environment Agency Water Resource Planning Guidelines (EAWRPG). The WReN objectives and metrics were further refined in consultation with stakeholders, regulators and customer focus groups. Customer views, for example, were sought through focus group discussion from both household and non-household customers. Feedback from the participants provided information on level of support for different objectives, customer ranking of metrics and the type of options they would prefer to see included in a best value plan. The research also helped assess the aspects of the process customers understood, and where further clarity on objective and metric definitions was needed.

The strongest level of support was for:

- ‘creating a plan that is affordable and sustainable over the long term’
- ‘contributing to the Government’s ambition in the 25-year environmental plan’
- ‘meeting the future PWS’ (now amended in response to specific customer and stakeholder feedback see below)

The detailed outputs of the customer engagement are presented in detail in Appendix 7 and further summarised in **Section 3.3.** WReN used the customer feedback along with other stakeholder feedback on balance to support in the decision-making process and we have made updates in response to feedback through the process (see Appendix 4 for further details of the changes made to objectives and associated metrics).

A high-level summary of the ten WReN objectives is provided in Figure 2-3 with a more detailed description provided in Appendix 4.

Figure 2-3 A high-level summary of the ten WReN objectives

1. Meet the future PWS and non-PWS needs in our region.

2. Meet and maintain a PWS drought resilience level of service of 1:500 for level 4 restrictions

3. Contribute to the Government's ambition in the 25 Year Environment Plan to '*leave the environment in a better state than we found it*'

4. Achieve the WReN environmental destination and River Basin Management Plan (RBMP) objectives (sustainability reductions) taking a catchment wide approach

5. Meet demand management policy requirements to reduce leakage and per capita consumption as defined in the Water Resources National Framework

6. Identify WReN's potential to contribute to national resilience

7. Incorporate Strategic Environmental Assessment outputs and other relevant environmental legislation in decision making

8. Achieve multiple benefits including non-drought resilience

9. Produce a plan that supports the views of regional stakeholders and water companies' customers and is not detrimental to social wellbeing

10. Create a plan that is affordable and sustainable over the long term

3. Where we are today

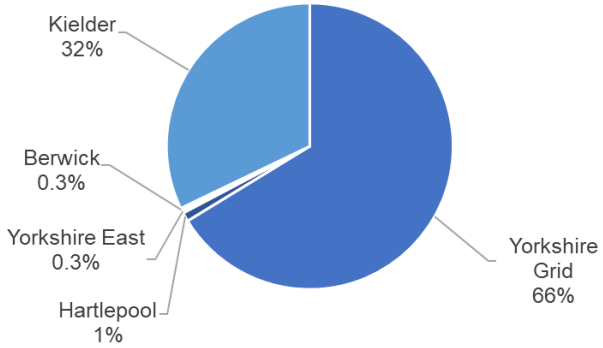
This section provides information on the current water resources position for our region, as well as what our customers and broader stakeholders have told us about their priorities based on the engagement that we have completed so far. For public water supply, it summarises what we said in the last round of company plans (WRMP19) and, at a high level, our progress in delivering those plans. It also identifies what we know about the current water needs in other sectors and the status of our natural environment for our region.

3.1. Current water resources

Public Water Supply

The current consumptive water need for public water supply (PWS) in the WReN region is over 2,000,000 litres per day. This is supplied by our five potable Water Resource Zones (WRZs). The two largest of these are Yorkshire Grid and Kielder and these supply water to approximately 98% of the region's 8 million population.

Figure 3-1- Percentage (%) population supplied by each of the five potable WRZs in the WReN region



Yorkshire Grid and Kielder water resource zones are well connected within their respective zones but the region is currently less well connected between zones.

Northumbrian Water currently operates a non-potable Industrial WRZ in Teesside, which supplies water to industrial water users in that area. For WRMP24, Northumbrian Water has merged this WRZ with its Kielder WRZ and so the data presented in this submission reflects this merger.

In WRMP19, with the exception of the Yorkshire Grid, the supply-demand balance for WReN's water resource zones showed a surplus in the baseline dry year annual average scenario over the full 25-year planning period, without the need for interventions. The Yorkshire Grid zone forecast showed a risk of the zone falling into deficit, starting from 6 Ml/d in the mid-2030s and increasing to 34 Ml/d by 2045. This deficit was primarily caused by the risk that climate change will significantly reduce future available water resources. However, through its WRMP19, Yorkshire Water committed to closing the Yorkshire Grid zone deficit through an enhanced leakage detection and repair programme alongside investment in some existing borehole supplies by 2025. These investments are intended to improve resilience and help ensure the risk of longer-term deficit in this zone, as identified in WRMP19, is mitigated.

Although WRMP19 did not show deficits in all WRZs, all three water companies committed to reducing leakage throughout the 25-year planning period[11].

WRMP19 25-year planning period commitments across the region as a whole

Leakage
12% reduction in AMP7 period of 2020 to 2025

PCC (per capita consumption)
reduction in customers' water use to 125 litres per person per day

Water companies are required to report on their progress against WRMP targets on an annual basis. Yorkshire Water has achieved its AMP7 leakage target to date. Northumbrian Water has a slightly lower performance against target due to the impact of successive freeze/thaw events at the beginning of

[11] Regional value for reduction in customers' water use calculated based on a weighted average reflecting the size of each WRZ

2021 although is on track for meeting its end of AMP7 target. For Hartlepool, it is not possible to report against a specific leakage target as Anglian Water has a combined target for both its Anglian and Hartlepool regions.

For per capita consumption (PCC) in 2020/21, the Covid-19 pandemic led to an increase in the amount of water used by customers through the reporting year for all water companies. A significant increase in demand was seen due to:

- more people remaining at home in the day either because of working from home or having been furloughed,
- using more water because of increased handwashing,
- having more time to garden and therefore doing more watering,
- using more paddling pools and hot tubs at home.

Nationally, across the industry, the impact of this has been estimated as an increase in PCC of between 3 and 15%, with peak demand increasing by 20 to 40%[12]. Non-household demand was 15 to 40% lower than normal due to many businesses being closed for a significant proportion of the year. However, this reduction was not sufficient to counterbalance the rise in domestic use and across the industry total demand was between 2 and 5% higher.

In WRMP19, all water resources zones were considered to have good underpinning resilience as they showed a surplus against a 1 in 200-year drought event after implementation of preferred plan actions.

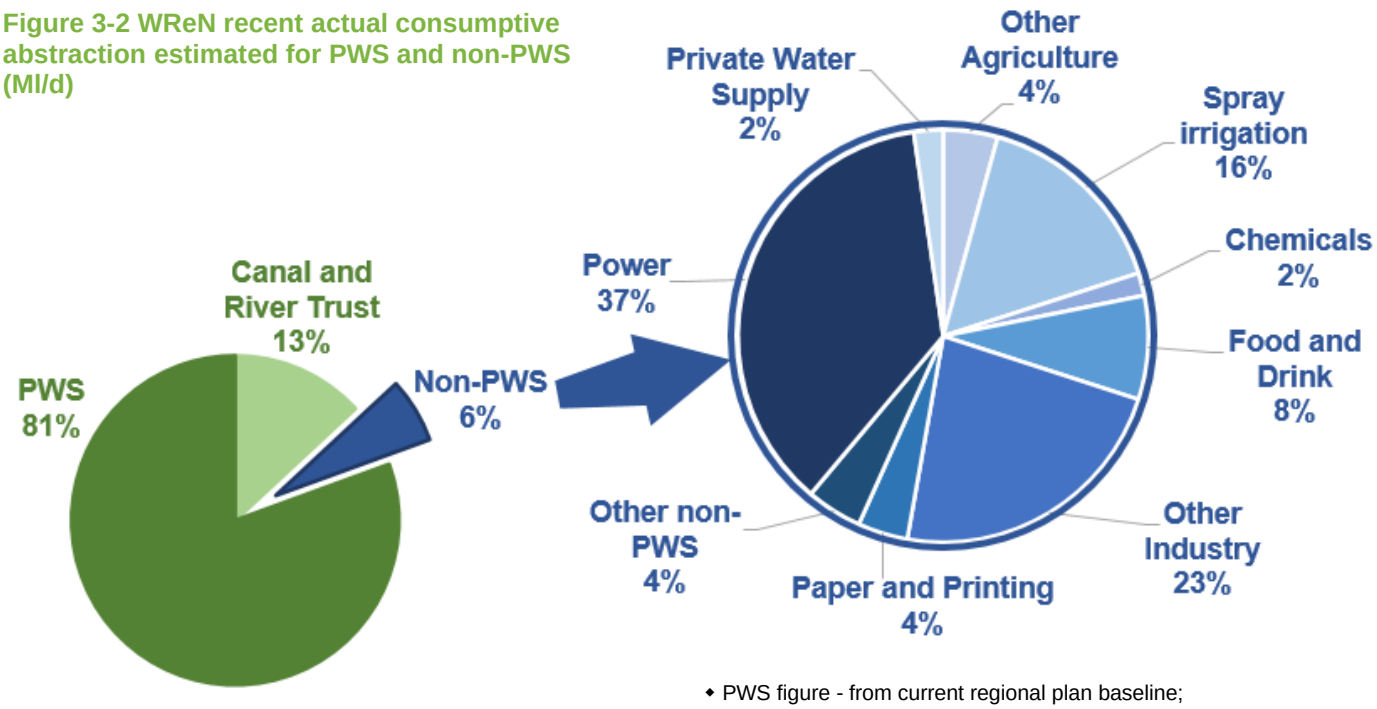
For the WReN Regional Plan and WRMP24, all WRZs have been re-assessed against a 1 in 500-year drought using the latest planning methods. The results of this along with our updated demand and supply forecasts are presented in **Section 4** of this report.

Other sectors

The consumptive demand for non-public water supply sectors in the WReN region amounts to approximately 6% of total water abstracted for consumptive use including Canal and River Trust (CRT) navigation abstractions (or 8% excluding CRT navigation abstractions). In other words, the water abstracted and used in WReN is dominated by that taken for public water supply as shown in **Figure 3-2**.

However, as a part of the regional planning process, it is necessary to consider the current and future demands from other sectors as well as PWS. Unlike PWS, there is no holistic plan for water use in other

Figure 3-2 WReN recent actual consumptive abstraction estimated for PWS and non-PWS (Ml/d)



- PWS figure - from current regional plan baseline;
- Canal and River Trust figure - from analysis of abstraction data provided by Canal and Rivers Trust (assumed all consumptive);
- All other non-PWS figures - from 'Understanding Future Water Demand Outside of the Water Industry', Defra (2020)

[12] Northumbrian Water Group (NWG), 2021, Impact of Covid 19 on NW Demand, page 7

sectors, and therefore it is not currently possible to report progress against targets in the same way as it is for water companies' WRMPs.

3.2. Status of the natural environment

The Government's 25 Year Environment Plan commits to improving at least 75% of WFD waterbodies to as close to their natural state as soon as practicable. The proportion of surface waterbodies currently in the WReN region achieving Good or High ecological status/potential in the WReN region[13] is 20%[14], compared to the national average[15] of 16%. The proportion of groundwater bodies achieving Good quantitative status is 83%, relative to the national average of 73%.

Out of the 80% of waterbodies not achieving good ecological status or potential, 8% is due to abstraction and flow, although this does not account for longer-term flow pressures which the Environmental Destination component of the regional plans seeks to address.

The Environment Agency published the next round of River Basin Management Plans (RBMPs) in draft for consultation between October 2021 and April 2022. A consultation on the draft flood risk management plans 2021 to 2022 also ran at the same time. The responses are being reviewed and will help shape how the water environment is managed. The Environment Agency is also in the process of updating Catchment Abstraction Management Strategies (CAMS), and water company AMP7 Water Resources WINEP investigation schemes are ongoing. Collectively, alongside additional work in support of Environmental Destination (see Appendix 6), this will inform the measures within future RBMPs including water resources measures (see also **Section 1** considerations for longer-term investigation).

3.3. Customer priorities

Our draft regional plan draws on customer priorities, identified via:

- WRMP24 customer engagement undertaken at water company level in 2022
- WReN customer engagement from 2021
- PR19 customer research

This allowed us to compare and contrast customer preferences across the region.

A summary of customer views across several key areas of interest is presented in Table 3-1. Overall, the views across the three research pieces do not vary significantly. We used customers' views to inform the strategic choices we made and the options we chose as part of our draft plan.

Table 3-1 High level customer views for key topics

Topic	High-level customer views
Affordability	Affordability is a top concern with customers, particularly in the context of the recent cost of living crisis.
Supply/drought resilience	Provision of safe and continuous supply, is a top priority, particularly in the face of climate change.
Leakage	Reducing leakage is a top priority with customers, this view remaining a constant across the research (2019-2022).
Environmental improvement	Customers support environmental improvements. There is willingness to pay a small increase in bills for investment against targets as long water companies are transparent about this (affordability will be a key consideration in the pace of delivering improvements).
Demand reduction	A mid-range concern with customers; water saving devices, voluntary metering and behavioural changes are preferred.
Levels of service	Improvements to levels of service were typically seen as a low priority. Customers think restrictions could help them realise the value of water and instil long-term behavioural change. It is also seen as least costly.
Option preferences	Slight preference shown for groundwater abstractions (due to perceived lesser

[13] Based on data from the main River Basin Districts in the region; the Northumbrian River Basin and Humber River Basin.

[14] River Basin Management Plans – 2019 update

[15] England and Wales only (excluding Western Wales)

Topic	High-level customer views
	environmental impact) and water transfers (due to improvements in resilience within the region). Overall, achieving a reliable supply of water is more important regardless of the combination of options chosen to achieve this. It is clear that customers are more interested in the 'outcome' or impact of the specific option regardless of type.
Water trading	Customers are open to the idea of water trading providing that: a) no adverse effects on supply within our region b) recipient companies don't use it as an 'easy option' which could lead to greater inefficiencies (proxy for leakage).

3.4. Stakeholder priorities

WReN recognises the importance of engaging with those who have an interest in water resources in the region for the creation of a truly regional plan. We have engaged with stakeholders throughout the regional planning process, including on the emerging plan which was published for consultation in January 2022. During this consultation, we received detailed responses from a range of stakeholders including regulators and statutory bodies; water retailers; energy sector; industry consultants and suppliers; and landowner associations such as National Farmers Union and Country Land and Business Association.

An overview of the key themes from feedback received is provided in **Table 3-2** along with actions we have taken whilst shaping our plan.

Table 3-2 Overview of emerging plan feedback and action taken

Feedback and action
General approach to planning and decision making In general, stakeholder responses to the emerging plan consultation confirmed that the WReN decision making approach and support tools for the regional plan development are seen as appropriate to the scale of the problem faced in the region. However, it was noted that further assessment was required to develop the BVP including further assessment of when is best to deliver these targets, the risks to delivery and the triggers for further interventions or options should demand management not be achieving the savings expected. ***ACTION: WReN have undertaken further assessment of future deficit risks and sensitivity analysis (including for 1 in 500 year drought resilience) to set out their best value plan and ensure a fully adaptive plan, with suitable pathways identified with specified trigger points for interventions. We have taken a 'twin track' approach to close the deficit through consideration of both demand and supply options with our preferred approach to reduce demand through a number of demand management measures. Our plan shows however, that we cannot rely solely on demand reduction in the Yorkshire Grid zone and supply options have also been identified.***
Collaboration *Intra- and inter-regional collaboration* across companies, regions and nationally to develop and align processes and plans such as the reconciliation process, is recognised as a big step forward. It was also widely acknowledged that the plan demonstrates *collaboration across sectors and non-public water supply and* this is very much welcomed. However, it was also recognised that further work is required to understand non-PWS water resources needs and to integrate them into the regional planning process. ***ACTION: WReN has continued to work with other sectors and regulators through regular Stakeholder Steering Group meetings as well as via sector specific sub-groups which have been set-up with priority sectors (energy, agriculture and navigation) to:*** ○ ***understand the current and future water needs of non-PWS abstractors in the region*** ○ ***understand the challenges individual sectors are facing*** ○ ***look forwards as to how the regional planning process can facilitate the***

Feedback and action
creation of opportunities for joint solutions moving forwards. *This is further detailed in* ***Section 5.6*** *(***Table 5-2*** *and Appendix 8.*
Transfer Options It was recognised that the uncertainty around the *potential loss of Severn Trent Water (STW) transfer* had been clearly highlighted and that it could present a material change to the WReN regional plan. ***ACTION: WReN has continued to work with STW and WRW to understand the national picture and needs through reconciliation. The final position on this scheme will only be known later in the regional planning process from further ongoing work via the RAPID gated process. We have therefore taken a pathway approach and have considered one pathway where the transfer is stopped, and another pathway where the transfer is maintained.*** It had also been widely noted that transfers from WReN have not been selected by other regional groups and that there is a need to evidence that robust decision-making has been undertaken around the option choices available to other regions, particularly why export options from Kielder have not been chosen. ***ACTION: Further work has been undertaken across the regions including through the reconciliation process to explore Kielder export options. Currently no Kielder option has been selected by other regions due to high cost and significant environmental implications, but Kielder still remains a potential option for consideration as part of the RAPID gated process.***
Environmental destination Environmental destination had general support and it was recognised WReN had a good level of information at catchment level that could be built upon to frame future ambition further. However, work was needed to fully understand and prioritise changes required to water abstraction, further understand the long-term view and evidence an agreed way forward. ***ACTION: We have continued the dialogue with other sectors and regulators to gather additional information and prioritise needs for further investigation. Working with Ofwat, the EA and other regional groups (e.g. via the Regional Co-ordination Group), a set of common reference scenarios were developed for further sensitivity testing and consideration of abstraction changes. These scenarios form the basis for the Environmental Destination elements of our adaptive plan pathways.***

Stakeholder Steering Group

The WRNF emphasised the importance of involving stakeholders from non-PWS sectors in order to better understand the future water needs of other sectors as well as key environmental groups to inform and contribute to the development of WReN's environmental ambition.

WReN's Stakeholder Steering Group (SSG) consists of water company leads, regional EA representatives and primary stakeholders from the energy, agriculture and environment sectors. The group meets bi-monthly and has been important in steering the development of our regional plan.

Sector specific engagement

Outside of the Stakeholder Steering Group, WReN has undertaken separate discussions with other sectors such as energy, agriculture, environment and navigation.

The absence of coherent, overarching plans for non-public water supply sectors, together with other constraints such as competition law, makes it extremely difficult for many of these sectors to accurately plan for their future water needs at a sectoral level. We have therefore been working with non-public water supply stakeholders to better understand how well the national framework data represents reality and seek to ensure we are accounting for their future water needs as accurately as possible. A summary of the discussions held, including the challenges each sector is facing and potential next steps for how we can work collaboratively moving forwards is provided in **Section 5.6. Appendix 8** provides a more detailed overview of our stakeholder engagement activities throughout the regional planning process.

4. What the future looks like

This section sets out our regional future environmental, public and non-public water supply needs for our draft regional plan. It reflects a full refresh of our public water supply and demand forecasts in line with the draft Water Resources Management Plans, which includes significant potential abstraction reductions required to achieve our environmental destination. This section also sets out what we currently know about future demand in other sectors, the impacts of work with other regions around inter-regional transfers, and various other considerations that will continue to evolve as we move towards future planning rounds.

4.1. Sustainable abstractions and wider environmental work

Sustainable abstraction is essential to support healthy ecology and the natural resilience of our rivers, wetlands and aquifers. Abstraction reductions have a major influence upon our future water resources position, and significant work has been undertaken to understand future requirements.

Ongoing WINEP work in AMP7

The Water Industry National Environment Plan (WINEP) collates the actions that water companies are required to deliver as part of their environmental obligations. Water resources focussed WINEP drivers have an ongoing, cyclical role in determining the extent and pace of changes to abstraction and the resulting impact on WRMP supply forecasts.

It is important to note that water companies in our region have already done much work to improve the water environment. For example, water companies are already:

- Changing the timing and volumes of releases of water from several reservoirs to reflect a more natural flow, with higher winter flows and lower summer flows, as well as 'spate' releases to ensure river conditions which allow migratory fish to move up and downstream at keys times of their annual life cycles.
- Installing screens on river abstraction intakes to ensure eels do not become entrapped.
- Building fish passes or easements on structures (e.g. weirs) which prevent fish from moving naturally up and down rivers.
- Addressing the impacts that reservoirs have on the natural 'form' of rivers, for example by adding gravel to rivers which are depleted of natural sediment by the presence of a dam wall.

Moreover, Northumbrian Water continues to work closely with land managers and farmers to improve the quality of water at their abstractions. In AMP7 the focus of the work is on:

- Reducing pesticides, nitrates and cryptosporidium in raw water, as well as addressing the problem of colour in water from degraded peatland. To achieve this, Northumbrian Water engages with farmers and offers them grants to enable change in farm infrastructure and farming practices.
- Supporting the Pennine Peat Life Programme to regenerate degraded peatlands which supply the upland reservoirs in the Tees catchment.
- Supporting partner organisations to deliver projects which take a holistic approach to improving river habitat, increasing biodiversity, and addressing the impacts of climate change, focusing on the South Tyne catchment.
- Reducing the risk of spreading of invasive non-native species (INNS).

