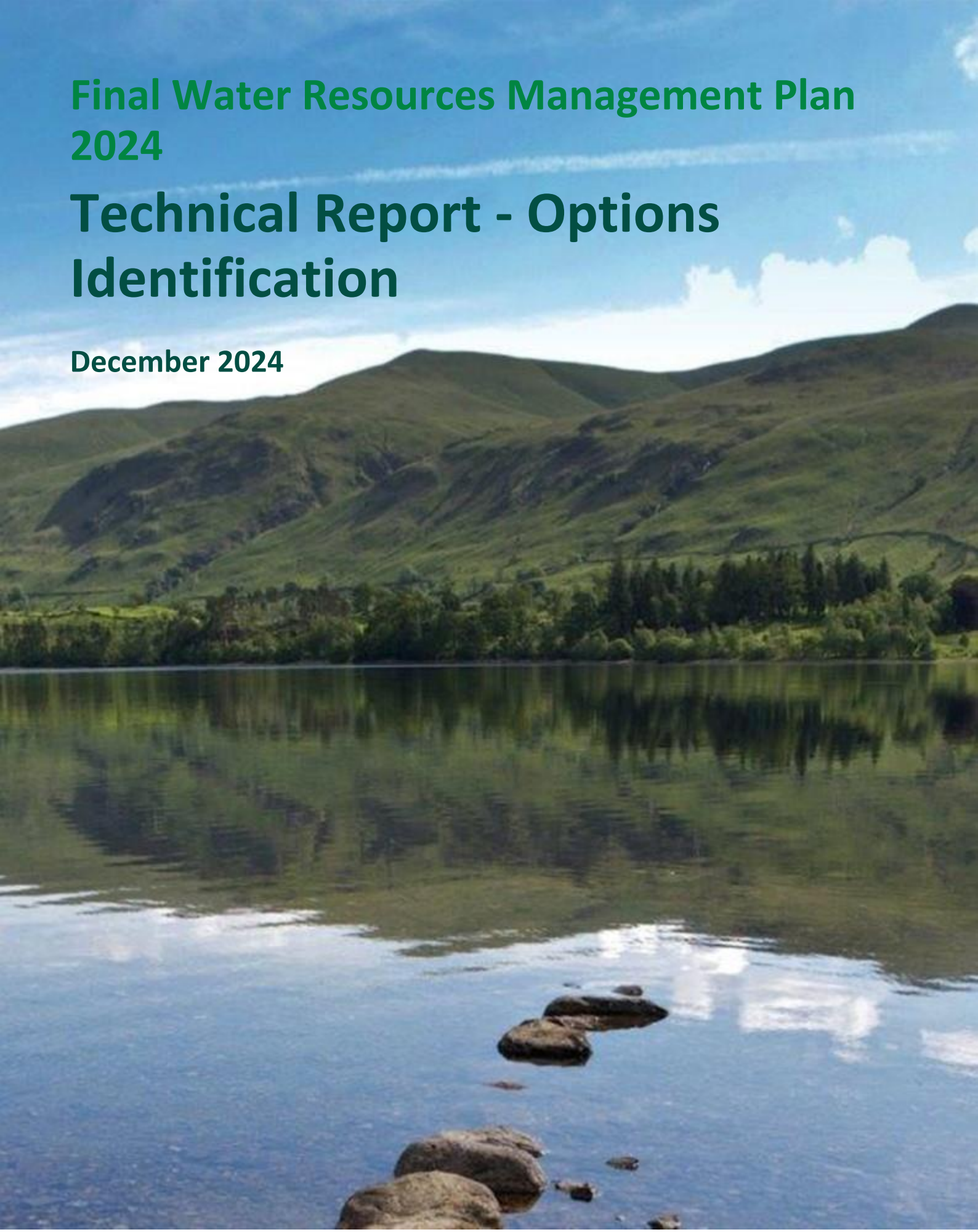
Final Water Resources Management Plan 2024

Technical Report - Options Identification

December 2024



United Utilities

Water for the North West

Contents

1. Introduction 5
1.1 Changes from draft to revised draft WRMP24 6
1.2 Changes from revised draft to Final WRMP24 6
2. Overview of the options identification process 8
3. Identification of unconstrained options 10
3.1 Overview 10
3.2 UUW resource management options 11
3.3 Production management options 19
3.4 Network management/production management options 20
3.5 UUW demand management options 21
3.6 Water transfer options 33
3.7 Third-party options 34
4. Unconstrained to feasible options: Primary screening 37
4.1 Overview 37
4.2 Primary screening process 37
4.3 Primary screening results 39
5. Feasible to refined feasible options: Option development and secondary screening 41
5.1 Overview 41
5.2 Development of option scopes and assumptions 41
5.3 Creation of cost estimates 45
5.4 Calculation of Average Incremental Cost (AIC) 45
5.5 Carbon accounting 46
5.6 Assessment of option benefits and utilisation 50
5.7 AIC shortlisting to select refined feasible options 54
6. Refined feasible to constrained options: Detailed screening 56
6.1 Environmental assessments 56
6.2 Detailed screening 56
6.3 Multi-criteria analysis (MCA) 61
6.4 Environmental assessment feedback to Engineering 62
7. Constrained options to preferred programme 63
7.1 Water quality risk assessments 63
7.2 Level 2 engineering assessments 65
7.3 Identification of the preferred plan 65
7.4 Detailed environmental assessments 70
7.5 Options summary 76

Appendices

Appendix A Option categories and options as proposed 78

Appendix B List of options and screening outcomes 84

Appendix C UUW options screening 130

Appendix D Options available for decision making 139

Tables

Table 1 Changes made between draft and revised draft 6
Table 2 Changes made between revised draft to final 6
Table 3 Option categories for defining unconstrained options 10
Table 4 De minimis option capacity thresholds 11
Table 5 Supply-side drought permit options 18
Table 6 List of reservoirs considered for improved reservoir compensation release control 20
Table 7 PALM approach/categories, with example interventions/options 23
Table 8 Type of meter and meter reading with estimated benefits 27
Table 9 Metering options considered 28
Table 10 Third-party options considered for WRMP24 36
Table 11 Primary screening criteria 38
Table 12 RAG grading system explanation 38
Table 13 Screening criteria used for demand options 39
Table 14 WRMP24 primary screening results 40
Table 15 UUW carbon pledges and science-based targets 46
Table 16 Scope 1, 2 & 3 greenhouse gas emissions (company wide, 2021/22) 46
Table 17 Basis for reported DO benefit values 52
Table 18 Examples of key demand option benefit assumptions 53
Table 19 Sample output of simulated utilisation in “extreme drought” 54
Table 20 Target WAFU for AIC shortlisting 55
Table 21 Detailed screening criteria 57
Table 22 Detailed screening results 57
Table 23 Best value metrics 61
Table 24 SWQRA risk assessment scenarios 63
Table 25 Table of limiting hazards considered for each category 64
Table 26 Summary of the preferred and alternative plans 65
Table 27 80-year whole-life carbon for the preferred options 69
Table 28 Final option status breakdown 77
Table 29 Resource management options 78
Table 30 Production management options 79
Table 31 Customer management options 80
Table 32 Distribution management options 81

Table 33 Environment Agency option type for WRMP tables 82
Table 34 Screening of groundwater sources 130
Table 35 Screening of surface water sources 134
Table 36 Constrained supply options 139
Table 37 Feasible demand options 145

Figures

Figure 1 Options identification process 8
Figure 2 Example of flow data derived for surface water options and used to support unconstrained options development 12
Figure 3 WRW approach to assessing the maturity of third-party and trading options 35
Figure 4 High-level water quality risk assessment example 44
Figure 5 Carbon pledges 48
Figure 6 AIC shortlisting graphic 55
Figure 7 Amount of abstraction that can be licensed in sensitive rivers 59
Figure 8 Assessment against equivalent 'actual flows' 60
Figure 9 Natural flow derivation from QUBE 61
Figure 10 Example of the United Utilities service area mapped to UKHAB 75
Figure 11 Example of the GIS offsetting site identification tool 76

1. Introduction

This technical report details how United Utilities Water Limited (UUW) has identified supply-side and demand-side options for inclusion in our Water Resources Management Plan 2024 (WRMP24). Options identification is an intrinsic part of the development of our WRMP, and is required to allow us to identify and consider plausible options to maintain our supply-demand balance or meet other related drivers (e.g. demand management and leakage targets), while at the same time ensuring adequate water supply reliability for all customers up to 2045 and beyond. Options are also identified with a view to supplying potential regional or national needs.

Our options identification approach follows the latest guidance from government and regulators. The Water Resources Guideline[1] (hereafter referred to as the Guideline) remains the primary guidance document stipulating key areas that should be considered in the options identification process. WRMP24 is the first set of plans developed under the new regional planning regime[2] and, therefore, differs significantly from previous WRMPs including new requirements for alignment with regional planning and consideration of strategic schemes where appropriate.

In line with government and regulatory guidance, the options identification methodology takes into account requirements to:

- Assess the feasibility of regional and inter-regional solutions;
- Align WRMPs with Regional Plans;
- Align WRMPs to the integrated development of water resource solutions[3];
- Align with drought planning guidance[4] to identify and develop drought demand and supply options; and
- Align with our Drainage and Wastewater Management Plan (DWMP).

Key considerations as the options are defined and developed include:

(a) **Resilience and reliability**: This includes an appreciation of how options can benefit our local and regional customers, the environment and demonstrate reduced susceptibility to drought. A key requirement of the overall WRMP is to understand resilience and define the benefits that increased resilience can provide, for example in terms of water available within the supply system at certain times. The options identification tasks of WRMP24 consider options that either maintain or enhance the resilience of the supply system. While resilience criteria might not be fully transparent at the options identification phase, the appraisal of options that pass the screening process and the development of the preferred programme includes resilience as one of the core objectives.

(b) **Environmental objectives**: Legislative drivers include for example, Environmental Destination, River Basin Management Plans and Water Framework Directive 'no deterioration', Habitats Directive and wider climate change considerations. The options identification process supports these objectives by considering risks and defining through the outputs of the process, those options that do not compromise these objectives at the planning stage, and the screening out of options that are considered to fail these objectives or be unmitigable. Further evidence and analysis are required as part of ongoing options development if they become part of the preferred programme submitted as part of the WRMP.

(c) **Range of options**: This involves exploring a wide range of options to ensure that the final list is robust and comprehensive. This will include consideration of our DWMP, which we are developing for the first time, and aligning for example, with our WRMP effluent reuse options. As well as considering local and strategic transfers to and from other water companies, this includes options that are identified by and developed with

[1] Environment Agency, Ofwat and Natural Resources Wales (2021) Water resources guideline. Version 10 updated Dec 2021.

[2] As set out in the Joint Regulatory Letter (August 2018) from Defra.

[3] As set out in Environment Agency (2020) Meeting our future water needs: A national framework for water resources.

[4] Environment Agency (2020) Water company drought plan guideline, April 2020.

other third parties such as industrial customers with existing abstraction licences, or developers of technologies to reduce customer demands for water.

(d) **Drought plan options**: These are now considered within the context of the WRMP process and aligned to our latest Final Drought Plan, published in September 2022.

(e) **Demand management**: Demand management consideration is primarily through metering, leakage reduction and water efficiency options. These include options identified by the company or by third parties.

1.1 Changes from draft to revised draft WRMP24

Table 1 Changes made between draft and revised draft

Change	Reason	Update(s)	Relevant section(s)
Update to preferred options	Change in water transfer requirements and our demand management strategy.	Tables and text updated	Section 7.3, Appendix B, Appendix D
Carbon	Environment Agency request for additional detail on description of greenhouse gas emissions and update to our carbon approach.	Updated text on our revised carbon approach and estimates.	Sections 5.5, 7.3
Drought permit and level of service options	Included as preferred options.	Updated text on option development (costing, utilisation, etc.).	Sections 3.2.16, 3.5.4, 5.3, 5.6.6
Catchment management	Clarification of baseline work being undertaken in the area.	Updated text on catchment management initiatives.	Section 3.2.15
Metering cost-effectiveness	Environment Agency request for additional detail on metering cost-effectiveness.	Table and text added	Section 3.5.2
Option status summary	To provide summary of final option status.	Table and text added.	Section 7.5

1.2 Changes from revised draft to Final WRMP24

Table 2 Changes made between revised draft to final

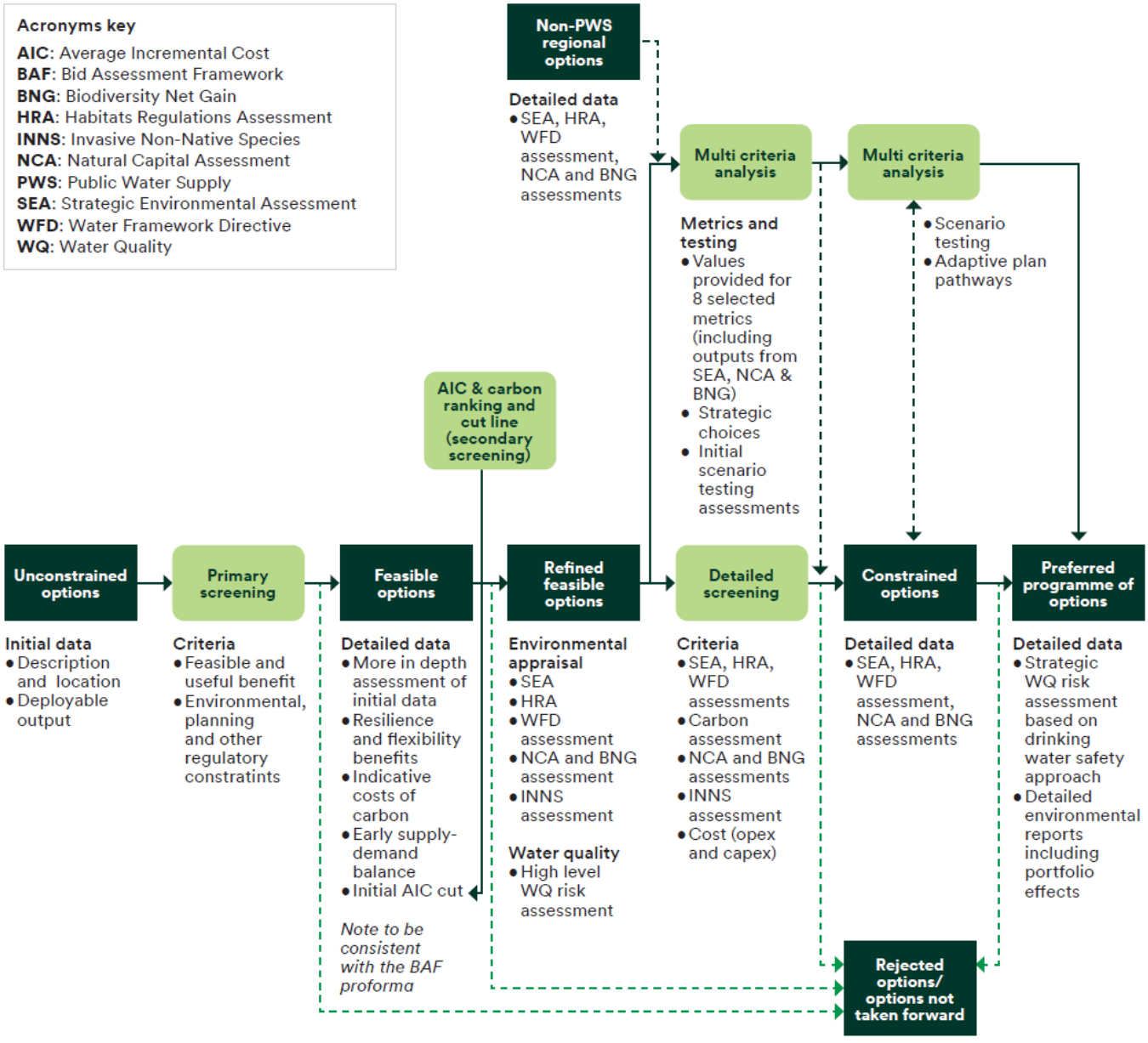
Change	Reason	Update(s)	Relevant section(s)
Provided examples of the improvements we have made to business-as-usual practice in AMP7 to reduce outage		Provided examples of the improvements and summarised what we have put forward for PR24	Section 3.2.8

Change	Reason	Update(s)	Relevant section(s)
Provided further details with regards to our pledges to reduce our carbon footprint		Provided further details for our 6 pledges to reduce our carbon footprint	Section 5.5.1
Updated table to include Castle Carrock and other drought plan options (i.e. TUBs and NEUBs)	Information missing from revised draft submission	Updated Table 26 and Table 27 to include Castle Carrock and other drought plan options (i.e. TUBs and NEUBs)	Section 7.3 and
Updated summary final option status breakdown table	Changes in options from revised draft	Updated summary final option status breakdown in Table 28	Section 7.5

2. Overview of the options identification process

Our WRMP has been developed in collaboration with Water Resources West (WRW), the regional group established to develop a regional water resources plan for the West of England and part of Wales. This collaboration has included developing methodologies for different WRMP workstreams to ensure that member water companies[5] adopt a consistent approach to key components of their WRMP that feed into the regional plan. The WRW options identification workflow is shown in Figure 1 with key components of the options identification process summarised below and discussed in further detail in subsequent sections of this report.

Figure 1 Options identification process



Following the assembly of a list of unconstrained options, primary screening criteria are applied to discount options that are considered infeasible and/or with unmitigable risks to produce a list of feasible options. Each feasible option is then assessed to provide costs (monetary and carbon) to construct and implement the option. To arrive at a more manageable list of feasible options for further assessment, a refined list of feasible options is produced by filtering out low cost/benefit options but ensuring that sufficient options remain in the process to allow real choices when assessing the preferred programme. Detailed screening refines the list of refined feasible

[5] United Utilities Water, Severn Trent Water, South Staffs Water and Dŵr Cymru Welsh Water.

options to a constrained list to be used in decision making to arrive at the preferred programme of options. To support this, a suite of environmental assessments[6] are completed to understand the potential impacts of the options and the environmental and social monetised cost impacts. Options discounted throughout the process are placed on the list of rejected options with an explanation of why they are rejected.

This document is set out in keeping with the above workflow based on the following sections:

- Section 3 which describes how we have developed our unconstrained options for consideration in our WRMP;
- Section 4 which describes how we have narrowed down our list of unconstrained options to feasible options;
- Section 5 which describes how we have developed our feasible options to better understand costs and scope and considered further screening to produce our refined feasible options;
- Section 6 which describes how we have assessed the possible environmental effects of our refined feasible options and further screening to derive our constrained options; and
- Section 7 which describes the assessments carried out on our constrained options to help inform decision making and the eventual selection of our preferred programme of options.

It is important to recognise the interrelationship between the options identification, decision making and environmental assessment methodologies. Options identification includes the development of technical details (e.g. scope, cost, supply/demand benefit) required to feed into environmental assessments and as specified in the decision making methodology. In its purest form, the boundary between options identification and decision making is considered to be the end of detailed screening, which determines the list of constrained options.

[6] Strategic Environmental Assessment (SEA), Habitats Regulations Assessment (HRA), Water Framework Directive (WFD), Natural Capital Assessment (NCA) and Biodiversity Net Gain (BNG).

3. Identification of unconstrained options

3.1 Overview

The list of unconstrained options used to develop the feasible options considered in our previous plan (WRMP19) was used as a starting point for our WRMP24 unconstrained options list. Options were also added to the list from within the Company (e.g. to resolve specific water resource resilience issues and meet demand management targets) and following consultation with external parties (e.g. other abstraction licence holders and potential new market entrants referred to as third parties). We have also engaged in bilateral discussions with other water companies to identify opportunities to better share resources, either as imports to, or exports from, our water supply system, and developed options to support regional planning.

In line with UK Water Industry Research (UKWIR) guidance[7], four generic option categories are considered when compiling the unconstrained options list as summarised in Table 3. Customer, distribution and some production management options are referred to as 'demand' options where the option provides a reduction in water consumed. Options related to the use of a source of water are termed 'resource' or 'supply' options. This distinction in terminology is used throughout the report. Our demand management approach supports the population of the customer and distribution management options. Resource options were assembled using the approach outlined in Section 3.2 and the production management options in Section 3.3.

Each generic option category comprises a number of recommended option types. To ensure consistency of approach, we have communicated this categorisation as part of our third-party engagement activities. We have further enriched this list with bespoke types of options that are not explicitly detailed in the UKWIR Report, for example, capture and use of urban surface water interceptor sewers and trade effluent reuse. Our methodology, therefore, demonstrates that we have developed an unconstrained list of plausible, technically feasible options and that as a minimum, we have considered options presented in the UKWIR Report. This approach ensures that we have, to the best of our knowledge, considered all options, which is commensurate with the requirements of the WRMP Guidance. Appendix A shows the option types we have considered. Option types used in the Environment Agency WRMP tables are provided in Table 33 and for consistency have been used in subsequent option lists in Appendix B and Appendix D.

Table 3 Option categories for defining unconstrained options

Option category	Examples of option types
Resource management	Surface water, groundwater, reclaimed water, abstraction licence trading (this includes both imports and exports of water to and from our supply system)
Production management	Leakage detection on raw water systems, water treatment works process loss reduction
Customer management	Metering, water efficiency, changes to level of service
Distribution management	Leakage detection and reduction

For all options including those offered from third parties, other than some customer management options[8], we considered it appropriate to set a de minimis limit on the quantity of water supply/saving offered in order to immediately eliminate options that are trivial in the context of water resources in our region. The de minimis volume was set at 0.1 per cent of our dry year, or critical period[9], distribution input for each water resource zone.

[7] UKWIR (2012) Water Resources Planning Tools 2012. Report Ref. No. 12/WR/27/6.

[8] By their very nature, customer management options relating to water efficiency do not generally deliver large volumetric savings. These types of option are often raised as important, to be considered by customers, regulators and stakeholders and they can easily be drawn together into programmes for implementation. It is appropriate not to apply the de minimis threshold to these options.

[9] This is the peak demand expected over a two-to-three-month period and applies in the Carlisle Resource Zone.

Options were considered if they equalled or exceeded the quantities shown in Table 4. In some instances, we used judgement if the options were close to the de minimis volume amounts.

Table 4 De minimis option capacity thresholds

Resource Zone	Demand plus target headroom in 2017 from WRMP19 (Ml/d)	De minimis option threshold (Ml/d)
Strategic	1,794	1.800
Carlisle	30	0.030
North Eden	7	0.007

3.2 UUW resource management options

3.2.1 Existing and new groundwater sources (GWE/GWN), surface water sources (SWE/SWN) and impounding reservoirs (RES)

For surface water and groundwater options, we adopted a systematic approach to identify possible options from our existing sources and potential new sources. The types of options considered can be split into four categories:

- Category 1 – Increasing the output of existing sources (those with abstraction licences and currently in use);
- Category 2 – Reinstating existing sources (those with or without abstraction licences but are not currently in use). This included our drought contingency sources;
- Category 3 – Increasing the storage capacity of our existing impounding reservoirs; and
- Category 4 – Construction of new surface water abstractions (e.g. rivers) or groundwater abstractions (e.g. boreholes) or transfer of other raw water sources (e.g. mine outflows).

All options considered our Environmental Destination, Water Industry National Environment Programme (WINEP), abstraction licence capping and the risk Invasive Non-Native Species (INNS). We used publicly available Environment Agency (EA) datasets[10] to ensure that we considered the full geographical coverage of our supply area and to identify available surface water and groundwater catchments where new or increased abstraction could be possible. With reference to these datasets and terminology, options were defined within four River Basin Districts (North West, Solway-Tweed and parts of the Dee and Severn that overlap our operational boundary). Within each River Basin District, we defined options for each of the Management Catchments (e.g. Alt and Crossens, Ribble, Douglas, North West Groundwater) and then down to what are termed Operational Catchments within each Management Catchment (e.g. using the four examples from above: Alt, Crossens; Calder, Darwen, Hodder and Loud; Douglas, Yarrow and Lostock; and Permo-Triassic, Carboniferous aquifers). Options were not identified to any higher resolution, i.e. down to individual waterbody level as this was considered too detailed for this process.