As well as continuing to invest in activity to deliver improved water quality across upland, lowland and groundwater catchments, Yorkshire Water is undertaking the following investigations in AMP7:

- Nitrates investigations and other raw water initiatives to improve source water quality (e.g., optimising the location and timing of abstraction from upland catchments with high dissolved organic carbon)
- Investigations to confirm sustainability of public water abstraction from chalk environments
- Investigations to consider long-term requirements beyond immediate WFD drivers for licences with modelled long-term deficits

Licence capping and sustainability reductions

Regional plans must demonstrate that they account for the impact of Environment Agency's policy on capping of time-limited abstraction licences to prevent deterioration of waterbodies. The Environment

Agency has confirmed that where an abstraction licence change is necessary to prevent deterioration in England, groundwater licences will either be capped at a recent actual average utilisation or at the maximum peak abstraction, depending on the risk that deterioration will occur. This capping will occur on licence renewal, for affected time limited licences or licences with a time limited variation, and by 31 March 2030 for all affected permanent groundwater licences.

In preparing their draft WRMP24 supply forecasts, water companies have considered whether:

- any of their abstraction licences are unsustainable at the full annual licensed quantity; and
- if not, whether they need to implement any sustainability reductions to reduce the annual licensed quantities to a sustainable level of abstraction.

Northumbrian Water have specifically looked at:

- the need to implement any sustainability reductions on groundwater licences during AMP8, arising from AMP7 Water Industry National Environment Programme (WINEP) investigations and options appraisals;
- whether there are any un-used abstraction licences that pose a risk of deterioration under the Water Framework Directive and if these can be surrendered;
- whether any groundwater licences will need to be capped to Max Peak or Recent Actual Average on renewal or by March 2030, to reduce the risk of waterbody deterioration under the Water Framework Directive.

Northumbrian Water has agreed sustainable levels of abstraction for each of its sources in the Berwick & Fowberry WRZ with the Environment Agency and these have been used in their baseline groundwater DO assessments. Moreover, having been notified by the Environment Agency that two groundwater licences are un-used (Routing Burn, Seal Burn, Black Burn and Halton Lee Gate), Northumbrian Water will include investigations in their PR24 WINEP to establish whether these licences are still needed or can be surrendered. As the two licences are not currently in use, they are not included within Northumbrian Water's baseline WRMP24 DO or supply demand balance.

Northumbrian Water have several groundwater abstraction licences with time limited variations which are due for renewal during AMP8. The Environment Agency has confirmed that none of these licences are considered to pose a risk of deterioration and so will not be subject to capping on renewal. Northumbrian Water have therefore not included any environmental destination sustainability reductions within their WRMP24.

Yorkshire Water is in the process of delivering its AMP7 water resources WINEP investigations whilst concurrently developing its AMP8 programme. Some of these AMP7 WINEP investigations have been completed, whilst others are ongoing. Those which have been completed have not identified any changes to abstraction licences that would materially affect the supply forecast. This has been in agreement with the Environment Agency. Many of the waterbodies considered within the scope of the AMP7 investigations have also been identified as having potential long-term flow deficits in the national Environmental Destination scenarios. Where relevant, the AMP7 investigations will consider the long-term flow pressures linked to climate change to ensure consistency with the regional plan.

Hartlepool Water has completed AMP7 investigations into the sustainability of its abstractions from the Skerne aquifer. The investigations concluded that no licence reductions are required on the basis that the waterbodies are compliant with WFD screening thresholds. More broadly, Hartlepool Water has committed to capping its permanent groundwater licences to recent actual average levels by 2035.

4.2. Environmental destination

The Environment Agency's WRNF policy document (the 'National Framework') identifies that, nationally, a step change is required to improve the water environment and address unsustainable abstractions from it, in order to improve resilience to drought, climate change and increase environmental protection, by 2050. This is a longer-term strategy and is aimed at going above and beyond the current legal obligations that water companies must fulfil.

Through our environmental destination we will ensure that sustainable water supplies and long-term environmental resilience go hand in hand. Within this and future iterations of the plan we will take an evidence-based approach to understanding the long-term needs of the environment and the most appropriate solutions to achieve a shared ambition. Working with others, we will protect and enhance catchments, in particular those which support our most rare and valuable species and habitats.

Environmental destination scenarios

The National Framework sets out a range of environmental destination scenarios that Regional Water Resource Groups and their constituent water companies need to build into their draft WRMP24s to deliver the step change in resilience and environmental protection required. These scenarios are described in the table below, and appropriate low/high scenarios included in our adaptive planning framework described later in this document.

Table 4-1. Environmental destination scenarios

Name	L/M/H	Description
Ofwat core	Low 1	Based on current known legal requirements for abstraction reductions up to 2050 only. The scenario should represent the lowest plausible abstraction reductions that meet currently known legal requirements in force at that point in time, in alignment with low Ofwat common reference scenario.
Business as Usual (BAU)	Low 2	National Environmental Destination BAU scenario used as starting point, locally validated to remove waterbodies with significant uncertainty whether reductions are required.
Business as Usual "Plus" (BAU+)	Medium	Expands on BAU through the inclusion of Common Standards Monitoring Guidance (CSMG) flow targets for European protected areas. This should take account of any local flow target for European sites where one has been agreed (with the EA/NE). Where one has not been agreed the default would be to use the default CSMG flow target. **This is the minimum scenario for inclusion within SDB baseline forecasts for regional planning groups.**
Enhanced	High	High scenario aligned with the national WRNF Enhanced scenario.
Enhanced (locally agreed)	High	High scenario (as above) incorporating any local agreements with regulators (*noting that no local agreements have been made through Water Resources North and this scenario has not been considered*)

We have worked with the Environment Agency, to identify a longer-term environmental destination for our region, to deliver longer term sustainability and environmental resilience. The licence and abstraction reductions proposed under environmental destination are to achieve and maintain sustainable abstraction to 2050 (and beyond), taking into account climate change impacts and future demand.

Northumbrian Water

Northumbrian Water adopted the Business as Usual Plus (BAU+) Environment Destination scenario in calculating their DO for WRMP24 preferred plan. This already includes the sustainability reductions arising from completed WINEP investigations, which are already included within their baseline WRMP24 supply forecast.

Under the BAU+ scenario, and their alternative scenarios, there are no further abstraction or licence reductions applicable to Northumbrian Water's abstraction licences and hence, no environmental destination reductions in deployable output are needed in their area.

Yorkshire Water

Yorkshire Water has assessed a range of environmental destination scenarios to inform the preferred plan position and the alternative pathways (see **Section 7.3**). The abstraction reductions under the BAU+ scenarios have been taken into account in calculating the final plan DO. The table below summarises the timing and extent of the impacts of deployable output through the planning period in relation to Environmental Destination for Yorkshire Water.

Short-term licence changes to meet Water Framework Directive Objectives

As there are no confirmed legal requirements for abstraction reductions at any of Yorkshire Water's

sources, no changes are assumed under the baseline scenario. Yorkshire Water assumed a 6 Ml/d impact on DO from some groundwater sources under the BAU scenario, based on licence capping to recent actual usage with peak use (within existing licensed volumes) permitted for short term operational use. Under the BAU+ scenario, Yorkshire Water assumed the DO impact from these groundwater sources would increase to 11Ml/d[16]. This is due to the additional impact of climate change on natural flows. Under the Enhanced scenario, a more significant climate change impact is assumed, resulting in a loss of 17 Ml/d in deployable output.

Long-term licence changes to meet Environmental Destination

As the estimated abstraction reductions in the WRNF are not currently known legal requirements and are subject to uncertainty over whether the reductions are required, Yorkshire Water have assumed zero long-term reductions in the Baseline and BAU scenarios respectively.

Under the BAU+ scenario Yorkshire Water have assumed 131 Ml/d reduction in abstraction (dry year annual average) from the River Derwent abstraction at York linked to achievement of Common Standards Monitoring Guidance (CSMG) targets for the River Derwent, effective from 2050, in line with regulator expectations. Hence, the BAU+ scenario may lead to a total DO loss of 142 Ml/d by 2050 across groundwater and surface water sources.

The Enhanced scenario represents the 'worst' case loss of DO from the lower Derwent under the same environmental driver as BAU+. The licences under consideration will be investigated in depth as part of an AMP8 Environmental Destination WINEP scheme and the outputs reflected in future iterations of Yorkshire Water's WRMP.

Table 4-2. Yorkshire Water Environmental Destination Scenarios DO impact

Scenario	Total DO impact (Ml/d)	Year licence change effective from
Baseline	0	-
BAU	-6	2035 for groundwater
BAU+	-142	2035 for groundwater 2050 for rivers
Enhanced	-289	

[16] Selected licences at the groundwater sources are subject to ongoing AMP7 WINEP investigations which will conclude in 2024.

4.3. Impacts of abstraction reductions on non PWS sectors

To achieve the environmental destination ambitions, similar action to reduce abstractions is also required from non-PWS abstractors. Hence, the Environment Agency is working with these non-PWS licence holders to ensure they also deliver their proportion of change. However, the mechanisms and timing of changes will be different from those that apply to water companies. WReN is working closely with the Environment Agency to support these sectors to make practical planning assumptions about how licence reductions to prevent deterioration may be represented in supply forecasts for non-PWS abstractions.

The national model provided estimates for the reductions in abstraction required from other sectors in the WReN region, under BAU and Enhanced scenarios. This shows potential reductions of ~8Ml/d (BAU) and 10 Ml/d (Enhanced) for the agricultural sector and 4 Ml/d (BAU) and 16 Ml/d (Enhanced) for the industrial sector. These reductions are constrained to particular catchments and more information is available in the catchment dashboards[17]

4.4. Public water supply forecasts

Following consultation on our January 2022 Emerging Plan, we have completed in full our updates for public water supply and demand forecasts following the last WRMP round. The forecasts align with the latest and best available forecasts in the water company draft WRMP24 publications alongside this draft regional plan.

This section reflects the *baseline supply-demand position* before any options to deliver further leakage reductions or reductions in per capita consumption (PCC) have been applied (described in Sections 6 and 7). They also reflect the position without the benefit of drought measures such as temporary use bans. Our forecasts reflect significant reductions in abstraction linked to the ambition for greater protection of environmental needs. They take account of the latest population and property forecasts, and latest approaches/data for assessing drought resilience and climate change.

This modelling is specific to providing the data we require to complete forecasts of future public water

[17] Catchment dashboards are available upon request

supply (as opposed to non-PWS / other sectors). Further details of the modelling and key data assumptions can be found in Appendix 2 and 3, and the individual water companies' dWRMP24s.

A supply-demand balance compares the forecast water available for use with the forecast demand for each year of the planning period. If this balance shows a deficit between the available supply and the demand for water, we need to identify solutions to close the gap.

Changes to the baseline forecasts

We have produced a forecast of available supplies over the next 60 years which takes into consideration the factors influence the supply-demand balance position. Our WReN draft Plan presents a material supply-demand **deficit** from the start of the planning period for the Kielder and Yorkshire Grid zones, as a result of changes to the way the baseline is calculated in the draft regional plan[18]. The baseline presented in this section excludes the benefit of drought measures and demand measures, which were included in the Emerging Plan baseline, and brought most zones into (or near to) surplus. As described earlier, the benefit of further demand management and leakage reductions have not at this stage been applied to our forecasts; in the emerging plan these created or enhanced the surplus position.

Beyond these factors, compared to forecasts in previous planning rounds, the underlying baseline deficit is mostly driven by:

- updated DO methodologies to assess resilience to a 1:500-year drought at a system level
- new methodologies and data for assessing climate change impact on supply (impacting the supply demand balance from the start of the planning horizon)
- demand changes as a result of Covid-19

Deficits increase over time, largely the result of further climate change impacts, abstraction reductions to meet environmental drivers, demand growth, and changes to existing water imports into our region.

Assessment of 1 in 500-year drought resilience

To better inform our understanding of drought resilience, we have used new, more sophisticated methods for our public water supply forecasts for this round of planning compared to WRMP19. We have done this to meet the WRNF expectation that water companies would achieve resilience to a 1 in 500-year drought, without recourse to Level 4 drought restrictions (i.e., standpipes, rota cuts or in the case of some areas of the region, pressure reductions) required, by 2039.

Specifically, we have applied long-periods of 'stochastic hydrological' data (plausible synthetic scenarios based on historical hydrological patterns) to water company water resources models, to better assess supply availability under severe and extreme drought events. This is particularly important for the Kielder and Yorkshire areas, given the potential for water exports or inter-regional transfers to be considered. This change in input data from stochastic to historic data, has decreased our DO estimates.

Climate change impacts

The potential impacts of climate change on water resources for public water supply have been considered in water resources planning since 1999. In the 2019 WRMPs, water companies used UK Climate Projections 2009 (UKCP09) data. For the development of our regional plan and the dWRMP24s, we have updated our assessment of the potential impacts using the latest UK Climate Projections 2018 (UKCP18) projections.

Like other regions, our focus on the first draft of our regional plan has concentrated on applying the Regional Climate Models (RCMs) data, which is spatially coherent and allows for consistent assessment across regional modelling. We have assessed climate change impacts on our supply-demand balance under a medium emissions scenario for our central estimate position. Further details on how this has been carried out is included in Appendix 2 & 3.

Water resources modelling results using the new data showed that the expected impact of climate change is significantly greater than was shown by the UKCP09 data used at WRMP19. It is most severe in the Yorkshire Grid and Kielder zones. In terms of scaling the impact of climate change over time, climate change impacts have been scaled back to 1990, so some climate change influence is included on our forecasts even at the start of the planning period.

[18] This is in line with the definition of the dWRMP24 baseline in supply-demand tables. This is different from the baseline presented in the emerging regional plans. This distinction is important when comparing between previous plan versions.

Major influences on baseline demand

The effect of the Covid-19 pandemic will continue to affect PCC and demand in the next few years and could potentially cause permanent changes to demand and PCC henceforward. We expect that there will be longer term impacts on societal activities, for example the increase in working from home. Some areas in the region – notably in the commercial sector – have seen a large decrease in water use due to lockdowns. There still remains considerable uncertainty as to how long it will take for the sector to return to pre-Covid levels; whether all non-household sectors will return will have an impact on non-household consumption for the planning horizon.

Work continues to understand the short to medium term impact of covid on our plans, and we continue to participate in collaborative water industry studies and engage with Regulators to understand and discuss covid impacts and how we should consider them in our forecasts. However, based on recent research, including an industry project with Artesia[19], we have applied a 'new normal' impact of Covid-19 on demand to household and non-household consumption for all demand scenarios. Where appropriate water companies have updated their demand management options (metering and water efficiency) which have a direct impact on household consumption.

Baseline impacts summary

The combined effects of the new stochastic data and the requirement to be resilient to a 1 in 500-year drought, and the updated climate change projections result in a step-change reduction in our future supply forecasts. This is exacerbated by increased demand as a result of Covid-19. This results in an underlying deficit for WReN from the start of the planning period (prior to inclusion of any drought measures and demand/leakage reduction interventions).

Key drivers of increasing deficits over time

The availability of future water supply is influenced by a range of factors. Whilst there are common challenges to water supply across all regions, the influence of the factors varies by geography and each region faces their own unique challenges. The key challenges/upward pressures and their proportional impact to future water supply (to 2050) in the WReN region, under baseline conditions, are discussed below. These are primarily focused in the Yorkshire Grid zone, with Kielder zone seeing minor impacts. Berwick, Hartlepool and Yorkshire East zones remain in surplus throughout the planning period Consideration has also been given to forecasts beyond 2050 to 2085, however, the forecasts become much more uncertain.

Environmental needs

Greater allowance for environmental needs causes by far the biggest pressure on available supply, with a loss of 141 Ml/d of water availability in the Yorkshire Grid zones over the 2025-50 planning period. This is primarily a result of adopting the "Business As Usual Plus" (BAU+) Environmental Destination scenario, which is discussed in detail in Section 4.2.

Climate change

Application of climate change over the planning period results in a further loss of 52 Ml/d of water availability (combined across Kielder and Yorkshire Grid) after the initial baseline impacts. However, climate change is a major area of uncertainty on available supplies and is a key component of our target headroom uncertainty allowance. We have also included it in our stress testing to aid development of the best value plan (**Section 5.5**).

Demand growth

Demand is predicted to increase slightly by 34 Ml/d over the 2025-50 planning period (combined across Kielder and Yorkshire Grid). In alignment with WRMP24 Guidance, population and property forecasts have been designed to reflect Local Authority planned growth. For WReN this is the Housing Plan scenario. Further details on how this has been assessed is included in Appendix 2.

Changes to existing water transfers (imports)

As part of developing our plan, we have considered transfers of water between companies and regions to meet our own needs, and also to support water resources challenges in other regions (i.e. the export of water from our region). These aspects are described later in Sections 5.3 and 6.3 respectively.

However, as part of an 'inter-regional reconciliation' process to align transfer options between regional

[19] Collaborative Study - The impact of COVID-19 on water consumption during February to October 2020 – Final report, (2021), Artesia Consulting – available upon request.

plans (completed in Spring 2022), changes to an existing import and transfer of water into our region was identified that impacts the baseline supply-demand position. A material impact on supplies in the Yorkshire area is currently forecast through cessation of an existing transfer of water from the Water Resources West (WRW) area.

The existing contract for the transfer of water from the Derwent Valley reservoirs in the Severn Trent Water (STW) area (WRW) to Yorkshire Water (WReN) is under review for termination in 2035 due to the impacts of abstraction licence capping to prevent environmental deterioration in the WRW/STW area. Ceasing the transfer is a feasible option for STW in their dWRMP24 that has been selected in their preferred plan, due to lack of feasible alternatives.

A potential future alternative option is to increase the capacity of the Derwent Valley reservoirs in the STW area, and this has informed the scope of the new RAPID Upper Derwent Valley Reservoir Expansion Strategic Resource Option (UDVRE SRO)[20] scheme. The SRO project is exploring a range of different reservoir enlargement options, which, if delivered, would protect Yorkshire Water's import whilst also addressing supply-demand deficits within the WRW region.

We have been in regular dialogue with WRW about the future availability of this transfer throughout the development of both our draft regional plans. Our emerging plans previously assumed the SRO would be able to support both WRW and WReN needs within the BVP[21], allowing the existing transfer to continue (note the loss of the existing transfer was included in a pathway in the WReN emerging plan). However, the reviews during the spring 2022 reconciliation determined that the SRO project was still at a very early stage of development and should not be included in the preferred pathway for the draft plans. This was largely due to questions over feasibility, and significant uncertainties on the size and scale of benefit.

For the SRO scheme to be included in the preferred plans it would need to be sized to accommodate a significant number of uncertain needs, including the impacts on STW of licence capping in the 2030s as well as the long-term environmental destination scenarios by the 2050s, plus Yorkshire Water's long-term needs. STW's environmental destination need (aligned to BAU+) is bigger in the draft plan compared to the emerging plan – this increases the risk of the SRO project not finding a feasible reservoir option to meet all the needs.

The uncertainties around the SRO scheme mean that YW's dWRMP24 baseline planning assumption is that the existing transfer is likely to terminate from 2035. This represents a loss to the Yorkshire Grid of circa 47 Ml/d (DYAA scenario), which has been carried through into WReN's supply forecast. It should be noted that loss of the transfer would cause specific sub-zonal deficits for Yorkshire Water requiring specific options to offset the loss of the transfer. These options differ from those required to address more widespread deficits in the Yorkshire Grid zone (e.g. driven by climate change or environmental destination). In short, losing the transfer breaks the existing integrity of the resource zone.

However, as the final position on this scheme will only be known later in the regional planning process, we have also considered a second pathway in the plan which reflects the potential for the SRO to be successful and the existing transfer maintained (Section 7).

Supply-demand balance summary

We have used the dWRMP24 projections of future supply and demand to calculate a supply-demand balance for all water resource zones in the region. The key data components of the supply-demand balance position along with the underpinning assumptions are provided in Appendix 2. A summary of the supply-demand balance position is shown below. **Table 4-3** shows our supply-demand position[22] prior to the inclusion of further demand management and leakage reductions beyond the AMP7 2020-2025 period, or the benefit of drought measures.

The baseline supply-demand balance demonstrates that water resource pressures do not affect all WRZs in the WReN region to the same degree. Berwick, Hartlepool and Yorkshire East zones remain in

[20] Technically, as well as exploring different option variants for reservoir enlargement, the SRO includes backfill options for Yorkshire Water. However, where the SRO is referred to in the context of this document, the reservoir enlargement component is the focus.

[21] Whether this option would constitute part of the best-value in future, if viable, would require further exploration when the SRO work is further progressed. It is possible that applying options in the WReN area to offset the loss of the transfer may still constitute the best-value plan by comparison.

[22] This data is for the core 25-year planning period to 2050 that drives planning needs in our plan. We have also forecasted out to a 60-year planning period, albeit at higher level, which is used rather for the purpose of scenario analysis on our plan (Section 8.2).

surplus throughout the planning period. Kielder sees an initially sizeable deficit that reduces over time. Major underlying deficits are shown in the Yorkshire Grid zone, which increase significantly through the planning horizon (over 2.8 times the deficit in 2050 compared to 2025).

Table 4-3 Baseline supply-demand balance: Position prior to further demand management, leakage reductions and drought measures

	Summary of forecast surplus (+) and deficits (-) – Ml/d		
Zone	**2029/30**	**2039/40**	**2049/50**
Berwick	+1.02	+1.20	+1.28
Hartlepool	+9.37	+3.31	+3.69
Kielder[23]	-23.60	-4.42	-2.92
Yorkshire East	+4.19	+4.13	+3.98
Yorkshire Grid	-104.60	-157.46	-298.81

Baseline supply-demand scenarios

It is important to recognise that all forecasts have inherent uncertainty around them. If the future turns out differently to our forecasts, this could change our supply-demand balance position and whether we have a supply surplus or deficit in each resource zone. This is in part accounted for in our target headroom allowance assessment (which provides a buffer for uncertainty), but major long-term uncertainty areas have been considered as part of our adaptive planning and scenario framework.

To assess the sensitivity of our supply-demand balance position to these uncertainties, a number of supply-demand scenarios have been considered. Stress testing has been undertaken for the baseline supply-demand balance against the Ofwat Common Reference Scenarios (CRS)[24] for low and high:

- Climate Change
- Demand
- Technology
- Abstraction reductions (environment)

The Common Reference Scenarios (CRS) set out a set of plausible bounds or extremes for key uncertainty areas for testing. They allow us to understand the sensitivities of our supply-demand position and how this may impact future investment needs and required solutions. The use of key scenarios in our plan decision-making process is described further in **Section 5.5**.

For those zones already in surplus, scenario testing did not highlight a material risk of deficit requiring intervention within the plan. In the case of Kielder, scenario testing demonstrated that our plan investment choices were not sensitive to changes in the supply-demand balance (Section 7). However, in the case of Yorkshire Grid, testing on the supply-demand balance baseline showed that:

- The zone is particularly impacted by climate change and abstraction reduction (environment) uncertainties, and to a lesser extent demand.
- Under all 'low' scenarios, a sizeable deficit is still observed throughout the planning horizon, and over 150 Ml/d deficit by 2050 in all cases.
- Under 'high' scenarios there is a tangible additional risk of materially larger deficits, with deficits of around 350 Ml/d under the high environmental destination and climate change scenarios.
- When looking to the longer-term, by 2084/85 deficits range between 271-465 Ml/d across all scenarios, which is also relevant to exploring our long-term investment needs.

Therefore, the Ofwat CRS are particularly important to help inform the resulting planned investment and solutions, so that they can suitably meet the needs of the future if the forecast position changes as part of the best-value adaptive plan. For this reason, our future choices and best value plan is largely focussed on the Yorkshire Grid and closely aligned with Yorkshire Water's dWRMP24.

4.5. Non-public water supply forecasts

In addition to public water supply, the WRNF expects regional groups to explore water demand outside of the water industry and consider the needs of other sectors. WReN has worked with representatives across the main sectors in the region, including agriculture, power and navigation to develop an

[23] It should be noted that the Northumbrian Water Industrial zone has been presented as part of the Kielder zone as these two zones have been merged for this round of planning. This represents a change in zonal reporting from WRMP19. It should also be noted, however, that the merger of these two zones does not result in a straightforward addition of the DOs, and surpluses/deficits, because of the way that potable demands were previously accounted for within the Industrial zone.

[24] PR24 and beyond: Final guidance on long-term delivery strategies (April 2022)

updated demand forecast for non-public water supply. A summary of baseline and future predicted abstraction for the WReN region is provided in **Table 4-4**, categorised by primary and secondary sectors.

Data used in forecasts

At this stage, the demands presented for non-public water supply sectors largely remain those contained in the WRNF. There are various uncertainties around these data, particularly around the future projections for water demand including the long-term impact of behavioural changes following the Covid-19 pandemic. Nevertheless, engagement with other sectors to date has largely validated the growth factors attributed to each sector as it is recognised that this is the best information available at present. An exception to this is the power sector, where updated projections have been provided through the sectors Joint Environment Programme (JEP)[25]. Additional abstraction data has also been provided by the Canal and Rivers Trust which has been used to update the baseline demand for the non-public water supply. However, no growth forecasts are currently available to update the future demand for navigational abstraction. Previously, these abstractions where exempt from licensing and so they are not reflected in the WRNF data.

Consumptive only water use

The updated demand forecast suggests the WReN region will require an additional 249 Ml/d of water to support other sectors. This increase is largely driven by demand from the power sector which is forecast to increase to 296 Ml/d by 2050, from a baseline of 60 Ml/d. This figure has been obtained from the work undertaken by the JEP as previously stated. The data presented in the WRNF did not account for net zero commitments, which is likely to result in higher freshwater demands in some locations. As suggested in the JEP report, there is considerable uncertainty in the potential water requirements for the power sector at a regional level largely due to the uncertainty in how the UK will approach decarbonisation. Whilst it is possible to consider forecasts for the UK as a whole, it becomes harder to predict future need at a more granular scale (i.e. regional, sub-regional, catchment) as it is not presently known where, within the UK, much of the future demand may occur. This is discussed further in **Section 5.6** and **Appendix 8**.

There may be capacity within existing licenced volumes to accommodate the forecasted demand. However, as discussed in **Section 4.1** the Environment Agency are undertaking a review of existing licences, which may be capped at recent actual volumes to prevent WFD status deterioration. As a result, new sustainable water sources may be required in the future to meet this deficit.

Whilst not insignificant, the future water requirements of non-public water supply sectors are approximately 31% of the overall demand for the region (including public water supply). However, many of the abstractions contributing to the additional 250 Ml/d required for non-PWS abstractions are constrained to specific locations. Therefore, it is important to consider water needs of our non-PWS sectors at a more localised scale, however, this presents various challenges such as data availability and a lack of funding.

Non-consumptive water use

These forecasts are based on consumptive only abstraction and the numbers associated with other sector abstractions are considerably larger when inclusive of non-consumptive data, with the power sector surpassing PWS abstraction more than three-fold. This is largely attributed to the hydropower and non-evaporative cooling energy processes which return a large proportion of the water initially abstracted to the environment directly and locally, with little or no treatment. Whilst the emphasis of the WReN Regional Plan is on consumptive abstraction, it is also important to consider the non-consumptive freshwater requirements of other sectors.

Our approach for non-PWS sectors' supply forecasts is detailed in **Section 5.6**.

[25] Scenarios for the projection to 2050 of Water Use by Power Producers – updated using FES21, A Moores, Joint Environmental Programme, Report ref. ENV/695/2021

Figure 4-1 Forecasted growth in 2050 (above) compared with baseline values (below) for main non-PWS sectors

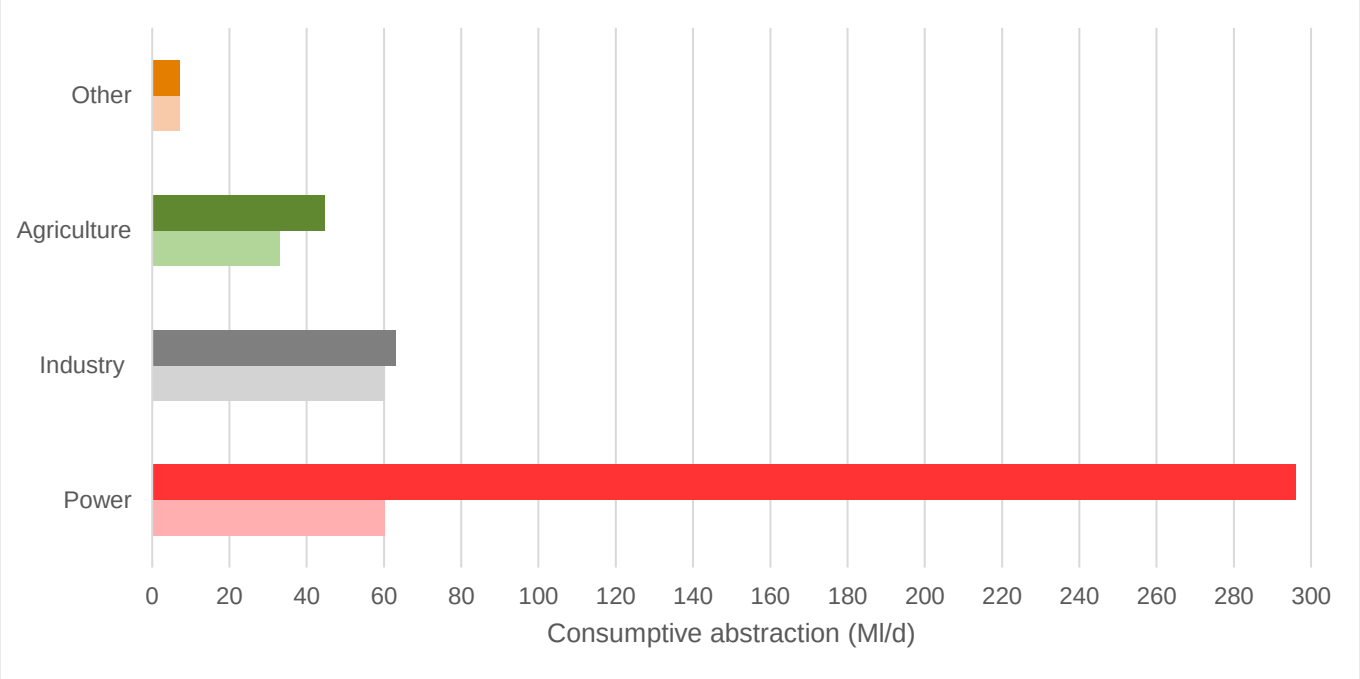


Table 4-4 Baseline and future predicted abstraction in the WReN region, by primary and secondary sector[26][27].

Primary Sector	Secondary Sector	Baseline Total Abstraction Recent actual consumptive (Ml/d)	Future Total Abstraction in 2050, consumptive (Ml/d)
Agriculture	General	6.7	6.7
	Horticulture	0.2	0.3
	Other Agriculture	0.1	0.1
	Spray	24.2	34.8
Total Agriculture		**31.2**	**41.9**
Aquaculture		0.09	0.09
Industry	Chemicals	2.9	3.6
	Food and Drink	13.1	16.3
	Industry General	0.6	0.5
	Metals	2.5	2.3
	Minerals	16.7	15.7
	Other Industry	17.7	17.0
	Paper and Printing	6.5	7.3
Total Industry		**60**	**62.7**
Other	**Total Other**	**7.2**	**7.2**
Power	Evaporative Cooling	41.9	*JEP projections do not break forecasts down to secondary sector level*
	Hydropower	0.00	
	Non-evaporative Cooling	0.00	
	Process Water	11.8	
	Production (general)	6.4	
Total Power		**60.1**	**296[28]**
Private Water Supply		3.8	3.6
Non-PWS Sub-total		**162**	**412**
Navigation (Canal and River Trust)[29]		340	340
Non-PWS Total (including navigation)		**502**	**751**
Public Water Supply[30]		***2084***	***1710***

[26] Unless specified otherwise, figures from 'Understanding Future Water Demand Outside of the Water Industry', Defra (2020)
[27] Figures may not add due to rounding or due to clipping of WRNF data to WRZs contained within the WReN region only.
[28] Figure from JEP (2021) Scenarios for the projection to 2050 of Water Use by Power Producers – updated using FES21, A Moores, Joint Environmental Programme, Report ref. ENV/695/2021
[29] Figure from analysis of abstraction data provided by Canal and River Trust, assumed all consumptive. No growth forecasted by CRT therefore assumed growth factor of 1
[30] Figures from draft Regional Planning tables

4.6. Evolving considerations for supply availability

Alternative reservoir management strategies

We have been undertaking work to explore alternative approaches to reservoir compensation flow management that could increase ecological, water resources and flood resilience in the region in the long-term. We are proposing to continue this work, including through into the 2025-2030 AMP8 period as part of our future WINEP work. We consider this offers the potential for multiple benefits to be achieved through adoption of alternative reservoir flow management regimes.

Growing demand in non-PWS sectors

A number of new non-household water demands have been identified in the north east of our region including hydrogen production on Teesside and car battery production within the wider Kielder Water Resource Zone. NWL has met with these companies to agree demand forecasts which have subsequently been included in the WReN baseline Distribution Input forecast. We have continued to work closely with NWL, the Environment Agency and both existing and new non-household businesses and which is reflected in this current draft regional plan position.

As discussed in previous sections, WReN set-up sector specific sub-groups for priority sectors (energy, agriculture and navigation) to understand the existing data and work together to develop actions to help address any further data needs and to ultimately lead to a better understanding of their demand forecast for input into future water resources planning cycles.

Critical period and peak demand

As an overall region, dry year average considerations are the dominant driver of the resource position and need. Month to month seasonality of demand is inherently included in the water resources modelling assessment of DO. Operational experiences during recent hot, dry periods (notably 2018 and 2020) have tested public water supply system but not led to any security of supply risks.

Yorkshire Water includes a critical period scenario in its dWRMP24 for the Yorkshire Grid. The scenario represents a four-week summer demand increase, such as that experienced in 2018. This scenario also shows a deficit that is considered when selecting the solution programme. This is considered to be primarily a local area concern, rather than one that materially affects the WReN strategic regional plan. However, it is important when considering water transfer needs to ensure that the lost capacity from a transfer does not impinge on local peak demand considerations. If in the future another region selects a transfer from our region the availability during a critical period scenario would need to be considered.

5. Our Approach

We have undertaken a problem characterisation to assess the risks associated with water resources in our region, alongside consultation with our stakeholders including regulators and other regional groups to develop planning process methodologies that are aligned with policy, guidance and where appropriate, consistent across companies and other regions.

A 'twin track' approach was taken to identify both demand reduction options and supply options. Working with regulators, other sectors and water companies, we reviewed existing and new options available to us and identified a feasible options list for further development.

We developed planning objectives and measurable criteria (metrics) in consultation with stakeholders, regulators, and our customers, to support our decision making for the development of a best value plan through an iterative process including reconciliation with other regions. Multi-criteria analysis supported by environmental appraisal was used in our decision-making process to support us in finding the plan which meets both inter- and intra-regional needs and as well as providing the best value to society and customers.

An adaptive planning approach has been taken which provides alternative pathways which can be taken according to the outcome of key future uncertainties. This allows us the flexibility to divert to an alternative future if required

5.1. Overall plan timeline and approach

The WReN draft regional plan has been developed through a collaborative approach with both in-region and out-of-region regulators, other sectors and wider stakeholders. The overall timeline and approach for development and delivery of the final regional plan in autumn 2023 is provided in **Figure 5-1** and this reflects a collaborative view across all regional groups. The regional reconciliation processes undertaken in autumn 2021 (iteration 1) and spring 2022 (iteration 2) allowed for an iterative approach which has been key to enable alignment with other regions, confirm strategic choices and select options that meet the national need across regions. This process is further detailed in **Section 5.4.**

The WReN regional plan has been delivered through a number of workstream groups, which were formed from, and led by, water resources planning experts from within the three water companies. In developing

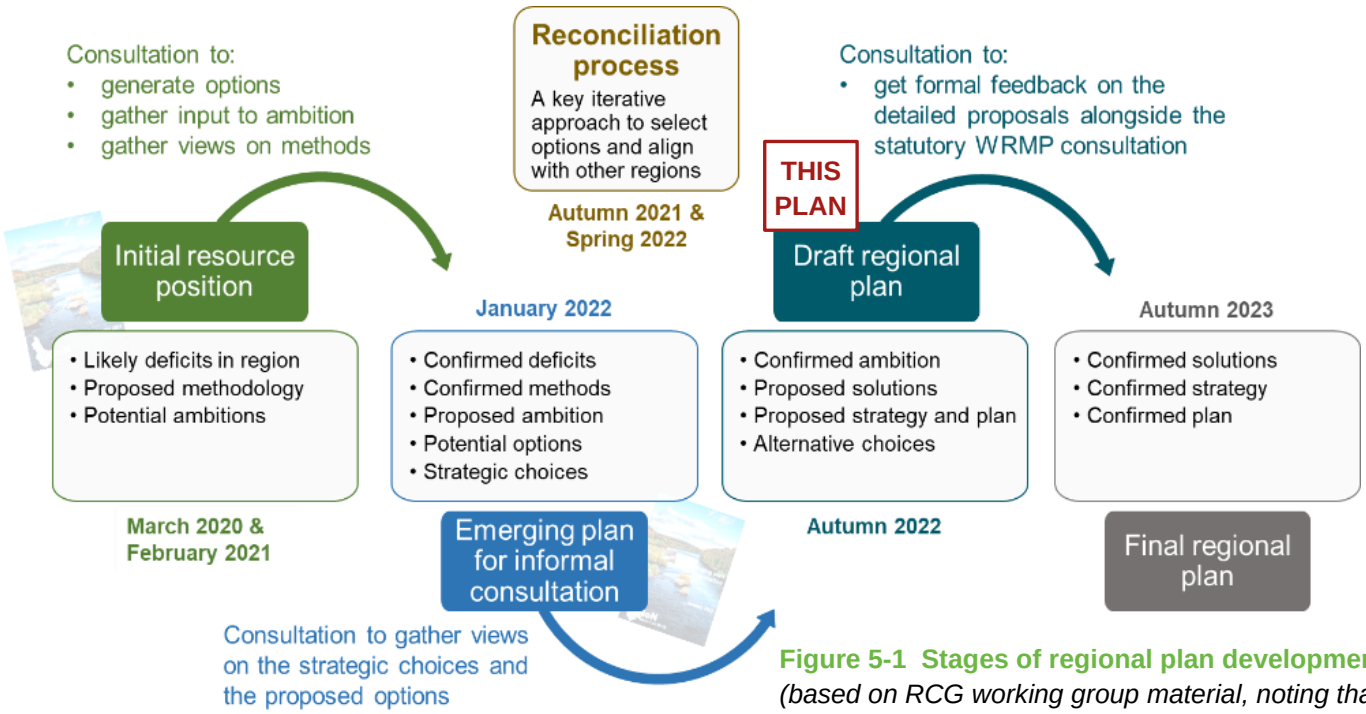


Figure 5-1 Stages of regional plan development
(based on RCG working group material, noting that date for Draft plan is to be confirmed)

the plan, these workstream groups have followed methods that are consistent with the Environment Agency's Water Resources Planning Guidelines and other industry water resources guidance, such as that published by UKWIR. These experts are involved in both regional and water company level (WRMP) planning which has facilitated alignment, where appropriate, across the three water companies and with the regional plan throughout the process.

The timeline in **Figure 5-1** shows how the regional plan has developed from our initial resource position in March 2022, which set out our potential needs, methodologies and ambitions, through reconciliation to publication of our emerging plan in January 2022 and this draft regional plan. The initial resource position helped us to understand our needs and potential ambitions at the beginning of the process. Further gathering of data, consultation feedback and reconciliation helped to shape the subsequent emerging plan. Each stage of the process has been been developed by using the most up to date requirements and data available at the time of preparation.. A further consultation and feedback process on this draft plan will be carried out alongside consultation on the water companies draft WRMP24s and this will be used to finalise the plans in autumn 2023.

Data presented in this report has been subjected to internal checks and peer reviews as well as being informed by and incorporating individual company data sets which have undergone both internal and external formal assurance processes. These checks have been carried out proportionately to the level of risk, maturity of data, and materiality of changes since WRMP19. The content of this plan was presented to a Board of water company directors who have been kept informed throughout the planning process. A further formal assurance process, including oversight from both external assurance providers and water company boards, will be completed prior to publication of the autumn 2023 final plan.

5.2. Environmental Destination

Our approach to Environmental Destination is described in detail in Appendix 6. As described in **Section 4.2**, the National Framework 'Environmental Destination' scenarios illustrate potential changes in abstraction that may be required to ensure the water environment is sufficiently protected in the long-term. In developing our draft plan, we have reviewed the national scenarios and explored the potential impacts on the environment and water supply.

The EA has been clear that the modelled scenarios are not intended to be confirmed final figures for any catchment. Instead, they are intended to start a broader conversation with stakeholders and regulators to understand what changes to abstraction may be required in the long term. Consequently, the national model outputs provide a basis for:

- initial engagement with stakeholders and regulators to validate the national figures with local knowledge
- beginning (or continuing) dialogue with catchment partners to explore long-term ambitions
- selection and prioritisation of catchments requiring further investigation
- selection of scenarios to test within the regional plan.

Following publication of emerging regional plans, to promote consistency between each region's interpretation of the National Environmental Destination scenarios, Ofwat, working with the Regional Co-ordination Group and the EA, developed a set of common references scenarios that the regional groups should consider (see **Section 4.2**). These scenarios form the basis for the Environmental Destination elements of our adaptive plan pathways.

WReN's short, medium, and long-term priorities in support of Environmental Destination are set out in Appendix 6. Our approach is consistent with that set out in the final guidance[31] and the joint Environment Agency, Natural England and Defra letter to regional groups[32] (plus further communication from the Environment Agency[33]) on expectations around long term Environmental Destination.

5.3. Regional supply-demand options under consideration

We identified and developed a range of PWS options for appraisal within the regional plan where a deficit, or where a material risk of deficit exists. A 'twin track' approach was taken to close the deficit which looks at

[31] Long-term water resources environmental destination - Guidance for regional groups and water companies. October 2020 v1

[32] Defra, Natural England, Environment Agency – letter issued to regional groups, 12th August 2021.

[33] Environment Agency – Item from Environment Advisory Group meeting agenda 01/11/21: Expectations for long term environmental destination in final plans

ways of both reducing demand through demand options and increasing supply through supply options. Our preferred approach to meeting deficits is to reduce demand, as this reduces the amount of water we need to take from the environment. However, our regional plan shows that we cannot rely solely on demand reduction in the Yorkshire Grid zone and therefore we also needed to identify new and sustainable options for increasing supply.