We then correlated our existing abstractions to their Management and Operational Catchments (categories 1 to 3). This included both licensed and unlicensed sources of water. It was then possible to assess in which Operational Catchments there was potential to either increase a particular source/group source output, or where, if little or no abstraction occurred from our sources, it might be possible to construct a new source of water. A cross check with our unconstrained options assembled for our previous WRMP was also made at this stage to ensure that no options had been omitted. Option capacities at this stage were only provided as being indicative.

For category 1 options, existing yield and capacity information was considered to determine if there was any opportunity to increase the amount of water that could be taken from a particular source. There are a limited number of such sources in our supply area and often, these are groundwater sources with existing constraints (such as pump capacities). Any options that were identified by this process were attributed as SWE or GWE type options.

[10] http://environment.data.gov.uk/catchment-planning/

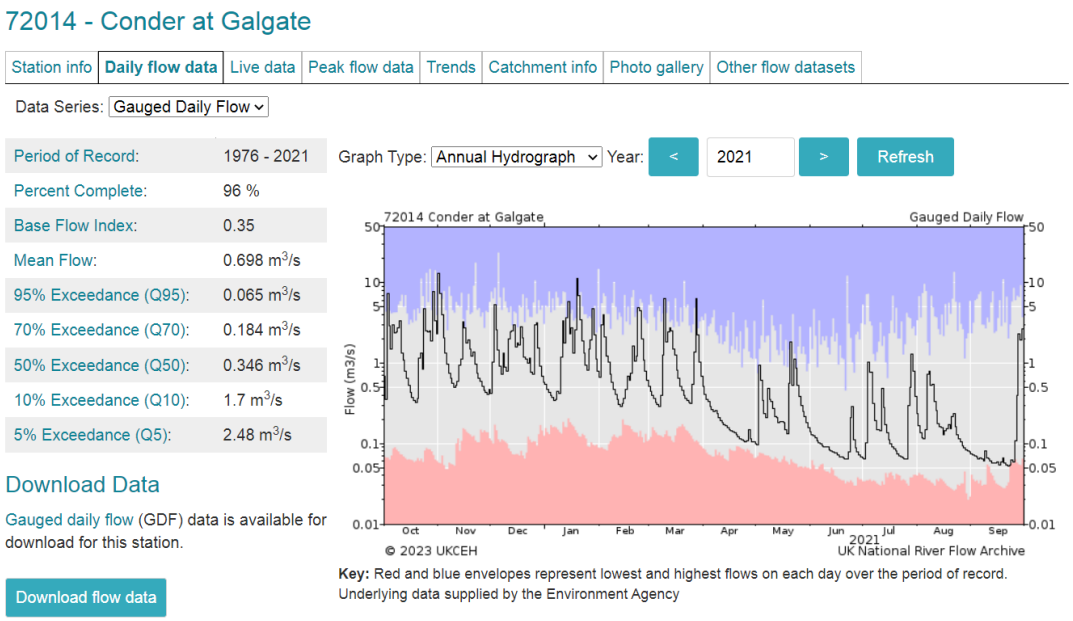
For category 2 options, we completed a review of our unused abstraction licences to understand what their historical output was. Where such data was available, this allowed for indicative capacities to be given. Where little data were available, further assessment was needed (see below). These were generally SWN or GWN options, although in some cases, unused reservoirs were also considered as RES type options.

For category 3 options, we completed an analysis of the potential additional volume that could be provided from our impounding reservoirs. We based this analysis on the depth-storage estimate of the additional volume in the top metre of the reservoir and whether this could be utilised at the de minimis option capacity for a minimum period of six months (>180 days). Sites where the abstraction could not be maintained for six months were discounted and considered not viable. In all, 125 reservoirs were considered in this approach and ten reservoirs were developed into unconstrained options with indicative scopes provided for engineering assessment. These were attributed as RES options.

For any new abstraction locations (category 4), an assessment was made of the most likely position for the abstraction. For surface water options, the point chosen was the waterbody furthest downstream within the Operational Catchment. For groundwater options, indicative locations were selected to align with our existing infrastructure (mainly existing water treatment work locations). The capacities of these type of options are sometimes difficult to ascertain at the unconstrained options stage but where possible, high-level hydrological/yield assessments were undertaken using available data.

For surface water options, flow data were ascribed to individual catchments either using the EA's catchment website or the Centre for Ecology and Hydrology (CEH) National River Flow Archive data pages[11]. In both cases, the purpose of this exercise was to ascertain the environmental flow requirements in the watercourses or the flow conditions. In the example shown in Figure 2 taken from the CEH National River flow archive web page, the low flow Q_{95} data were used as evidence of the availability of water and used to inform a possible option capacity. The assumptions used were documented (e.g. option capacity equals 25 per cent of Q_{95} flow).

Figure 2 Example of flow data derived for surface water options and used to support unconstrained options development



In all cases, our internal discussions, including with Water Asset and Network Management staff, were integral to determining the suitability of the proposed option locations relative to existing or proposed new water treatment works in order to best utilise the option capacity and seeking to minimise the option cost.

[11] http://nrfa.ceh.ac.uk/

3.2.2 Urban surface water (SWU)

Surface run-off, particularly from urban areas during and following rainfall events, represents a potentially significant resource that could be captured and utilised. We undertook an analysis of our wastewater network surface water catchments to understand which areas could generate significant flow volumes during a 1 in 30-year storm event. We highlighted five potential catchments that could generate flows up to 20 Ml/d after this type of event and then considered where this run-off could be taken for suitable treatment using our existing water treatment works locations. Significant risks associated with the development of this type of scheme include:

- Difficulty in predicting flows with any certainty as it is rainfall dependent, and it is possible to have low or zero flow when the resource may most likely be required (e.g. during the summer). However, this could be mitigated with suitable storage;
- Difficulty in predicting water quality risks with the raw water or stored water with any certainty and, therefore, difficulty in treating to the required water quality standards; and
- Water quality risks from misconnected sanitary appliances, highway type spills, petrol service station leaks and stagnation of stored surface water prior to treatment.

3.2.3 Aquifer storage and recovery (ASR) including managed aquifer recharge (MAR)

ASR/MAR is not currently used in our supply system and there are a number of potential technical/regulatory constraints that may limit its application. There may, however, be potential for innovative operational solutions utilising ASR/MAR to support peak demand or water quality to achieve water treatment benefits. To better understand this, we commissioned a feasibility study to investigate the potential benefit of ASR/MAR across a number of existing borehole groups in Fylde, Cheshire, Merseyside and Lancashire. The study indicated that there appears to be no critical water quality issue that would prevent the application of ASR/MAR in parts of Cheshire, and implementation of the technique may lead to improvements in native groundwater quality that currently requires moderate treatment. This may lead to an improvement in operational performance and more flexibility in how sources are used by removing certain water quality constraints. However, without further, more detailed work, there is no certainty at present that this type of option would lead to a successful outcome. We are investigating the feasibility of aquifer recharge as part of our place based planning pilot in the Fylde area. This may inform future plans.

3.2.4 Infiltration galleries (IGA)

Infiltration galleries comprise horizontal drains made of perforated pipes that are laid below the water table in certain aquifers, particularly shallow sand and gravel deposits. They can also be used to collect sub-surface flows from river systems and the water piped to a collection well before being pumped to storage. Infiltration galleries are often used in areas with poor water availability and not commonly used in the UK. There are water quality and contamination risks due to shallow flow pathways and regular maintenance is required to protect the yield of the system. Opportunities for the development of infiltration galleries are considered to be limited above and beyond those abstractions proposed from either groundwater or surface water sources and there is no certainty that a scheme could be designed successfully.

3.2.5 Desalination options (DSL)

Desalination technology is proven around the world as suitable for large scale water supply schemes, however, less in the UK as they are usually associated with high cost and carbon emissions. Four potential locations for new desalination water treatment works were considered within our region, for both the Strategic Resource Zone (SRZ) and Carlisle Resource Zone (CRZ). The location of these sites and the most suitable locations for the treated water to be used within our current supply system was agreed following internal discussions.

3.2.6 Conjunctive use of sources (CON)

We completed a piece of work to identify possible options that, with improved connectivity or operation of our existing system, could be considered as new unconstrained options. This was completed using our water resources modelling software, Aquator™. The conclusion of this work was that the water supply system in the

Strategic Resource Zone is already well connected in terms of dealing with dry year demand or drought in the region. With the opportunity to further link the network limited, it was considered that investment would be better used to bring new raw water into the resource zone to realise further benefits.

Overall, as part of options identification, we have carefully considered how any resource options are used conjunctively as part of the wider resource zone, and so CON principles are well represented in the inherent consideration of options through this process elsewhere. For example, one option was identified, which involved increasing the capacity of a raw water collector main in the Fylde area, which did realise some additional benefits when analysed with Aquator™. This option was later amalgamated with other GWN type groundwater options in this same area to provide a single option.

3.2.7 Changes in level of service (LOS)

Level of service is described as the reliability of water supply to customers expressed as the frequency of the imposition of water use restrictions. Through our customer and stakeholder engagement research we considered whether changes to the level of service would be favoured. This work is documented in our *Technical Report – Customer and stakeholder engagement.* The conclusion of this exercise was that customer preferences favoured increased levels of service and demonstrated high willingness to pay to reduce the frequency of temporary use bans (TUBs) from the current 1 in 20 to 1 in 40 as part of our research. In the case of drought permits, there is also a high level of concern with some stakeholders on the existing frequency of those being implemented.

We included three proposals as unconstrained options relating to possible changes in relation to the implementation of TUBs and non-essential use bans. The change in level of service for TUBs from 1 in 20 to 1 in 40 was taken forward as a feasible option following consultation feedback received from the Environment Agency (see our draft WRMP24 Statement of Response[12]).

3.2.8 Outage reduction (OUT)

The amount of supply available to meet demand during a drought is termed 'Deployable Output'. The period in which an asset is unavailable or has reduced capacity is termed an 'Outage', and it can reduce the total deployable output within a resource zone. Or equivalently, "Outage is a short-term loss in deployable output" (EA, 2020). We have considered two possible ways in which the availability of water resources could be improved by modifications to our outage allowance.

(1) Reduction in outages by refurbishment (enhanced maintenance) of raw water infrastructure; and

(2) Reduction in outages of raw water transfer systems through proactive asset condition assessment and smart operation of non-infrastructure assets.

As a company we aim to maintain our assets to minimise outage. Part of our business as usual practice is to find ways to continuously improve outage and as such we do not have any outage options. Examples of the improvements we've made to business as usual practice in AMP7 include:

- We have built on our operational hydrology and water production capabilities to ensure better alignment between water resources and operational planning by introducing a number of new roles in both modelling and outage management;
- We have embedded our dedicated outage management processes to ensure resilience and optimisation of our regional water supply system. Our outage management approach grades all outage requests in order to define scale and impact on water resources; requests are then modelled in Miser to understand the best production plan across the region. This plan goes through a governance process;
- Under our multiple award winning 'Maintenance Excellence' transformation programme we have created new systems/processes between scheduling teams and operational colleagues to group maintenance activities and undertake proactive maintenance to reduce the number of site outages required. Proactive maintenance has increased companywide by 12% since 2022. This has resulted in optimised outage plans

[12] https://www.unitedutilities.com/globalassets/z_corporate-site/about-us-pdfs/wrmp24-drafts/uuw-draft-wrmp24-statement-of-response1.pdf

for the year, as highlighted by our sector-leading performance within our unplanned outage measure. We continue with work to improve proactive maintenance;

- In our Strategic and Carlisle conjunctive use systems we assess all planned outages using our Miser model, which takes into account the current system conditions (water resource levels, planned current and future outages, reservoir drawdowns). The Miser model informs us of the optimum window for maintenance (planned) outages; and
- For consistency we have worked to align, as much as possible, our Aquator (long-term planning) model with our Miser (operational planning) model.

We will continue to align our 'Maintenance Excellence' and outage programmes to reduce the number of outages required by grouping maintenance activities. This will further align to our cleaning and capital maintenance programmes. We are also continuing with work to move to a proactive-led maintenance regime.

As part of our PR24 submission we proposed investment in a number of water treatment works to upgrade the resilience of existing treatment processes (targeted at water quality issues) and improve overall asset health rather than the capacity of Water Treatment Works (WTWs). This investment is driven by deterioration in raw water quality. The interventions resulting from this investment will ultimately lead to fewer outages at the sites where the upgrades take place. In future assessments of outage allowance, the frequency, duration and impact of the outages at these sites could be reduced. The impact of this should be seen in the outage allowance of future WRMPs, however the effect is expected to be relatively small. Since this investment isn't driven by a supply-demand balance requirement, no additional outage reduction options have been considered for our plan.

3.2.9 Raw water transfers (RWT)

The transfer of raw waters has been considered in other option types, either between catchments or direct to treatment works and, therefore, no specific options have been described under this category within our existing supply system. However, there are a number of third-party export options that are considered as raw water transfers (Section 3.7).

3.2.10 Tankering of water (TAN)

Due to the geographical size of the three water resource zones that form our supply area, tankering of water would not satisfy operational needs and would involve significant environmental impact from traffic movements and to communities and is not considered viable to meet the supply-demand balance. Therefore, this category has not been considered as an unconstrained option. We do deploy tankering at scale to minimise the impact of operational issues, however, tankering is not a long-term solution.

3.2.11 Rain cloud seeding (RCS)

It is possible to artificially create precipitation during periods of dry weather. Rainfall during this process occurs when super cooled droplets of water, those that are still liquid but are at a temperature below the usual freezing point of zero degrees Celsius, form ice crystals. These fall from the air, often melting on their way down to form rain. Chemicals are used such as silver iodide or solid carbon dioxide and promote rainfall by inducing nucleation. This can be done either by spraying from the ground or using aeroplanes.

The process has been trialled in Australia, France, Spain and the USA. In the United Arab Emirates, the technique is credited with the creation of 52 storms in the Abu Dhabi desert, while China reports use of the technology in reverse to keep the Beijing Olympic Games of 2008 dry. Recent research suggests that the process is not as effective as was originally believed and there is no certainty that rain cloud seeding would have success as a supply-demand option to be considered in the WRMP process. A reference is provided for further details[13]. A generic unconstrained option was developed and presented to the primary screening process with these risks identified.

[13] Zev Levin, Noam Halfon, Pinhas Alpert. Reassessment of rain enhancement experiments and operations in Israel including synoptic considerations. Atmospheric Research, 2010; 97 (4): 513 DOI: 10.1016/j.atmosres.2010.06.011.

3.2.12 Tidal barrages (TBA)

Tidal barrages are used primarily for energy supplies rather than providing additional sources of water for public water supplies through both the ebb and flood flows via turbines. There is reported evidence that the impoundment of sea water can alter the water chemistry (reduced turbidity) and hence affect sun penetration and the ecosystem. There is no certainty that construction of such a scheme would offer a defined supply-demand benefit. A generic unconstrained option was developed and presented to the primary screening process with these risks identified.

3.2.13 Wastewater treatment works effluent reuse (EFR)

We have defined a number of potential effluent reuse schemes as unconstrained options. This is where final treated effluent from our wastewater treatment works (WwTW) is retreated to potable treated water standards. This can be either direct (piped straight to treatment) or indirect (re-abstracted from the environment from the downstream receiving watercourse).

We adopted a similar approach to the assessment of effluent reuse schemes, which we completed for our last WRMP:

- We considered 275 of our WwTW[14] split across all of the water resource zones;
- We then reduced these sites in number by applying the de minimis option capacity threshold to the documented dry-weather flow[15]. This reduced the number of sites to 154. Clearly, this number is too large for each to form individual unconstrained options so further analysis was needed;
- We considered whether it would be possible to analyse environmental objectives for the receiving watercourses, but this proved to be inconclusive and so a geographical GIS radial analysis between the proximity of existing WwTW locations to existing water treatment work locations was completed in order to reduce the number of sites further. A distance of two km was used, the assumption being that construction schemes further than this would be cost prohibitive. This is the same approach we used in the previous WRMP;
- It was then assumed that up to 50 per cent of the dry weather flow may be available for abstraction downstream of the discharge point, because retention of some flow within the watercourse would be required;
- Further sites were then discounted based on other evidence, for example, if the water treatment works was already detailed as another unconstrained option with a new resource;
- The result of this work was that eight potential sites (seven in the Strategic Resource Zone and one in the Carlisle Resource Zone) could be considered as unconstrained options; and
- No options were selected for the North Eden Resource Zone, which has very small WwTW locations geographically remote from existing small groundwater water treatment works sites. With no proposed supply-demand deficit, it was considered unlikely that a new effluent reuse scheme option would be required.

3.2.14 Trade effluent reuse (TER)

We have considered whether trade effluent discharges could form a potential resource option. However, apart from one source of trade effluent located in north-west Cumbria, all of the trade effluent we receive requires treatment and already goes to our existing WwTW facilities. The site in Cumbria discharges to a local watercourse and we have developed a surface water option for this operational catchment. Therefore, no separate TER type options have been developed as unconstrained options.

[14] We have more than 560 WwTW in our region, a large number of which are very small, rural sites with appropriate but constrained treatment capacities. These were excluded from the analysis.

[15] The dry weather flow for wastewater treatment works compliance is measured as the total daily flow exceeded for 20 per cent of the year (Q_{80}). It represents flows received at a works during dry weather.

3.2.15 Catchment management schemes (CAM)

UUW is reliant on the natural ecosystems of the North West region to provide a resilient water and wastewater service to customers. The natural environment and ecosystem services are under increasing pressure from demographic change and climate change, which is driving the need for us all to do more to protect and enhance nature. Through the delivery of the ground-breaking Sustainable Catchment Management Programme (SCaMP) which aims to secure multiple benefits at a landscape scale, we are recognised within the UK water industry as being at the forefront of catchment management. We are further developing our delivery in this area, taking in the wider needs of catchments across our business and beyond through our Catchment Systems Thinking (CaST) approach. This approach relies heavily on working in partnership with other landowners and stakeholders to promote the principles of sustainable catchment management.

Since 2010, we have worked collaboratively with owners of non-UUW owned land for the protection of water quality within catchments for rivers, reservoirs and groundwater. This work has comprised a mix of advice, partnership working, investment, incentive schemes, benefits in kind (e.g. targeted hire of weed wipers to reduce pesticide use) and joint catchment activities. We will continue to work collaboratively with third party landowners, regulators (EA, Natural Resources Wales, Natural England, etc.) and stakeholders (e.g. National Trust, rivers trusts, etc.) to support activities that benefit the quality of raw water, helping them to deliver outcomes aligned with our objectives. This work will focus particularly on the catchment of the Rivers Dee, Eden, Lune, Wyre, Eden, Upper Duddon and Poaka Beck.

A resilient catchment maintains services for people while protecting the natural environment, taking into account future trends and variability. Learning from the response of large, upland catchments to the impact of storm events, we have implemented a catchment resilience scheme at Thirlmere in Cumbria since 2020. This is a long-term project that will seek to restore natural processes (river restoration, peat restoration, woodland regeneration) and enable the landscape to better cope with and recover from short-term events as well as long-term changes to the climate. In AMP8, we are proposing to roll out this approach to other catchments where UUW has a significant land holding and/or interest in the number of customers supplied from the source. Locations and scope will be agreed through the WINEP development process, but it is expected that there will be investigations and interventions across the North West and Wales including Thirlmere, Haweswater, Upper Duddon, Bowland, West Pennines, South Pennines, Goyt Valley, River Dee and Upper Severn catchments.

During our current business plan period 2020–2025, we are trialling place-based planning within the Eden, Wyre and Upper Mersey catchments. Place-based planning will help to support the delivery of our CaST approach. By working with local authorities and planning agencies, we will be better equipped to manage water close to where it falls and tackle issues at source. This will allow us to extend the work completed through the Wyre Natural Flood Management project, for example, to tackle the challenge of pesticide use within the Wyre catchment. Existing monitoring currently in place identifies deteriorating water quality with regard to pesticides, *E.coli*, coliforms and ammonia, which can be linked to human and agricultural activity. We work to reduce the raw water challenges, such as pesticides, whilst maintaining a multi-barrier approach so we are not solely reliant on one treatment stage. Place-based planning, therefore, has the opportunity to improve these interactions with the environment to improve water quality and, if water quality is satisfactory and can be treated, provide benefit for water resources.

We will keep each catchment under review to target our response based on the risk presented by the catchment and to minimise the need for future capital investment in additional stages of water treatment. A significant focus of our planned work on catchment over the next 25 years will be to deliver “Natural Resilience”. The concept is to protect our valuable water resources to enable them to withstand extreme weather events and the impact of climate change.

In the NEP (National Environment Programme for Wales) we have committed to working in partnership with other water companies and stakeholders in the River Dee catchment. We will implement the recommendations of our 2020–2022 turbidity investigation by delivering nature based solutions to reduce erosion in the highest priority areas. Contributions from partners will enable this project to deliver multiple benefits by combining our efforts to engage with farmers and land owners in the catchment to improve the resilience of the Dee catchment to the effects of extreme weather events and turbidity.

We have been working through the environmental destination methodology as a regional group to identify options in the highest priority catchment (Wyre), which will feed into a short-medium-long-term plan for the catchment. As there is limited evidence about the benefits of nature based solutions for additional deployable output, through the WINEP we have proposed four investigations related to the management of sensitive habitats in the catchment associated with our abstractions; namely at Grizedale Brook and Tarnbrook Wyre. We will work with partners such as the Wyre Rivers Trust to understand the costs and benefits associated with the use of nature based solutions (e.g. riparian planting) at these specific locations, specifically with regard to their ability to provide additional deployable output. We will also be looking at the water resources benefit of sediment management and habitat improvement overall in the catchment, linked to other initiatives going on by UUW and third parties such as the Wyre Natural Flood Management programme. Another area where there is a knowledge gap is around the impact of the Lune transfer on the Wyre and we will be investigating the impact on fish populations.

Over time, we will commit to repeating the methodology in other catchments according to the priority agreed. For UUW, this will align with our other two strategic catchments; Upper Mersey and Eden. As the catchment investigations will not deliver a deployable output benefit, they will be included in our PR24 programme build as WINEP driven activities, rather than WRMP activities.

3.2.16 Drought permit options

Section 4 of the WRMP main report discusses our approach to improving resilience to extreme drought events. In advance of considering whether to improve this aspect of supply system and in line with the planning guidelines, we developed drought resilience options mirroring all of the supply measures in our Drought Plan. These correspond to actions linked to levels of service such as implementing drought permits and orders, but also include disused sources that we don't include in our deployable output calculation. While these measures would be implemented in a repeat of some of the historic droughts that have traditionally been covered by the WRMP process, their role is to protect us if the drought develops into something more severe than we have experienced before.

We developed a number of Drought Permit (DPS) unconstrained options making sure that the supply side options, as listed in our Final Drought Plan as drought management actions[16], were represented as resource management options (Table 5). The drought supply measures were included in the whole assessment because they constitute viable sources of water that can be used to address any type of deficit.

Table 5 Supply-side drought permit options

Option ID	Option name	Description
WR167	DPS_DELPH	Reservoir drought permit to temporarily reduce compensation flows to the Croal Irwell catchment.
WR168	DPS_DOVESTONE	Reservoir drought permit to temporarily reduce compensation flows to the Goyt Etherow Tame catchment.
WR169	DPS_JUMBLES	Reservoir drought permit to temporarily reduce compensation flows to the Croal Irwell catchment.
WR170	DPS_LONGDENDALE	Reservoir drought permit to temporarily reduce compensation flows to the Goyt Etherow Tame catchment.
WR171	DPS_RIVER LUNE	Drought permit to temporarily reduce prescribed flows to the Lune catchment and allow abstraction from existing conjunctive use scheme.
WR172	DPS_RIVINGTON 1	Reservoir drought permit to temporarily reduce compensation flows to the Douglas catchment.
WR173	DPS_RIVINGTON 2	Reservoir drought permit to temporarily reduce compensation flows to the Douglas catchment.