The options identification process started by reviewing the potential choices available, ('the unconstrained list') and assessing which are suitable for addressing the risks that have been identified ('the constrained list'). Any option considered not 'feasible' was excluded from the constrained list and the 'feasible options' were then developed further. An option may have been considered unfeasible if there are technical limitations that make it undeliverable or if a risk to the delivery of the option is judged too high to proceed.

Approaches to identifying the initial set of options in the unconstrained list included:

- review of WRMP19 list of options
- review of the options suggested in the WR27 Water Resources Planning Tools, UKWIR 2012 report.
- consideration of bulk transfer opportunities in consultation with other water companies including both intra-region and inter-region transfer.
- consultation with third parties to review existing third-party options and identify new options.
- consultation within the water companies with staff who have knowledge of the supply system and operations, water production planning and service delivery
- review of the specific system constraints and associated risks to the network e.g. learning from the dry period of 2018 and investigating which areas of the Yorkshire Grid network were under stress (links to the critical period scenario)
- review of new and existing techniques and network improvements for driving leakage down

Options to meet public water supply needs

Supply options

Our options for increasing supply are a combination of increasing use of existing available resources and introducing new supplies. Options have been developed in zones where there are strategic supply-demand planning problems to solve. From the perspective of the WReN area, the focus of supply options identification and appraisal was on addressing material forecast deficits in the Yorkshire Grid area, supported by work in the Kielder zone, particularly regarding the viability and impacts of exports of available water in the Kielder reservoir (which makes use of surplus water as opposed to development of new resources).

The range of different types of supply options that are available and have been considered within the development of our plan to meet the deficit in the Yorkshire Grid include:

- Groundwater and surface water enhancement:
greater use of existing resources that we are already permitted to abstract.
- New groundwater and surface water sources:
require abstraction permissions to be granted by the Environment Agency.
- Aquifer recharge:
discharge water to groundwater when the water is not needed in supply and conserve for when it is needed.
- Bulk supply transfer:
raw, potable or partially treated import water from neighbouring zones or regions including the import of raw water from river Tees (supported by Kielder reservoir and Tyne Tees Transfer)
- Conjunctive use
- Desalination
- Tidal abstraction (as an alternative to desalination)

The feasible supply options by option type and number are shown in Figure 5-2.

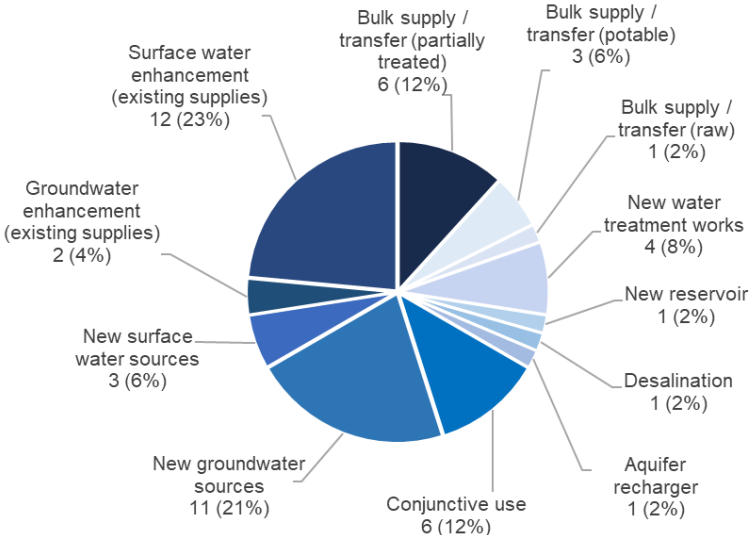


Figure 5-2 Number of feasible supply options by option type identified to meet Yorkshire Grid deficit

Many of our supply options are alternative uses of the same source, allowing for choices to be made around where a resource can provide most benefit in a given scenario. Our focus has been on strategically relevant options to the regional plan. Further details on the Yorkshire Grid zone supply options can be found in Appendix 5.

Options that have potential to support regional decision making (inter-regional imports or exports) have been considered in the regional reconciliation process. These are:

- **Exports of raw water from Kielder reservoir to United Utilities (UU) in the WRW region**;
  These were explored but not selected by WRW (see **Section 6.3**). There are significant cost and environmental implications surrounding the options (including an INNS risk) and the exports would also reduce Kielder storage further in extreme droughts. However, as part of the RAPID gated process, Kielder remains one of 27 potential options for UU.
- **New Upper Derwent Valley Reservoir Expansion Strategic Resource Option (UDVRE SRO):**
  This option would avoid the loss of the existing import from WRW to WReN in 2035 whilst also addressing supply-demand deficits within the WRW region. However, the final position on this scheme will only be known later in the regional planning process from further ongoing work via the RAPID gated process. We have therefore taken a pathway approach in relation to this option and considered two pathways in the plan; one where the transfer is maintained, and one where the transfer is stopped.
- **WReN to WRE transfers:**
  Inter-regional transfers from WReN to WRE have been explored to address deficits in WRE resource zones. However, the WRE zones in surplus are geographically much closer to the WRE zones in deficit than the WReN zones and therefore are not justified or included within the plans

Demand side

Demand options are an important part of our plan as they reduce the daily average volume of water needed for supply and hence reduces the gap between supply and demand. Demand reduction activity can help lower peaks in demand and help conserve supplies for longer. The measures available to us have been considered for:

- **Leakage reduction measures**:
  Reducing water lost when transferring water from our treatment works to our customers such as pressure management and new ways to detect and locate leaks (active leakage control).
- **Per capita consumption reduction measures:**
  Helping our customers reduce the water they use in their homes to decrease the average daily per capita consumption (PCC) such as through installation of smart meters and water efficiency campaigns.
- **Reducing retail demand:**
  Working with retailers (who provide retail services to commercial properties) in our area to help commercial users reduce their demand for water.

There are a number of demand management options identified to address the deficit in Yorkshire Grid Zone, meet national targets on leakage and per capita consumption reduction and to support resilience in other WReN areas, particularly where there is decreasing surplus. **Figure 5-3** presents the types of different options available to meet demand reduction for the main WReN zones. It should be noted that it does not represent the breakdown of how we will meet the policy requirement.

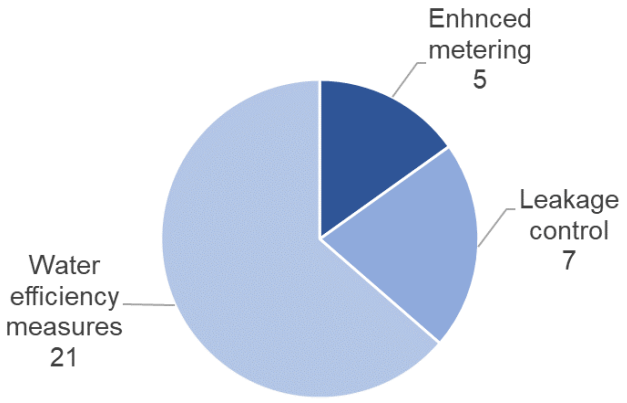


Figure 5-3 Number of feasible demand reduction options by type for key zones

In the previous round of Business Plan submissions, each company developed a Bid Assessment Framework[34] for submission of third-party options to the WRMP process. We will fully consider any third-party options that are submitted via this route and consider whether this is relevant to the strategic regional plan or WRMP only. No third-party options

[34] Found for each of the 3 Companies at https://www.ofwat.gov.uk/regulated-companies/markets/water-bidding-market/water-resources-market-information/

have been proposed that would contribute to the loss of the STW transfer and support the national approach. We will continue to develop options for future iterations of our plans and through the WRMPs and are open to considering new or innovative solutions including assessing third party options via the bidding market. More information on how to submit into this market can be found in our water companies' Bid Assessment Frameworks on their respective websites.

Options to meet non-public water supply needs

Options to meet other sector needs, outside those of public water supply, may be broadly split into those that solely and specifically address other sector needs (in their own right), and those that could be jointly developed to also meet public water supply deficits in a holistic manner.

There are no non-PWS solutions identified for this iteration of our regional plan. However, we will continue to explore potential multi-sectoral opportunities as we continue to engage with other sectors to understand non-public water supply needs as outlined in **Section 3.4** and **Section 4.5.**

5.4. Regional plan reconciliation process

One of the most important drivers for the adoption of regional level planning is the need to explore water resource resilience at a national and regional level rather than purely at a water company level. This is in order to promote and facilitate the exploration of water transfers within and between different regions.

The exploration of water transfers is particularly important for regions under serious water stress, who may have difficulty sourcing sufficient supply within their own region to meet demand for water. The transfer of water from a region (to another) may be possible due to there being a material existing surplus, or through creation of new supplies via the development of new options to facilitate the export of water (which could be cheaper or less environmentally impacting, for example, than developing new resources in other more stressed regions).

Even where a supply-demand deficit exists (or could plausibly occur in future) in the region from which the transfer of water takes place, it is possible that more cost-effective options could be developed compared to equivalent new resource option development in other regions, enabling transfers still to take place.

Each region has its own issues, risks and challenges to overcome in the next 25 years and beyond (our regional plan looks as far out as 2080). Nevertheless, the regional planning process gives rise to opportunities for collaboration with different regions and other water sectors to develop sustainable solutions which benefit both people and the wider environment. As such, the process is designed to offer more freedom, especially in the early stages, to explore strategic issues in advance of the statutory WRMPs.

Considering that all regional groups work to the same timeline, delivery of a coherent set of best-value plans across all regions requires effective and planned collaboration. In recognition of this, regional planning groups and regulators worked to develop a 'reconciliation' process. This process aimed to ensure that regional plans iteratively appraise solutions and align with each other as far as is feasible in the available timescales. The first round of reconciliation ran through autumn 2021, and a further round of reconciliation occurred in spring 2022 following consultation on the emerging regional plans. All regions conducted a jointly coordinated set of plan stress tests, to ensure that the resulting reconciled outputs were suitably robust at this stage in the process. Our draft regional plan is consistent with the outcomes of reconciliation in terms of inter-regional transfers, so that it is suitably aligns with the plans of other regions as part of the broader national picture.

5.5. Decision making process for best-value

Options appraisal overview

As part of their WRMP development, each water company must ensure *'Their plan is a best value plan for managing and developing their water resources so they are able to continue to meet their obligations to supply water and protect the environment, and is based on sound and robust evidence including relating to costs'* (based on the Water Resources Planning Guideline, WRPG). The Environment Agency's Best Value Plan supplementary guidelines specifically defines a best value plan as *'one that considers factors alongside economic cost and seeks to achieve an outcome that increases the overall net benefit to customers, the wider environment and overall society'*.

The WReN decision-making process is intrinsically linked to this, being based upon the options appraisal

of individual water companies where there is a supply-demand need to address[35]. However, our activity as part of WReN has complemented company level activity by facilitating in particular the effective consideration of in-region and inter-regional transfer options, where appropriate. The WReN best value plan therefore aims to meet the region's objectives and that of the constituent water companies, and which aligns with other regions and supports the national goals.

The emerging plan consultation confirmed that the WReN decision making approach and support tools for the regional plan development are seen as appropriate to the scale of the problem faced in the region.

The assessment of future needs in our region has highlighted a significant PWS deficit in the Yorkshire Grid zone, in part driven by the outcome of inter-regional level scale planning through loss of the transfer from STW as outlined earlier in this document. This risk requires a best value plan to be identified through the options appraisal and decision-making process. The Yorkshire Water Enterprise Decision Analysis (EDA) model has been used for the purpose of appraising the solution to this deficit[36], supported by work with Northumbrian Water in particular regarding the viability and impacts of exports from the Kielder zone.

We have selected a Multi-Criteria Analysis (MCA) approach as it allows options to be assessed against multiple objectives to produce a solution based on both monetised and non-monetised criteria. The criteria or metrics are derived from pre-defined objectives. This builds on the more traditional Economics of Balancing Supply and Demand (EBSD) aggregated methodology (programme optimisation based on least cost to meet supply-demand deficits over time). The outputs of the EBSD optimisation model are assessed against wider metrics (i.e., other than cost) to evaluate both financial and non-financial impacts and benefits. Our process allows for consideration of "trade-offs" in selecting a best value plan.

Metrics and trade-offs

Metrics sit beneath the overarching WReN objectives. They describe the performance of alternative optimised solutions and selected portfolios (at a programme level) considered in determining our plan. However, this is not to say that the metrics used will (or should) cover all aspects of our planning considerations in line with our objectives. For example, we may be completing long-term work towards environmental destination that brings benefits of a non-supply-demand nature, and so cannot be reflected in an options appraisal process aimed at solving supply-demand resource needs. However, metrics are the key descriptors of programme performance when assessing how best to meet future supply-demand needs (including potential water exports). Over time, if new needs manifest, metrics could be added to the process in future iterations of the plan.

The development of our objectives and metrics has been completed taking into account, on balance:

- Regulatory and policy aspirations (**Section 1.1)**;
- Customer preferences (**Section 3.3**); and,
- Stakeholder engagement[37] (**Section 3.4**).

As part of the process, we have attributed how each metric would influence the optimisation. For example, metrics may be defined by whether they should be achieved, optimised (to minimise or maximise), or for the purpose of a specific options appraisal, set as a scenario constraint (where a particular objective outcome may be constrained into the plan to compare to alternative programmes). These concepts are explained further in Appendix 4, with extensive additional detail on the development and definition of our objectives and metrics, including taking into account associated engagement.

Our current metric areas included in our options appraisal are shown in **Table 5-1** below:

[35] As described later in Section 7, at this stage options appraisal to meet the acute needs of the Yorkshire Grid is key for the WReN plan.

[36] As such, the full detail of the options appraisal modelling is detailed in the Yorkshire Water WRMP24 main report, but also detailed further in Appendix 5.

[37] As described above, this is not to say that it is possible for all such views to change the metrics used in technical options appraisal process, but rather may influence the future plans in other ways, or identify future required activities to better define tangible needs in future plan revisions.

Table 5-1 Decision-making metrics summary (Detailed metric technical definition is included in Appendix 4)

Metric areas	Planning status	Metric areas	Planning status
PWS Drought resilience	Achieve or enhance	Multi-abstractor benefit	Optimise
Biodiversity	Optimise	Carbon	Optimise
Natural Capital	Optimise	Customer preferred option type	Optimise
Leakage reduction	Achieve or enhance	Human and social well-being	Optimise
PCC reduction	Achieve or enhance	Financial Cost	Optimise
Flood risk management	Optimise	Option Deliverability	Optimise

Presenting metrics in the regional plan

We compare the metric performance of candidate solution programmes to identify if there is a best performing solution programme that should be put forward as the preferred or best value plan. The metrics represent a range of criteria each measured by a qualitative unit or a quantitative scale that is appropriate for that particular criterion. This makes it difficult to compare programme metric scores using the measured values as they are not consistent, therefore we have normalised the values to a scale from 0 to 100 to provide consistent units. A score of 100 is the most optimal value for all metrics. When comparing solution programmes, a score of 100 will be applied to the programme that presents the best value for an individual metric. All other programmes are applied a normalised score that is relative to the optimum programme for that metric.

Building the best-value plan

We have created a best value plan that addresses both the DYAA and critical period scenario deficits over a 60-year planning period. During the process of determining the best value plan we produced multiple optimised solutions using our DMF optimiser model. Initially we used the optimiser to create least cost solutions that optimised based on cost (financial capital) alone. Only feasible options that had passed screening as part of the options identification process were included in the optimiser.

A preliminary stage of optimisation was first undertaken to address baseline supply-demand deficits in the Yorkshire Grid zone with different levels of drought resilience prior to 2040. This also included runs with and without the demand management and leakage policy aspirations being met, to understand how this changed the options portfolios.

As part of the publication *PR24 and beyond: Final guidance on long-term delivery strategies (April 2022)*, Ofwat set out good practice for scenario testing as part of development long-term adaptive strategies. We have followed this guidance to complete our own plan testing, which uses the 'Ofwat Common Reference Scenarios' for the purpose of testing sensitivity around our baseline position. The Common Reference Scenarios (CRS) set out a set of plausible bounds or extremes for key uncertainty areas for testing. Optimisation runs were also completed using the low and high abstraction reductions (environment) and high climate change scenarios, given these

materially affected the supply-demand challenge to be solved.

The preliminary optimisation runs allowed us to understand the frequency of selection of options across a range of scenarios, initially on a least-cost basis. However, the least cost solution may not provide best-value for meeting other objectives. In addition to the least cost runs we produced further optimisation runs to minimise carbon, and to maximise the environmental and social benefits of the options.

We used the outputs of the least cost and best value optimisation runs to create a portfolio of supply options for consideration in the preferred plan. The portfolio was used to create candidate solution programmes to be considered as the best value plan. The aim of the candidate solution programmes was to improve on the metric values compared to the least cost solution and create a best value plan. The candidate solution programmes were compared against each other using the MCA approach of comparing metric values at a programme level. The candidate solutions were created through the optimiser model by mandating options into the solution to meet key objectives.

As an output of the process, five candidate solutions were produced, but only four were taken forward to the metric assessment stage (presented in **Section 7**). Trade-offs were explored in determining the best value plan.

Adaptive planning scenarios and pathways

Not all risk and uncertainty can be quantified accurately and, although our forecasts incorporate the most up to date information available to us, our plans are still based on estimates, and we must consider this in our final preferred plan. The known risks in our plan allow us to incorporate an appropriate level of flexibility and divert to an alternative future if required. Our regional plan should be adaptive, and as part of the process we have included alternative pathways representing key future uncertainty areas for our plan.

A pathway is akin to a ‘plan within a plan’, allowing us to show how our solutions would change if a different path or branch was followed. Hypothetically, any of the material plan uncertainty areas could trigger alternative pathways in the regional plan. In line with the EA supplementary guidance, pathways should be kept to a small number to aid communication and clarity on the plan.

Risks, including the loss of the STW import and the environmental destination licence reductions, can be linked to key dates that trigger an alternative pathway. To ensure we are prepared for diverting to an alternative plan, we identify decision points in advance of the pathway diverging. There are other significant uncertainties in our plan that are not determined by a point in time, such as the impact of climate change on supply and the outcome of demand reduction interventions. Ongoing monitoring of risks against our pathways in future is critical.

We have created alternative pathways with reference to the Ofwat CRS, where appropriate in the context of material supply-demand risks. The alternative pathways included in the development of our best-value plan are:

- **Pathway 1: Preferred plan (most likely) scenario**, which includes loss of the existing STW transfer in 2035
- **Pathway 2: STW transfer maintained**, representing a situation where the reservoir enlargement, part of the SRO, yields suitable benefit (as was retained on basis of being justifiable in a BVP context)
- **Pathway 3: Low demand reduction**, representing demand side option delivery uncertainty where half of the leakage and demand management savings by 2050 are achieved
- **Pathway 4: Enhanced environmental destination,** where environmental needs on the River Derwent are greater than assumed.
- **Pathway 5: Ofwat core scenario,** this pathway represents the minimum interventions required to ensure the future risks are mitigated and we are resilient to future drought events.

By looking at how the solutions change between these scenarios, should the future turn out differently to our central supply-demand estimates, we have sought to identify potential options or solutions that are more adaptive or allow us to minimise the risks of a sub-optimal plan in the future.

Environmental assessment within the options appraisal process

The regional plan must ensure appropriate environmental appraisal is carried out on options to suitably inform the plan decision making. The aim of the environmental appraisals within the plan is to provide for a high level of protection of the environment, integrating environmental considerations into the preparation and adoption of the plan with a view to contributing to sustainable development. Throughout development of the plan the environmental appraisal seeks to identify, describe and evaluate the likely significant effects on the environment of implementing the plan and propose measures to avoid, manage or mitigate any significant adverse effects and to enhance any beneficial effects.

For water resources planning purposes, these assessments consist of Strategic Environmental Assessment (SEA), Habitats Regulation Assessment (HRA) and Water Framework Directive (WFD) assessments, including Invasive Non-Native Species (INNS) and natural capital considerations. Environmental assessments have been undertaken following the most up to date guidance, including the Water Resources Planning Guideline (WRPG) for WRMP24[38], Environment Agency Direction, UKWIR decision making/best value report and UKWIR environmental assessment guidance[39].

Water companies are required to undertake assessments at a WRMP level. Many options for consideration at the regional plan level come from WRMPs, and the regional plans also feed into the WRMPs via identification of new options to consider and by providing planning solutions with which WRMPs need to align. Hence, WRMP24 and WReN options are assessed in an integrated way to ensure consistency and allow comparable assessments.

Consideration is made of how the environmental assessment findings actively inform and add value to decision-making, alongside other considerations such as cost, affordability, resilience and customer service expectations. The outputs from the environmental assessment workstream were used to inform the environmental, societal and resilience decision-making metrics which were included in the WReN option appraisal process. Further input from the environmental assessment workstream was also considered in a qualitative review during development of planning solutions.

The methodologies for environmental assessment are documented in the environmental assessment Scoping Report[40], which is available on the WReN website. The Scoping Report was issued for consultation with the Environment Agency, Natural England and Historic England as well as wider stakeholders e.g., members of the WReN steering group to seek agreement on the scope and approach. Following consultation, the comments received were reviewed and amendments to the scope and/or approach have been made (where relevant). A table detailing comments received and our response is provided as supporting information to Appendix 8 and is also provided as an appendix to the SEA Environmental Report.

5.6. Non-PWS approach

Whilst we have been undertaking significant work with other sectors to better understand their resource needs and risks (see **Section 4.5**), the understanding of future supply-demand need for other sectors is significantly more ambiguous than that for public water supply. For the WReN area, this has represented a particular challenge, and therefore we consider that at this stage the defining targeted options that solely and specifically address other sectoral needs across the region is impractical. It is anticipated that this journey will continue to evolve into the final plan revision, and later planning cycles.

Instead, our focus has been three-fold: to understand the current and future water needs of non-PWS abstractors in the region; to understand the challenges individual sectors are facing; and to look forwards as to how the regional planning process can facilitate the creation of opportunities for joint solutions moving forwards.

We invited representatives from non-PWS sectors to input into the draft plan. These inputs are summarised in Table 5-2 and detailed further in Appendix 8. They reflect the current understanding on two key sectors (agriculture and energy) gained from our on-going liaison and discussions.

[38] Environment Agency (2021) Water resources planning guideline, July 2021. Available at Water resources planning guideline - GOV.UK (www.gov.uk)

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

[40] Ricardo Energy & Environment (2021) Water Resources North Regional Plan – Environmental Assessment. Scoping Report. Available at https://www.waterresourcesnorth.org/about-us/document-library/

Table 5-2 Summary of key challenges and opportunities provided by non-public water supply sectors (agriculture. energy and navigation) in WReN region

Sector	Current and future water needs	Challenges for the sector	Next steps
Agriculture	**Data availability** The agricultural sector needs to have projections of demand and supply demand balances for each CAMS catchment. This needs to be based on likely irrigation needs under a range of future scenarios e.g. likely water availability and climate change. This will highlight the scale of the challenge and the geographical focus of the challenge. Only then, can the sector understand the possible range of solutions that could be practical and applicable and only then, can the sector understand what multi sector opportunities could be arrived at. **Environmental destination** More detailed analysis of the environmental destination scenario implications are required. What does this mean for individual businesses? **Abstraction Licensing / Licence capping** The agricultural sector needs to further develop the method of engagement on the Environment Agency's sustainable abstraction licence review process. The sector/abstractors need longer warning times to allow time to adjust and invest in the right solutions for their businesses. This may be in the form of constructing a winter storage reservoir to move from summer abstraction to winter abstraction. This process requires alignment and streamlining of the planning process, obtaining an abstraction licence and tying in with grant funding if available In addition, the construction of infrastructure is a long term investment for agricultural businesses. Long term security of abstraction licences to support this planning is required. E.g. A 25 year investment in a reservoir cannot be underpinned by	The next revision of the National Framework which is due to start in 2025 and not complete until 2029 will not address the short and medium term challenges faced by the agricultural sector. To meet the full potential of the Regional Plan requirements (as set out in the WRNF), the agriculture sector propose that funding needs to be made available for the following: • to the Water Resources Regional Groups to facilitate the collaboration of all sectors into a regional plan i.e. technical program that brings sectors data together (regional water resources simulator) and leads on policy development. The Regional Groups then seek to perform the duty of an enabler within the regional planning process and remove barriers which could prevent multi sector planning. • to the sectors to allow them to carry out planning. The aim is for the agriculture sector to be on the same footing as PWS with regards to being seen as an essential water user and with the planning capability to support this. For the agricultural sector this includes funding to develop & grow abstractor groups, including where these are not already in place. This will allow the planning work to be undertaken at local level, directly with abstractors. WReN only has a couple of informal abstractor groups but has a significant number of grower groups for the potato and field vegetable sectors. Such grower groups would be a good starting point to create a more formal abstraction focused group.	The need and ask of the agricultural sector is for appropriate funding to be available for the sector to be included and involved in the water resources regional planning as outlined. The Water for Food Group has set up a Task & Finish Group to create a framework for an Agricultural Water Resources Management Plan and Drought Plan which will cascade into regional planning groups and through to individual abstractors. This will support business planning from the ground through to regional planning and national planning. This will review the planning within current regulation and legislation and review what would be required in drought status. Looking to the future, it has to be questioned whether the current abstraction licencing system is and will be the right process in light of climate change e.g. should there be a distinction between summer and winter abstraction or should it be based on flows and being able to abstract, within a catchment programme, when water is available regardless of the month. The NFU welcomes the multi sector working opportunity however, we must understand how this can be achieved. Examples of future areas to explore, based on discussions with WReN to date include; • Working together to understand the data gaps and what would be required to fill these (e.g. resources, funding) .

Sector	Current and future water needs	Challenges for the sector	Next steps
	an abstraction licence which has a 6 yearly review period which will be implemented within the Environmental Permitting Regulations and is currently observed through the common end dates on time limited licences. When considering proposed licence capping based on the WRNF data, the baseline used is outdated and not reflective of current water usage, including covering periods of recent drought. **Multi-sector planning** Multi sector planning means just that i.e. a plan for water resources which balances the needs of the environment alongside public water supply, energy and agriculture. The agriculture sector needs assurance that water for food production is seen as essential water use. The Government in the Food Strategy are asking for fresh fruit and veg to increase by 30% per capita but the sector needs assurance, certainty and confidence that access to water for food production is a priority and will be provided.	Whilst within water resources we often reflect on water scarcity and drought, flooding occurs across the region and impacts on farm businesses and the agricultural sector. Working in a multi sector way, we must look at how we can manage water better. Where are the hot spot areas and how can we provide storage opportunities which tie into environmental opportunities and look to provide a water source. In working in this multi sector arena, what opportunities are there to collaborate and deliver through the PWS WINEP programmes which provide benefits for all?	• Begin by focussing on “hot spot” areas where there are large deficits
Energy	Towards the end of the decade, the demand for water from power and hydrogen production is likely to begin to increase, with increasing uncertainty into the 2030s and beyond. Individual power station sites have data on their water consumption which is submitted to the EA. Data is not collected centrally by the sector. A fixed abstraction volume is required to operate a station at full load. Abstraction licence reductions could render power stations inoperable, resulting in stranded assets. Future investment at sites to contribute to net-zero targets requires certainty that	• The competitive nature of power production and competition law prevent power companies from collaborating and there can be no power sector plan. • For a power station there is a significant difference between availability of water on an annual basis and the reliability of an abstraction at a particular point in time. • Power stations operate 24 hours a day in a dynamic market with half hourly trading of electricity. Therefore unavailability of water for just half an hour can have an impact on	• Continue to work with WReN and the ‘sector group’ to continue more targeted discussions • Important to continue to understand likely future demand forecast for power and hydrogen production associated with public water supply as well as from non PWS • JEP to continue to update its projection of water use by power producers model when significant new information becomes available and communicate results.

Sector	Current and future water needs	Challenges for the sector	Next steps
	the water rights will be available for the lifetime of the asset. The Joint Environment Programme (JEP)[41] has rerun its projection of water use by power/hydrogen producers model for the modelled sites that sit within the WReN boundary using FES21 – the future energy scenarios produced by National Grid in 2021. This provides a range of potential water uses by future power and hydrogen production in the region. It is important to understand that there is significant uncertainty resulting from the range of potential pathways to net zero and the location of future plant. Power plant operators and developers make decisions based on market conditions, there is no duty to develop power plant projects. Therefore it is not possible to know what type of future plant will be developed where and by whom.	both commercial performance and system security. • The power sector does not have easy access to Environmental Flow Indicators on river reaches that are of interest to the sector. This makes it difficult for a potential power project developer and investors to evaluate the site specific risk of water unavailability. • Historically power sector water abstraction licences have been robust. Increasing pressure on water resources, the move to time-limited abstraction licences and 12 or potentially 6 yearly reviews under the transfer of abstraction licencing to the Environmental Permitting Regime increases the uncertainty in water availability and therefore increases the risk for investors in dispatchable low carbon power projects. • Currently it is not clear if sufficient water will be available for power/hydrogen developments in the WReN region, as future developers and locations of power/hydrogen plant are unknown, but also because there is uncertainty in future water availability and abstraction license reviews. • There is no funding mechanism for joint research and development of water resources for all users. Water companies have access to funding for projects that benefit PWS customers, but this is not available for non-PWS. Providing regional groups with funding to facilitate full multi-sector consideration and assessment would be a step forward. • Currently no long term solution to ensuring that the power sector has access to the water it is expected to need in the future to decarbonise and provide electricity system security.	

Sector	Current and future water needs	Challenges for the sector	Next steps
Navigation	The WRNF data does not include navigational abstraction by the Canal & Riverst Trust (CRT) as these were previously exempt from licensing. CRT provided WReN with data to present in the Regional Plan alongside the non-PWS data, however, this data does not capture all abstractions as some are still exempt or are groundwater abstractions which are not included. The data provded by CRT are an estimation of average abstractions during 2011-2018. Where gauged records are not available, abstraction estimations are based on considerations of the hydraulic dimensions of each site (as well as donor catchment flow data) therefore there is still a degree of uncertainty of the overall data. CRT abstractions have been treated as fully consumptive as although water may return to the system, there is considerable spatial and temporal variability in where it is returned. Hence, there is a risk of over-estimating abstraction for CRT, nevertheless the Trust are a significant abstractor. There is no significant growth in abstraction expected for this sector. However, canal demands for water are complex: abstraction supports environmentally sensitive water bodies and ecological needs, as well as statutory navigation functions. The Canal & River Trust was previously exempt from abstraction licensing; however, they have recently transitioned into the licensing regime.	• Licencing – Water Act 2003 has potential to reduce water availability. Risk of conditions being applied which limit the amount available to abstract when applying for licenses on abstractions that have previously been exempt. • Existing canal transfers play an important role for public water supply. Abstraction reductions for environmental destination and actions to prevent WFD status deterioration (i.e. licence capping) is likely to have an impact upon levels of service experienced by canals. • Navigational drought – impacts of drought conditions include restrictions and closures of canals and waterways.	• CRT currently updating modelling to better understand their future water resource requirements. Once available, this should be considered in the WReN regional plan going forwards. • CRT currently working on an example case study to demonstrate the potential to unlock water resources with 3rd party investment, far beyond the Trust's affordability. • CRT currently working on an example case study to exemplify cross catchment transfer capabilities across the Trusts' waterways. • Through our regional planning, we are seeking to facilitate opportunities to change canal operations for wider benefit (environment/society/economy). Canals are already used for water transfer in our region and have the potential to supply and transfer more. The Canal & River Trust is currently updating its water resources strategy and Water Resources North is providing support in this regard. Currently there are several opportunities for transferring water between regions, using the existing canal infrastructure.

[41] Scenarios for the projection to 2050 of Water Use by Power Producers – updated using FES21, A Moores, Joint Environmental Programme, Report ref. ENV/695/2021

5.7. Non-drought resilience considerations

In line with the company WRMPs in the previous planning round, generally we do not consider that there is a significant non-drought resilience need or risk at regional scale that warrants specific assessment. For example, Hartlepool has a single source of supply, but assessment and appraisal of this is very much a local issue rather than a regional one. Aspects such as asset flood risk and water quality are mainly addressed by company business plans, or in design standards within options development completed by engineering teams. We will ensure that any options meet relevant minimum design standards as they are implemented. In addition, our options appraisal process included an overarching flood resilience metric and a multi-abstractor benefit (e.g., water quality) metric, both of which measured option impacts qualitatively, using SEA objective outputs. See Appendix 4 for further details.

The loss of the existing STW transfer from the WRW area to WReN would fundamentally change the configuration of the Yorkshire Grid, which leads to specific additional resilience considerations as part of options and solutions development. This has been accounted for as part of exploring the impacts and candidate solutions to address a loss of the import (**Section 7**). In the development of the Yorkshire Water draft WRMP24, a specific resilience metric was introduced to help facilitate the identification of the preferred plan as part of a further, more detailed examination of this issue.

6. Strategic choices

When developing a regional plan there are a vast array of potential considerations, choices and asks of the plan that need weighing up. As we are creating a strategic plan, it is not feasible to focus on every nuance and choice at a regional scale, with more detailed local questions being covered by the individual company WRMPs. In this section we outline the key strategic question areas of our regional plan, which we also presented and consulted upon in the previous emerging plan in January 2022.

Our emerging regional plan included a set of strategic questions which would help guide our development of the draft plan. During the consultation period on the emerging plan in January and February 2022, we received comments from a range of stakeholders including regulators and statutory bodies, water retailers, energy sector, industry consultants and suppliers and landowner associations such as National Farmers Union and Country Land and Business Association. These comments have been collated, reviewed and incorporated into the development of this draft regional plan.

The strategic question areas are summarised as follows:

- Should we continue to plan for meeting **demand management and leakage government aspirations** by 2050? (Section 6.1)
- What **pace and profile** should we pursue towards achieving the long-term **demand management and leakage** reduction targets? (Section 6.1)
- If there is a **deficit prior to 2039**, should our strategy be to **adopt a lower 1 in 200-year drought resilience level** to help meet that deficit? (Section 6.2)
- Are any **water export options to other regions** being selected by adjacent regional groups, and if so, is that supportable in our best-value plan? (Section 6.3)
    - Linked to the above, what is our **best-value adaptive plan** to address *loss of the existing Derwent transfer into the WReN area*? What key **alternative solutions** are there? (Section 7)
- What is our current view of **Environmental Destination** impacts? How far should we pursue **evidence** of flow-based benefits prior to adopting into our core plans? (Section 6.4)

The above list does not include every potential question we considered in developing our draft regional plan; however, it summarises the most tangible choices we have had to make or explore.

In the sections below we cover the strategic choice areas for the draft regional plan, taking into account feedback from consultation on the emerging plan where appropriate.

6.1. Demand management and leakage reductions

In defining our demand management strategy for the draft plan, we considered the feedback we received from our customers and stakeholders after the publication of the emerging regional plan in January 2022. We know that driving consumption down and tackling leakage are priority areas for our customers before we implement supply-side options. As such, they form a critical part of our plan to address the supply-demand deficits summarised earlier in this document.

The feedback from regulators such as the Environment Agency and Natural England indicated that our emerging plan did not present sufficient detail in relation to the actions to drive down PCC and tackle leakage. Regulators told us they will expect us to clearly evidence our demand management strategy and stress test the plan to an alternative future where we might not be able to achieve our demand management targets.

In response to this feedback, we have undertaken more work to refine our supply-demand balance and define our demand management strategy alongside our chosen supply options, to ensure we can cover the deficits we will encounter in the future. Further details are included in the water company WRMPs, beyond the summary provided in the regional plan. Targets and delivery are owned at a water company level.

Level of aspiration by 2050

Overall, we plan to meet the 50% reduction in leakage reduction policy aspiration (from 2017/18 levels) and 110 l/p/d PCC target by 2050. However, meeting the government policy aspirations for PCC is not only the responsibility of water companies; to meet these targets we are reliant on the introduction of government initiatives on water labelling. Importantly, if successful, this would help us overachieve the PCC reduction target to 106 l/p/d in the Yorkshire Grid which is where our biggest PWS challenges are.

We have outlined our demand management options in Section 7.1. Our plan is supported by investments in active leakage management and smart metering. We also explore the assumptions and uncertainties related to the achievement of our ambitions. These are mainly around the technological improvements that would allow us to tackle leaks more effectively and the successful rollout of the water labelling initiative.

Consideration was given as to whether lower or higher levels of aspiration should be pursued for leakage. This was also supported by testing the impact of lower levels of aspiration where this interacted with supply-side investment (Yorkshire Grid zone). Whilst it was concluded that options to meet the policy aspirations by 2050 should be included in the best-value plan, going beyond these was discounted due to the risks and uncertainty upon the plan.

Although meeting the policy aspirations is considered feasible, it is considered extremely challenging. With current leakage reduction techniques and costs it would not be possible to achieve the target by 2050. There is a high reliance upon future innovation beyond existing leakage techniques and methods. As the planning period progresses, we will actively seek measures to make current leakage reduction techniques more efficient and we expect new technology to make further reductions feasible at a lower cost. We produce WRMPs and business plans every five years and with each iteration, we will review the leakage techniques available and the costs and benefits.

Recognising the scale of the challenge, in addition to the Ofwat Common Reference Scenarios, we have also stress tested our plan to a scenario that assumes only half the demand reductions are possible for the Grid zone (see **Section 7.2**). The results show that the Yorkshire Grid would be at risk of deficit in this scenario, although this would only materialise from 2060 onwards. To mitigate against this risk, the progress against the PCC and leakage targets will be monitored year on year. Should there be any indication that we are starting to follow a low demand reduction trajectory, we will prepare to bring in planned supply options sooner than otherwise required in the preferred plan. We will also consider further mitigation measures in the form of additional demand management options in WRMP24.

Pace and profile of delivering reductions

The pace of PCC and leakage reductions at regional level is shown below. Each Company has considered an appropriate pace for each of their zones and/or areas taking account the specific challenges faced both in water resources terms and in delivery.

Table 6-1 Regional PCC and leakage reductions over time (final planning DYAA)

Regional	2029/30	2039/40	2049/50
PCC (l/h/d)	126.8	113.9	108.0
Total leakage (Ml/d)	352.1	281.9	233.7

Given the sizeable deficit to address in the preferred plan (Section 7) for the Yorkshire Grid, pace and delivery is key to regional investment decisions, and the timing or selection of supply-side schemes impacting multiple zones. Table 6-2 shows the specific reduction profile for this zone.

Table 6-2 Yorkshire Grid PCC and leakage reductions over time (final planning DYAA)

Grid zone	2029/30	2039/40	2049/50
PCC (l/h/d)	121.6	111.2	106.4
Total leakage (Ml/d)	240.1	188.9	159.6

In defining this pace of delivery, the following aspects were taken into account:

- Profiles assume the combined benefits of smart metering/networks included in our plan, and water efficiency initiatives. The assumption is that by installing smart meters into new households, meter optant properties and switching existing meters to smart we can

reduce the PCC of metered customers by 3% on average.

- Smart metering will be installed to both household and non-household properties from 2025 onwards (i.e. from the start of the planning horizon), building on recent trials. From 2025, all new developments will be provided with smart meters, and any customers choosing to switch from an unmetered to metered supply (optants) will be fitted with a smart meter. A smart meter retrofit programme will also occur over 15-years, recognising the scale of this undertaking.

- The interaction with the selection of supply-side schemes as part of the options appraisal process was explored (Section 7). The pace of leakage delivery was also determined in the context of the need for long-term innovation to achieve future reductions in a cost-efficient and deliverable manner; so reductions have to be suitably spread over time.

- The timing of wider government initiatives on water labelling and building regulations is key to reducing consumption. Initially company level initiatives have the largest impact, but over time water labelling benefits increase and by the 2040s has the greater impact. A Water UK/Defra project developed a number of demand management scenarios based around the potential impact of government-led interventions on per capita consumption (PCC). A scenario for water labelling (without minimum standards) was suggested to achieve 11 l/h/d by 2050. However, a WRSE study in 2021 reviewed the outputs and the predicted benefits, including evidence from Australia and concluded that the benefits from water labelling could not be disaggregated from benefits of other initiatives running at the same time. A more conservative water labelling benefit of 6l/h/d was therefore proposed. The Yorkshire Grid is based on a 6 l/h/d benefit by 2050. For this zone, the 11 l/h/d used by other companies (including others in WReN) was not considered realistic, given it already has one of the lowest average PCCs in England.

6.2. Drought resilience

In line with the Government's 25-year Environment Plan, water companies should plan to be resilient to a 0.2% annual chance (1 in 500 year) of failure caused by drought by 2039 (where failure is defined as implementing an emergency drought order).

Our refined supply-demand balance assessments have shown that, in line with government expectations to be resilient to a 1 in 500-year drought event, Northumbrian Water is capable of maintaining a surplus in both water resource zones across the planning period under this resilience standard once demand management and leakage reductions have been taken into account (**Section 7**). On the other hand, Yorkshire Water have made a choice to implement the 1 in 200-year drought resilience standard at the beginning of the planning period, and switch to a 1 in 500-year drought resilience standard in 2039/2040. This decision was taken as the Grid zone is in immediate deficit at the start of the planning period, therefore a lower drought resilience standard in the interim is required to reduce deficits until demand management and supply-side options are implemented.

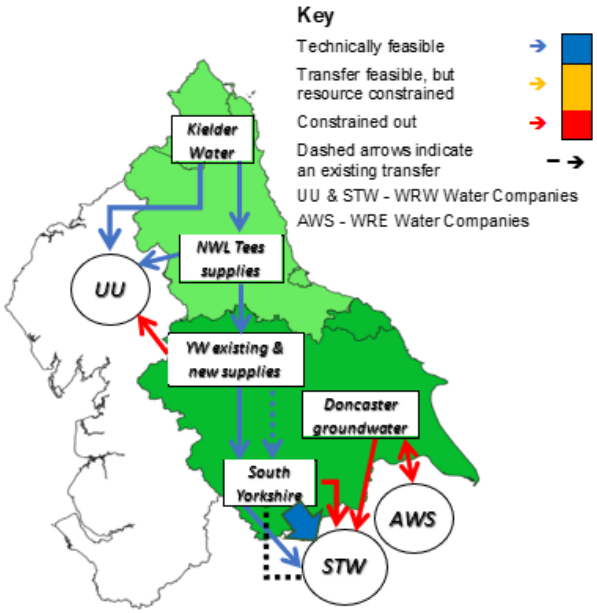
Yorkshire Water customers research results indicated that the level of service is typically seen as a low priority for investment, although this may in part be caused by the infrequency of experiencing such events; the duration of events (when they occur) is probably more important than the frequency. Therefore, the decision to remain at a reduced level of service until 2040 is compatible with customer research, taking account also of the affordability of investment over time.