[16] https://www.unitedutilities.com/corporate/about-us/our-future-plans/water-resources/drought-plan/

Option ID	Option name	Description
WR174	DPS_ULLSWATER	Drought permit to temporarily reduce hands-off flow and relax 12-month rolling abstraction licence limit in the Eden and Esk catchment.
WR175	DPS_VYRNWY	Drought permit to temporarily reduce compensation flows to the Vyrnwy catchment.
WR176	DPS_WINDERMERE	Drought permit to temporarily reduce hands-off flow and relax 12-month rolling abstraction licence limit in the Kent and Leven catchment.
WR179a	DPS_TARN WOOD	Drought permit to temporarily increase annual licence limit at groundwater source to enable continuation of abstraction at the maximum daily abstraction rate.
WR179b	DPS_BOWSCAR	Drought permit to temporarily increase annual licence limit at groundwater source to enable continuation of abstraction at the maximum daily abstraction rate
WR179c	DPS_GAMBLESBY	Drought permit to temporarily increase annual licence limit at groundwater source to enable continuation of abstraction at the maximum daily abstraction rate
WR184	DPS_FERNILEE	Reservoir drought permit to temporarily reduce compensation flows to the Goyt Etherow Tame catchment.

Our *Technical Report – Supply forecast* details an explanation of work to develop severe and extreme drought scenarios and results from testing of risk in this area. Our *Technical Report – Deciding on future options* explains how options appraisal and stress testing of the plan has included severe and extreme drought resilience as an integral component of decision making.

We also considered demand-side Drought Plan measures, however for the draft plan they were discounted at the outset and not converted into WRMP options. To produce a supply-demand balance benefit relative to the status quo, the frequency and duration of restrictions must be increased to reduce demand, i.e. we must deteriorate our levels of service. Currently, we have the worst service level for temporary use bans (TUBs) in the Water Resources West region, and one of the worst nationally. Our customer research has provided a strong steer to reduce restrictions, and as such we have a strategic choice to improve the level of service for TUBs from 1 in 20 years (5 per cent annual chance of occurrence) to 1 in 40 years (2.5 per cent annual chance of occurrence), as presented in Section 7.2 of the main WRMP document.

Following consultation feedback received from the Environment Agency on the draft plan we elected to include the improvement in TUBs level of service from 1 in 20 to 1 in 40 years as a feasible option. Along with the 14 drought permits options, we used our decision support tool ValueStream to check if the drought measures should form part of our preferred plan. The assessment is outlined in Sections 7.2 and 7.3 of the *Technical Report – Deciding future options* report.

We carefully calculated the benefits of our Drought Plan demand measures to include them in our final planning supply-demand balances. This work is described in our *Technical Report – Supply forecast*.

3.3 Production management options

3.3.1 Raw water losses (RWL) and supply system operation (SSO)

We have defined a RWL option that considers reducing raw water losses, which occur in our network and there is an associated methodology that has been written to show the approach and assumptions we have taken. Costs and associated volumetric benefits have been derived for replacement of raw water mains.

In this context, raw water losses are those which are not accounted for in the leakage or outage sections of the WRMP (treated water losses). These could be net loss from the resource system (comprised of water main/aqueduct pressure system losses, open channel/low pressure system losses, losses from break-pressure tanks and small reservoirs) or where improvements to operation could offer supply system benefits (such as regular washing-out of raw water mains due to sediment build up and poor quality of source water).

The quantification of the losses was defined in this analysis as the losses between the abstraction meter and the water treatment works, but does not include, for example, losses from dams or stream bed losses in catchments both of which would be extremely difficult to calculate. However, our analysis demonstrates that the largest

proportion of raw water loss falls into background losses and not bursts, which are very small and less than the de minimis threshold. Therefore, it is assumed that background losses from raw water systems would be dealt with via mains replacement/renewal and lining.

We have also defined options that consider raw water losses, but in the context of water that is lost from our supply system by improved reservoir compensation release control, in effect a supply system operation (SSO) improvement through the installation of automated telemetry, instrumentation and telecoms signalling. Compensation is stored water released from a reservoir to ensure a continuous flow in the downstream watercourse. We release more water than the statutory requirement from the majority of our reservoirs due to limitations in technology and infrastructure. We have completed a piece of work to identify potential sites where infrastructure improvement could allow us to better control the exact quantities of water that need to be released to protect the downstream environment and hence allow us to conserve impounding reservoir storage. We reviewed the statutory compensation requirements for 76 impounding reservoirs considered in WRMP19, and using updated over-release values, applied a minimum threshold of 0.5 Ml/d to arrive at a shortlist of reservoirs to consider in WRMP24 (Table 6). The shortlist comprises 23 UUW impounding reservoir sources that provide an opportunity to obtain c. 28.5 Ml/d through a reduction in compensation control in line with the statutory requirement.

Table 6 List of reservoirs considered for improved reservoir compensation release control

Reservoir group	Individual reservoirs
Cumbria	Haweswater, Thirlmere
Wet Sleddale	Wet Sleddale
Rivington	Rivington
Macclesfield	Lamaload
Rochdale	Greenbooth, Springmill, Watergrove, Cowm
Stocks	Stocks
Buckton Castle	Greenfield, Yeoman Hey, Dovestone, Chew
Wybersley	Kinder, Errwood, Fernilee
Rossendale	Cowpe, Cragg Holes, Cloughbottom, Clow Bridge
Longdendale and Audenshaw	Longdendale Bottoms (Woodhead, Torside, Rhodeswood, Vale House, Bottoms & Arnfield)
Oswestry	Vyrnwy

3.4 Network management/production management options

3.4.1 Intra-company transfers (ICT)

We have considered whether there are any opportunities to further connect parts of our existing water resource zones together or for new connections between resource zones. Some of these options are where we know that there are sources of water in one resource zone that could be utilised in an adjacent resource zone (for example, groundwater source availability in the North Eden Resource Zone that could be used in the Carlisle Resource Zone). In this example, the option would be attributed as a GWN or GWE type option or if the treated water output volume was increased, this would be an increasing treatment capacity option (ITC).

We have also considered options that have resulted from our assessment of the water resource zone integrity. The UKWIR/Environment Agency definition of a Water Resource Zone is as follows:

"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"

This work required a desktop review of detailed operational schematics for each Demand Monitoring Zone (DMZ) to identify any areas of the water resources zones that schematically are isolated from the main system or appear 'separate' from the rest of the system in terms of operational management. The conclusion was that in a few

discrete areas, there was a potential benefit from improved connectivity and which we, therefore, included as options.

3.4.2 Increasing treatment capacity (ITC) and treatment work losses (PRO)

We have considered a number of options to increase the treated water output within parts of our supply system. This has comprised looking at existing constraints within the water resources collection system (e.g. pump capacities less than abstraction licence, water treatment works sized at less than the yield of the water source) and considering where there was potential to remove any of these constraints. This defined four possible options (three in the Strategic Resource Zone and one in the North Eden Resource Zone, which also qualified as an ICT option).

In terms of options that consider treatment work losses (PRO), we completed water use audits at 70 of our water treatment facilities. In the year that the audit was completed, we calculated that only less than two per cent of abstracted water was either discharged to sewer or removed from site in the form of residual water in processed sludge cake. The two greatest contributors to water losses at treatment sites are associated with membrane treatment facilities that are less water efficient than gravity filtration processes, and the requirement to periodically backwash/clean filters dependant on material loading.

The backwashing/cleaning of filters is the single largest point of process water loss; regular filter washing is critical in ensuring that an adequate barrier is maintained to facilitate delivery of water quality parameters. Filter backwashes are optimised for turbidity, head loss and time and, therefore, only wash when water quality starts to deteriorate. Backwash frequency will depend on raw water quality and at times of high solids or colour loading, filters will need to be backwashed more often. This is particularly true of upland surface waters that are affected by algal blooms. Raw water quality has a large impact on treatment works water efficiency.

The majority of our treatment works have a washwater handling system, including recycling to works inlet and de-watering processes. Bound by the advice of the Badenoch-Bouchier reports relating to cryptosporidium management, best practice allows for a maximum of ten per cent inlet flow to be recycled to the head of the works to manage risks of contamination. The remaining washwater is either thickened into a sludge, discharged to sewer, or tankered to a wastewater treatment facility before being recycled to the environment or pressed into sludge cake and discharged to land.

Optimisation of the backwashing and washwater handling processes are business as usual activities to ensure that water quality is maintained and works efficiency is maintained. We have, however, undertaken an exercise to investigate possible water saving alternatives, specifically reducing demand on the large strategic reservoirs in Cumbria. One option has been identified to re-cycle some of the filter washwater and sample water discharged to sewer and partially treated water lost via the washwater penstocks at one for our water treatment works.

Having conducted a thorough review of water treatment works process losses and identified that they amount to less than two per cent of total abstraction and managing these volumes against the requirements to maintain adequate water treatment processes that meet water quality standards, we do not feel that there is an opportunity to include additional water treatment works process loss options.

3.5 UUW demand management options

To develop an exhaustive list of unconstrained demand management options for WRMP24, we used three main sources of information:

(1) Our previous WRMP (e.g. our WRMP19);

(2) Benchmarking against the WRMP and demand management/reduction plans of other companies; and

(3) A horizon scan of new demand management/reduction approaches and/or technologies.

In developing the list of unconstrained demand options, various external and internal factors[17] were considered, as summarised below:

- The National Framework for Water Resources[18] clearly sets out the expectation that water companies will reduce demand by reducing per capita consumption (PCC) to 110 litres of water per person per day (l/p/d) by 2050, drive down water use across all sectors and halve leakage rates by 2050[19];
- The area supplied by UUW is not classified as an area of serious water stress[20] and, therefore, the option of charging by metered volume for all customers is not available;
- It is unlikely that a change in policy regarding supply pipe adoption will occur in the shorter term (5 to 10 years);
- Technology is continually developing, particularly with regards to smart metering and leakage detection, but concerns around system integration, operation and maintenance, training, as well as scalability, often mean the roll out of new products is delayed;
- In relatively recent years, we have seen digital disruption via the rapid growth of digital innovation (e.g. network sensors and smart meters combined with machine learning and artificial intelligence to create digital twins); and
- The restrictions and changes to working locations as a result of the COVID-19 pandemic had a major impact on water consumption/usage patterns.

The unconstrained option list has also been developed based on industry guidance[21], consideration of political, environmental and regulatory reasons for promoting demand management measures, and by assessing and benchmarking what is being done in other water companies. Factors that have informed and shaped our leakage, metering and water efficiency unconstrained options are discussed in the following sections.

3.5.1 Leakage

We have committed to reducing leakage by 15 per cent by 2025 and 50 per cent by 2050. The leakage options developed are, therefore, required to identify how the targets are to be achieved for “best value”, while ensuring savings are sustainable for the future. Four aspects of leakage management were considered using the PALM (Prevent/prevention, Aware/awareness, Locate and Mend) approach/categories used by the wider industry, as follows:

[17] External factors include legislation and policy set by government and regulators, current trends in the industry and technology and innovation. Internal factors include existing company commitments, processes and mechanisms, integration of technology and innovation and data availability.

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

[19] We have set out a number of ambitious short-term and long-term targets for leakage and PCC: to reduce leakage by 15 per cent (c. 67 Ml/d) by 2025 and an additional 35 per cent (c. 157 Ml/d) by 2050, whereas targets for PCC have been set at 135 l/p/d by 2025 and 110 l/p/d by 2050.

[20] https://www.gov.uk/government/publications/water-stressed-areas-2021-classification

[21] UKWIR (2012) Water Resources Planning Tools 2012. Report Ref. No. 12/WR/27/6 and UKWIR (2002) Economics of Balancing Supply and Demand Report.

Table 7 PALM approach/categories, with example interventions/options

PALM category	Description	Example interventions/options	Pertinent to UUW
Prevent/ prevention	Ability to stop leaks from occurring or, at least, reduce the size of leaks	Pressure management and/or optimisation, including active pressure and/or remote control (flow modulation) Mains rehabilitation/renewal/replacement, including mains lining Calm networks, including tackling pressure surges or "pressure transients"	In AMP5, we carried out a company-wide desktop modelling exercise and identified a number of existing pressure management valve (PMV) optimisation schemes and over 1,000 new potential pressure management schemes. A number of schemes were delivered in AMP6 or identified to be delivered in AMP7, including the installation of PMV flow modulation/remote control units on over 700 existing PMVs. Our mains rehabilitation/renewal /replacement rate is a key area of focus, as we seek to address the deterioration in water network asset health
Aware/ awareness	Ability to identify a leak as it occurs	Additional district metered areas (DMAs) and/or DMA optimisation (changing the configuration, metering arrangement and/or size). Optimisation of the areas upstream of DMAs (covering larger service reservoirs, trunk mains etc.). Smart networks (we term this "Dynamic Network Management"), smart meters and network sensors (e.g. acoustic/noise, flow, pressure, strain etc.).	A key area of innovation and investment over AMP6 and AMP7. We invested in approx. 70,000 acoustic sensors that cover approx. 20% of our water network. We combined this with advanced analytics of the sensor sound files to remove "false positives" and ensure we are identifying leaks (pressure management valves and lampposts can sound like leaks).
Locate	Ability to find/pinpoint the exact location of the leak	Activity to expedite (or, at least, robustly prioritise) the pinpointing of leaks using: • Aerial surveys (drones, plans, satellites etc.) – although, depending on accuracy, these can be considered under "Aware" as well. • Automatic acoustic/noise correlation • Optical fibres • Step testing • Surface sounding	Once we are made aware of a potential leak, our highly skilled Leakage Technicians carry out investigations to determine if the issue is related to a leak (or, for example, illegal use) and, if a leak is identified, mark the precise location of the leak for repair. We acknowledge that it can take years to develop the skills required and, therefore, we have sought to ensure that we are "fit for the future" with our Leakage Apprenticeship programme and in-house training suite.

PALM category	Description	Example interventions/options	Pertinent to UUW
Mend	Action to fix/repair the leak	Activity to expedite (or, at least, robustly prioritise) the repair of: • Mains, including trunk mains • Mains fittings • Communication pipes • Supply pipes (assets within the property boundary and owned by the property owner) • Reduce disruption via "no dig" and "in pipe" repair techniques	Following leak location, UUW promotes work to our network partners to repair leaks on the various assets. We work with our network partners to prioritise leak repairs, based on customer impact and size of leak, as well as how we can implement innovative techniques (e.g. "live repairs") to reduce repair times generally.

3.5.1.1 Prevent/prevention

Pressure management and mains renewal have for many years been seen as the primary solutions to leak prevention, although developments with the identification of pressure transients have brought asset maintenance and asset health to the forefront.

Pressure management

All water companies have some focus on pressure management, whether this be optimising savings of existing assets or the installation of new pressure management schemes. However, there is built in conflict with the DG2 poor pressure outcome delivery incentive (ODI), which means it is not always possible to have pressure optimised all of the time. Options being looked at across the industry include:

- Installation of new sub district metered area (DMA) PMV schemes covering small property numbers;
- Use of low head loss PMVs;
- Optimisation of source pressures;
- Flow modulation/remote sensor/remote control of all PMVs;
- Flow modulation/remote sensor/remote control of all pumps;
- Upsizing of mains causing high head losses;
- Installation of high-rise building pumps or single property boosters to enable optimisation of a network where pressures are kept high to maintain supply to a handful of properties;
- Dual control/demand control – dynamic pressure management solutions where an area could be supplied by more than one PMV during peak flow periods, while maintaining lower pressures; and
- Combi-systems, which pump during high flows and reduce pressure during low flows.

As the cost per megalitre per day (Ml/d) saved through traditional pressure management solutions continues to increase as schemes become smaller or require enabling works such as right sizing of mains and cross connections, the continued options for pressure management to reduce demand need to be built around more non-traditional solutions, digital twins and dynamic networks in future AMPs. Smaller water companies such as Bristol Water are more adaptable to implementing more complex solutions to pressure management, with the extension of their dynamic DMA programme, which utilises automated boundary valves with multiple PMVs to continually manage pressure within a zone for different times and flow conditions.

Mains rehabilitation and asset health

Aspects of asset health, which could impact on demand include but are not limited to:

- Pressure management valve (PMV) maintenance – a poor performing PMV can cause increased pressures or pressure transients, in turn causing an increase in leakage and risks of bursts. Development of condition-based maintenance will help reduce leakage outbreaks, meaning 'find' resources can focus on new leaks to reduce leakage levels and not just help to maintain leakage levels due to leaks caused by failing assets;

- Air valve maintenance – air valves can cause leaks and bursts due to poor maintenance by allowing water to leak out through the air valve, air valve slam, which causes pressure transients and/or causing air entrapment, which could cause pressure transients or PMVs to be increased due to increased head losses;
- Surge vessels – lack of surge vessel maintenance can increase the risk of pressure transients on the network;
- Pump controls – start up and stop speeds can result in sudden failures;
- Valve operations – the implementation of a smart valve management system and improvement in live valve status data can help to reduce pressure transients caused by inappropriate valve operation, reduce DMA breaches (inoperable DMAs and inaccurate leakage estimates), and reduce the impact of valves left partial shut on customer pressure, which could cause an increase in a PMV setting and in turn leakage and bursts rates;
- Adopting leak-free or ultra-low loss networks – effectively ensuring that self-lay schemes are handed over to UUW to the standards where they do not leak; and
- Operational use – improvements in the understanding of operational use with metering of standpipes, water treatment processes, and development of source-to-tap balances need to be developed to improve the accounting of every drop extracted and identification of opportunities to reduce operational use.

3.5.1.2 Aware/awareness

DMA configuration, metering and management has been the baseline method for identifying leaks in the UK for over 30 years. However, it has limitations and there is a constant need to maintain and update setups to resolve conflicts with other drivers (such as poor pressure and water stability), while trying to reduce the impact of growth on the effectiveness of certain DMAs. As DMAs increase in size or start to have conflicts with other drivers, the effectiveness on the ability to identify and measure outbreaks reduce due to opening of valves, or by making it harder to identify leaks in flow data or increase effort to find leaks as DMAs grow in size.

We are one of the industry leaders in the measurement and targeting of upstream leakage across our strategic trunk main systems, but as with DMAs, the management to maintain this performance or to make improvements comes at a cost. There are also issues around meter accuracy, which can have a big impact on measured leakage numbers and the ability to identify leakage on the upstream network.

Recent innovation in acoustic sensing now means that identification of leaks is not only a function of DMA management and metering, but the products, which historically have been used to ‘find’ leaks can now perform the identification step as well. Digital solutions are also being developed through AI and digital twinning, but these are limited by the level of sensors and metering across the network.

3.5.1.3 Locate

Technologies such as satellites, drones, sniffer dogs, improved trunk main leak sensors, optic fibres and the development of improved software or at point data analytics (i.e. real time data at key assets to identify potential leaks due to unusual changes in service reservoir levels, pump speeds, PMV inlet and outlet pressures), are playing an increasing role in locating leaks. As more sensors are deployed collecting more data types (flow, pressure, acoustics, temperature, vibration, etc.), the more information complex AI software solutions will have to develop to provide improved leak identification assessments on live data sets.

The implementation of automated meter reading (AMR) devices with continuous flow alarm functionality or smart metering is also seen as a key factor to reduce find times for customer side leakage. There are, however, concerns that this may shift the focus of resources to find and fix smaller leaks instead of focusing on larger leaks, which could impact on reducing overall leakage. As more customers opt to move to meter billing, it is anticipated that they will become more incentivised to get leaks repaired. It is, however, recognised that the system needs to be developed so that customers are informed of potential leak alarms as early as possible. Just informing customers of a leak as part of their water bill will cause customer dissatisfaction, especially when the company has meter technology available to identify leaks on a more regular basis.

3.5.1.4 Mend

The industry recognises the need to reduce repair times but conflicts with ‘always on’ requirements or changes in legislation and permits to carry out road and street works pose a challenge. The perceived lack of innovation to fix

leaks has enabled a new stream of innovation looking at things such as pinpoint repairs or no dig repairs techniques such as in pipe repairs, robots and pipe lining. With more companies increasing meter penetration and the ability to identify supply pipe or customer-side leakage, there is also a need to develop new ways of getting such leaks repaired, either by the customer or by offering repairs for free. Innovation is not only needed to improve the ability to pinpoint customer side leakage, enable repairs with minimum disruption to the customer and to reduce cost, but also to incentivise or enforce repairs, while not impacting on customer satisfaction. A number of water companies within the UK offer one or two free repairs for each customer over a set period, resources to find or repair leaks at a reduced cost or offer full replacement on failure. Others utilise water audits/visits to help to find and repair both supply pipe leaks and internal plumbing losses such as leaky loos.

Improving the physical repair time is not the only solution. There is also opportunity to improve backroom activities to manage jobs right first time and enable repairs to happen quicker by removing bureaucratic hurdles and improving relationships. The potential of a national utilities' platform may open a new way of working collaboratively with councils, highway agencies and other utilities to improve planning or share resources to help speed up repairs.

3.5.1.5 Summary

Based on the benchmarking exercise, the unconstrained leakage options need to consider:

- Investment in improving metering and the setup of both DMA and upstream areas to improve identification and calculation of leakage across the network;
- Increasing coverage of permanently installed sensors is seen by the industry as a trusted method to deliver efficiencies in find times and drive leakage down;
- Digital solutions to help improve find times and fully utilise data collected by the roll out of sensors to further drive find efficiency. However, how to do this and what benefits will be realised are not yet really understood in regard to scalability, cost and impact;
- Customer-side leakage is still an issue in the industry with regards to understanding the true level of customer-side leakage and how best to tackle repairs. Options need to consider both supporting customers and the potential for a move to supply pipe adoption. The key element, however, is to build more confidence in customer leak levels. The roll out of customer metering, in particular smart meters, will help build confidence in the 'true' level of customer side leaks, which need to be addressed each year, and in turn help identify the most cost-effective way to manage this in the future;
- The use of technology questions the impact on 'find' resources, especially when trying to drive leakage down. There is uncertainty if increased customer metering and roll out of technology will enable 'find' resource levels to over perform against current levels, or lead to a need for more resources to verify larger numbers of smaller leaks to manage total leakage at the targeted lower levels;
- Technologies such as satellites, drones, etc. are all viable options, but confidence in their effectiveness is variable, especially as increased sensor deployment is seen as a proven option. However, these should be included as tools that could help an overall programme of find options;
- Innovation within the repair arena is starting to occur, but there is limited information on cost, tangible benefits or scalability. Options, however, need to consider that there will be development in this area, although actual benefits may be limited;
- There is a need to increase main renewal rates, and options need to consider improvement in mains renewal targeting;
- Pressure management is key, but schemes will either deliver smaller benefits for increasing cost or need to be more complex and non-traditional schemes. This also means a change in culture and approach, which in turn may take time to fully implement; and
- Benefits and costs of options that focus on improving processes for asset health and maintenance currently have a high level of uncertainty. These options are, however, critical, and certainty may improve with changes in data collected and the development of digital solutions.

For further information on our leakage reduction strategy, please see our *Technical Report - Demand for water*, Section 10.1.

3.5.2 Metering

As at 2021–22, household metering penetration in the area supplied by UUW is 47 per cent (excluding vacant/void properties) and 45 per cent (including vacant/void properties). Non-household metering penetration is 91 per cent for non-households. For metering option identification and development, we have considered that:

- Several water companies in the South of England have near full metering penetration, following implementation of compulsory metering programmes;
- Several companies, including UUW, have experienced a decline in optant metering rates and are seeking alternative strategies to implement metering (e.g. enhanced/proactive metering);
- Advanced metering infrastructure (AMI)/digital/smart meters are rapidly becoming the metering technology of choice, due to the benefits to consumption/usage and leakage via continuous flow alarms/alerts that could signify a customer-side/private leak and an understanding of night use for the leakage calculation.