6.3. Water transfers

As per the regional planning expectations outlined in **Section 1.1**, we have completed significant work to determine whether we can support national water resources resilience. This includes both transfers from areas with surplus or, if new water resources in our region were to be developed, to subsequently transfer water from new options to others outside the region (i.e. if a further surplus was created). We also explored whether these transfers may offer better value and more sustainable solutions than those developed purely at a local level in other regions, as part of the inter-regional reconciliation process (**Section 5.4**).

Figure 6-1 provides a conceptual representation of eight key[42] WReN options we explored in further detail for the potential transfer of water between regions.
It should be noted that these key transfers are just a sub-set of options originally discussed or explored, with 'early stage' unconstrained or small-scale options not being depicted. Further details of these transfer options are provided in Appendix 5.

Figure 6-1 Key transfers explored by WReN



Scheme Name	Status
Yorkshire Grid network to STW	
Kielder to UU transfer	
Cow Green to UU transfer	
Tees to STW via YW	
Doncaster to STW	
Bi-directional Doncaster to AWS	
Sheffield to Peak District (YW to STW)	
York to UU transfer	
Reduce STW import to YW	

In practice, no exports from the region have been selected by other regions, albeit there has been a significant change (essentially a 'reverse trade') through cessation of the existing Severn Trent transfer in 2035 as described in **Section 4.4**. This is due to current lack viable alternatives to meet environmental drivers in a specific zone for Severn Trent, as opposed to a collective 'best value plan' choice.

Export options to STW were not included in the plans, recognising also that for Yorkshire Grid there is an underlying deficit (compared to the traditionally view of this zone being in surplus for export) that would require further supply options to be developed to facilitate an export. The extent of options required, and thus the price point for such exports is therefore significantly greater than may have been anticipated at the start of the regional plan development process. Therefore, whilst the transfers may be technically feasible, the resource position constrains their practical application. In the case of the Tees to STW transfer via YW, the feasibility of this option for export is also impacted by our own plan position (Section 7).

In the case of the use of Kielder or Cow Green Reservoirs to support UU, significant further modelling work has been completed between NWL and UU to explore the level of availability to export water (noting that this work did not consider exports to both UU and YW at the same time). On the basis of availability alone, both options are viable to export water under a typical central SDB scenario, although in high scenario stress testing there is the potential for limitations to the transfer that could occur.

Despite this, UU did not select either of these options as part of their plans. Given the strategic prominence of Kielder Reservoir, WReN and WRW specifically explored the potential for export as part of inter-regional reconciliation. Kielder was not selected by WRW mainly on the basis of cost (driven by the assets needed to facilitate a transfer, as opposed to the cost of raw water provision by NWL) and carbon impacts. The cost difference to alternative options at this time was significant. WReN, NWL, WRW and UU will continue to appraise this option and will agree with RAPID whether or not to proceed with a Strategic Resource Option to investigate the option further.

It is worth noting also that a RAPID commissioned modelling study by The University of Manchester[43] also concluded that there were few, if any, cost-effective inter-regional transfers originating from WReN, and that with respect to accessing Kielder, the distance between this source and areas that require the water significantly increases the costs of possible transfers.

[42] As part of the WRMP process, there are a number of smaller transfer options that have been explored that are not depicted. Only larger strategically relevant transfers are depicted in the context of the regional plan. It is also worth noting that there may be options variants for certain transfers, representing different potential capacities.

[43] Slaughter, A., Harou, J.J., Tomlinson, J., Matrosov, E., Wilson, J., Dennis, J., Read, M.,
Dunford, T., Stokes, M., O. Walker, A. Widmaier, 2021, "A water supply-demand model for
England and Wales", RAPID commissioned report

Transfers to WRE

This aspect was also revisited during inter-regional reconciliation, and no transfers have been included from the WReN to WRE regions. This is because:

- YW, which adjoins WRE, does not have a long-term surplus in its grid zone without significant intervention (i.e. offsetting options), and so it is highly likely that water exported to WRE would need to be from the Kielder zone, resulting in long transfer distances. The Yorkshire Grid zone is already in significant deficit, requiring supply options to be developed even after demand management and leakage reductions (Section 7).
- Transfers have previously been explored as part of exploring strategic options between WReN and WRE, but the export would geographically send water to Lincolnshire, whereas WRE deficits require water into the Cambridge and Essex areas of the region. The Anglian system has numerous resource zones. Whilst there is a degree of interconnectivity by 2025, no additional capacity remains because existing transfers are largely utilised in response to WRMP19 drivers including peak licence caps and 1 in 200-year drought resilience.
- From the points above, in combination, transfers were not pursued by WRE on the basis of high cost, high carbon and environmental impact.

Given that no transfers have been selected by other regions as such, our plan choices are focussed on addressing the loss of the Derwent transfer from WRW / STW in 2035, and considering how transfers between areas of our region may help resolve water resources pressures concentrated on the Yorkshire Grid. Transfers within the region have been explored to meet WReN's own needs and challenges for consideration in the preferred plan (Section 7).

6.4. Environmental destination

The environmental destination component of our regional plan has initiated a broader conversation with stakeholders and regulators to understand what changes to abstraction may be required in the long term. One of the first steps in developing our plan was the prioritisation of catchments for further review based on national model scenarios. Prioritisation ensured that we could focus on those catchments with the greatest environmental risks and opportunities.

In support of the emerging plan, we conducted an online survey with a targeted group of stakeholders to explore local concerns and aspirations. Initial observations indicate that:

- There is a common view that whilst water abstraction is not currently a significant pressure, it is likely to be in the future
- Measures which deliver the greatest long-term resilience include nature-based solutions, flood-plain reconnection, variable reservoir releases / linking flood mitigation with water resources, plus improving water storage through better drainage.
- Various organisations, and in particular NGOs and water companies through local partnerships, are best placed to deliver solutions.
- Perceived barriers to implementation of resilient solutions include resource (financial and human) and lack of catchment-scale strategic planning or inclusion of natural capital into decision making.

We will build on the initial outputs from this survey in subsequent engagement activities (and alongside individual water company business planning in support of the next Price Review).

The common reference scenarios for environmental destination allow us to adaptively plan for environmental destination reductions that were not otherwise included in the emerging plan. We presented the environmental destination modelled scenarios in **Section 4.2** and the adaptive pathway for environmental destination is presented in **Section 7.3.**

At this time, the uncertainties around the final abstraction reductions required to deliver environmental destination are high. Noting the affordability concerns of customers and the need to deliver long-term effective solution as desired by stakeholders, we have based our plan upon the BAU+ scenario in the reported or central supply-demand balance in our plan. At this stage in the process, we do not consider planning higher levels of abstraction reduction to be appropriate, until further investigations at a site level. We have ensured our plan is adaptable to the alternative environmental destination scenarios.

To develop the evidence base underpinning the adaptive plan, we have identified a range of short, medium and long-term priorities for environmental destination. These are set out in detail in **Section 7.4**.

7. Our draft Regional Plan

Our draft Regional Plan includes a full revision of our supply-demand forecasts in line with Company WRMP submissions. Prior to applying further demand management and leakage reductions, drought measures and any further required supply options, the Kielder and Grid zones have forecast deficits.

In the case of Kielder, a healthy supply-demand balance results in our final planning position once the benefits of further demand management and leakage reductions are applied. For the Grid zone, further supply options are required to address the sizeable deficits in this zone, along with the loss of the existing import from Severn Trent in 2025 to meet environmental drivers in the Water Resources West area.

We have completed a full options appraisals to determine the benefits and disbenefits of our feasible options, to best guide our choices for the draft plan. Once the options have been selected, we tested the plan against a variety of scenarios to understand how the plan might change if the future supply demand balance is different from what we envisage. We have also presented alternative pathways as part of our plan, for example, to reflect the prospect of the existing transfer to be retained if the SRO work shows sufficient availability to meet both regions' needs in future.

7.1. Best value plan

Drivers of change

As shown by the baseline supply-demand position presented in Section 4.4, the two largest resource zones in our region present deficits prior to implementation of further options in our plan.

For Northumbrian Water, the Kielder zone shows a deficit of around 24 Ml/d by 2029/30, reducing to around 3 Ml/d by 2049/50. The deficits in the Kielder zone are mainly driven by the incorporation of the latest estimates of supply availability under 1:500 drought conditions combined with the impacts of climate change. The benefits of drought measures are also excluded from the baseline forecasts[44].

When looking at Yorkshire Water, the Grid zone presents a deficit of around 105 Ml/d from the start of the planning period, rising to 299 Ml/d in 2049/50. The underlying deficit is mostly caused by the implementation of the latest estimates of supply availability in drought, combined with climate change. However, the significantly increasing deficit over time is driven by (in order of magnitude):

- phasing in of abstraction reductions to meet the environmental destination (impacting the supply demand balance from 2035) – this forms the majority of the impact
- the termination of water imports from Severn Trent (impacting the supply demand balance from 2035), noting that this causes localised supply integrity issues that also need to be resolved
- further climate change impacts over time.

As the Yorkshire Grid zone is showing a large and immediate risk of deficit, Yorkshire Water produced an equivalent baseline DYAA supply forecast for the Grid zone 1 in 200-year level of service drought scenario for emergency drought orders. The new 1 in 500-year drought resilience level is expected to be met by 2039 at the latest, based on the Water Resources National Framework. When comparing the 1 in 200 to the 1 in 500-year drought resilience standard forecasts, there is still a material deficit at the start of the planning horizon of around 106 Ml/d by 2035/36. Whilst the baseline supply-demand figures do not include the benefit of drought measures, this result reaffirms the underlying risks and need to invest in both supply and demand interventions to ensure we are resilient to future dry weather conditions.

[44] In the Emerging Plan the general position for Kielder was presented as being in supply-demand surplus. Whilst the supply-demand position has been fully refreshed for the draft Regional Plan, it is worth noting that inclusion of the benefits of demand side drought measures such as Temporary Use Bans (TUBs) would broadly result in the zone either being in balance or in surplus. However, for the draft Regional Plan, the planning tables require these to be excluded for the purposes of presenting the baseline forecasts.

Options selected in the preferred draft plan

Given the above position, options are needed to bridge the deficits in the Kielder and Yorkshire Grid zone. For Northumbrian Water, no supply options have been selected in the preferred draft plan since demand management options needed to meet government expectations (as covered by our strategic choices in the previous section) alone is sufficient to cover deficits in the Kielder zone. For Yorkshire Water, investment in both supply and demand reduction options is required, and so is the focus of best-value plan choices through options appraisal related to our region.

Demand options

We have identified demand management options that will meet government aspirations with regards to achieving 50% leakage reduction, and reducing PCC to 110 l/p/d by 2050 (Table 7-1).

Table 7-1 Demand options benefiting Company zones with supply-demand deficit (Kielder and Grid)[45]

Water company	Option name	Benefit @ 2050 (Ml/d)
NWL	Active Leakage Control to reduce leakage by 50% by 2050	48.57
NWL	Metering Replacement of existing meters with smart meters by 2035 and Enhanced Optant Smart Metering	15.61
NWL	Water Efficiency Programme In home interventions and digital engagement to reduce PCC to 110l/p/d by 2050	47.18
YW	C5 Smart Metering and Water Efficiency	27.85
YW	L6 Active Leakage Control 95 Ml/d	95.30

In developing our demand management options, we have considered customer preferences which we confirmed through customer research. Customers place a high emphasis on leakage reduction and to support them in reducing their own water use. Active leakage control and smart metering are a key component of our plans. We are also reliant on the successful delivery of the government's water labelling initiative. Full details of the demand options applied to each company and zone are included in the draft WRMP24 submissions.

For Northumbrian Water, those demand reduction measures required to meet government expectations alone are sufficient to bridge all deficits in the Kielder zone, and result in a sizeable supply-demand surplus (see **Table 7-3** later in this section). Stress testing of the Ofwat Common Reference Scenarios has shown this resulting surplus to be robust to change.

In the case of Yorkshire Water, the scale of the deficit is significantly reduced, although not eradicated. Demand management equates to a demand reduction benefit of 63 Ml/d in the Yorkshire Grid zone by 2049/50, and with the addition of leakage reduction benefits this increases to 158 Ml/d.

Demand management policy assumptions and uncertainties

We are set to achieve the PCC target of 110 l/p/d requirement in our region. However, there is a degree of reliance on benefits derived from the introduction of the water labelling initiative by the government to help us achieve this target. The success of water labelling is dependent on government action, and those of appliance manufacturers, so there is a risk that the water labelling will not have the outcome we expect. Moreover, we are assuming that technology for leakage reduction will improve and become more economic over time, and that customers will respond positively to water saving initiatives. These assumptions create uncertainty in the solution programmes as we cannot guarantee that the policy reductions will be achieved. Tracking and monitoring progress as part of future planning cycles will be critical.

The eventual benefit achieved is particularly important for the Yorkshire Grid zone given the scale of the deficit, as any shortfall would have to be made up by other options. With water labelling, the average PCC is projected to be 106 l/p/d by 2050; without labelling it is projected to be 112 l/p/d, therefore missing the 110 l/p/d target. To ensure that our plan is suitably adaptive, we have stress tested our best value plan against a scenario which assumed that we can only

[45] Further options are also applied in zones with surplus, towards the government policy aspirations.

meet half of the demand reductions we envisage now (see **Section 7.2**).

Supply options

Our preferred plan contains a variety of supply options required to bridge deficits in the Yorkshire Grid zone. The supply solutions selected from our options appraisal process are presented in **Table 7-2** (the relative best value plan performance presented later in this section). This includes those to meet deficits beyond 2050 in our longer-term forecast period to 2084/85 used to inform the plan. For full definition of the options the reader is referred to the Yorkshire Water draft WRMP24.

As described earlier, there are other measures that will be implemented to mitigate deficits in the earlier part of the planning horizon. For example, operating at 1 in 200 level of service and implementing drought measures during dry weather are necessary to preserve supplies until we become resilient to more extreme droughts (i.e. 2039 at the latest). These measures have an immediate effect on the supply-demand balance.

Table 7-2. Preferred (best value) plan supply-side solutions

Preferred plan supply-side solutions	First year of benefit	Benefit (Ml/d) on full implementation
R13 East Yorkshire borehole – new groundwater supply and WTW	2025/2026	6 (8 maximum)
R37b(ii) R. Aire abstraction – new surface water supply to Bradford WTW	2025/2026	34
R3a abstraction licence transfer between two WTW at low flows	2027/2028	0.3 (15 maximum)
DV3 Magnesium Limestone new GW supply – new groundwater supply	2027/2028	5
R8b Sherwood Sandstone SRE	2027/2028	5
R8g Sherwood Sandstone support to grid	2028/2029	15
DV8(v) – Increase York WTW capacity to existing site footprint capacity - new treatment stream adjacent to existing site	2029/2030	50
DV8(iv) – New York WTW to south Yorkshire treated water transfer - 50Ml/d capacity 0 Ml/d benefit	2035/2036	n/a – required to transfer new source of supply to South Yorkshire
DV7a(vi) – Tees to WTW SR - 140Mld -transfer from Northumbrian Water supported by Kielder Water	2049/2050	140
R31a Additional bankside storage at York WTW	2066/2067	11
R85 Rebuild Kirklees WTW – new WTW	2068/2069	8

Transfers

As described earlier in Section 6.3, exports to other regions have been explored, but none have been selected as part of the inter-regional reconciliation process. We have also explored transfers between companies and zones in the WReN area to meet in-region needs.

A range of raw water export options from the River Tees (Northumbrian Water) to Yorkshire Water have been considered, supported by Kielder reservoir via the Tyne Tees Transfer system. A range of options sizes have been assessed, including modelling to test the impacts and interventions on the Kielder zone. The 140 Ml/d River Tees to Yorkshire Water option is included in the best value plan, by allowing areas of deficit in the region to benefit from those with surplus, albeit it is not required until 2040.

A 10 Ml/d export of treated water from Northumbrian Water's Darlington Water Treatment Works (WTW) to Yorkshire Water has also been considered, but this has not been selected in the best value plans of either water company.

Supply options deliverability risks

The benefits from new supply solutions also carry some uncertainty that we must factor into our planning. The near-term solution risks were considered when forming the preferred plan. However, there are further investigations required to conduct in future to:

- firm up the benefit of the options
- consider the environmental and social impacts and how to mitigate the effects of options
- achieve a 10% biodiversity net gain
- reduce our operational carbon to align with carbon net zero targets.

This creates a further risk that the time to implement could take longer than predicted, especially if the impacts and mitigation measures are complex. The risk of delivery is offset in the medium term as our plan includes sufficient supply and demand options to create a surplus. If early investigations show any of the supply options included in our best value plan will not achieve the assumed benefit, we can bring forward the implementation of options that make use of existing supplies. We shall also continue to explore further options to address this risk for our final plan.

For the longer-term risks from 2050 onwards, we will have sufficient time to monitor the progress of our plan and bring in more options in future WRMPs if the solutions are not achieving the benefits. The final decision on the future of the STW transfer and the River Derwent licence will be made in advance of the final dates, which would also influence the longer-term options.

Whilst modelling to understand the availability of the export from the Kielder zone has been completed, given the severe dry year in 2022 we will continue to work to explore how availability may change under different drought events and/or future utilisation patterns. There is also the potential for the option becoming an SRO and entering the RAPID gated process, which would also add further detail to the options design.

Final draft plan supply-demand balance position

By comparison to the baseline supply-demand balance shown in Section 4.4, a final planning supply-demand balance position summary (with target headroom) is presented for each WRZ in **Table 7-3** (which also includes the demand management and leakage reductions for zones not in baseline deficit).

As seen from this table, the Kielder zone deficits are and the zone is in significant surplus following implementation of our plans. This is due to demand side drought measures increasing the 1 in 500 deployable output, along with demand for water decreasing as a result of metering, water efficiency and leakage strategies. The Yorkshire Grid zone sees a reversal in the large deficits presented in the baseline supply-demand balance, owing to demand management and supply side options.

Table 7-3. Supply-demand balance (including headroom). Figures have been rounded.

Zone	2029/30	2039/40	2049/50
East SWZ	+4.29	+4.43	+4.38
Grid zone	+121.41	+70.40	+114.01
Kielder	+37.93	+99.72	+130.30
Berwick and Fowberry	+1.37	+1.95	+2.27
Hartlepool	+11.13	+5.28	+5.71

Best value plan performance

We developed several plans (i.e. a selection of options or solutions with an implementation schedule) through the water resources management planning process. This allows us to compare the performance of different or 'alternative' plans against a 'preferred plan', as described in Section 5.5 It is important that our plan considers cost and that we aim to meet the objective to produce a plan that is affordable and sustainable over the long term. Therefore, we compared the metric scores of our least cost plan to the metric scores of other candidate plan solutions and the best-value or preferred. The least cost plan is determined using only economic cost information and as its name suggests, is the plan with the lowest cost to restore a supply surplus in all years of the planning period with a baseline supply deficit forecast. The least cost plan does not consider other monetised criteria such as carbon or other societal and environmental impacts and benefits.

For Kielder, the least cost plan essentially performs the same as the best value plan and core plan, as only demand management solutions are required to meet the government policy objectives.

For Yorkshire Water Grid, the different candidate plans perform differently (**Figure 7-1** overleaf). The candidate solutions[46] differ as stated below (**Table 7-4**):

Table 7-4 Basis of candidate solutions

Candidate solution	Basis
01	Optimisation of options, but with mandated options to: • Meet demand management policy • Address loss of Derwent transfer • Address River Derwent environmental risks • Address YW resilience needs
03	As Candidate Solution 1, but with specific options mandated to increase resilience benefits. Constrained optimisation.
04	As Solution 3, but with reduced groundwater and total new supply benefits reduced.
04.01	As Solution 4, but addresses risk of deficit in the longer-term (2060s).

As seen in Table 7-5 the total highest score is given by the best value plan solution 04.01, with the lowest score given by the least cost plan.

Our assessment concluded Candidate Solution 04.01 is best value. This solution programme has the highest normalised score for five of the 13 best value metrics (customer preference, human and social wellbeing, biodiversity, multi abstractor benefit and flood risk management).

All candidate solutions score 100 on PCC and leakage as the benefits have been mandated into the programmes. Candidate solution 04.01 presents the lowest cost solution of the candidate solutions. Candidate solution 04.01 scores mid-way between the highest and lowest programme resilience scores and scores lowest on public water supply drought resilience.

Candidate solution 03 (blue) scored highest on programme resilience and public water supply drought resilience as it was designed to maximise resilience benefits. Implementing more supply options has a clear benefit to resilience and securing supplies, but this must be balanced with the potential for successful delivery. Our SEA assessment has highlighted risks that we need to investigate further before we could conclude whether the combination of options included in Candidate solution 03 is deliverable.