When looking at potential benefits achieved through metering programmes[22], the key benefit is the improvement made to the water balance based on the ratio of measured/metered demand against unmeasured/unmetered demand. This in turn will help to improve assumptions around PCC, customer-side leakage and in turn leakage on the distribution network. With changing demands caused by the COVID-19 pandemic[23] and the likelihood that more people are likely to opt for increased homeworking (compared to pre-pandemic ways of working) once the pandemic is controlled, the need to increase metering penetration is even more important to ensure demand is captured correctly to ensure leakage estimates are accurate.

Based on the benchmarking exercise, the unconstrained options for metering, therefore, need to consider:

- What is realistically achievable for delivery of full meter coverage?
- What is the risk and impact on joint supplies on costs, programme and meter coverage?
- What delivery mechanisms could be utilised and what impact will they have on increasing metering penetration to desired levels and at what cost?
- What meter type to install? See Table 8.
- How does maintaining current metering levels impact ability to deliver water efficiency and leakage targets?

Table 8 Type of meter and meter reading with estimated benefits

Type of meter and meter reading	Meter read frequency	Qualitative benefits	Quantitative benefits, based on benchmarking and studies
Basic meters that are visually read	Generally, approx. 6 monthly reads for billing	Understanding of consumption/usage	Approx. 8% reduction in consumption/usage.
Automatic meter reading (AMR) meters that are planned drive by and/or walk by	Generally, approx. 6 monthly reads for billing	Understanding of consumption/usage	Approx. 8% reduction in consumption/usage.

[22] Varying benefits for reducing PCC have been quoted, however, one key element identified is the benefit to find and reduce supply pipe leakage. The 2019 PwC report Funding approaches to leakage reduction states "*One example is the impact of customer (smart) metering. Metering penetration can help influence supply pipe leakage and the effects on customer behaviour and consumption are potentially significant. Some companies have reported estimates of benefits from historical experience, e.g. Southern Water, Thames Water and Affinity Water reported significant demand reductions of 8–16.5 per cent from increasing metering penetration over the 2010–15 and 2015–20 periods. However, these do not distinguish between changes in consumer demand driven by behavioural changes, and genuine reductions in leakage*".

[23] For further details please refer to our *Technical Report - Demand for water*.

Type of meter and meter reading	Meter read frequency	Qualitative benefits	Quantitative benefits, based on benchmarking and studies
Automatic meter reading (AMR) meters that are passively collected by bin lorries/wagons	Depends, but often fortnightly	Understanding of consumption/usage, as well as continuous flow alarms/alerts that could signify a customer-side/private leak	Approx. 8% reduction in consumption/usage, as well as improved targeting of our water efficiency audits/visits.
Advanced metering infrastructure (AMI)/digital/smart meters	Depends, but can provide hourly data	Understanding of consumption/usage, as well as continuous flow alarms/alerts that could signify a customer-side/private leak and an understanding of night use for the leakage calculation	Approx. 14% reduction in consumption/usage and an increase in leakage detection efficiency (not searching for distribution-side leaks in DMAs when the increase in flows is due to customer-side/private leakage or changes in night use).

Table 9 shows the metering options we considered during the options identification process for all metering types. This breakdown was not previously provided in our draft plan as change of occupier (COO) metering is included as part of our enhanced metering for cost efficiency. Having carried out a cost and benefit assessment at WRMP19 where COO metering was screened out, our current enhanced metering strategy ensures that customers are placed on a measured bill at COO on a metered property. This is much more efficient than attempting to install a meter during COO. Selective and optant metering are baseline activities which will progressively get smaller in part due to the enhanced metering programme. As part of our metering strategy, we will only be installing AMI capable meters in AMP8 many of which will be AMI active, however inevitably some will be installed in areas that have not yet been prioritised for communication network coverage.

Table 9 Metering options considered

Household or non-household	Metering strategy	Option ID	Baseline or option status	Rationale	Average AIC at capacity (p/m^3)
Household	Compulsory metering of new households		Baseline		N/A
Household	Free Meter Option (FMO) optant metering		Baseline		N/A
Household	Enhanced Free Meter Option (FMO) optant metering promotion	WR604 and WR628	Baseline	UUW continually seeks out opportunities to increase the uptake of the FMO therefore, this is considered a baseline activity	N/A
Household	Change of occupier metering	WR605	Preferred option (as part of WR603)		138
Household	Replace existing household meters with smart meters	WR618 and WR619	Preferred option (as part of WR619)		38

Household or non-household	Metering strategy	Option ID	Baseline or option status	Rationale	Average AIC at capacity (p/m^3)
Household	Selective metering (where these meters are used for billing/charging)	WR613 and WR614	Preferred option (as part of WR603)		138
Household	Selective metering (irrespective of whether these meters are used for billing/charging) – UUW refer to this as "enhanced metering"	WR601, WR603, WR606, WR607, WR608, WR609, WR610, WR611 and WR612	Preferred option (as part of WR603)		161
Household	Compulsory metering of all households	WR600	Unconstrained option	The area supplied by UUW is not classified as an area of serious water stress and, therefore, the option of charging by metered volume for all customers is not available	N/A
Non-household	Compulsory metering of new non-households		Baseline		N/A
Non-household	Meter all non-households	WR602	Baseline		N/A
Non-household	Replace existing non-household meters with smart meters	WR615, WR616 and WR617	Preferred option (as part of WR615)		14

3.5.2.1 Water tariffs

The Artesia report produced for Ofwat on reducing household water demand[24] identifies that *"For areas where meter penetration is high, the use of tariffs provides a potential tool for managing demand in households. Theory suggests that there is a price elasticity for demand" … "meaning that demand will fall by less than 0.5 per cent for every 1 per cent increase in price".* There are generally two main types of tariffs identified in the literature, these being rising block tariffs comprising additional charges for volumes above a threshold or multiple thresholds, and seasonal tariffs comprising increased charges during specific periods. There are other concepts such as tariffs implemented during drought conditions, but in all cases, there is a need for the tariff to be fair, easy to quantify, not overly complex, consider occupancy/household size and not cause water debt.

Tariffs can be used to support other options such as developing a mechanism to reduce surface water charges for homes with greywater reuse and/or rainwater harvesting systems. Special tariffs can be developed to help with water poverty, to obtain buy in to switch customers to meter billing based on reduced rates.

In essence, tariff management as an option for demand management is reliant on first achieving a high level of metering penetration (preferably with smart meters), linked to improvements with support and communication around water efficiency. Careful consideration is required around the mechanisms of how implementing a tariff strategy would impact customer satisfaction, how it is needs to be communicated and how it is managed so as not to cause water poverty.

Key decisions and concerns on tariff management options include:

[24] Artesia Consulting (2018) The long-term potential for deep reductions in household demand. Report no. 1206. April 2018.

- What level of meter coverage is acceptable to enable tariff management?
- What type of tariffs are viable and acceptable?
- How to reduce the risk of water poverty?
- Need to support and educate customers on water efficiency.
- Limited evidence of benefits or how tariffs change behaviours.
- How to fairly offset size of household (occupancy).

3.5.3 Water efficiency

Water efficiency is key to reducing customer consumption/usage, which in turn can help reduce investment levels required to deliver to acceptable levels of service, reduce supply-demand deficits and offset potential investment in new resources. We already have a number of programmes promoting water efficiency devices including:

- Customers can order internal water efficiency devices for free from the UUW website;
- Customers can order subsidised water butts from the UUW website; and
- Offer of free water efficiency home audits to review and install various water efficiency devices for free.

At a high level, key factors that impact water efficiency drivers include:

- All water companies provide a mix of free water efficiency products, however, there is uncertainty regarding the magnitude and sustainability of actual versus quoted potential benefits;
- Option G of the Building Regulations[25] provides developers with an option to achieve a PCC of 110 l/p/day (compared to 125 l/p/d for standard new builds), to be implemented though local planning authorities. There is, however, no real mechanism to ensure this is achieved. Some water companies are providing incentives to developers, but there is no evidence this is delivering to expectations;
- Additional support is needed to influence legislation around water labelling, building standards and integration of greywater/rain harvesting systems within new builds; and
- From April 2021 we have been pushing for developers to deliver a PCC of 100 l/p/day for new builds.

Our strategy for deciding the best approach for applying water efficiency measures is done regionally (including Carlisle and North Eden resource zones) using a Catchment to Customer model from which area-specific town action plans are developed. This would include area wide/area specific communications (i.e. local radio, social media and partnership with local water advocates). Also, customers are then prioritised based on whether they would benefit most from a meter, high users or sensitivity to dry weather. Specifically, for unmeasured customers or high users, we will engage with them through direct messaging about installing a meter or directing them to our website (including Get Water Fit) for hints and tips to save water. For example, there are six focus areas (DMZs) for FY24 where a town action plan will be developed and Carlisle is one of them. Along with other DMZs in the region via our catchment to customer model, North Eden will be monitored and will be included in the town action plan when appropriate, however any customer identified to benefit from a meter or high consumer/leak will be engaged with as part of the direct communication programme.

We appreciate there are additional opportunities to secure further savings with regards to new build development and retrofit considering the government roadmap within the Environmental Improvement plan. We will continue to ensure that our charging arrangements for new connections comply with Ofwat's charging rules and principles, which includes environmental protection. We aim to evolve our current environmental incentives scheme to look for more innovative ways to encourage developers to build more water efficient homes. We are also involved in a Water UK working group that has been tasked to specifically look at environmental incentives and look forward to a potentially more consistent approach across the board.

[25] Requirement G2 and Regulations 36 and 37 of the Building Regulations 2010 – Water efficiency.

3.5.3.1 Water efficiency devices

When looking at water efficiency devices and benefits achieved, the Artesia report on water efficiency[26] provides a detailed review of a number of water efficiency programmes delivered by various water companies. This highlights the variability in potential benefits achieved from water efficiency drivers, and differing devices, even within the same water company. In most cases, however, actual benefits achieved based on metered consumption is lower than 'quoted' potential benefits. Based on a mix of devices installed, average savings of 13.5 litres per property per day were achieved, but a number of trials by water companies showed savings as low as 3 to 6 litres per property per day when actual meter data were used to assess benefits.

The factors impacting the variability in benefits achieved is caused by a mix of:

- Targeted programmes for high users versus generic area-based programmes of works, i.e. some people may already be focused on their water usage so potential benefits are low;
- Most programmes involve a suite of devices, and it was not possible to attribute measured benefits to a particular device;
- Differing customer behaviours versus assumed behaviours;
- Different requirements, settings and performance of existing plumbing;
- If devices are self-ordered, self-fitted, or fitted for free by the water company on the back of a water audit;
- Impact on finding and resolving supply pipe leakage or internal plumbing losses, such as leaking loos is a key benefit, but then impacts of numbers quoted to have been saved by a water efficiency audit; and
- No details of connection pressures and the impact that has on water usage versus benefits achieved.

Based on the benchmarking exercise, water efficiency options need to consider:

- Which water efficiency products to offer or should a suite of devices be offered?
- How to include innovation to continually update the offering of water efficient products?
- To allow customer to fit themselves or be fitted?
- How to maximise benefit for effort and cost?
- How to cost in education and IT needs to provide a better customer experience and enable continued focus for the customer to ensure benefits are maintained?
- To resolve customer side leakage as part of the offering.

3.5.3.2 Water labelling

Water labelling has been identified as an intervention, which could provide a sustainable impact on household consumption by ensuring water efficiency and plumbing standards are focused on reducing demand and leakage. The European Water Label[27]and Waterwise Checkmark[28] are voluntary and has over 10,000 products registered. It is limited to bathroom and kitchen fittings and does not include white goods or outside use. Many UK water companies are keen to see mandatory water labelling. Water Sense, a water labelling programme within the United States of America run by the Environment Protection Agency (EPA), claims to have saved over 4.5 million megalitres and over 294 billion kwh of energy since 2006 due to water labelling and government run programmes such as annual fix a leak day.

When considering 'white goods', there are water efficient appliances available within the marketplace, often identified as 'energy efficient' rather than water efficient, but these come at a significant price in comparison with basic units. Without overall changes to building regulations or wholesale support for water labelling, it is difficult to quantify potential costs and benefits achievable for a water company to proactively promote water labelling,

[26] Artesia Consulting (2015) Water efficiency evidence base statistical analysis. Report no. 1096. July 2015.

[27] http://www.europeanwaterlabel.eu/

[28] https://www.waterwise.org.uk/checkmark-for-offices-2/ and https://www.waterwise.org.uk/waterwise-community-checkmark/

but it is critical that they start to work with bodies such as Waterwise to help improve communication and support efforts to enable a change in policy and standards. This is probably even more important as it is anticipated that COVID-19 will cause an increase in average household demands due to the increase in homeworking going forward.

3.5.3.3 Greywater reuse and rainwater harvesting

Greywater reuse and rainwater harvesting systems have been considered for a number of years with the EA issuing guidance on rainwater harvesting systems for non-potable domestic use in October 2010[29]. Since then, there have been a number of small bespoke trials and case studies in the UK and internationally, which identifies potential benefits of 25 to 50 per cent of domestic usage[30]. Recent studies involving a UK-based water company and a developer saw a small number of new build houses of differing sizes have greywater and rain harvesting systems installed. Consumption was then later compared with houses on the estate without the systems and it was identified that the cost of installation was on average ~£3,600 per unit, with benefits ranging from 25 to 45 per cent reduction in consumption for larger households.

There are a number of concerns around the implementation of greywater or rain harvesting systems, with costs, maintenance and the scalability and sustainability of benefits being the main concerns for water companies. There are also concerns that although these systems may help reduce overall demand for average day conditions, therefore, helping to sustain resources, there will still be occasions when consumers will need the full daily usage from the distribution network, and, therefore, additional considerations will need to be made in infrastructure design and investment.

However, as identified in the Waterwise Report: How do people feel about domestic water recycling systems[31], public receptivity is generally at a high level:

"The findings of this research, both in terms of public receptivity to rainwater harvesting and greywater recycling systems, as well as the main barriers to uptake, are largely consistent with prior studies. Perhaps most notable is the generally high level of positivity towards the idea of water harvesting and reuse systems within the home. The main factors that might prevent people from implementing these systems have been shown to be cost, disruption to the home during installation, a lack of understanding of how the systems would work, concerns about maintenance, and some concern about water quality, particularly with regard to greywater recycling."

Based on the potential benefits, although not entirely in control of water companies, there is a need to start to investigate and promote such systems with a desire to have more structured demand management options in place for future WRMPs. In developing these options, the following consideration is required:

- Although there are concerns regarding greywater and rainwater harvesting, there is a need to understand how water companies can support or influence regulations and developers to install such systems in new builds and what benefits could be provided to the developer;
- Without understanding how to influence developers to build properties with rainwater and greywater systems and the benefits and risks of such systems, it is difficult to see pushing for the retrofitting of such units as a cost-effective solution. However, thought should still be given around how this could be done and what an offering might look like for future WRMPs;
- Need to understand whole life cost of managing these systems and potential additional costs that may be inherit by customers, i.e. maintenance contracts, treatment (chemical and energy costs) etc; and
- This is probably even more important as the impact of COVID-19 will cause an increase in average household demands due to the increase in homeworking going forward, and there needs to be significant innovation into scalable solutions to make a tangible and sustainable impact on household demands.

[29] Environment Agency (2010) Harvesting rainwater for domestic uses: An information guide.

[30] Ricardo Energy and Environment (2020) Independent review of costs and benefits of rainwater harvesting and grey water recycling options in the UK. Report No. 13617100. September 2020.

[31] Waterwise (2019) How do people feel about domestic water recycling systems: Public perception of rainwater harvesting and greywater recycling for domestic use.

For further information on our water efficiency strategy, please see our *Technical Report - Demand for water*, Section 10.2.2.

3.5.4 TUBs and NEUBs

Earlier implementation of temporary use bans (TUBs)[32] or non-essential use bans (NEUBs)[33] could improve our supply demand balance due to the additional demand savings, but at the same time would increase the frequency of occurrence and deteriorate our levels of service. We screened out TUBs and NEUBs options very early in the WRMP24 options identification process due to concerns about customer acceptability. With regards to TUBs, at a 1 in 20-year return period we already have the lowest level of service in the WRW region, and one of the lowest in the country. In 2018, very dry weather led us to issue a notification of TUBs to customers. Whilst a change in the weather fortunately averted the need to implement TUBs, we faced a very severe backlash from customers. Our recently commissioned WRMP customer research demonstrated very strong support to improve the level of service for TUBs. NEUBs would have a severe impact on some of our business customers and in WRMP19 we improved the level of service from 1 in 35 years to 1 in 80 years.

The change in level of service for TUBs from 1 in 20 to 1 in 40 was taken forward as a preferred option in the plan following consultation feedback received from the Environment Agency on the draft plan.

3.6 Water transfer options

We are working closely with our regulators and other water companies in a collaborative approach to develop national solutions to meet the challenges of population growth, climate change and ensure resilient water supplies for future generations. These significant infrastructure schemes are called Strategic Resource Options (SROs) and in order to facilitate their development, Ofwat has formed the Regulators' Alliance for Progressing Infrastructure Development (RAPID), which brings together the English water regulators Ofwat, Environment Agency (EA) and Drinking Water Inspectorate (DWI) along with representation from Natural Resources Wales (NRW). RAPID has introduced a gated assessment process during AMP7, with the objective of selecting the best value SROs for delivery in AMP8 and beyond.

We are directly involved in two SROs – the Severn to Thames Transfer (STT) SRO and the North West Transfer (NWT) SRO. The STT SRO is being jointly delivered with Severn Trent Water and Thames Water and could facilitate water being transferred from the North West and Midlands to the South East via a new interconnector between the River Severn and River Thames. The NWT SRO could enable up to 180 Ml/d of water to be released into the River Severn, with new water resources identified to backfill the volume released in order to maintain supply resilience to customers within the North West. The new water resources being identified and selected to support delivery of the NWT SRO also form part of our WRMP and are, therefore, subject to the same options identification process as our other WRMP options. We are also investigating with Northumbrian Water the possibility of utilising Kielder water into our Strategic Resource Zone.

As part of our due diligence to develop a comprehensive list, we also ensured that strategic water resources options identified in the Jacobs 2020 Report[34] were considered. Smaller scale, inter-company transfers from WRMP19 were also included and reviewed with discussions held with water companies to discuss their feasibility for WRMP24.

[32] Restriction on customer water use under powers provided in the Water Industry Act 1991, which can be introduced by a water company where it is experiencing, or may experience, a serious shortage of water for distribution. Previously referred to as a hosepipe ban.

[33] Water companies can impose restrictions on the 'non-essential' use of water under TUBs and Drought Orders. The use of water is considered to be non-essential when used for certain purposes such as using hosepipes or sprinklers to water gardens, wash cars, etc.

[34] Jacobs (2020) Meeting regional and national water resources needs: Gap analysis of the current strategic infrastructure scheme portfolio. July 2020. Report commissioned by the Regulators' Alliance for Progressing Infrastructure Development (RAPID) to understand opportunities to increase the availability and sharing of water resources that are in the wider national and regional interest.

3.7 Third-party options

We continue to work with third parties on demand management/reduction via our Innovation Lab, various pilots/trials and other commercial routes. We currently work with around 40 third parties to deliver demand management/reduction activities. We have looked carefully at whether non-UUW options can offer better value than ones that are developed ourselves. We have referred to these as third-party options.

In addition to potentially providing better value, third-party options also expose UUW to external competition. This is in line with UUW's Bid Assessment Framework (BAF)[35], which sets out the structure and approach that we will take in relation to competitively tendering requirements for water resources, demand management and leakage services.

The principles that we adopted when identifying third-party options were that they should be treated equitably with our own options and that the process should be made as accessible as possible so that third parties were not put off by the complexity of putting forward their options. Moreover, we focused our attention on raising awareness amongst third parties to ensure that they were given the maximum opportunity to submit any proposals that they had.

As a result, we developed and executed the engagement strategy as described below.

The first step in developing this strategy was to identify the types of third parties that we were targeting. Through a series of workshops, we identified key areas in relation to the development of the WRMP. A persona is a written representation of an intended audience. This was vital to the success of a project as they help in the design of decision making, bringing user behaviours and goals to the forefront of planning.

The following target personas were identified:

- **Global Companies**: Subsidiaries of global organisations with plants in the North West. Often these have been traditional manufacturing plants or similar, which may have a strong connection to their local area;
- **SMEs**: These range from traditional mills creating fabric and clothing for fashion brands to companies providing construction and building services. They are often companies with a long and proud history of manufacturing in the area dating back to the 1800s;
- **Trusts**: Various trusts connected to waterways and serving local people and communities to promote sustainable futures for waterways and other areas of interest;
- **Agriculture**: Agriculture accounts for two per cent of fresh water abstracted in England and Wales. Target farmers in this area are likely to have 20+ employees;
- **Authorities**: Public Authorities with landholdings in the region who may already hold a historic abstraction license; and
- **Hospitality**: Businesses operating the leisure/visitor economy that have a historic license.

Once these personas were identified, we developed a multi-channel strategy to support our engagement. This identified direct mail, LinkedIn and trade media as the most effective channels for reaching the target personas. To bring these channels together and to direct stakeholders to one central repository, a virtual platform was developed on our collaboration portal. Information was provided on which ideas and options could be delivered.

In particular, direct communication was made with any third parties that had previously engaged with us as part of WRMP19. Furthermore, we also interrogated the Environment Agency's National Abstraction License Database to identify any third parties that had unused abstraction licences. We then invited those with more than the de minimis surplus to be involved in the process.

Stakeholders were given considerable opportunities to provide their ideas and options as well as ask questions of our project team at all stages of the engagement activity. This included posting Periodic Information Notices

[35] UUW's Water Resources Bid Assessment Framework: https://www.unitedutilities.com/globalassets/z_corporate-site/pr19/supplementary/s5006_bid_assesment_framework.pdf

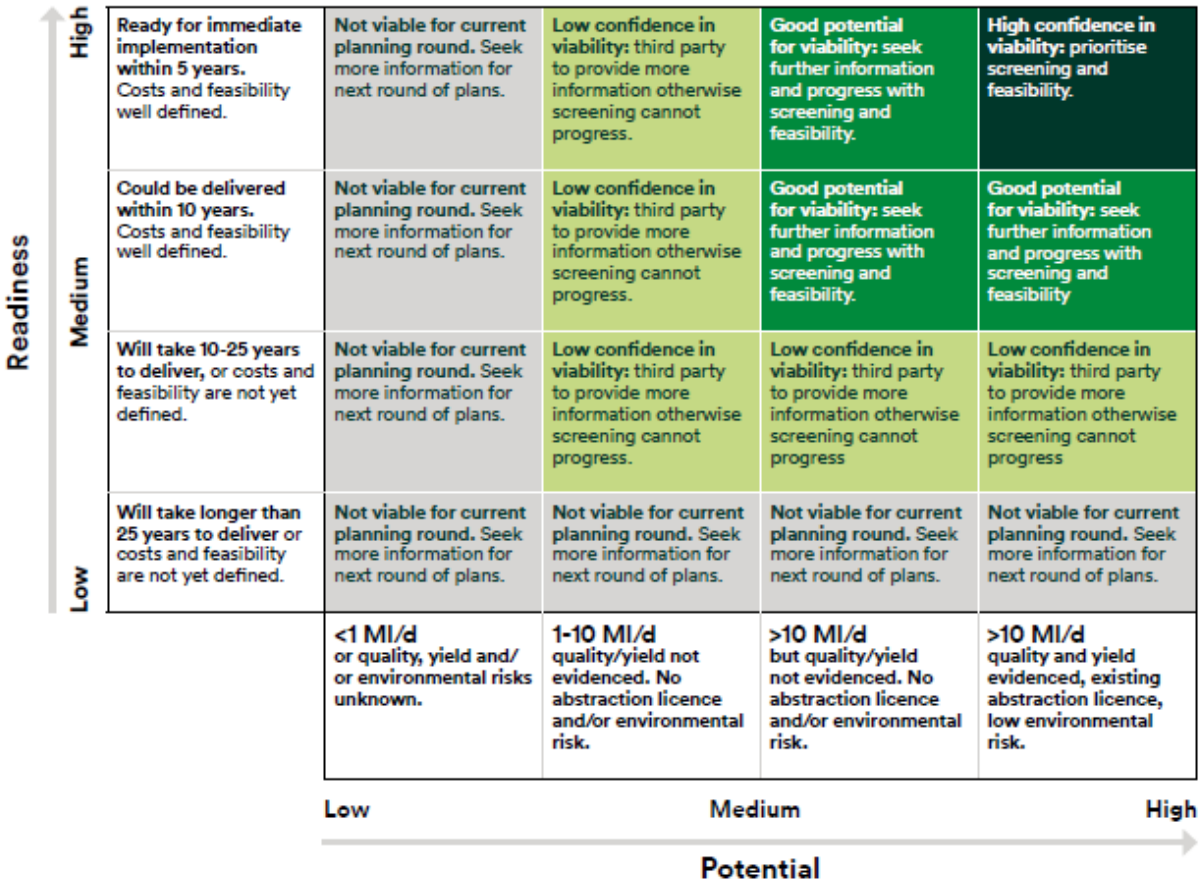
(PINs); direct stakeholder mailing; a project email address; online portal; targeted social media advertising; and a webinar with Q&A session.