The other trade-offs are natural capital, carbon and public water supply drought resilience. Option reliability shows little variation. Although candidate solution 04.01 does not have the lowest natural capital score it is equal to all, but candidate solution 03 and scores highest of all programmes on biodiversity. The carbon results of all solution programmes show a very small range (72 to 78) and this is not considered material.

It is important to note that the best value portfolio is not selected through the metric performance alone, but also through the outcome of testing of options appraisal modelling outcomes across a range of pathways and scenarios. Options that were selected most frequently can be considered better value than the others. As model runs were optimised on cost alone, further analysis was needed to identify if any of the options not selected in the least cost runs should be included in the candidate solution portfolio based on their wider value. The approach is summarised in Section 5.5, along with Appendix 5 and the Yorkshire Water draft WRMP24 submission.

To aid consultation responses on the alternatives explored, Table 7-6 allows the reader to compare the alternative options selected under different candidate solutions, should they be interested in the location and nature of specific options.

Section 7.3 explains the adaptive pathways used to explore options and plans under different situations.

[46] Further detail available in Appendix 5, and within the YW draft WRMP24 submission, depending on the level of interest of the reader.

Figure 7-1 Number of depictions of metric performance between alternative candidate solutions

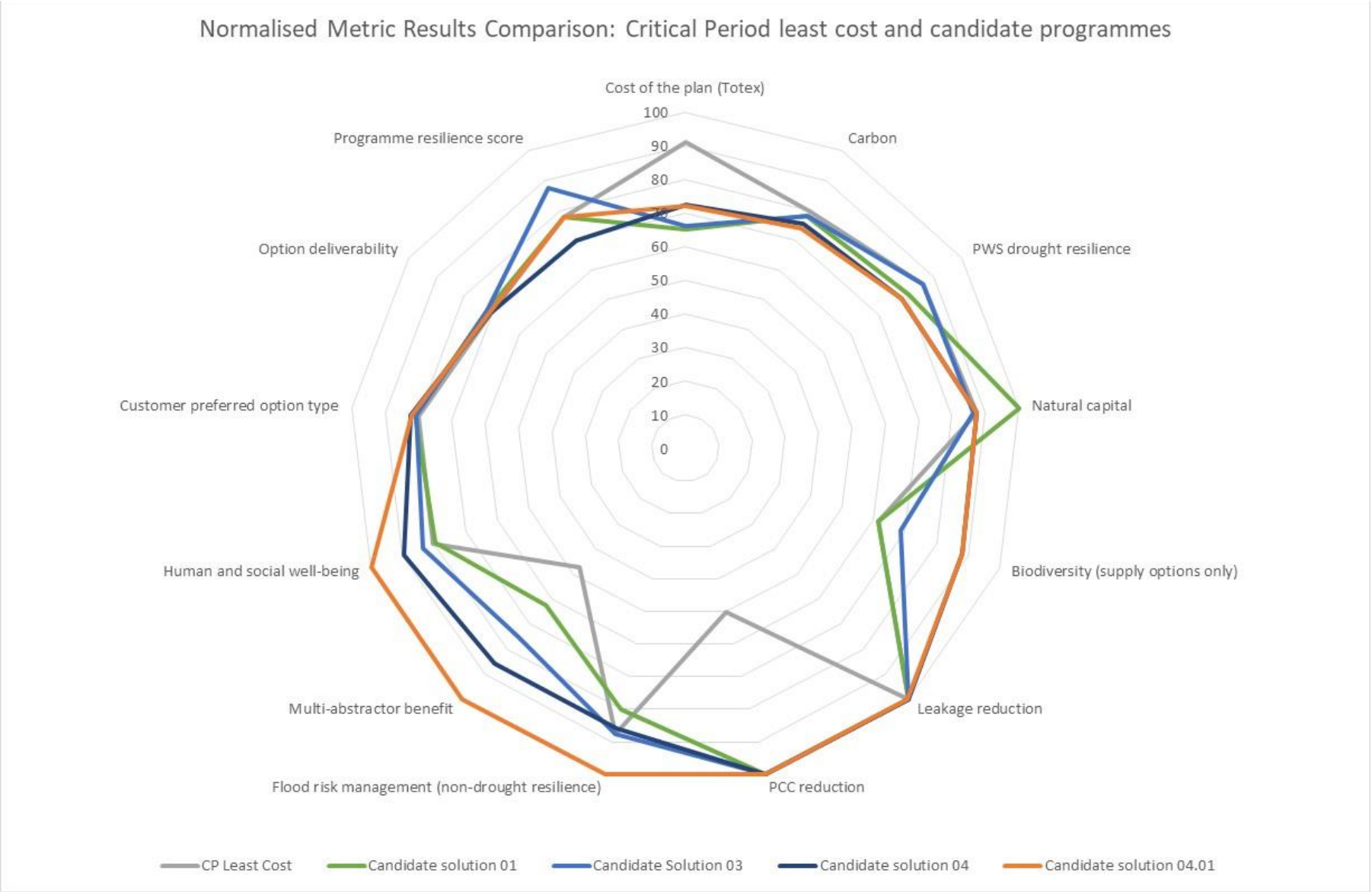


Table 7-5 Comparison of metric normalised scores between WReN regional reconciliation candidate solutions to address Grid deficit metrics compared to a least cost (with supply options only) scenario

	Cost of the plan (Totex)	Carbon 000s tCO2	PWS Drought resilience	Natural Capital £ NPV	Biodiversity (supply options only)	Leakage reduction Ml/d	PCC reduction 2050 l/h/d	Flood risk management (non-drought resilience) (SEA)	Multi-abstractor benefit (SEA)	Human and social well-being	Customer preferred option type	Option Deliverability	Programme resilience score	Total normalised score
Best Value Plan (Candidate solution 04.01)	72	74	78	88	88	100	100	100	100	100	82	71	78	**1131**
Candidate solution 03	63	78	86	100	72	100	100	87.50	86	86.79	81	72	88	**1100**
Candidate solution 04	73	75	78	88	88	100	100	85.71	86	89.61	82	71	70	**1086**
Candidate solution 01	65	78	81	100	62	100	100	80	62	79.65	81	72	78	**1039**
Least cost	100	92	86	85	100	100	50	50.00	43	56.65	75	72	50	**960**

**Values are normalised not absolute values, with 0 representing the worst performance and 100 representing the best performance.*

Table 7-6 Candidate solutions comparison (options selected) – Best value plan Vs alternatives, including least-cost

	DV3 Magnesium Limestone new GW supply	DV7a(v) Tees to York Pipeline – NWL import 80 Ml/d	DV7a(vi) Tees to York Pipeline – NWL import 140 Ml/d	DV8(iv) Tees to York Pipeline – NWL import 50 Ml/d	DV8(v) New WTW (York) supplied by the River Ouse	Household Flow Regulators A	R3 Increased River Ouse pumping capacity	L6 Active leakage control 95Ml/d	R13 East Yorkshire Groundwater Option 2	R29 Reservoir De-silting	R31a Additional bankside storage at York WTW	R3a River Ouse licence transfer	R5 Aquifer Storage and Recovery Scheme 1	R51 Supply Dales from the Tees – treated	R85 Rebuild Kirklees WTW	R86 West Yorkshire new WTW	R8b Sherwood and Magnesian Limestone BHs option 2	R8c Sherwood and Magnesian Limestone BHs option 3	R8f Sherwood and Magnesian Limestone BHs option 4	R8g Sherwood Sandstone support to North Yorkshire	C5 Smart Metering and Water Efficiency	R37b (ii) R. Aire abstraction option 4	R6d Grid – Doncaster Wellfield bidirectional link 20Ml/d	R85 CP Rebuild Kirklees WTW
Least cost plan	✓		✓	✓	✓	✓		✓	✓	✓	✓		✓	✓		✓	✓	✓	✓	✓				
Candidate solution 01	✓		✓	✓			✓	✓	✓		✓	✓				✓	✓	✓	✓	✓	✓		✓	✓
Candidate solution 03	✓		✓	✓	✓			✓	✓		✓	✓				✓	✓		✓	✓	✓		✓	
Candidate solution 04	✓		✓	✓	✓			✓	✓		✓	✓					✓			✓	✓	✓		
Candidate solution 04.01 (best-value plan)	✓		✓	✓	✓			✓	✓		✓	✓			✓		✓			✓	✓	✓		

A best-value plan for the region

As described in Section 5.5, as the key supply-demand challenge occurs in the Yorkshire Grid zone, the options appraisal process is driven by the Yorkshire Water WRMP24. However, through WReN, the potential for export from Northumbrian Water has been undertaken in a collaborative manner, allowing areas of surplus to support those in deficit within our region. YW has ensured that the selected export does not impinge on Northumbrian Water's plan position and broader regional impacts have been taken into account. In line with customer feedback, Yorkshire Water are undertaking significant demand-side action in addition to drawing on new supply-side schemes. Our approach to metrics has ensured that the costs and impacts cover assets in the Northumbrian Water area developed by/for Yorkshire Water to facilitate the transfer (e.g. carbon, environmental impacts).

Northumbrian Water has sufficient raw water within its Kielder WRZ to meet its own forecast customer demand over the planning period, forecast demand on Industrial Teesside and to provide a 140 Ml/d raw water transfer to Yorkshire Water from 2040. The 1:500-year drought resilience standard is not impacted by the transfer of water for Northumbrian Water, whilst helping to deliver improved resilience in the Yorkshire Grid. Operationally any impacts of the scheme are modest, given the regulated nature of the export from existing Northumbrian Water sources, whilst supporting significant environmental improvements to be delivered elsewhere in the region. Northumbrian Water and its customers receive some financial benefit from the export, reflecting a fair transfer of 'value' within the region for the use of available surplus water.

Best value plan costs and bill impacts

We know that a reliable supply of water is a priority for our customers. The investment that Ofwat allows for these plans will help us to continue to provide this essential service long into the future, but the cost of investments will be added to customer bills.

We know that this is a difficult time for customers with the current cost of living pressures that we are experiencing. We continue to work hard to make sure that our bills remain affordable for all. It is important to remember that the cost of the best value plan is spread across the planning horizon (2025 to 2085). The costs are also proportionate to each area, according to the level of investment needed to meet deficits. This means that the bill impact for Yorkshire Water customers will be higher than that for Northumbrian Water customers, due to the supply options (including the transfer of water from Northumbrian Water) required in the Yorkshire Water area.

For Northumbrian Water, the impact of the 'best value plan' would increase the typical bill between 2025 and 2030 by ~£7/annum in their region. For Yorkshire Water, the bill impact will be ~£4/year in the period 2025-2030, rising to ~£14/year by 2050. It is important to note these bill impacts are based on initial estimates. Further, more detailed assessment of the impact on customers' bills will be completed through the full PR24 business planning process.

7.2. Stress tests

A WRMP24 requirement is to undertake sensitivity testing to different planning assumptions, to understand how the best value plan might have to adapt if the future is different from what we envisage now. Ofwat has set out common reference scenarios with high and low parameters for climate change, demand, technology and abstraction reductions (environment). These are set to simulate futures where for example, climate change may be more or less severe, or more abstraction reductions may be required to protect the water environment. The lower scenarios typically relate to 'core' or low regrets investments that are required in all cases.

The scenarios are not exhaustive and within our region, we have also created other scenarios to test against. Stress testing is an important step required to inform the planned investment and solutions, so that they can suitably meet the needs of the future if the forecast position changes as part of the best-value adaptive plan.

For Kielder zone, no long-term abstraction sustainability reductions under environmental

destination are required, so they have not been included in the scenario testing. Results show that no supply deficits are caused by any of the common reference scenarios. Hence, their best value plan is sufficient to maintain a 1:500-year supply surplus in both WRZs and is a no regrets plan.

On the Grid zone, the stress testing scenarios have been adjusted to incorporate the benefit of planning to a 1 in 200 drought return period and the assumed benefit from drought measures until 2038/39. From 2039/40 onwards, any deficits represent a DYAA 1 in 500 level of service and no assumed benefit from drought measures.

The high climate change and environmental destination scenarios present a surplus until the mid to late 2070s; however, without the benefit of water labelling, they would be in deficit in the early 2060s. Under a combined high climate change and enhanced environment destination scenario can be met by the best value solution in the first 25 years of the planning period. With the assumed benefit of water labelling, it has a marginal surplus from 2050 to 2060 and without any benefit from labelling it would be in deficit from 2050 onwards.

The Ofwat Core scenario represents a lower deficit future which could occur if the Severn Trent Water transfer is maintained, and Yorkshire Water do not lose any of their River Derwent licence through the environmental destination (CSMG target). Under this scenario the internal transfer main from York to South Yorkshire (DV8(iv)) the Tees transfer (DV7a(vi)) option and the R31a Bankside storage at York WTW option would not be required.

As the high stress test scenarios risks are beyond the first 25 years of the planning period, there would be time to monitor the impacts of climate change and to plan for the enhanced environmental destination outcome. To demonstrate mitigation of these risks, Yorkshire Water have included the tidal abstraction reservoir (R78) option as an alternative scenario to their best value plan. This gives us time to complete the investigations before the risks emerge.

Testing also been completed on the sensitivity of the preferred plan on the Grid zone to demand reduction uncertainties. This scenario assumes half the assumed benefits, included in the preferred plan for leakage and PCC reduction. In this scenario, the zone becomes vulnerable in 2039 when the switch to a 1 in 500 level of service occurs. A marginal surplus in the DYAA baseline scenario would remain until 2060. This allows time to monitor the success of the demand reduction options and invest in further options in the future if the need is triggered. However, the surplus is very small, and the higher scenario shows a risk of a deficit and lower level of service may need to be operated to for a longer period.

If we were following this lower demand reduction scenario combined with the high climate change scenario, Yorkshire Water would require additional supply by the late 2030s in the Grid to be resilient to a 1 in 500 drought return period. The solution to this is to monitor the impact of demand reduction and climate change, and prepare for bringing the Tees transfer option forward in AMP8 to ensure the option can be brought online for 2039/40 if our plan (WRMP29) shows we are following a low demand reduction pathway. We have selected this option as it is already part of our longer-term solution, and it would be required by 2049/50 under the baseline scenario. We would need to develop further options for the longer-term deficit, and we shall consider this in the next planning round.

7.3. Adaptive pathways

In Section 7.2 above we explained the results of our sensitivity testing to understand whether our central (most likely) final plan supply demand balance, and therefore our Best Value Plan, is sensitive to less likely (low or high) planning assumptions on demand, climate change, technology and environmental abstraction sustainability reductions. The final step in formulating our preferred plan is to create an adaptive plan that enables it to be flexible to the uncertainties and divert to an alternative future if required.

Adaptive planning is a framework that is used to manage risk and uncertainty in the Best Value Plan. An adaptive plan presents:

- a central pathway and preferred programme representing the most likely future (based on the uncertainties); and,
- alternative pathways and programmes should our supply and/or demand forecasts manifest differently.

It is important to highlight that adaptive pathways are based on the risks that are most material and do not represent all the uncertainties. To plan for all uncertainties would be overly complex and the outcome may become unmanageable. There is also a risk of over investing if we do not balance our actions

with the time our plan can allow for the risks to develop.

For the Kielder zone, the sensitivity testing has shown that under all scenarios, a supply surplus is maintained across the planning period. Consequently, the preferred Best Value Plan does not need to be an adaptive plan.

For the Yorkshire Grid zone, no additional options are required beyond those included in their preferred plan. However, there are several risks that can be linked to key dates that trigger an alternative pathway. To ensure we are prepared for diverting to an alternative plan, we identify decision points in advance of the pathway diverging. Yorkshire Water's.

The decision points and triggers for their five potential pathways on the Yorkshire Grid Zone are shown in **Figure 7-2** later in this section. The associated pathway positions are explained below:

Pathway 1: The Preferred plan (most likely) scenario - This is the most likely pathway represented by the baseline supply-demand balance for the Grid zone.

Pathway 2: Severn Trent Water (STW) transfer is maintained - This pathway assumes the STW transfer could be maintained in the future. Under this scenario there are two options included in the preferred plan that would no longer be needed. The decision would be made in 2030 and the pathway triggered in 2035.

Pathway 3: Low demand reduction - This pathway assumes the combined benefits of leakage reduction and PCC reduction will be half that assumed in Yorkshire Water's preferred plan pathway. This pathway would bring forward the Tees transfer option and leave Yorkshire Water vulnerable in the longer term. A decision point in 2032 and a trigger in 2038 for this pathway have been included. However, the uncertainty cannot be defined to a single year, and Yorkshire Water will monitor progress, review and alter the preferred plan accordingly.

Pathway 4: Enhanced environmental destination: This pathway represents the enhanced environmental destination and the risk of additional deficit if the outcome of the River Derwent investigations is more severe than assumed in our preferred pathway. Under this scenario we would be required to invest in additional option in 2060s.

The trigger for the pathway is 2049 and the decision point is in 2032. The time between the decision and the trigger allows for the complexities of this pathway to be resolved. Currently, the scale of the loss is unknown, but could be high (130Ml/d or more). This reduction in our available supply would have a significant impact particularly if we were also following the low demand pathway. We have allowed time for understanding the impact and ensuing we have sufficient options implemented that can reliably secure supply to our customers.

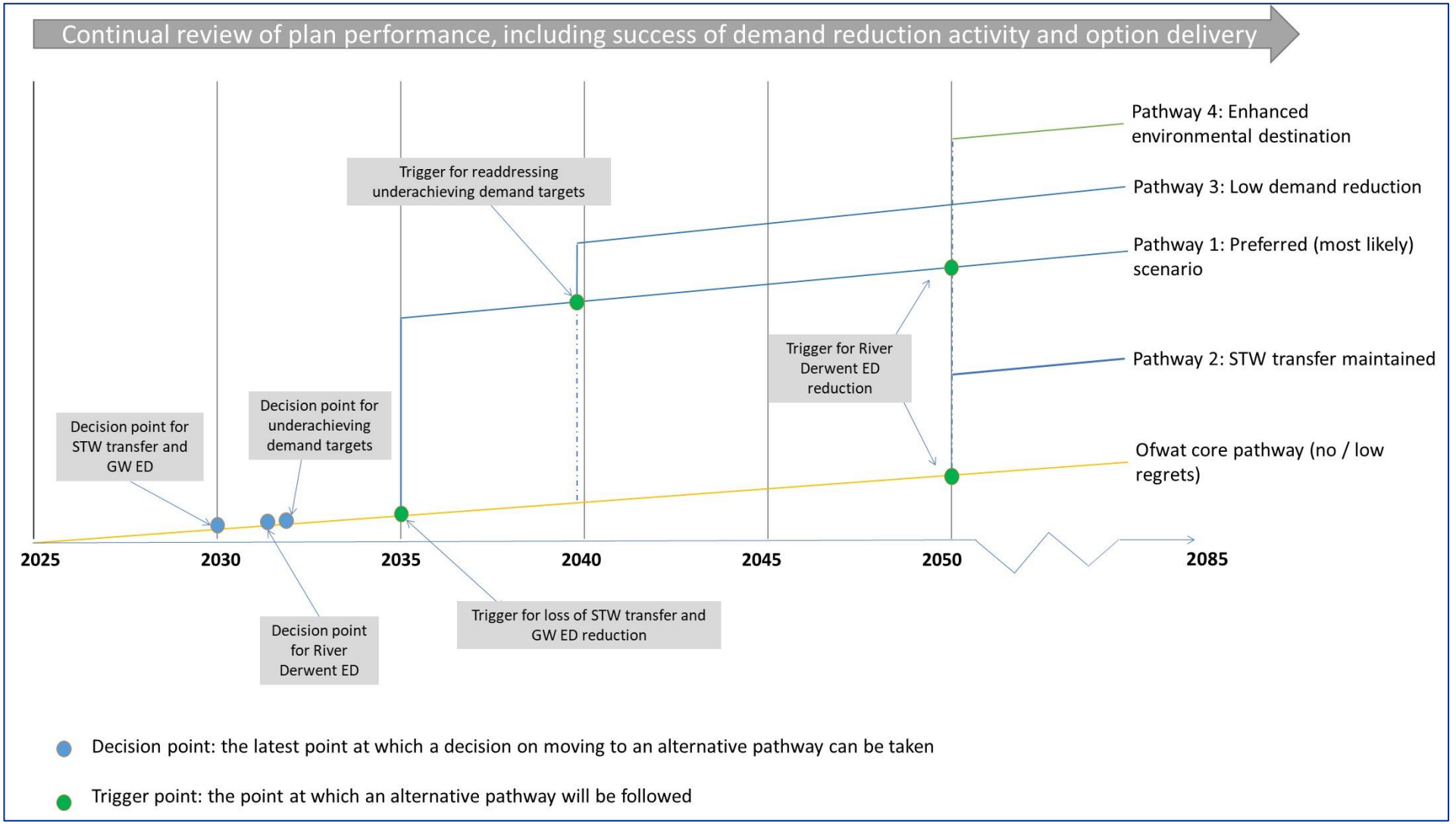
Ofwat core pathway: This pathway represents the minimum interventions required to ensure the future risks are mitigated and we are resilient to future drought events. It assumes all options planned for AMP8 (2025-2030) and AMP9 (2030-2035) will be implemented. However, as in Pathway 2, there is potential that the Severn Trent Water transfer could continue if their plan diverts to a different pathway. There is also a possible outcome from the River Derwent environmental destination investigations that the licence is not reduced. This alternative outcome would negate the need for three options included in the preferred pathway.

The options included in each of the alternative pathways are presented in the table overleaf. This shows a consistent selection of a 'core' of options across most pathways, and a smaller set of options as described are subject to change across pathways.

Table 7-7. Options included in different adaptive pathways

Option Name	Pathway 1: Preferred (Most Likely) Programme	Ofwat Core Programme	Pathway 2 – STW transfer maintained	Pathway 3: Low demand reduction	Pathway 4: Enhanced environmental destination
C5 Smart Metering and Water Efficiency	✓	✓	✓	✓	✓
DV3 Magnesium Limestone	✓	✓	✓	✓	✓
DV7a(vi) – Tees to York Pipeline – NWL import 140 Ml/d	✓	×	✓	✓	✓
DV8(iv) – Tees to South Yorkshire – NWL import 50Ml/d	✓	×	×	✓	✓
DV8(v) – Tees to South Yorkshire – NWL import 80Ml/d	✓	✓	✓	✓	✓
L6 Active Leakage Control 95 Ml/d	✓	✓	✓	✓	✓
R3a River Ouse licence transfer	✓	✓	✓	✓	✓
R8b Sherwood Sandstone and Magnesian Limestone Boreholes option 2	✓	✓	✓	✓	✓
R8g Sherwood Sandstone Boreholes support to North Yorkshire	✓	✓	✓	✓	✓
R13 East Yorkshire Groundwater Option 2	✓	✓	✓	✓	✓
R31a Additional bankside storage at York WTW	✓	×	×	✓	✓
R37b (ii) River Aire Abstraction option 4	✓	✓	✓	✓	✓
R85 Rebuild Kirklees WTW	✓	✓	✓	✓	✓
R78 Tidal Abstraction Reservoir	×	×	×	×	✓

Figure 7-2 Best value plan core adaptive pathways for tackling the Grid zone deficit within WReN[47]



[47] Further details on options development and implementation schedules over time are presented in the YW draft WRMP24 main technical document.

7.4. Environmental destination

Our stakeholder engagement revealed that our environmental destination has general support but there is further work needed to fully understand and prioritise changes required to water abstraction, to further understand the long-term view and evidence an agreed way forward.

It is recognised that WReN has a good level of information at catchment level and can build on this to frame future ambition with catchment stakeholders including continued dialogue with other sectors and environmental regulators; gathering additional information to prioritise needs for further.

In pursuing our long-term environmental destination, we also need to recognise the overlaps between this and WINEP investigations. The investigations might reveal information that can then be used to make decisions about licence changes or other measures to improve the water environment for the longer-term.

In the first five years of the plan (2025-2030) our focus is to undertake investigations that will provide a robust evidence base for our long-term environmental destination and the strategic choices/trade-offs that may be required. In the following five years (2030-2035), we will implement licence changes (where identified as required) to meet WFD objectives and continue our strategic options development and assessment. In the following 10 years (2035-2045), we will aim to progress the solutions identified in previous years, to support long-term environmental destination. In the period 2045 to 2050 (or sooner, if appropriate), we anticipate implementing all licence changes required to support the long-term Environmental Destination.

The outcome of our plan in the context of the Environmental Destination driver is that WReN will continue to support the principles of the Enhanced WRNF scenario whilst maintaining resilient water supplies. To this end, our short, medium and long-term priorities for environmental destination are described in Table 7-8.

Table 7-8. Short, Medium and Long-Term priorities for environmental destination

Short Term (0 – 5 years)	Medium Term (5 – 15 years)	Long Term (15 years +)
Complete AMP7 WINEP investigations to improve understanding of individual and cumulative impact of abstraction licences and relevance to regional plan. Implement AMP7 WINEP Implementation Schemes Prioritise further investigation for AMP8 in line with EA WINEP guidelines. Continued engagement with stakeholders to understand long-term aspirations and trade-offs, in particular for priority catchments. Explore alignment of regional planning activities with other initiatives (e.g., chalk stream restoration strategy and lowland peatland taskforce), where appropriate.	Undertake AMP8 investigations. Improve understanding of future use from other sectors and incorporate into future plans. Continue to review plans within adaptive planning framework, iterating the approach to environmental destination as required. Reflect outcomes of AMP7 investigations in company water resources plans / regional plan Undertake further investigation, where identified as being required following finalisation of first regional plan. Implement co-created WINEP.	Continue to review plans within adaptive planning framework, iterating the approach to environmental destination as required. Continue to implement co-created WINEPs

Planned AMP8 activity and investigations

AMP8 investigations and collaboration with other sectors will improve understanding and inform future plans.

Yorkshire Water AMP8 investigations include:

- Catchment-scale WINEP investigations to identify a sustainable long-term solution for the Lower River Derwent protected areas.
- Regional-scale WINEP options appraisals to develop and assess the feasibility of solutions to achieve environmental destination.
- Other WINEP options appraisals to identify sustainable water resources solutions at various groundwater sources.
- Exploring alternative approaches to reservoir compensation flow management that could increase ecological, water resources and flood resilience in the region in the long-term.

Northumbrian Water is working closely with regulators and stakeholders to identify what needs to be included in the WINEP for delivery in AMP8 (2025 to 2030). A challenge to aim for even more ambitious environmental outcomes for AMP8 has been set by regulators and in response, Northumbrian Water has been 'thinking big' around the delivery of more positive outcomes for the water environment and customers. Some of the proposals build on investigations undertaken in AMP7, while others build on the success in supporting partners to deliver holistic environmental projects. To this end, Northumbrian Water is working closely with other environmental organisations to identify the opportunities to develop bigger and better projects which will deliver multiple benefits for the environment.

Wider environmental work

We also contribute to wider environmental improvements that may not give a direct water resource benefit but offer wider environmental benefit (e.g. catchment solutions, flood risk benefits, wetland/peat restoration). These include:

- Further improvements in water quality, quantity available and biodiversity through continuing and extending Yorkshire and Northumbrian Water's catchment management schemes via the PR24 WINEP process.
- Continuing to grow water company support for our region's Rivers Trusts and CaBA to deliver meaningful improvements in river water quality and to remove obstructions, to provide the greatest ecological benefit to our region's rivers.
- Exploring alternative approaches to reservoir compensation flow management that could increase ecological, water resources and flood resilience in the region in the long-term.
- Continuing to work with upland stakeholders to deliver restoration of valuable blanket bog habitats, for a range of benefits including water quality, water retention, biodiversity and carbon sequestration.
- Improving our understanding of how WReN can support lowland peatlands through engagement with the Lowland Agricultural Peatland Task Force.
- Co-creating individual water company business plans with stakeholders in support of the next Price Review (PR24) to ensure local knowledge and aspirations accounted for in our investment plans.
- Continuing to work in partnership across various catchments to support the removal of barriers to migration and improving spawning habitats for Salmon through river restoration and the appropriate timing/volume of reservoir releases. This includes building on the success of the return of Atlantic Salmon to the River Don in Yorkshire.
- Supporting Defra's Chalk Stream Restoration strategy to protect and enhance the UK's most northerly chalk stream habitats in the East Riding of Yorkshire, including through the Chalk Stream Restoration Flagship programme in the Hull Headwaters.
- Protecting and enhancing priority species through Yorkshire Water's Biodiversity Enhancement programme.

We welcome your views on our draft plans

8. Next Steps

We will actively seek feedback from our customers, stakeholders and regulators on our draft regional plan alongside the water companies' draft WRMP24s in the consultation period through a number of informal and formal channels. We will use this feedback to further shape our final regional plan which will be reflected into the water companies' final WRMP24s in autumn 2023.

8.1. Consultation on the draft regional plan

Our draft regional plan has been developed alongside the water companies' draft WRMP24 and represents the best available data at the time. There will be a 14-week consultation period with stakeholders and regulators following publication of our draft regional plan alongside the draft WRMP24s.

The draft WRMPs can be found on the water company websites:

Yorkshire Water
Northumbrian Water
Anglian Water (HW)

Feedback from our stakeholders as part of this consultation will form a key part in determining any changes that may be needed before the final plan submission in autumn 2023.

Feedback and will be sought through a number of informal and formal channels including a national launch webinar, a WReN regional plan webinar and via direct email.

Have your say

The consultation period on the draft regional plan will start on **18-November-2022** and close on **24-February-2023**.

Please email your comments to **granville.davies@yorkshirewater.co.uk** or **william.robinson@nwl.co.uk**.

We will review the feedback and further engage with consultees to discuss the way forward on specific comments if necessary. We will communicate key messages received from the consultation and how feedback through this process is used to update, shape and improve the final regional plan that will be submitted in 2023.

Have your say

Key areas for feedback

- The approach to setting out future forecasts and uncertainties
- The strategic choices that we have made
- Our selection of options included the plan, compared to potential alternatives
- Our adaptive planning approach to address future uncertainties including loss of STW transfer and environmental destination
- Our approach to delivering environmental destination and improvements
- Challenges and opportunities associated with incorporating other sector needs

8.2. Towards the final WRMP24, regional plan

We will share feedback from our draft regional plan with water companies so they can consider in their revisions to WRMPs alongside feedback from the WRMP consultation.

We will take on board any relevant feedback on the three water company level WRMPs to ensure continued alignment with draft WRMPs .

We will continue to work with other sectors through our regular WReN Stakeholder Steering Group meeting and targeted forums in order to further understand the challenges, opportunities and the actions required to refine the approach for integrating other sectors into future regional planning cycles.

We will continue to consult and work closely with regional groups, water companies and other relevant parties through consultation and beyond, and in particular with Severn Trent Water and Water Resources West on the Derwent Valley strategic resource option.

As we monitor the current drought situation (the most severe drought since 1995/96), we will gather more information on the areas in our system most impacted to help identify where options could be required to strengthen our network and use this learning to inform our final WRMP24.

Glossary

Abstraction Licences	An abstraction licence gives you a right to take a certain quantity of water from a source of supply (inland water such as rivers or streams or an underground source).
Adaptive plan	An adaptive plan is a framework which allows you to consider multiple preferred programmes or options and sets out how you will make decisions within this framework. It responds to future uncertainties by setting out a sequence of manageable steps or decision-points, when these are required and how it will be monitored.
Adaptive pathways	Adaptive pathways indicate how the plan would change within an adaptive plan according to the decisions and steps that could be taken over time. Each pathway is a portfolio of options with a schedule of dates for when each option will be implemented.
AISC	Average Incremental Social Cost
Alternative plans	Several plans (as selection of options with an implementation schedule) may be developed through the water resources management planning process. Different or 'alternative' plans can be compared against a 'preferred plan'.
AMP	Asset Management Period (5-year price review period)
AMP6	Planning period 2015-16 to 2019-20
AMP7	Planning period 2020-21 to 2024-25
AMP8	Planning period 2025-26 to 2029-230
Baseline	A description of the present and future state, before any the adjustments due to changes or losses (e.g. due to development).
Best Value	An approach that considers other factors alongside costs when comparing different options e.g. other factors such as the environment, resilience and customer preferences
Catchment Based Approach (CaBA)	The Catchment Based Approach (CaBA) is a community-led approach that engages people and groups from across society to help improve our precious water environments: Home - CaBA (catchmentbasedapproach.org)
CAMS	Environment Agency's Catchment Abstraction Management Strategies (local licensing strategies that set out how water resources will be managed within a catchment area)
Catchment Plan (CP)	A catchment plan identifies the main issues within a catchment and prioritises work which will improve the catchment as a whole. This puts the catchment in a better position to achieve Water Framework Directive (WFD) targets, as well as other environmental and social goals: Catchment Planning | The RRC (https://www.therrc.co.uk/catchment-planning)
Decision-making metrics	Decision-making metrics are associated with developing an optimised best value plan. They sit beneath the overarching objectives to be achieved in the plan and might include measures of cost, environmental, social, and supply-demand benefits. Each metric is a criterion used to appraise option programmes or portfolios, towards identifying an overall best-value plan. They describe wider aspects of interest to regional water resources planning, beyond simply meeting supply-demand at least-cost as in traditional water resources planning.

Defra	Defra is the Department for Environment, Food and Rural Affairs and is the UK government department responsible for water resources in the UK.
Deployable Output (DO)	Deployable output is a building block in determining water supplies available for use and is defined as the output for specified conditions for a water resources system as constrained by; hydrological (source) yield; licensed quantities; abstraction assets; raw water transfer assets; treatment; water quality; and levels of service.
Dry Year Annual Average (DYAA)	Represents a period of low rainfall and unrestricted demand and is used as the basis of a water company's resources management plans.
DWI	The Drinking Water Inspectorate (DWI) was formed in 1990 to provide independent reassurance that water supplies in England and Wales are safe and drinking water quality is acceptable to consumers.
Environmental Destination (ED)	Describes a long-term destination (to 2050 and beyond) for environmental improvement and sustainable abstraction considering factors such as climate change impacts and future demand.
Environment Agency (EA)	The Environment Agency (EA) is an executive non-departmental public body, sponsored by the Department for Environment, Food & Rural Affairs. They are responsible for environmental regulation in England and includes producing and updating River Basin Management Plans.
Feasible options	A set of options that are suitable to assess for inclusion in the preferred plan. Feasible options are identified from a longer list of options by a process of *screening* to remove options with constraints that make them unsuitable for further promotion.
Habitats Regulations Assessment	A competent authority must decide if a plan or project proposal that affects a European site can go ahead. A European site is protected by the Conservation of Habitats and Species Regulations 2017 as amended (known as the Habitats Regulations). A habitats regulations assessment (HRA) under the Habitats Regulations, is applied to test if a plan or project proposal could significantly harm the designated features of a European site in England and Wales and their inshore waters (within 12 nautical miles of the coast).
HW	Hartlepool Water (Anglian Water Services)
Headroom	The difference between water available for use and demand at any given time.
Level of service (LoS)	Frequency with which the different types of specified actions would need to be taken during dry weather periods to help maintain the water supply.
l/h/d	Litres per head per day
Ml/d	Mega litres per day
Multi-criteria analysis (MCA)	Multi-criteria analysis is a structured technique for assessing options against a number of distinct objectives whose performance can be measured against a number of distinct objectives. It can also be used to explicitly explore the trade-offs between different candidate plans to inform the selection of preferred or alternative plans.
National Framework	The Environment Agency's National Framework explores England's long-term water needs and sets out the scale of action required for a resilient water supply that meets the needs of the future generation. It sets out a greater level of ambition for restoring, protecting and improving the environment that is the source of supply.
Natural Capital	The environment's stock of natural assets that support life including water, soil, air, minerals and ecosystems.

Non-Governmental Organisations (NGOs)	NGOs are typically voluntary groups of individuals or organizations that are not affiliated with any government and are formed to pursue purposes of public interest.
Non- Households	Properties receiving portable water supplies that are not occupied as domestic premises.
Non-public water supply (non-PWS)	Non-public water supply is any water supply that is not provided by a water company.
NWL	Northumbrian Water Limited
Ofwat	The Water Services Regulation Authority, or **Ofwat**, is the body responsible for economic regulation of the privatised water and sewerage industry in England and Wales. The Environment Agency is responsible for environmental regulation, and the Drinking Water Inspectorate for regulating drinking water quality
Per Capita consumption (PCC)	The amount of water typically used by one person per day.
Preferred options	The set of water resources options included in the preferred plan.
Preferred Plan	A set of options that has been selected through the water resources planning process which are shown to perform better against the objectives of the plan.
PR19	Price Review submission to Ofwat 2019
Regulators' Alliance for Progressing Infrastructure Development (RAPID)	RAPID was formed to help accelerate the development of new water infrastructure and design future regulatory frameworks and is a joint team is made up of the three water regulators Ofwat, Environment Agency and Drinking Water Inspectorate.
Regional Climate Model (RCM)	A regional climate model is a numerical climate prediction model forced by specified lateral and ocean conditions from a general circulation model (GCM) or observation-based data set that simulates atmospheric and land surface processes, while accounting for high-resolution topographical data, land-sea contrasts, surface characteristics, and other components of the Earth-system. https://glossary.ametsoc.org/wiki/Regional_climate_model
Regional plan	A long-term multi-sector adaptive water resource plan.
Representative Concentration Pathway (RCP)	A greenhouse gas concentration trajectory adopted by the Intergovernmental Panel on Climate Change (IPCC). Different pathways were used for climate modelling representing different climate futures which could arise depending on the volume of greenhouse gases emitted over time.
River Basin Management Plan (RBMP)	River basin management plans (RBMPs) describe the challenges that threaten the water environment and how these challenges can be managed and funded. The plans are based upon a detailed analysis of the pressures on the water bodies within the river basin district and an assessment of their impacts They set out the environmental objectives for the water bodies and a summary of the programme of measures that will be taken to achieve them.
Screening	The process where options are filtered using a set of screening criteria that determines whether they have constraints that make them unsuitable for further promotion. Defined screening criteria are used to ensure options are screened consistently. There may be several iterations of screening before a feasible list of options is determined.
STW	Severn Trent Water

Site of Special Scientific Interest (SSSI)	Site of Special Scientific Interest (SSSI) is a conservation designation and protects an area that's of interest to science due to particular features within its boundary e.g. rare species of fauna or flora or important geological / physiological features
Special Area of Conservation (SAC)	Special Area of Conservation (SAC) is a conservation designation to protect one or more special habitats and/or species – terrestrial or marine – listed in the Habitats Directive.
Special Protection Areas (SPAs)	Special Protection Areas (SPAs) are protected areas for birds in the UK.
Strategic Environmental Assessment (SEA) European Directive 2001/42/EC	'An assessment of the effects of certain plans and programmes on the environment'. Transposed into UK law via The Environmental Assessment of Plans and Programmes Regulations 2004
Strategic choices	Strategic choices are the key decisions to be taken in developing the plan and maybe regional or company or zone specific.
Strategic Resource Options (SROs)	Large-scale, inter-region strategic transfers of raw water being considered by companies and regional groups and supported by *RAPID* (see above).
Stress Testing	A process to test the resilience of a plan against future uncertainties.
Supply demand balance (SDB)	Supply minus demand and target headroom. An annual average presented for each year of the planning horizon (2025-2085).
Sustainability reduction	A sustainability reduction is the reduction in water company deployable output due to a sustainability change to a licence, driven by environmental legislation or need. A sustainability reduction is calculated by the water company and included in its WRMP, and would be linked to expected or possible interventions to be included in the WINEP.
Target headroom	This is a quantified *headroom* based on statistical analysis of uncertainties which is factored into the supply and demand balance estimates.
Unconstrained list of options	A list of possible water resource options that could reasonably be used in the plan before they are filtered (screened) using a set of defined screening criteria which will determine those that are unsuitable for further promotion.
UKCP09	United Kingdom Climate Projections 2009
UKCP18	United Kingdom Climate Projections 2018
UU	United Utilities
WAFU	Water Available For Use
Water Framework Directive (WFD) 2000/60/EC	A piece of EU legislation that requires all member states to make certain steps to protect and improve the quality and quantity of water within water bodies such as lakes and rivers.
Water Resources Management Plan (WRMP)	WRMPs are developed and published by water companies. They set out how water companies intend to achieve a secure supply of water for their customers and a protected and enhanced environment. The plan forecasts supply and demand over at least the statutory minimum period of 25 years. If a deficit is forecast, then the plan should consider supply-side options to increase the amount of water available and demand-side options to reduce the amount of water required. These plans are prepared every 5 years and reviewed annually and the two numbers following 'WRMP' indicate the year the plan is published.

Water Resources National Framework (WRNF)	A national framework for water resources - Meeting our future water needs, Environment Agency (March 2020)
Water resources planning guideline (WRPG)	Water resources planning guideline - GOV.UK (www.gov.uk), UK Government, 2021
Water Resource Zone (WRZ)	The WRZ is the principal building block used by companies to develop forecasts of supply and demand and produce a supply-demand balance (SDB). UKWIR/Environment Agency defines the 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."
What-if scenarios	This approach is applied to test proposed plans and explores what would happen if the future was different to that assumed in the forecast. For example, what if the impacts of climate change were more than assumed for the forecast or population growth was lower than forecast
WINEP (Water Industry National Environment Programme)	WINEP represents a set of actions that the Environment Agency have requested all 20 water companies operating in England, to complete between 2020 and 2025, in order to contribute towards meeting their environmental obligations. https://data.gov.uk/
YW	Yorkshire Water Services Limited

APPENDICES

A range of supporting appendices have been additionally supplied by WReN to complement this summary report. The appendices below have been previously consulted on regulators and other stakeholders (e.g. alongside the January 2022 emerging plan). They have continued to be developed and refined and incorporate feedback received from stakeholders and regulators. We will review any feedback received from the consultation of this draft regional plan where appropriate will update, shape and improve the final regional plan that will be submitted in 2023.

The following documents are available as standalone files to go alongside this draft region emerging plan for consultation:

- Appendix 1. Meeting the needs of the National Framework
- Appendix 2. Data input assumptions & commentary
- Appendix 3. Drought resilience and climate change
- Appendix 4. Objective and metric development
- Appendix 5. Option identification and appraisal
- Appendix 6. Environmental destination
    - Catchment dashboards – *Available on request*
- Appendix 7. WReN customer engagement report June 2021
- Appendix 8. Stakeholder engagement and collaboration
- WReN Strategic Environmental Assessment (SEA) Draft Environmental Report.

How to find out more

More information about Water Resources North, including our publications and how you can contact us, is available on our website, www.waterresourcesnorth.org.

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