To make it as easy as possible for stakeholders to get involved with the development of the WRMP, we adopted a digital-first engagement process that responded to social distancing restrictions in place due to COVID-19. These digital methods of engagement enabled us to reach a greater number of stakeholders from a wider geographical area and a broader mix of sectors than traditional face-to-face engagement would have enabled.

As part of this process, we have made direct contact with almost 200 stakeholders and targeted many more via the trade media and social media work outlined within this report. Engagement with the process is regarded to be a success, demonstrated by the interaction with our online methods. The project portal received 271 hits, compared with the direct outreach this represents a high level of engagement. The LinkedIn posts reached up to 2,500 LinkedIn users with many resulting in click-throughs. The most successful post secured almost 100 click-throughs, which helped to encourage sign-ups and option submissions. This represents a good level of engagement when compared with similar content posted from our LinkedIn page and when compared to other engagement processes for similar targeted utilities and infrastructure consultations.

Options identified during the abovementioned third-party engagement strategy in addition to new potential third-party options were assessed to determine their maturity and whether there was sufficient information with which to proceed. Figure 3 shows the approach adopted by the WRW water companies to assess the maturity of third-party options[36]. Options considered to have good or high confidence in viability were considered for high-level screening and further feasibility and environmental appraisal. This included developing engineering scopes and cost estimates similar to our own options. Options considered to have low confidence were only taken forward if there was sufficient information available to allowing screening.

Figure 3 WRW approach to assessing the maturity of third-party and trading options



[36] Adapted from UUW's BAF.

The results of the maturity assessment is summarised in Table 10. For completeness this includes all the third-party options considered for WRMP24 including those carried forward from WRMP19. It should be noted that not all options categorised as having good potential for viability based on the maturity assessment remained in the process. Some options were subsequently discounted as during ongoing third-party discussions we were advised that they were no longer available or should not be considered further. Some options were eventually screened out following further hydrological yield assessments (e.g. anticipated yield below the de minimis threshold). While all of the demand third-party options can technically be considered to have good potential for viability, the nature of the offerings (e.g. asset condition maintenance, products and software) are essentially already embedded in our activities as we continue to work with third parties on demand management/reduction via initiatives such as our Innovation Lab, various pilots/trials and other commercial routes (frameworks etc.).

Table 10 Third-party options considered for WRMP24

Maturity assessment	Supply	Demand
High confidence in viability	2	
Good potential for viability	34	18
Low confidence in viability	10	
Not viable for current planning round	10	
Total	**56**	**18**

As stated in the third-party principles at the beginning of this section, we have endeavoured to make the process as simple as possible for third parties to participate. To that end, we have completed Level 1 engineering assessments and environmental assessments for all supply options with high confidence and good potential for viability. Not only has this ensured that third parties that do not possess the resources to undertake such assessments are not disadvantaged, but also it has also increased the consistency so that it is possible to compare all the options on an equal footing.

4. Unconstrained to feasible options: Primary screening

4.1 Overview

This section describes the primary screening process and how we have applied this to our unconstrained options to arrive at a list of feasible options. A key principle of primary screening (also referred to as high-level screening), is to ensure that all options have been subjected to the same scrutiny at the initial stage of the options identification process. It is our priority that this assessment has been applied consistently across all unconstrained options, both our own options and those received from third parties, to achieve a balance between the number of feasible options and the availability of realistic choices. It is also important that the assessment provides an initial consideration of environmental impacts. In so doing, the potential to have unacceptable impacts that cannot be overcome is considered for all options, noting that more detailed environmental assessment is completed on feasible, constrained and preferred options at subsequent stages of options identification and decision making. Primary screening intentionally does not include an assessment of cost so as not to introduce cost bias at this early stage. An appreciation of the costs of implementing an option is introduced at secondary screening.

To ensure consistency across the WRW water companies, a common approach to primary screening was adopted. This included use of a common set of high-level screening criteria consistent with those used in each water company's WRMP19. It was also agreed that individual water companies would rescreen their WRMP19 rejected options to confirm if the previous reasons for rejection were still valid. Rescreening the feasible WRMP19 options against the high-level screening criteria was not considered necessary on the assumption that they would still pass primary screening, and that instead, these options should proceed to more detailed screening. New WRMP24 options would, however, be taken through the primary screening process.

Primary screening was carried out by an externally appointed, independent party (Wood[37]) to provide evidence of an objective, systematic, rigorous and consistent approach to evaluating the relevant unconstrained options. The full primary screening methodology and results are documented in a separate report[38]. A summary of the assessment and results is provided in the following sections. Options that pass the primary screening stage are termed feasible options while those that are screened out are referred to as rejected/discounted options.

4.2 Primary screening process

In preparation for primary screening, WRMP19 screening criteria were mapped to that of WRMP24 to confirm where previously collated data could support the new screening exercise and to identify additional information/sources required to undertake screening. Several sources of environmental data were used to inform screening of the resource options[39].

Options identified for primary screening (new WRMP24 options and rejected WRMP19 options) were assessed against a range of criteria covering four key areas as set out in Table 11 – option benefit; engineering risk and delivery feasibility; environmental, planning and other regulatory constraints; and political and customer acceptability. A Red-Amber-Green (RAG) approach was used to grade each option to a given criterion on a satisfactory to unsatisfactory basis ('Green' being satisfactory and 'Red' being unsatisfactory). Two levels of 'Amber' were used in a yes-no form to allow more clarity in the screening process. Responses bordering close to a satisfactory result were assigned 'Yes-Amber', while those closer to an unsatisfactory result were tagged 'No-Amber'. It should be noted that the significance of a yes-no response varied depending on the wording of the

[37] Also appointed to carry out the suite of environmental assessments (Section 7.4) and audit the detailed screening process (Section 6.2.1).

[38] Wood (2021) UUW WRMP24 Options Appraisal: Primary Screening of Unconstrained Options.

[39] For example, the Environment Agency's Catchment Data Explorer for environmental Water Framework Directive catchment data (https://environment.data.gov.uk/catchment-planning/); Natural England's Designated Site Viewer (https://designatedsites.naturalengland.org.uk/SiteSearch.aspx); and Defra's Magic Map application to identify designated sites (https://magic.defra.gov.uk/MagicMap.aspx).

screening criteria. For criteria 1 to 6, 'Yes' denoted a positive response ('Green'), while for criteria 7 to 11, 'Yes' indicated a negative response ('Red'). An example of the RAG screening assessment of an option to criterion 1 is shown in Table 12.

Table 11 Primary screening criteria

Theme	No.	Screening criteria
Option benefit	1	Is the likely scale of supply benefit (yield)[40] to water companies and/or other sectors relative to the supply deficiency sufficient to proceed?
	2	Is the option in a location that makes deployment practicable?
	3	Is the option likely to be granted an abstraction licence or other necessary consent?
	4	Could the option offer supply/demand benefits at a regional or national scale?
Engineering risk and delivery feasibility	5	Is the engineering complexity such that it is highly likely to deliver the benefit stated i.e. is it technically feasible?
	6	Is the technology established with more than one example of use at scale worldwide?
Environmental, planning and other regulatory constraints	7	Does the option cause unmitigable damage to a European designated site (SAC/SPA/Ramsar)?
	8	Does the option cause unmitigable damage to a Nationally designated site (SSSI/NNR/National Park/Ancient Woodland)?
	9	Does the option cause unmitigable damage to a site with significant heritage or visual amenity value (e.g. Scheduled Ancient Monument or AONB)?
Political and customer acceptability	10	Is the option politically unacceptable such that it is unlikely to gain planning approval?
	11	Does it cause significant negative socio-economic impact than cannot be mitigated?

Table 12 RAG grading system explanation

Screening criteria	Answer and RAG grade	Grade explanation	Example option response
1. Is the likely scale of supply benefit (yield) to water companies and/or other sectors relative to the supply deficiency sufficient to proceed?	Yes – Green	Significant supply benefit available – high certainty of supply.	A sustainable 15.5 Ml/d WAFU benefit indicated.
	Yes – Amber	Moderate supply benefit available – some uncertainty of supply.	A 5 Ml/d supply indicated, some uncertainty of summer flow availability.
	No – Amber	Moderate or small supply benefit available – some serious uncertainty of supply.	A 2 Ml/d supply indicated; groundwater body already shown to be heavily abstracted and in poor condition.
	No – Red	Supply benefit indicated is below the de minimis level for the WRZ or zero – significant uncertainty of supply.	Only 1 Ml/d supply benefit indicated which is below the de minimis level for the WRZ.

[40] The de minimis threshold for each WRZ as set out in Table 4 was used to inform this criterion for the resource options.

The aggregated RAG outcomes for the 11 criteria were used to arrive at a final screening verdict, considering the most significant responses across all the criteria. It should be noted that a 'Red' verdict for an individual criterion did not automatically screen out an option. Instead, a balance of probability decision was taken based on best available information and expert judgement. A 'Red' flag against criteria 1, 3 and 7 generally resulted in an option being immediately screened out. 'Red' and 'Amber' flags for all criteria were considered during the final verdict and the option screened out if a significant aggregation of unsatisfactory scores was received.

The screening criteria as set out in Table 11 were applied as and when relevant to a given option and were applied in full to resource options (both UUW and third-party options). A reduced list of screening criteria was applied to demand options due to reduced applicability. Only four criteria were applied to the demand options with the wording slightly modified to make them more relevant to the option type (Table 13). The above-mentioned RAG approach was also applied to the demand options.

Table 13 Screening criteria used for demand options

Theme	No. (relative to the full criteria list)	Screening criteria
Option benefit	1	Is the likely scale of demand saving benefit to water companies and/or other sectors relative to the supply-demand deficiency sufficient to proceed? Can UUW have confidence that potential savings will translate into a WAFU benefit with certainty?
Engineering risk and delivery feasibility	5/6	Is the option technically feasible and the technology established with examples of it in use at scale worldwide?
Political and customer acceptability	10	Is the option politically unacceptable such that it is unlikely to gain planning approval?
	11	Does it cause significant negative socio-economic impact than cannot be mitigated?

4.3 Primary screening results

The results of primary screening are shown in Table 14. Of the 90 supply options screened, 71 options were screened out, while 19 options were screened in and taken forward for more detailed review along with the WRMP19 feasible options. Some of the reasons for screening in options for further consideration were as follows:

- To engage further with third parties;
- To reassess available flow yields on selected abstraction/groundwater options;
- To reassess/enquire into specific licences that may have changed in status since WRMP19;
- To reassess some of the more complex and innovative options/technologies that may now be viable for potential pilot studies;
- To re-engage with customers, particularly non-household commercial and industrial customers, where more targeted demand saving schemes may be suitable; and
- To reassess the viability of rainwater harvesting/greywater reuse schemes for large industrial and commercial customers with high water usage.

Options were often screened out based on failure against key criteria with several of the more common failure flags being attached to:

- Option yields falling below the de minimis values for the respective resource zone;
- Option yields being highly uncertain/high likelihood of being unsustainable;

- Environmental risks being too great and/or deemed unmitigable;
- Waterbodies/groundwater bodies affected by the option already being in 'Poor' status or already under considerable stress;
- Option is not practical – engineering complexity is too substantial/operation of the scheme is not feasible; and
- Option is deemed far too politically or socio-economically unacceptable.

Reasons for discounting options are summarised in Appendix B.

Table 14 WRMP24 primary screening results

	Supply		Demand	
	UUW	**Third-party**	**UUW**	**Third-party**
No. of options requiring primary screening	58	32	58	15
No. of options screened out (or combined with other options)	45	26	34	15
No. of options screened in	13	6	24	-

All options that passed through primary screening were included on the WRMP24 list of feasible options along with the feasible WRMP19 options. The development of these options is summarised in the next section. Appendix B to this report provides a summary of the primary screening outcome. It should be noted that options in the appendix identified as unconstrained options include options that were discounted during the initial primary screening exercise and options discounted during subsequent phases of the options identification process if the reason(s) was consistent with key primary screening criteria. For example, options discounted as a result of WINEP outcomes (e.g. licence reductions) were eventually identified as unconstrained options as they would have failed primary screening criteria 1, 3 and 4.

5. Feasible to refined feasible options: Option development and secondary screening

5.1 Overview

This section describes how we have developed the feasible options following completion of primary screening of the unconstrained options. This stage of the process involved developing defined scopes for the feasible options that allowed them to be costed to an appropriate and consistent level of detail for assessment in regional decision making and our WRMP. In keeping with the WRW regional decision making methodology and our WRMP investment optimisation modelling, cost and supply/demand benefits data generated included capital costs to implement the option, fixed and variable operating costs, embodied and operational carbon costs and supply/demand saving volumetric benefit to the beneficiary resource zone. Consistent with the Guideline, a second stage of screening (secondary screening) was undertaken to reduce the list of feasible resource options and focus activity on the most cost-effective options. This resulted in a list of refined feasible options which was taken forward for environmental assessment.

The following section is structured as follows:

- Development of option scopes and assumptions;
- Creation of cost estimates;
- Calculation of Average Incremental Cost (AIC);
- Carbon accounting;
- Assessment of option benefits and utilisation; and
- AIC shortlisting (secondary screening) to select refined feasible options.

5.2 Development of option scopes and assumptions

5.2.1 Systems Thinking

The adoption and application of a Systems Thinking approach to the operation and maintenance of our assets is something that we have been working on since AMP6. It involves viewing our water assets as one end-to-end water system, understanding how the components of that system interact and impact each other, and, therefore, being able to learn and predict the overall performance of our system for customers, stakeholders and ourselves. Throughout AMP7 we have being trialling this approach as part of the development of our new water supply system in West Cumbria. This activity is focused on creating the required digital platforms and infrastructure to enable us to proactively monitor performance of the West Cumbria system and predict potential issues that could impact customer service or optimal system performance. We will use analytics and machine learning to optimise the system and determine required interventions. This automated decision making is being trialled through the use of a system optimiser across all critical sites, which will directly trigger remote control actions.

At this stage of WRMP option development, the level of scoping is not along the lines of a Systems Thinking approach, which would be adopted during subsequent phases of option development.

5.2.2 Option scoping

Option scopes were developed for all of our feasible options to enable us to assess the costs of constructing and operating each option. This was done using our internal engineering and cost estimating systems and is adequately documented as Level 1 engineering assessments. A consistent approach to scope development was adopted for the resource management options (UUW and third party) and included a description of the location of the required assets, the expected capacity, main operational features and assumptions around where the water would be treated and utilised within our supply system. In some cases, it was difficult to ascertain the exact benefit without understanding the modelled benefits in our water resources modelling software (Section 5.6).

The modelled data were used as appropriate to update the option scope. In some cases, multiple scopes were developed to allow options to provide water to different parts of our supply system. During this process, we were cognisant of the need to protect the customer's interests by using an efficient scope of work (for example, utilising existing water treatment work sites rather than building new ones). All of the assumed new or existing infrastructure requirements such as service reservoirs, pumping stations and pipelines were detailed in the scope so that the option could actually work within the current supply system configuration. This process also allowed us to describe any links or dependencies to other options and/or existing schemes where these were known.

The detail of the requirements for each scope was as follows:

- The location of the abstraction, which could either be an existing point of abstraction or a new site. In the case of a new abstraction, an indicative location was determined for costing purposes;
- The capacity of the option, which could either be existing/known abstraction licence quantities or an assessment of what the likely quantities available for abstraction might be. Where limited data were available to assess the possible capacity, generic data sources were used as appropriate, e.g. data from the National River Flow Archive to understand river flows in catchments or published data on groundwater yields[41]. In the case of third parties, discussions allowed us to ascertain the likely capacity of the option;
- The water quality of the option and possible risks. For our existing sources of water, historical raw water quality data were provided, where known. For new sites, assumptions were made about the likely water quality to determine suitable treatment requirements to ensure we meet our regulatory obligations for water supplies. In particular, changes in water quality type were noted as being important for the scope to consider ensuring that there would be no deterioration in the quality of water supplied to customers (e.g. where an option could change the composition of the existing water supply network and potentially cause aesthetic impacts, appropriate mitigation would need to be included). A similar approach was taken with the third-party resource options and this required collaborative working to ensure fair representation of the proposed scope along with any assumptions made; and
- Where a resource option was designed to transfer water or required commissioning of a new source, we considered mitigation for risks such as transfer of Invasive Non-Native Species (INNS) between catchments.

For third-party resource management options, this approach to scope definition and costing was also applied as we are required to quantify the costs and potential risks in exactly the same way as our own options to ensure parity between all options during the options identification process. The third party was involved with the definition of the scope as they were asked to provide indicative information.

As discussed in Section 3.5, we identified a wide range of demand options. For demand option development, we developed a modelling framework to allow option costs and benefits to be estimated. This modelling framework uses assumptions from activity we have completed and realised the benefits from, as well as the learning from our various recent pilots/trials (some of which are ongoing), including:

- Project Beehive (looking to achieve full smart metering in two district metered areas), as well as providing customers with visualisation of consumption/usage and leak alarms;
- Customer-side/private leakage technology trials to determine the most appropriate approaches/technologies to pinpoint smaller leaks;
- Working with allotments, such as Brighton Grove to provide rainwater harvesting facilities;
- Offering free water butts and new "Smart Water Butts" that support rainwater harvesting and minimise the impact of storm events on the wastewater network;
- Working with the education sector via water efficiency audits/visits (fitting water efficiency devices, as well as fixing "leaky loos" and dripping taps) and now "Water for Schools" (a combined water and wastewater offering of water efficiency and sustainable drainage systems);

[41] For example, the British Geological Survey's publication on the physical properties of minor aquifers in England and Wales. http://nora.nerc.ac.uk/12663/.

- Water efficiency home audits/visits and "Utilities Together" audits/visits, working with energy companies to provide a joint water efficiency and energy efficiency offering;
- Flow regulator trials to understand the impact of installing flow regulators on flows and pressures; and
- Our Macclesfield smart water network, which has increased our understanding of network sensor deployment, network data visualisation and the application of advanced analytics.

The modelling framework combines this understanding with the practicalities of delivering these interventions/options at scale, acknowledging that:

- There may still be some uncertainty over the precise costs and benefits (generally, we have to balance uncertain innovations with interventions/options with more certainty);
- Technology is changing rapidly and digital disruption may create new opportunities that we do not currently know about;
- We are still adapting to the realities of a world post the COVID-19 pandemic – again this may impact option cost and benefits.

The above points can only be addressed via an agile approach and this is why the WRMP24 planning framework is centred around adaptive pathways/planning.

5.2.3 Water quality risk management

For resource options that proceed beyond primary screening to the feasible or constrained option stages, the water supply system (whether a raw, partially or fully treated source) is subject to the Water Supply (Water Quality) Regulations 2016[42] and subsequent revisions or amendments. In particular, Part 3 (Regulation 4) ensures that water supplies are wholesome, Part 5 (Regulation 15) relates to the conditions of use and sampling requirements for new sources, and Part 8 (Regulation 27 and 28 relates to the risk assessment requirements. Guidance notes on the Regulations are provided by the Drinking Water Inspectorate (DWI)[43].

The risk assessment process and associated requirements for water quality sampling will vary depending on the type of water source. We expect to apply more detailed water quality sampling and analysis to water supply sources where the risks or uncertainty are known to be greater. Drinking water safety plans (DWSPs)[44] already exist for our current sources, so for options that comprise existing operational water supply sources, the water quality risks and required mitigation are well understood. We have, however, undertaken a high-level water quality risk assessment of the feasible options to assess the risks to drinking water quality based on expert judgement. A RAG approach was used to attribute risk as it relates to anticipated source/raw water quality, treatment requirements and customer acceptability. An example of the RAG assessment of a new groundwater option is shown in Figure 4. While there is some uncertainty of the raw water quality as this is a new groundwater source, the treatment requirements are considered standard/typical. There is, however, some uncertainty regarding customer acceptability of the change in water quality ('harder' more mineralised groundwater) as the supply has previously been 'softer' water from a river abstraction. This type of approach is consistent with the DWI's risk-based approach to planning for water resources and sufficiency of supplies.

[42] http://www.legislation.gov.uk/uksi/2016/614/contents/made

[43] http://www.dwi.gov.uk/stakeholders/guidance-and-codes-of-practice/wswq/index.html

[44] DWSPs must be completed by water suppliers for each of their supply systems to identify hazards of concern (or partially mitigated hazards) and any associated parameters and retain evidence that the sources of hazards have been identified and confirmed and the range of options for mitigation considered.

Figure 4 High-level water quality risk assessment example

WQ risk/opportunity				Comments
Source/raw water risks		X		Uncertainty re raw water quality. Assumed little treatment would be required but likely to require communication for acceptability.
Treatment requirements			X	
Acceptability		X		

High Medium Low

The main water quality considerations for us with regard to water supplies from resource options are broadly summarised as follows:

- *The water resource provider offers no guarantee with regard to the quality of water provided:* Should such an option become part of the constrained options list, UUW will have full responsibility for Water Supply Regulations compliance. We will take this into account in costing the option, by including the cost of undertaking and documenting the risk assessment, the cost of appropriate water quality sampling, the cost of supply shutdown or isolation, the cost of treatment and any other associated costs required to ensure compliance. It is likely, therefore, that the cost of this supply would reflect the lack of water quality guarantee from the supplier;
- *The water resource provider supplies raw or partially treated water to a guaranteed standard:* Should such an option become part of the constrained options list, then the supplier would carry a contractual obligation to meet the guaranteed standards and have obligations under the Water Supply Regulations. Notwithstanding this, UUW will have responsibility for Water Supply Regulations compliance from the point of transfer, and will take this into account in costing the option by including the cost of undertaking and documenting the risk assessment, the cost of appropriate water quality sampling, the cost of supply shutdown or isolation, the cost of treatment and any other associated costs required to ensure compliance treatment; and
- *The water resource provider supplies potable water directly into UUW's network (e.g. at a bulk supply point)*: Should such an option become part of the constrained options list, then the supplier would carry a contractual obligation to meet the guaranteed standards and have obligations under the Water Supply Regulations. Notwithstanding this, UUW will have responsibility for Water Supply Regulations compliance from the point of transfer and will take this into account in costing the option, including the cost of undertaking and documenting a risk assessment, the cost of appropriate water quality sampling (e.g. tap samples).

In all cases we envisage that UUW and the water resources provider would meet with the DWI to confirm the appropriateness of the supply option, and the relevant safeguards with regard to Water Supply Regulations.

5.2.4 INNS risk

A standardised approach was adopted for the control of INNS at this stage of option development. The scope of all new surface water sources transferring water to a reservoir/alternate location includes treatment comprising a microstrainer and biobullet dosing[45] to minimise downstream growth of zebra/quagga mussel larvae and thereby mitigate the transfer of INNS. For costing purposes, a poly dosing system is used as a surrogate for the equipment needed for biobullet dosing. For sites where surface water is taken directly to a new or existing treatment works, no specific provisions have been included as it is considered that the treatment process would provide adequate control of INNS. For groundwater sources it was assumed that there is no risk from INNS in the water and so no protection is required.

[45] Biobullet is a proprietary product for the control of biofouling pests such as zebra/quagga mussels. It encapsulates targeted toxins in a number of materials to ensure buoyancy, dispersability and palatability to the target species. Biobullets degrade to harmless concentrations within an hour of entering the water and are approved safe for use in drinking water facilities (www.biobullets.com).

As part of our INNS programme of works we have recently carried out an assessment of our existing assets looking at historical and future risks with suggestions of different mitigation measures that could be trialled to enable better understanding of available best technology to address specific INNS risks. It is anticipated that any learning from pilot testing would inform future costing iterations.

5.3 Creation of cost estimates

We have utilised the expertise within our estimating supplier to provide option costs for the resource options via our Investment Programme Estimating System (IPES) and have cross-checked with them, our approach to calculating demand management option costs. The estimating of the costs to build and operate options is consistent with our wider 2024 Price Review (PR24) assumptions and there is no distinction for the WRMP options that would differentiate them from estimates provided for other areas of the business. For our supply options, the cost to achieve 10 per cent biodiversity net gain (BNG)[46] was estimated as part of the environmental assessment (for permanent impacts only) and added to the option cost.

Costs for our own demand management options were derived from existing known and projected business costs (e.g. leakage repair and detection) and are based on contract prices. For third-party customer and distribution options, we worked with the third party to understand the components of their proposals in order to cost the option as accurately as possible. For third-party demand options, we prompted the third party to develop, cost and submit a scope based on their option proposal.

Costs for the drought permit and level of service change options were built up based on known and projected business costs to carry out similar activities. For the drought permit options this included costs associated with pulling together the drought permit application, the evidence required as part of the application and contractor costs during implementation and subsequent return to normal. Costs were based on the complexity and sensitivity of the site (e.g. designations, in-combination impacts that need to be considered, etc.) and were informed by applications we prepared in 2018. For the level of service option, costs were based on the average willingness to pay for the improved level of service (1 in 40)[47] and the number of billed properties as per our WRMP24 household properties forecast excluding voids.

It is recognised that at this stage of option development, there is some uncertainty associated with option capacities, scope, costs of construction, operation of schemes and delivery timescales. Our cost estimates are within a ±30 per cent margin of error and are aligned to the Association of Advancement of Cost Engineering (AACE) Class 4 estimates for project definition at the conceptual level[48]. To ensure consistency with the RAPID SRO approach, we have applied optimism bias adjustments to our feasible option estimates following a confidence grading exercise (assigning a high/medium/low confidence band to different uncertainty factors such as design complexity, innovation and technology and approvals) to consider uncertainty risk in a consistent way[49]. The expectation is that as option scopes are developed further in later stages, there will be a reduction in the level of uncertainty and the cost of risk, with optimism bias scaled back to a residual level by the time of contract award.

5.4 Calculation of Average Incremental Cost (AIC)

The Guideline is fairly prescriptive on costing information required for each option. To ensure consistency in our WRMP and the WRW regional plan, we used the financing cost approach adopted by the ACWG including asset

[46] New BNG requirements are set to be enforced in November 2023 which will require all new developments in England, bar a few exceptions, to deliver at least 10 per cent BNG.

[47] Based on customer preference research (see our *Technical Report - Customer and stakeholder engagement* for further detail).

[48] AACE Class 4 expected accuracy lower range is -15 per cent to -30 per cent and upper range is +20 per cent to +50 per cent. (www.processengineer.com/capital-cost-estimate-classes/)

[49] As adopted for the AMP7 RAPID/SRO schemes and described in the All Company Working Group's (ACWG) Cost consistency methodology, August 2020, Mott MacDonald.

life assumptions, discount rate and weighted average cost of capital. The net present value (NPV) of costs was calculated for each option over an 80-year appraisal period using the standard declining long-term discount rate as set out in the Treasury Green Book. The average incremental cost (AIC) in p/m^3 was calculated for each option based on the NPV of its costs (financing, capital and operational costs) and outputs (capacity).

5.5 Carbon accounting

5.5.1 UUW's approach to climate change

In 2020 we made six carbon pledges as part of our commitment to tackling climate change (Table 15). Central to these was to set science-based targets (SBTs) for all emission scopes. We are proud to be the first UK water company to have these targets approved by the Science Based Targets initiative (SBTi), a collaboration that defines and promotes global best practice in science-based target setting. The SBTi assessed and verified our SBTs in July 2021 and commended our ambitious 1.5°C aligned scope 1 and 2 target.

Table 15 UUW carbon pledges and science-based targets

Carbon pledges

- Pledge 1: Reduce scope 1 and 2 emissions by 42 per cent compared to baseline
- Pledge 2: 100 per cent of electricity used from renewable sources (achieved since October 2021)
- Pledge 3: 100 per cent green fleet by 2028
- Pledge 4: 1,000 hectares of peatland restoration by 2030
- Pledge 5: Create 550 hectares of woodland by 2030
- Pledge 6: Set scope 3 science-based target (achieved)

Science-based targets

- SBT 1: Reduce scope 1 and 2 emissions by 42 per cent by 2030 compared to baseline
- SBT 2: 100 per cent renewable electricity
- SBT 3: 66 per cent construction services suppliers by emissions have SBTs by 2025
- SBT 4: Reduce other scope 3 emissions by 25 per cent by 2030 compared to baseline

We have a strong legacy of managing emissions and public disclosures and have disclosed our greenhouse gas (GHG) emissions via the Carbon Disclosure Project (CDP) annually since 2010. We are proud that our 2022 disclosure achieved an overall Leadership (A-) rating and we are taking steps to ensure we maintain a Leadership rating in 2023 and beyond. Our baseline carbon footprint is calculated by estimating the individual GHGs that result from all of UUW's activities, converted to a carbon dioxide equivalent (tCO_2e). We report scope 1, 2 and all relevant scope 3 emissions; Table 16 summarises our scope 1, 2 and 3 GHG emissions for the 2021/22 reporting year[50]. Emissions have been estimated using the UK water industry Carbon Accounting Workbook v16 (CAW v16), the 2021 UK Government GHG conversion factors for company reporting and CEDA (Comprehensive Environmental Data Archive) factors. Our GHG inventory has been independently verified and certified by the Toitū carbon reduce programme, as aligned to the GHG Protocol Corporate Accounting and Reporting Standard (2015) and the international carbon reporting standard ISO 14064, Part 1:2018.

Table 16 Scope 1, 2 & 3 greenhouse gas emissions (company wide, 2021/22)

Scope 1, 2 & 3 GHG emissions	2021/22 tCO_2e
Scope 1 & 2 (net) location-based[51]	118,429
Scope 3	495,145

[50] Further information on our approach to climate change and baseline GHG emissions can be found at unitedutilities.annualreport2022.com/our-approach-to-climate-change.

[51] Location-based figures use average grid emissions to calculate electricity emissions.

Our 2030 science-based targets to reduce emissions and our long-term plan to achieve Net Zero for scope 1, 2 and 3 emissions by 2050, requires transformation, innovation and agility in response to an evolving understanding of emerging technologies and associated cost benefit. We have demonstrated our capability to reduce our GHG emissions having reduced them by over 70 per cent since 2005/6, largely from working to balance our energy consumption, self-generation and being smart about how we operate our assets to get best value while maintaining security of supply. In 2021/22 we generated a record 210 GWh of renewable energy from a mix of generation from wind, hydro, solar photovoltaics and energy recovery from bioresources (using sewage sludge to power combined heat and power generators). Between self-generated power and purchased electricity, from October 2021 100 per cent of the electricity we use has been from renewable sources.

We are also working towards meeting our other carbon pledges. We are trialling alternative fuels to replace fossil fuels used in our treatment processes and for transport, and have projects underway to restore peatland and plant new woodlands which will have a net GHG reduction. To address our scope 3 targets we are already working with suppliers such as Sapphire Utility Solutions to reduce emissions from their fleet as they carry out maintenance on our network and with Changemaker 3D on making made-to-measure objects out of more sustainable concrete on site through 3D printing.

Our six carbon pledges were made in United Utilities 2020 Annual report[52] and are shown in Figure 5. The pledges were made with the primary objective of climate change mitigation by a net reduction in greenhouse gas (GHG) emissions, whilst also delivering additional natural capital benefits such as air quality, biodiversity and improved raw water quality. These pledges predate the latest WRMP and their intent is to reduce net GHG emissions across the full UUW footprint, rather than their reductions being against a specific WRMP plan. As part of our PR24 submission to Ofwat in October 2023 we undertook assessments of various options in our Long Term Delivery Strategy. These set out the cost to mitigate the GHG emissions impact of different options. More detail is provided on our woodland and peatland carbon pledges below.

Pledge four aims to deliver 1000 hectares of peatland restoration by 2030 and pledge five intends to plant 1 million trees to create 550 hectares of woodland by 2030. The GHG benefits from peatland restoration and woodland creation will be estimated using the Peatland Code calculator and the Woodland Carbon Code calculator respectively. These voluntary certification standards set the requirements, and mechanisms for validation and verification for voluntary projects of peatland restoration and woodland creation. The schemes provide assurance to voluntary carbon market buyers that the climate benefits of the projects are real, quantifiable, additional, not double counted and permanent.

United Utilities intends to use the any carbon units issued to inset against our residual GHG operational emissions in our annual GHG emissions accounting. Units will be retired from the UK Land registry and reported in the Streamline Energy and Carbon report within our United Utilities Group Annual Report for the relevant financial year.

For peat restoration, the benefits of each hectare of restoration activity depend on the Peatland Code condition category before restoration. The claimable emission reduction is the difference in sequestration before and after restoration minus 10% leakage and minus a further 15% buffer. The potential value for 1000 hectares restored is anticipated to be in the region of c2,200 tCO_2e/year, using our most up to date analysis of our peatland land holdings and version 2 of the Peatland Code. Carbon units are only issued once verification is complete which will happen at five year intervals for each project. Therefore, we will not be able to retire any units from the UK Land registry and report as a tCO_2e benefit until five years after restoration has been completed.

Pledge 6 focuses on woodland creation: 1 million trees to create 550 hectares woodland by 2030. The carbon benefits of each hectare of new woodland depend on the following criteria

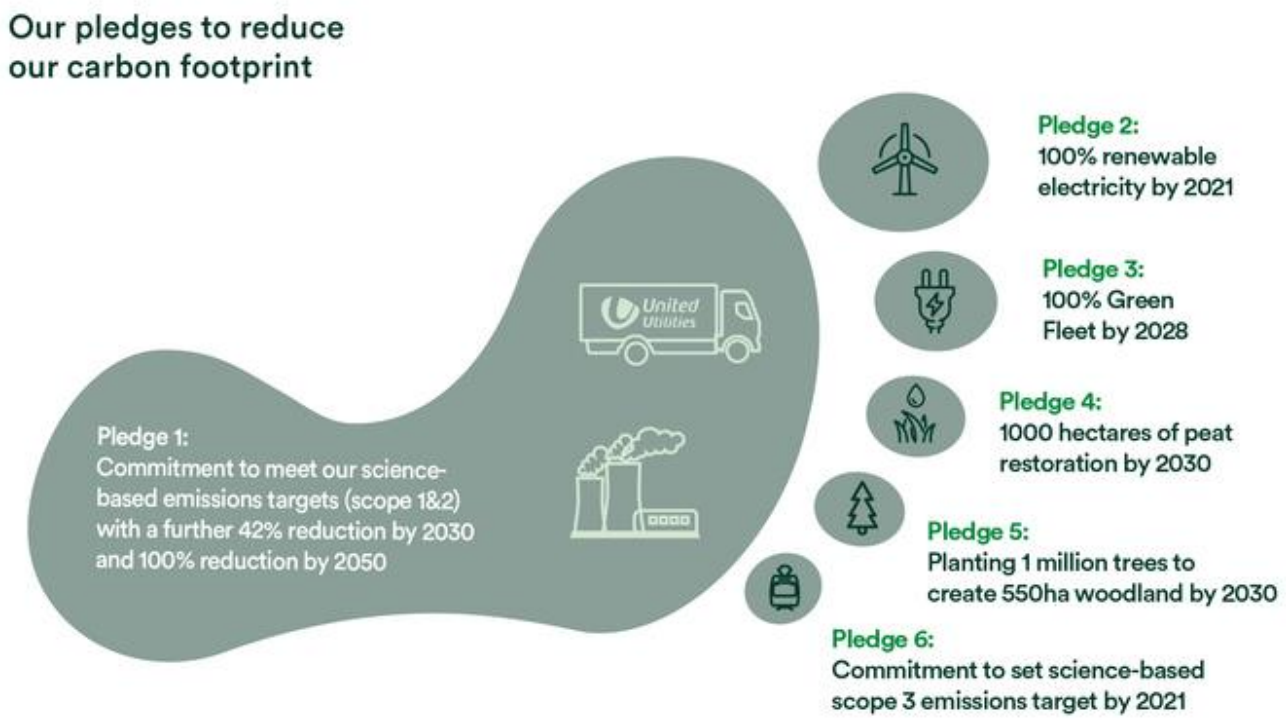
- the species of trees planted,
- the spacing of the trees,
- the yield class (how well the trees will grow in the planting position),

[52] Annual reports | United Utilities - Corporate

- the age of the trees,
- and the management regime.

The emission reduction profile is estimated for each project during the validation stage. Following initial validation, the verification stage assesses the carbon sequestration that has occurred as well as continuing sustainable forest management. Woodland carbon units are delivered through 5 or 10 year blocks per project. Therefore, we will not be able to retire any units from the UK Land registry and report as a tCO_2e benefit until verification a minimum five years after planting. We have estimated the potential annual value for 550 hectares to range from 1,000 tCO_2e/year to 10,500 tCO_2e/year once verified. These figures use average sequestration across all criteria (e.g. species, spacing etc). Actual planting will be planned to optimise the potential for the land which may not always be the maximum carbon benefit.

Figure 5 Carbon pledges



5.5.2 Carbon estimating

Carbon dioxide (CO_2) makes up the vast majority of GHG emissions[53] in the water sector and carbon valuation of the feasible options in a consistent manner allows water companies as part of decision making, to seek out the most cost-effective opportunities to reduce carbon (and climate change impacts). Our approach to carbon accounting is consistent with the latest UKWIR[54] and government guidance[55] and has been revised since our draft plan submission based on a new PR24 carbon tool developed by our external consultant[56]. The new carbon tool

[53] Other GHGs of note include methane (CH_4) and nitrous oxide (N_2O). Emissions of non-CO_2 GHGs are more volatile and uncertain to forecast than those for CO_2. In addition, measurement problems and underdeveloped policies to reduce non-CO_2 emissions are generally undeveloped and so judgements of feasibility are less certain.

[54] UKWIR (2022) Calculating whole life/totex carbon. Report Ref. No. 22/CL/01/32 and UKWIR (2012) Framework for accounting for embodied carbon in water industry assets. Report Ref. No. 12/CL/01/15.

[55] For example, the Department for Business, Energy and Industrial Strategy (BEIS) guidance on how to apply the Treasury Green Book supplementary appraisal guidance on valuing energy use and GHG emissions carbon prices.

[56] Mott MacDonald (2022) PR24 Carbon methodology.

has been closely aligned with our IPES cost and data models with improved coverage of water sector asset types and built to align with global standards on carbon quantification including the GHG Protocol and PAS 2080[57].

For our plan we have undertaken a whole-life GHG emissions assessment of all our feasible options across an 80-year lifecycle. This included a cradle-to-built asset assessment of capital carbon (initial build and replacement) classified as scope 3 emissions, and build-up of operational carbon (power, chemicals and maintenance) considered a combination of scope 2 and 3 emissions. Capital carbon (initial build) was estimated using the IPES cost and data models mapped to relevant carbon data (e.g. yardstick estimates of high carbon content items[58] for particular assets/components in the option engineering scope). This required a good understanding of option scope inclusions and exclusions to avoid double counting. Replacement carbon was estimated based on the assumed asset life categories, with the percentage cost composition for each category applied to the total capital CO_2e for each option, repeating the carbon intensity at the associated interval over the 80-year investment period. The annual operational power consumption in kWh/yr was converted to emissions in tCO_2 equivalents (tCO_2e) using energy conversion factors from the Treasury Green Book supplementary appraisal guidance[59]. Power grid decarbonisation was accounted for over the 80-year investment period with the option in use date taken as year 1 of operation. For chemicals, an annual operational carbon value (tCO_2e/yr) was calculated by multiplying the total mass of chemical consumed by the associated emission factor (in tCO_2e/t) and summing all chemicals consumed.

Carbon accounting for the demand options (metering, leakage and water efficiency) was carried out as follows:

- **Metering options**: Embodied carbon in a water meter was estimated based on the mass and assumptions concerning constituent materials (plastic, brass, concrete and steel). Embodied carbon was also estimated for the additional pipe (if required) to connect the meter. The number of meters and additional pipe installed under a metering programme was then multiplied by the per unit embodied carbon to obtain an estimate of embodied carbon for the option;
- **Leakage options**: Embodied carbon involved in leakage activities (network sensors, new valves, mains rehabilitation/renewal/replacement, repairs, etc.) was estimated based on the mass and assumptions concerning constituent materials. The specific activity was then multiplied by the per unit embodied carbon to obtain an estimate of embodied carbon for the option; and
- **Water efficiency options**: Embodied carbon in water efficiency devices (inside and outside) was estimated based on the mass and assumptions concerning constituent materials. The number of water efficiency devices delivered through different water efficiency options was multiplied by the per unit embodied carbon to obtain an estimate of embodied carbon for the option.

For all demand options, assumptions regarding vehicle types, distance travelled and number of vehicle movements during implementation were used to estimate carbon emissions from construction vehicle movements. Similar assumptions were made to estimate operational carbon from vehicle movements during operation factoring in the company's target to switch to a green fleet by 2028.

It is worth noting that a key benefit of demand options is reduced requirement for treating and pumping water. The carbon assessment takes account of this benefit via reduced power and chemical requirements.

5.5.3 Monetising carbon

Carbon cost (total NPV of monetised carbon) is one of eight best value metrics used in our decision making and following customer preferences research, it was given the highest weighting of all the best value metrics (see our *Technical Report - Deciding on future options* for further detail). These data have fed into our best value multi-

[57] PAS 2080 is a global standard for managing infrastructure carbon. It provides a framework to look at the whole value chain and aims to reduce carbon cost through intelligent design, construction and use.

[58] For example, concrete, steel, plastic and aggregate.

[59] https://www.gov.uk/government/publications/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal. Table 1: Electricity emissions factors to 2100, $kgCO_2e/kWh$ (last accessed 11/04/2023). Note that the GHG emissions per unit of electricity include CO_2, CH_4 and N_2O.

criteria analysis to determine our preferred programme of options. The whole-life carbon emissions were monetised by applying Treasury Green Book central estimate carbon prices per tonne CO_2e[60].

5.5.4 Carbon uncertainty

Our engineering estimates upon which the carbon assessments are based, are within a ±30 per cent margin of error and are aligned to the Association of Advancement of Cost Engineering (AACE) Class 4 estimates for project definition at the conceptual level (see Section 5.3). The expectation is that as option scopes are developed further in later stages, there will be a reduction in the level of uncertainty which will be reflected in the carbon assessments as changes in scope/design would be the main contributor to significant carbon value changes. The carbon models have been developed to align with the option scope inclusions and exclusions to avoid double counting between models.

With regards to GHG emissions modelling, uncertainty percentages are relatively low, ranging from about 1–5% depending on the asset and standard required. The majority of emissions factors are based on the Inventory of Carbon and Energy (ICE) database v3 and Civil Engineering Standard Method of Measurement Carbon and Price Book 4 (2013). These are both industry recognised datasets but it is acknowledged that some values may be outdated given that CESMM4 has not been updated since 2013. The carbon estimates are based on standard water industry assets and conventional methods of construction and do not account for anything that would fall outside of this, for example additional levels of security for a kiosk. The estimates also do not cover emissions associated with preliminary activities such as undertaking surveys which are considered to have negligible associated carbon. Carbon estimating for contractor add-ons such as interconnecting pipework & channels and service ducting are based on regression models characterised from previous projects. Other add-ons such as connections and service diversions apply an average tCO_2e/£ for project approach. End-of-life carbon impact for new built assets has not been considered as it is extremely uncertain and difficult to assess what the likely re-use, recycling or disposal value of long-life infrastructure may be.

For operational carbon estimates, we have focused on power, chemicals and maintenance and applied these as annual values from the assumed option in use date. Power grid decarbonisation (including transmission and distribution losses) has been accounted for as per the BEIS modelling data table in the Green Book Supplementary Guidance (grid average for commercial/public sector). Values are only available to 2100 and are assumed constant thereafter to the end of the planning period. For chemical emissions, an annual carbon value is determined based on the mass of the different chemicals and the associated emission factor. The potential decarbonisation of the chemical industry and thus reduction in associated chemical carbon intensity has not been accounted for due to the high uncertainty and lack of publicly available carbon reduction forecasts. It is recognised that data on chemical composition and type will improve as the option scopes are further developed. Maintenance carbon is based on a proportion of the construction cost and will similarly change as the option scopes are developed further.

5.6 Assessment of option benefits and utilisation

We assessed the benefit of our feasible supply options in terms of deployable output (DO)[61], using the same assumptions as our baseline supply forecast (details of which are included in our *Technical Report – Supply forecast*). The process followed and outcomes are described in the following sections for our Strategic and Carlisle Resource Zones. A system simulation approach was used for both resource zones using our Pywr and Aquator™ water resources models.

[60] https://www.gov.uk/government/publications/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal Table 3: Carbon prices and sensitivities 2010-2100 for appraisal, 2021 £/tCO2e (last accessed 11/04/2023).

[61] Deployable output is the output of a commissioned source, group of sources or bulk supply as constrained by licence if applicable, pumping plant and well aquifer properties, raw water mains and aqueducts, transfer and output restrictions, treatment and water quality. Refer to the Supply forecast appendix for a more detailed understanding of DO.

5.6.1 Strategic Resource Zone (SRZ)

A total of 137 options were identified for water resources impact assessment. The options were categorised as Type 1, Type 2 and Type 3 options. From a modelling perspective, Type 1 and Type 2 are identical and modelled as bulk supply options where the source DO is defined by capacity. In Type 2, the capacity is defined by the hydrological yield, whereas in Type 1 the capacity is defined by asset/design capacity. For Type 3 options, the source DO is also defined by hydrological yield, but additional model nodes and input data, for example stochastic flow sequences, are utilised to improve the realism of the simulation. In some cases, Type 3 representation was required to account for the complexity of the option scope or design (see below). As this is very time consuming, only high priority options, for example the most cost-effective options, were set as Type 3. For each option, a full stochastic system response DO model run[62] was completed and compared to our WRMP24 baseline scenario to determine the benefit of each option.

Of the 137 options assessed, 117 were categorised as Types 1 and 2 and were represented as a constant bulk input to a specified location in the model. There were 36 unique locations identified where options are connected into the supply network, which were then modelled at a range of capacities to derive a relationship between bulk input value and DO benefit.

As noted above, Type 3 options were not modelled using the simplified bulk input approach and required modelling individually. The Type 3 options comprised reservoir weir level increases, changes to water treatment work capacities, groundwater inputs and licence representation, compensation over-release reductions, additional connectivity and bulk inputs to multiple locations.

All model runs were completed with the following model setup of demand savings off, drought permits off, and water treatment work losses off. To keep the model run time manageable, 14 demand steps were modelled for each DO run[63]. With these demand steps, almost 3,000 stochastic runs were required to assess all the Type 1/2 and Type 3 options.

In general, for lower bulk inputs (e.g. 2 Ml/d, 5 Ml/d and 10 Ml/d) the most effective options are in the Pennines area of the Strategic Resource Zone. For higher bulk inputs (e.g. 20 Ml/d to 40 Ml/d) options tend to become less efficient in all areas of the model, as system constraints start to limit the ability of the model to move water around.

The bulk input to DO benefit ratio is better than 1 to 0.5 for 125 of the 137 options considered. The options that involve raising reservoir storage capacity provide particularly poor DO benefits with recommended alternative formulations for modelling suggested.

5.6.2 Carlisle Resource Zone (CRZ)

A total of 19 options were identified for water resources impact assessment. Option types included new abstractions, increases to existing abstractions, desalination, effluent reuse and water transfers.

The options were run in the model individually, and where options share the same model components or capacities, the DO impact was calculated once. Where options share the same model component but have different capacities, analysis for each capacity was completed. In these instances, a curve of DO impact (or 'benefit') versus option capacity was created.

For the majority of options, the input to DO benefit ratio is better than 1 to 0.5. Despite some options resulting in a low DO benefit when analysed individually, combinations of multiple options could have a mutual benefit on the selected options. The combined benefit could, therefore, be higher than the sum of the individual benefits.

[62] The Scottish method DO assessment utilises the full 19,200-year stochastic sequence and runs the model at a range of demands to determine the maximum demand that can be met, while also complying with our levels of service.

[63] Demand steps modelled are: 700 Ml/d, 10 Ml/d increments between 1,810 Ml/d and 1,880 Ml/d, 20 Ml/d increments between 1,900 Ml/d and 1,960 Ml/d, and 2,000 Ml/d

5.6.3 Water trading (NWT SRO)

As a constituent part of the STT scheme, the water resources benefits of the NWT SRO were determined on several levels:

- DO benefit of the STT scheme – DO modelling by Water Resources South East (WRSE)[64] which involved testing different levels of support, i.e. augmentation of flow in the River Severn to support transfers including from the NWT SRO;
- DO benefit of NWT SRO support to other parties – other regional groups and water companies, including West Country Water Resources, Severn Trent Water and South Staffs Water, undertook DO modelling to determine the benefit transfers from the NWT SRO;
- Capacity contribution to the STT scheme – the STT SRO team collated and combined the flow available from each support element to feed into the WRSE assessment; and
- Water resources benefits of the UUW options – our NWT SRO team selected feasible WRMP options to ensure that contributions to the STT scheme are effectively mitigated by bolstering our supply network.

The water resources benefits of the NWT SRO (and non-SRO trades) need to be calculated by prospective recipients because they relate to enhancements to their supply networks. As such, the results are reported in their respective regional plans and WRMPs. For our WRMP, we focused on determining the maximum trade amount that the NWT SRO can provide to the STT scheme and identifying the WRMP options required to support trading. Details on how the water resources benefits of the different UUW and Seven Trent Water support elements combined to form the NWT scheme are set out in the NWT RAPID Gate 2 submission report.

5.6.4 Reporting deployable output benefit

Table 17 shows the basis for DO benefit values used for WRMP table reporting purposes.

Table 17 Basis for reported DO benefit values

Resource zone	DO benefit scenario	Justification
Strategic	1 in 40 year TUBs from 2025	1 in 40 year return period for TUBs level of service constrains DO in the preferred/final plan scenario. This is the priority scenario.
Carlisle	1 in 200 year EDO[65] 2025–38 1 in 500 year EDO from 2039	These level of service metrics define DO in this resource zone.
North Eden	1 in 200 year EDO 2025–38 1 in 500 year EDO from 2039	These level of service metrics define DO in this resource zone.

The 1 in 500 EDO benefit scenario is reported for the drought permit options as they do not affect the 1 in 40 level of service (they are implemented subsequent to TUBs and therefore have limited impact on the TUBs level of service). The 1 in 40 level of service change DO benefit was derived from system response water resources modelling.

5.6.5 Demand reduction benefit

To develop demand option benefits, we used assumptions founded upon several sources of data and information, including:

- Benefits realised from demand management/reduction activity we have previously carried out (e.g. benefits of a leak repair or “leak flow rates”, benefits of mains rehabilitation/renewal/replacement, benefits of metering etc.);
- Benefits realised from our demand management/reduction pilots and trials (e.g. benefits of flow regulators);

[64] WRSE is made up of an alliance of the six water companies that cover the south east region of England.

[65] Emergency Drought Orders (e.g. standpipes). See our *Technical Report – Supply forecast* for further detail.

- Data and information from other companies (e.g. discussions around delivery approaches, challenges faced and key learnings); and
- Industry studies and technical papers (e.g. UK Water Industry Research projects into innovative leak detection and repair techniques, benefits of smart metering etc.).

Table 18 shows examples of some key demand option benefit assumptions used in our demand options development. These have been developed through specific benefits modelling work or through measurement/monitoring of activities we have undertaken.

Table 18 Examples of key demand option benefit assumptions

Demand option	Units	UUW
Leakage		
Unreported leak flow rates at 50 m pressure		
Mains	m^3/d	36.5
Fittings	m^3/d	6.1
Service/communications pipe	m^3/d	6.1
Private/supply pipe	m^3/d	6.1
Reported leak flow rates at 50 m pressure		
Mains	m^3/d	73.0
Fittings	m^3/d	6.1
Service/communications pipe	m^3/d	6.1
Private/supply pipe	m^3/d	6.1
Metering		
Reduction in per capita/household consumption/usage		
AMR meter (enhanced/proactive, change of occupancy)	%	8%
Smart meter (enhanced/proactive, change of occupancy)	%	14%
Water efficiency		
Property assumptions for consumption/usage options		
High users (usage greater than 500 litres/property/day)	%	11%
Properties with plumbing losses	%	8.2%
Water efficiency audit/visit impact on consumption/usage		
Home/household audit/visit (high user)	l/prop/d	60
Home/household audit/visit (property with plumbing losses)	l/prop/d	85

We use a demand options model to combine the option benefit assumptions into ambitious programmes of work that can be delivered effectively and efficiently at scale. In this stage, we consider option delivery timescales and the practicalities of implementation (e.g. commercial activities, resource requirements, technology requirements etc.) to increase the likelihood of achieving the expected benefits. We also consider how our ongoing pilots/trials into innovative delivery approaches and techniques may impact option benefits.

Finally, as we continue to deliver options to reduce consumption/usage and leakage, we will carry out benefits realisation to ensure we are incorporating the additional understanding into the options development process, as part of adaptive pathways/planning.

5.6.6 Option utilisation

Option utilisation is a performance metric that indicates how often an option may be used and is influenced by factors such as its operating cost (OPEX), location in the UUW network (as potential downstream constraints could limit utilisation) and demand profiles. The utilisation of the refined feasible supply options was calculated using the timeseries outputs of the Pywr and Aquator™ water resources models run under the central scenario which reflects our 'most likely (preferred) pathway'[66], and option OPEX data. The output presented as percentage of total capacity (Ml/d) utilised, was summarised over different classifications of the 19,200 years of stochastic data and determined for different severities of events which included: all years, 'normal' years, dry year annual average and 1 in 500 year drought resilience[67].

A sample output for some Strategic Resource Zone options is shown in Table 19. For WRMP table reporting purposes, the average utilisation of an option is taken as the average of the monthly utilisation values for the all years scenario while the maximum utilisation is taken as the maximum monthly utilisation value for the 1 in 500 year drought resilience event. Full results are provided in Section 3.4.1 of the *Technical Report – Deciding future options.*

Table 19 Sample output of simulated utilisation in "extreme drought"

			1 in 500 year droughts (bin, for e.g., 1:475 to 1:525 events)												
			% utilisation (Ml)												
Option ID	**Option name**	**Capacity (Ml/d)**	**Annual average**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**
WR111	GWE_WOODFORD	9	88	41	45	73	91	99	100	100	100	100	100	100	100
WR102b	GWE_WIDNES	17	80	37	33	58	90	100	100	100	100	100	100	92	49
WR076	SWN_RIVER BOLLIN	25	70	6	13	38	81	100	100	100	100	100	100	83	26
WR015	SWN_RIVER IRWELL	40	70	6	13	38	80	100	100	100	100	100	100	83	26
WR107b	GWE_RANDLES BRIDGE	12	72	6	13	38	77	100	100	100	100	100	100	90	35
WR113	GWE_TYTHERINGTON	3	84	35	31	59	81	96	100	100	100	100	100	100	100
WR049d	SWN_RIVER RIBBLE 49d	40	67	4	11	39	76	90	93	97	99	100	98	68	24
WR107a2	GWE_AUGHTON PARK a2	10	59	0	0	19	43	74	98	100	100	100	98	53	17

Demand options are assumed to have 100 per cent utilisation. Drought permit options are assumed to have 50 per cent utilisation as they would only be used when reservoirs are drawn down to drought level 2 (typical drawdown periods are about six months). The level of service change option is assumed to have 75 per cent utilisation as it will always be implemented before the drought permit options.

5.7 AIC shortlisting to select refined feasible options

At the feasible stage, we had a total of 130 supply options remaining. In keeping with provisions in the Guideline, we applied further screening to arrive at a more manageable list of feasible options for environmental assessment. This comprised ranking options by their AIC and carbon at capacity value[68] in each resource zone and starting at the lower end of the scale (i.e. the more cost effective options), selecting options to achieve a predetermined cumulative water available for use (WAFU). The target WAFU for each resource zone was based on early, very conservative supply-demand deficit projections which were further enhanced/inflated to ensure that sufficient options remained in the process to allow real choices when assessing the preferred programme. To prevent double counting of WAFU benefit for mutually exclusive options (e.g. option variants with different treatment processes or options of different capacities relying on the same source water), only the most cost

[66] For example with RCP6.0 climate change emissions.

[67] For this classification, a normal year represents a year with a return period between 1 in 1 (100 per cent annual chance of occurrence) and 1 in 20 (5 per cent annual chance of occurrence); a dry year represents a year with a return period between 1 in 20 to a 1 in 100 (1 per cent annual chance of occurrence); and an extreme event is represented by a 1 in 500 return period (0.2 per cent annual chance of occurrence).

[68] To ensure consistency in comparing AIC values, options were assumed to have 100 per cent utilisation.

effective option variant was considered in the AIC ranking and WAFU benefit assessment. Conversely, options with dependencies were considered together to ensure that one option was not selected to the exclusion of the other option. Figure 6 is a graphical representation of the AIC ranked options in the Strategic Resource Zone and selection of options to satisfy the target cumulative WAFU for the zone.

Figure 6 AIC shortlisting graphic

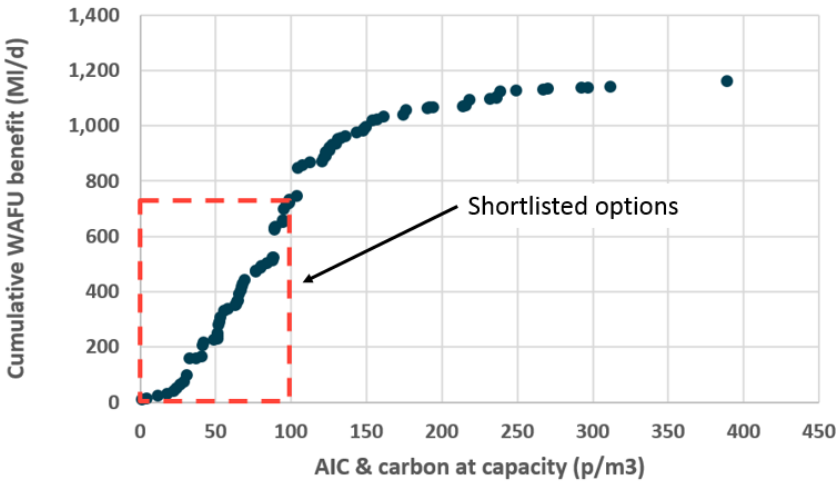


Table 20 provides a breakdown of indicative and target cumulative WAFU, the number of options considered and the number of AIC ranked options below the cumulative target WAFU cut-off. Of the 130 feasible options considered, 98 refined feasible options were carried forward for further assessment.

No shortlisting of feasible demand options was undertaken (i.e. all feasible demand options were carried forward to assess for inclusion in our preferred plan).

Table 20 Target WAFU for AIC shortlisting

Resource zone	Indicative WAFU (Ml/d)	Target WAFU (Ml/d)	No. of options considered	No. of options below the WAFU cut-off
Strategic	500	780	112	87
Carlisle	10	53	16	9
North Eden	0	8	2	2
Total			**130**	**98**

6. Refined feasible to constrained options: Detailed screening

This section describes how we have applied detailed screening to refine our list of refined feasible options to a constrained list of options to be used in decision making. Environmental assessments were carried out to support this. Additionally, the same information was used to carry out a multi-criteria analysis (MCA) used to assess options against different metrics during the decision making process. The outputs from the environmental assessments were also used to flag option specific issues that were fed back to our engineering team to see if they could be mitigated.

This section is therefore structured with the following sub-sections:

- Environmental assessments;
- Detailed screening;
- Multi-criteria analysis (MCA); and
- Environmental assessment feedback to Engineering.

6.1 Environmental assessments

Our environmental consultants, WSP (formerly Wood) and their partners Ricardo, worked across the WRW water companies to develop a common approach to the environmental assessments. They then consulted on the scope of the assessments with regulators including the EA and Natural England. Once the scopes had been agreed, the below assessments were undertaken on the supply options that remained at the refined feasible stage. For demand options only SEAs were carried out.

- Strategic Environmental Assessment (SEA);
- Habitats Regulation Assessment (HRA);
- Water Framework Directive (WFD);
- Biodiversity Net Gain (BNG); and
- Natural Capital Assessment (NCA).

The outputs of these assessments were provided in spreadsheet format so that the specific outputs could be used to drive the multi-criteria analysis that is explained in Section 6.3. Additional information on the environmental assessments is provided in Section 7.4

6.2 Detailed screening

Two detailed screening approaches were undertaken. Firstly, there was a common screening methodology, agreed by WRW for use across the regional plan that assessed the options against a set of common criteria. There was then another screening exercise, specific to UUW, to look at the relative feasibility of different supply options.

6.2.1 Common regional plan detailed screening

This utilised information derived from options benefit modelling, the Level 1 engineering assessments and the environmental assessments. The detailed screening criteria applied to the refined feasible options is provided in Table 21.

Table 21 Detailed screening criteria

Theme	Screening criteria
Option benefit	Is the scheme mutually exclusive with a lower cost, higher benefit, less environmentally damaging option?
	Is the option dependent on another option that has been screened out?
	Is the option durable/viable in the long term?
	Is the option flexible to changing circumstances in demand?
Engineering risk and delivery feasibility	Can the option be developed within the required timescale to meet the WRZ deficit?
Environmental, planning and other regulatory constraints	Does the option pass HRA compliance risks?
	Does the option increase the risk of flooding that cannot be mitigated and/or is the site at risk of flooding?
	Does the option breach any other legislative requirements that would render it illegal?
	Does the option transfer raw water between catchments and represent an unmitigable INNS risk?
	Does the option transfer water of a different quality that would breach DWI guidance (e.g. metaldehyde)?
	Does the option lead to deterioration of any of the waterbodies classified under the WFD?
	Does the option meet the social and environmental objectives of the relevant SEA?
	If in Wales, does the option comply with the Welsh Government's SMNR principles?
Political and customer acceptability	Is the option likely to be completely unacceptable to customers (for example in terms of taste and odour)?
	Is the option likely to be unacceptable to stakeholders?
Cost, carbon and natural capital (for use in decision-making only)	Capex Cost
	Opex cost
	Carbon impact (embedded and operational)
	Natural capital value
	What if any is the net gain to the environment provided by the option?
	Does the option provide other resilience benefits to water companies?
	Does the option provide benefit for other sectors and is supported by them?

Each option was assessed against the above criteria. The outputs provided were an overarching description of the option, a detailed screening result and a reason for the verdict. The possible screening results were: 'Pass screening criteria – no comment', 'Pass screening criteria – with uncertainty/likely mitigation', 'Pass screening criteria – with higher levels of risk or uncertainty to be resolved' and 'Fail screening criteria – significant, likely unmitigable risks flagged during screening'. A summary of the screening results is provided in Table 22.

Table 22 Detailed screening results

Screening result	Number of options
Not screened	2
Pass screening criteria – no comment	9
Pass screening criteria – with uncertainty/likely mitigation	55

Screening result	Number of options
Pass screening criteria – with higher levels of risk or uncertainty to be resolved	21
Fail screening criteria – significant, likely unmitigable risks flagged during screening	8
Total	**95**

As can be seen, there were two options that were not screened. This is because they were incorporated into existing options that were screened. It should be noted that only eight options were screened out with the majority having a lesser or higher level of risk.

Where environmental risk was found in individual options, this was fed back to Engineering for mitigation. This process is described in the following section.

6.2.2 UUW specific detailed screen

As part of the options identification, environmental screening was undertaken to ascertain whether certain options are more feasible than others. While this screening does not rule out specific options at this stage, it is helpful to understand the high-level environmental risk of the option and if the risk is too high, gives us more confidence to rule out the progression of the option.

6.2.2.1 Groundwater source options

The feasibility of groundwater options was assessed against the EA's Abstraction Licence Strategies (ALS). We have split the assessment based on short-term risk of deterioration ('No deterioration') and long-term (Environmental Destination). See Table 34 in Appendix C for a summary.

Short-term impacts

Assessment of potential short-term impacts has been underpinned by the Quantitative Test from the WFD Cycle 3 groundwater classification status. The criteria to prevent good quantitative status for a groundwater body can be summarised in the following statements:

(1) That the total abstraction from the groundwater body should not exceed the recharge to the groundwater body, after an allowance for dependent ecosystems if no assessment of these has been possible. This test should incorporate a review of available groundwater level monitoring data where appropriate.

(2) That groundwater abstraction should not cause a reversal in groundwater flow direction, which results in the significant intrusion of saline or other poor quality water into the groundwater.

(3) The groundwater flows to dependent surface water bodies should not be diminished by groundwater body-related pressures to the extent that they do not achieve good status, or that their status is reduced from high to good.

(4) That groundwater body-related pressures should not diminish groundwater flows or levels supporting groundwater dependent terrestrial ecosystems (GWDTEs) such that these ecosystems suffer significant damage in relation to conservation objectives.

Short-term risk of deterioration was assessed against the water availability of the specific ALS groundwater body management unit (GWMU). Many of the options involve increasing abstraction to the licence limit (some of which are currently unused sources), therefore, assessment has been done to understand the potential risk of future licence capping in line with recent EA guidance. This guidance came into effect in April 2022, and we have reviewed our options against the deterioration risk criteria, however, more work will be required during the next stage of option development. Where new water for abstraction is available up to the licence limit, the risk of licence capping in the short term is considered low. Where water is not available up to the licence amount, risk of deterioration is considered medium or high. High risk is stated where either the specific GWMU is considered over abstracted or there has been recent nearby licence reductions from the same aquifer due to AMP7 WINEP investigations. Medium risk is stated where there are other elements of WFD status, which is considered at risk, i.e. risk of saline intrusion but the waterbody is not over abstracted. For options related to the Lower Mersey Basin and North Merseyside Permo-Triassic Sandstone Aquifers and the Manchester and East Cheshire

Carboniferous Aquifers, the associated groundwater model is due to be updated, therefore, the risk of deterioration status may change. This is because there is considerable uncertainty with the current EA groundwater model, therefore, the water availability status shown in the ALS is potentially unreliable. Further analysis will need to be made to help support the progression or exclusion of groundwater options.

Long-term risk (Environmental Destination)

Long-term deterioration risk for all UUW sources was assessed through the Environment Agency Waterbody Abstraction Tool where options were cross referenced against the outputs (see our *Technical Report – Environmental Destination*). Due to the very high uncertainties attached to the outputs from the model, it is currently not possible to state the specific risk (e.g. high, medium or low). Therefore, we have considered long-term risk as either 'at risk based on current evidence' or 'no risk based on current evidence', where we have not made any conclusions of the specific licence reduction amount. For example, the same risk status is set irrespective of whether a ten per cent licence reduction is flagged in the long term, or 90 per cent reduction. Further site-specific investigations in AMP8 and beyond will be undertaken in order to improve our understanding of the long-term licence reduction requirements.

6.2.2.2 River source options

River source options have been assessed against the latest ALS, noting most were published in 2013 and, therefore, will be updated. Assessment updates will be made in light of any ALS changes; however, discussion will be held with the Environment Agency to understand if these changes are considered material. It is important to note (similar to groundwater source options), that no river source options are screened out at this stage. This is especially so for river options as understanding detailed risk of deterioration requires an Environmental Impact Assessment (EIA) as part of any licence application. Therefore, at this stage, only high level risk of environmental deterioration can be made. See Table 35 in Appendix C for a summary.

Short-term risk

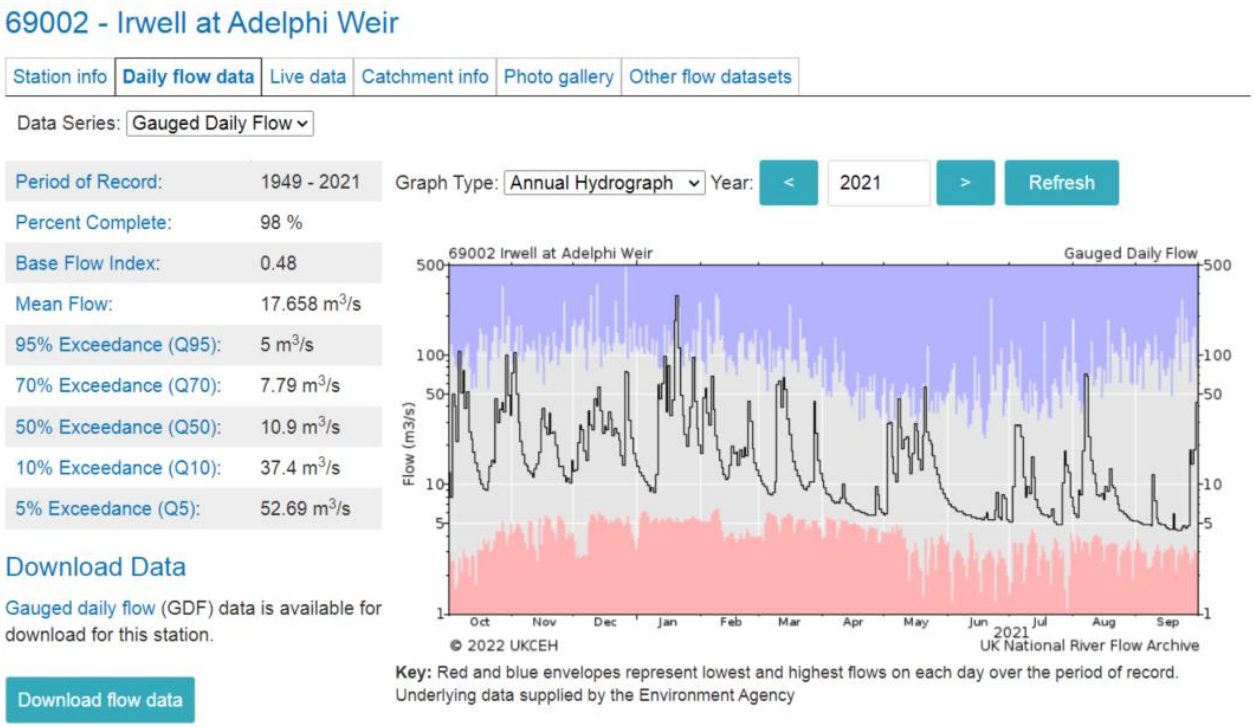
Water availability is assessed by the Environment Agency against natural river flows (all artificial influences, i.e. abstractions and discharges are removed) using the Ecological Flow Indicator (EFI) method. This is the default starting position for all abstraction licensing to ensure a specific abstraction does not cause an unacceptable risk to the environment. In more sensitive rivers, the amount of abstraction that can be licensed reduces. Figure 7 shows the percentage allowable abstraction from natural flows at different sensitivity bands.

Figure 7 Amount of abstraction that can be licensed in sensitive rivers

	high flow →			low flow
Abstraction Sensitivity Band	**Q30**	**Q50**	**Q70**	**Q95**
ASB3. high sensitivity	24%	20%	15%	10%
ASB2. moderate sensitivity	26%	24%	20%	15%
ASB1. low sensitivity	30%	26%	24%	20%

Each river source option has been assessed against the relevant ALS water availability and is scored either as 'water available, 'restricted water available' or 'water unavailable'. Currently, there are no options from catchments of which water is unavailable. The specific Hands off Flow (HoF) related to the ALS has been given as the equivalent flow duration curve percentile and is based on natural flows. Further assessment was made against equivalent 'actual flows' (see Figure 8 for example output) to understand the number of days of abstraction that might be available. For example, the equivalent ALS HoF could be <Q99.9 (or below lowest historical flows) where abstraction would be constrained for <0.4 days in an average year. Flow duration curve analysis is helpful for this type of assessment as it allows us to represent daily flow as a percentage of time (considering the whole flow record). A flow of Q95 is exceeded 95 per cent of the time and is, therefore, considered a low flow, whereas a flow of Q10 is exceeded ten per cent of the time and is, therefore, a high flow.

Figure 8 Assessment against equivalent 'actual flows'



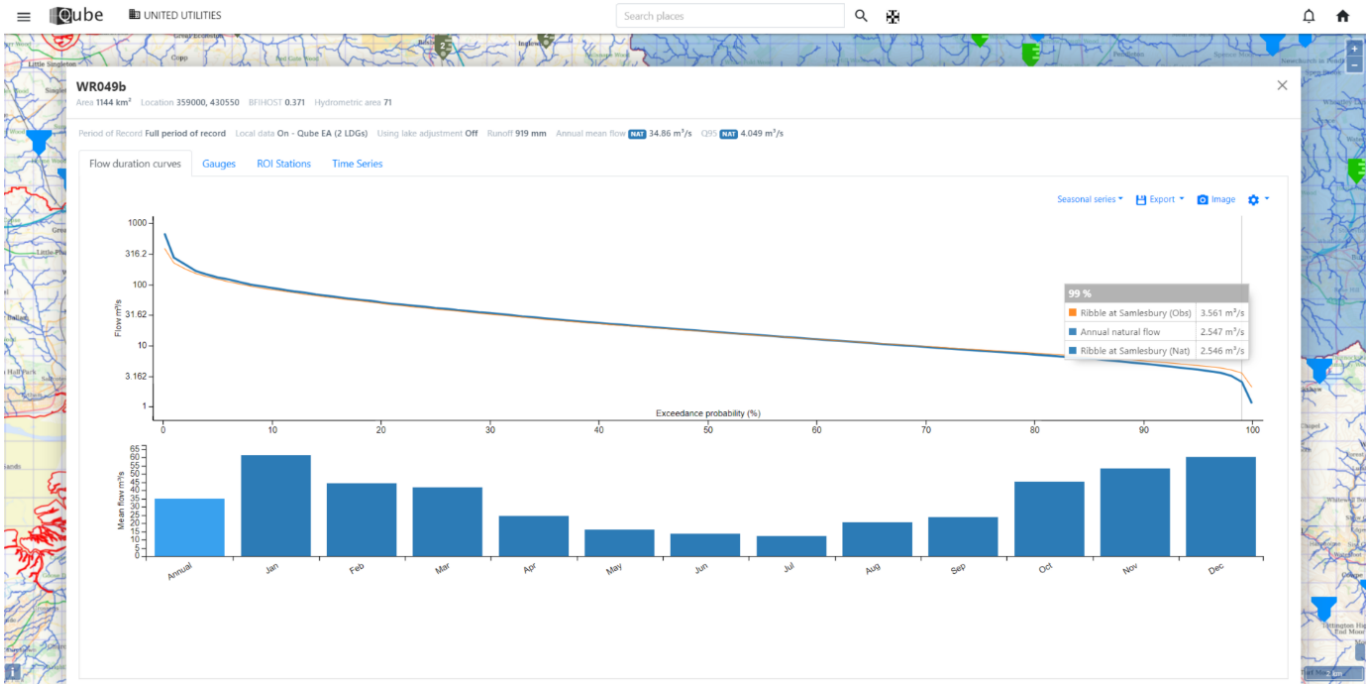
To support the EIA, we have undertaken some analysis looking at the potential degree of change in Q95 and Q99.9 natural and actual low flows (natural flows derived from QUBE[69] – see Figure 9).

This has highlighted which options could have the largest impact on flows. However, because water availability is based on environmental sensitivity, a small degree in flow change in one river could have a different impact on another. For that reason, further assessment would be needed via the EIA to understand the specific impacts on the river, its ecology and WFD status to ascertain whether a HoF based on actual or natural flow is required. This is especially so for discharge rich catchments where the actual flows may be significantly higher than natural flows due to effluent discharges and reservoir compensation flows. Therefore, at this stage in the process, short-term risk of deterioration (e.g low/medium/high) cannot easily be specified, however, we can conclude the risk of licence capping is low where new abstractions are in line with the specific ALS.

In some circumstances, using the ALS's water availability (and associated HoF) may suggest the abstraction could be unconstrained. As part of any EIA, assessment would need to be made to understand how sensitive the river environment is to flow changes noting the local ecology may have adapted to the actual flow regime rather than the natural flow regime, which in turn would dictate the specific HoF that would need to be applied.

[69] Our internal hydrological assessment tool.

Figure 9 Natural flow derivation from QUBE



Long-term risk

Long-term deterioration risk for all UUW sources was assessed through the Environment Agency Waterbody Abstraction Tool where options were cross referenced against the outputs (see our *Technical Report – Environmental Destination*). Long-term risk is assumed low for surface river options. This is because new abstractions will be assessed against current water availability and any new site specific HoF would provide a net benefit of environment protection in the long term, considering climate change. This is consistent with our screening approach for our Environmental Destination workstream. However, where specific flow constraints would need to be implemented in the future (i.e. Common Standards Monitoring Guidance), we will discuss these with the EA and Natural England to ensure any new abstractions meet these requirements.

6.3 Multi-criteria analysis (MCA)

The approach taken to our MCA is described in detail in Section 2 of our *Technical Report – Deciding on future options*. This is referred to as our 'best value' assessment. The best value metrics which were derived in collaboration with WRW to ensure consistency across the WRW water companies, are provided in Table 23 with flood risk, human and social wellbeing, ecosystem resilience and multi-abstractor benefits driven by the environmental assessments[70].

Table 23 Best value metrics

Best value metric	Description	Units of measure	Data basis
Cost	Total Net Present Value (NPV) based on capital expenditure (initial and replacement) and opex (fixed and variable).	£m NPV	Engineering assessments.
Carbon cost	Total NPV of monetised carbon cost.	£m NPV	Engineering assessments and HM Treasury Green Book[71].
Public water supply (PWS) drought resilience	Supply-demand balance change at 1 in 500 level.	Ml/d	Water resource modelling output.

[70] Scores for the SEA objectives were used to derive the WRW best value metrics.

[71] The Green Book, HM Treasury, 2018.

Best value metric	Description	Units of measure	Data basis
Flood risk	Qualitative assessment from environmental assessments.	£m NPV	SEA/NCA qualitative assessment converted to a linear scale and monetised.
Human and social wellbeing	Human health, social and economic wellbeing, cultural heritage, and air quality assessments.	£m NPV	SEA/NCA qualitative assessment converted to a linear scale and monetised.
Ecosystem resilience	Biodiversity, habitats and sustainable natural resource assessments.	£m NPV	SEA/NCA qualitative assessment converted to a linear scale and monetised.
PWS customer supply resilience	Supply interruptions, taste and aesthetics and hardness.	£m NPV	Derived from customer valuation assessment tool based on findings from customer research.
Multi-abstractor benefits	Water quality and quantity, and water resources.	£m NPV	SEA/NCA qualitative assessment converted to a linear scale and monetised.

The MCA assessment, together with the detailed screening previously described allowed us to narrow down the number of options during decision making. Ultimately, this led to a selection of options that aligned with the NWT SRO options. These options were the ones taken forward to the workshops that would ultimately provide feedback to Engineering. This process is described in Section 6.4.

6.4 Environmental assessment feedback to Engineering

A series of workshops led by our environmental consultant WSP were convened to discuss the environmental assessment findings of key options identified as potential preferred options. This focused on design to avoid, minimise, mitigate or offset significant environmental effects.

Supply options common to the NWT and WRMP workstreams were reviewed to consider regulatory risks (HRA and WFD), followed by significant effects (SEA and BNG), and applied a mitigation hierarchy to avoid, minimise, reduce or offset effects. The information was subsequently used by our Engineering team to revise the engineering assessments. This activity is described in Section 7.2.

7. Constrained options to preferred programme

At the constrained options stage, we conducted environmental assessments of all our refined feasible options, completed detailed screening and narrowed our options down to those also under consideration by North West Trading (NWT). To progress to the preferred programme stage so that the options are ready for decision making, we conducted the below assessments to improve our understanding of possible risks, constraints and opportunities:

- Water quality risk assessments;
- Level 2 Engineering assessments;
- Identification of the preferred plan; and
- Detailed environmental assessments.

The following sections describe these activities. Appendix D provides a list of options available for decision making to determine our preferred and alternative programmes.

7.1 Water quality risk assessments

An independent water quality risk assessment was carried out jointly with the NWT SRO project of supply options common to both workstreams. This comprised a high-level strategic water quality risk assessment (SWQRA) based on a drinking water safety approach to identify limiting hazards and assess their risks across the water supply system. At each stage from catchment to consumer (i.e. catchment, abstraction, conveyance, treatment, storage, distribution and consumer), pre-mitigated risks were assessed against relevant limiting hazards using a five by five risk matrix based on the likelihood and consequence of risks72, mitigation measures proposed, and resultant post mitigated residual risks assessed. Further details of the SWQRA framework methodology developed and carried out by Jacobs is in the NWT SRO Gate 2 report73 with the general approach and key outcomes summarised below.

The relevant options were grouped into four categories or risk assessment scenarios (Table 24) and a risk assessment carried out for each category against the limiting hazards considered in Table 25. Information used to inform the assessments included the option engineering scope summaries and existing drinking water safety plans.

Table 24 SWQRA risk assessment scenarios

Categories and relevant supply options	
Rivers • WR076 SWN_RIVER BOLLIN • STT041 SWN_RIVER ROCH • WR015 SWN_RIVER IRWELL • WR144 SWN_RIVER TAME	**Reservoirs** • WR812a WIT_THIRD PARTY_6a **Vyrnwy** • NWT_VYRNWY
Boreholes • WR 106b GWE_WALTON 2 • WR107b GWE_RANDLES BRIDGE • WR 154 ITC_WEST CHESHIRE 2 • WR153 ITC_WEST CHESHIRE 1 • WR149 ITC_WIGAN[74]	• WR111 GWE_WOODFORD • WR105a1 GWE_LYMM a1 • WR113 GWE_TYTHERINGTON • WR102b GWE_WIDNES

[72] Consequence scores were defined based on parameter scores for contaminants included in the DWI's Compliance Risk Index (CRI) methodology.

[73] Jacobs (2022) North West Transfer Strategic Resource Options (SRO) Strategic Water Quality Risk Assessment (SWQRA).

[74] WR149 ITC_WIGAN has been discounted subsequent to the draft WRMP SWQRA risk assessment.

Table 25 Table of limiting hazards considered for each category

Limiting Hazard	River sources	Borehole sources	Reservoirs	Vyrnwy
E.Coli	Y	Y	Y	Y
Cryptosporidium	Y	Y	Y	Y
Other Pathogens – Bacteria, Viruses, Protozoa	Y		Y	Y
Iron	Y	Y	Y	Y
Manganese	Y	Y	Y	Y
Aluminium	Y	Y	Y	Y
Nitrate	Y	Y	Y	Y
Nitrite	Y	Y	Y	Y
Metaldehyde	Y			Y
Total Pesticides	Y	Y	Y	Y
Corrosivity	Y	Y	Y	Y
Change in hardness/Alkalinity	Y	Y	Y	Y
Change in Source Type	Y	Y	Y	Y
1,4-dioxane	Y		Y	
NDMA	Y		Y	
PFOS	Y	Y	Y	Y
PFOA	Y	Y	Y	Y
Polycyclic Aromatic Hydrocarbons	Y			
Benzo(a)pyrene	Y			
Chloride	Y	Y	Y	Y
Chromium	Y	Y	Y	Y
Turbidity	Y	Y		Y
Total Organic Carbon	Y		Y	Y
Algae			Y	Y
Geosmin/2-MIB			Y	Y
Arsenic		Y		
Cyanide		Y		
Ammonium	Y		Y	Y
Invasive Non-Native Species (INNS)	Y		Y	Y

The key conclusions of the SWQRA are summarised below:

- Pre-mitigated catchment risks for most of the limiting hazards are medium to high;
- Majority of the risks are reduced at the treatment stage;
- Residual risks to consumer are low for several of the limiting hazards. These include E.Coli, Cryptosporidium, other pathogens (bacteria, viruses and protozoa), Nitrites, Polycyclic Aromatic Hydrocarbons, Benzo(a)pyrene, Chloride, Chromium, Cyanide, Algae and INNS; and
- For a number of limiting hazards the residual risks to consumers remained high or medium. These include hazards related to:
  - Consumers' perception of water (source, hardness/alkalinity and corrosivity). Mitigation is early customer engagement and we have undertaken customer research in areas where there may be changes in source

to help inform further customer engagement (see Section 5.3 of our *Technical Report - Customer and stakeholder engagement*);

- Limiting hazards related to Contaminants of Emerging Concern (CECs) – PFOS, PFOA, 1,4-Dioxane and NDMA assessed as medium risk due to lack of data. The current risk from these is however considered to be low but it is noted that this may increase in future; and
- Limiting hazards have been assessed as high or medium residual risk on the basis of available information. These include:
  - High risk – Aluminium, Nitrates and Arsenic; and
  - Medium risk – Iron, Manganese, Turbidity, TOC, Ammonium, Geosmin/2MIB, Total Pesticide and Metaldehyde.

Data gaps identified during the SWQRA have informed where sampling and/or monitoring may be required to get a better understanding of potential water quality risks and required mitigation which will feed into ongoing stages of option development.

7.2 Level 2 engineering assessments

With information from the environmental assessment workshops described in Section 6.4, our Engineering and Estimating teams updated the Level 1 engineering assessments for the constrained options. These activities included rerouting of pipelines away from designated sites where it was possible to do so as well as updating other aspects of the engineering solutions to mitigate or offset significant environmental effects. These revised engineering assessments are referred to as Level 2 assessments.

The Level 2 assessments were then passed to our environmental consultants to update their environmental assessments and also to the decision making workstream so that the preferred and adaptive plans could be developed.

7.3 Identification of the preferred plan

As mentioned above, the identification of the preferred plan (and alternative plans) was carried out by the decision making workstream. This is detailed in Sections 6 and 7 of our *Technical Report – Deciding on future options*. The specific output from this analysis was the preferred (best value) plan, least cost plan, best environment and society plan and best value plan using NCA metrics together with the dates when the options come into use[75]. Table 26 provides a summary of this information.

Table 26 Summary of the preferred and alternative plans

Option ID	Option name	Preferred plan	Least cost plan	Best environment and society plan	Best value plan using NCA metrics
WR065b	RES_WHITEHOLME			2030	
WR076	SWN_RIVER BOLLIN	2033		2033	
WR102f	GWE_WIDNES 2		2033		
WR105a1	GWE_LYMM a1		2033		
WR106b	GWE_WALTON_2		2033		2046

[75] For the supply options to support water transfer requirements (WR102b, WR111, WR113 and WR107a2), this refers to the calendar year in alignment with the Inter-regional reconciliation 3: Summary report (this is represented as FY31 in our WRMP Tables, as this is the financial year in which the benefit becomes available and the transfer impacts are realised). For all other options, the reported year is the financial year.

WR185	SSO_STOCKPORT PH II			2030	
WR191	PRO_NORTH LANCASHIRE			2030	2035
WR150	DPS_CASTLE CARROCK	2026	2026	2026	2026
WR502c	LEA-SRZ5_Permanent network sensors	2035	2046		
WR502e	LEA-SRZ12_Permanent network sensors			2026	
WR510	LEA-SRZ15_In-pipe repairs and lining technologies	2026	2035	2026	2026
WR511g	LEA-SRZ5_Pressure management	2049			
WR511j	LEA-SRZ15_Pressure management			2026	
WR516h	LEA-SRZ10_Mains rehabilitation/renewal/replacement		2026		
WR516h1	LEA-SRZ10_Mains rehabilitation/renewal/replacement	2026		2026	2041
WR516h2	LEA-SRZ25_Mains rehabilitation/renewal/replacement	2037		2036	
WR520c	LEA-SRZ5_DMA optimisation	2030		2026	2029
WR524d	LEA-SRZ10_Upstream tile optimisation	2027	2041	2026	2026
WR532	LEA-SRZ15_Dynamic Network Management			2026	2029
WR603e	EMT-SRZ15_Enhanced metering of households on single supplies (smart meters)	2026	2029	2026	
WR615c	EMT-SRZ5_Replace existing non-household meters with smart meters	2026	2026	2026	2029
WR619c	EMT-SRZ10_Replace existing household meters with smart meters	2026	2029		
WR619d	EMT-SRZ15_Replace existing household meters with smart meters			2026	2029
WR658c	WSD-SRZ10_Free water efficiency devices (inside/internal)	2026	2029	2026	2030
WR659c	WER-SRZ15_Free water efficiency devices (outside/external)	2026		2026	2027
WR661c	WUA-SRZ15_Free water efficiency visits (households)	2026	2029	2026	

WR669a	ISD-SRZ15_Flow regulators		2030	2026	2026
WR677c	WUA-SRZ10_Non-household water efficiency programme	2026	2027	2026	
WR685c	WER-SRZ15_Rainwater harvesting and water reuse (new builds)			2026	
WR694f	WSA-SRZ15_Government intervention (e.g. water labelling)	2026	2026	2026	
WR502a	LEA-CRZ10_Permanent network sensors	2029	2045	2026	2045
WR511a	LEA-CRZ5_Pressure management	2026			
WR520a	LEA-CRZ5_DMA optimisation	2027	2026	2026	2027
WR603a	EMT-CRZ5_Enhanced metering of households on single supplies (smart meters)	2026	2026		2026
WR619a	EMT-CRZ10_Replace existing household meters with smart meters	2026	2036	2026	2036
WR658a	WSD-CRZ10_Free water efficiency devices (inside/internal)	2026	2037	2026	2037
WR661a	WUA-CRZ15_Free water efficiency visits (households)	2028	2035	2026	2035
WR677a	WUA-CRZ10_Non-household water efficiency programme	2026	2034	2026	2037
WR685a	WER-CRZ5_Rainwater harvesting and water reuse (new builds)	2026		2026	
WR694d	WSA-CRZ15_Government intervention (e.g. water labelling)	2026	2026	2026	2026
WR659a	WER-CRZ15_Free water efficiency devices (outside/external)	2048	2049	2026	2049
WR669b	ISD-CRZ15_Flow regulators	2026	2036	2026	2036
WR516a1	LEA-CRZ15_Mains rehabilitation/renewal/replacement	2038	2031	2026	2031
WR615a	EMT-CRZ5_Replace existing non-household meters with smart meters	2026	2047	2026	2028

WR511c	LEA-CRZ15_Pressure management			2026	
WR601a	EMT-CRZ10_Enhanced metering of households (smart meters)			2026	
WR502b	LEA-NERZ10_Permanent network sensors		2027	2026	2027
WR520b	LEA-NERZ5_DMA optimisation		2038	2026	
WR524b	LEA-NERZ5_Upstream tile optimisation			2026	
WR603b	EMT-NERZ5_Enhanced metering of households on single supplies (smart meters)	2026			2038
WR619b	EMT-NERZ10_Replace existing household meters with smart meters	2026		2026	
WR661b	WUA-NERZ15_Free water efficiency visits (households)			2026	
WR677b	WUA-NERZ10_Non-household water efficiency programme		2032	2026	2032
WR694e	WSA-NERZ15_Government intervention (e.g. water labelling)	2026	2026	2026	2026
WR685b	WER-NERZ15_Rainwater harvesting and water reuse (new builds)			2026	
WR669c	ISD-NERZ15_Flow regulators			2026	
WR615b	EMT-NERZ5_Replace existing non-household meters with smart meters	2026	2026	2026	2026
WR511f	LEA-NERZ15_Pressure management			2026	
WR601b	EMT-NERZ10_Enhanced metering of households (smart meters)			2026	
WR658b	WSD-NERZ10_Free water efficiency devices (inside/internal)			2026	
WR167–176 & 184	SRZ drought permits	2026	2026	2026	2026
WR179a–c	NERZ drought permits	2026	2026	2026	2026
WR755	CURRDM_VUR_CRL	2026	2026	2026	2026

These plans were then passed to the Environmental consultants so that the detailed environmental assessments could be carried out. Due to the level of uncertainty of all but the preferred plan, the portfolio or 'in combination' assessment was carried out only on the preferred plan.

The total GHG emissions for our preferred plan over 80 years is a reduction of 387,556 tCO_2e (Table 27) which reflects the predominance of demand management options as we look to meet our demand policy ambitions and targets. As the preferred options are taken forward and implemented, the associated GHG emissions will be recorded and disclosed as part of our annual reporting. Our approach to managing emissions will continue into detailed delivery, working closely with our supply chain to fully value GHG emissions throughout our decision making to ensure that we keep minimising the emissions from our infrastructure investments, taking a whole life view of all the drivers we need to deliver to secure the overall best value for customers.

Implementation of our WRMP24 will support achievement of our science-based targets to reduce our scope 1 and 2 emissions by 42 per cent and our scope 3 emissions by 25 per cent by 2030 (from a 2019/20 baseline), and help achieve our long-term net zero ambition by 2050. As each preferred option is progressed through to implementation, the associated capital and operational GHG emissions will be included in our emissions inventory and disclosed in our annual reports. Collectively, our science-based targets, carbon pledges and net zero ambition support delivery of the UK government's net zero GHG targets and commitments.

Table 27 80-year whole-life carbon for the preferred options

Option ID	Option name	Resource Zone	Year selected	80 yr whole-life carbon (tCO_2e)
WR076	SWN_RIVER BOLLIN	SRZ	2,033	53,888.0
WR510	In-pipe repairs and lining technologies	SRZ	2,026	(6,440.5)
WR516h1	Mains rehabilitation/renewal/replacement	SRZ	2,026	(78,821.7)
WR603e	Enhanced metering of households on single supplies (smart meters)	SRZ	2,026	(205,578.6)
WR615c	Replace existing non-household meters with smart meters	SRZ	2,026	(13,410.5)
WR619c	Replace existing household meters with smart meters	SRZ	2,026	(13,150.7)
WR658c	Free water efficiency devices (inside/internal)	SRZ	2,026	(1,384.5)
WR659c	Free water efficiency devices (outside/external)	SRZ	2,026	(1,937.6)
WR661c	Free water efficiency visits (households)	SRZ	2,026	(11,621.2)
WR677c	Non-household water efficiency programme	SRZ	2,026	(1,901.7)
WR694f	Water labelling without minimum standards	SRZ	2,026	-
WR524d	Upstream tile optimisation	SRZ	2,027	(11,079.6)
WR520c	DMA optimisation	SRZ	2,030	(253.5)
WR502c	Permanent network sensors	SRZ	2,035	(43,632.9)
WR516h2	Mains rehabilitation/renewal/replacement	SRZ	2,037	(50,307.6)
WR511g	Pressure management	SRZ	2,049	(1,104.8)
WR511a	Pressure management	CRZ	2,026	429.6
WR603a	Enhanced metering of households on single supplies (smart meters)	CRZ	2,026	(1,813.7)
WR615a	Replace existing non-household meters with smart meters	CRZ	2,026	(536.9)
WR619a	Replace existing household meters with smart meters	CRZ	2,026	(419.2)
WR658a	Free water efficiency devices (inside/internal)	CRZ	2,026	(14.1)
WR669b	Flow regulators	CRZ	2,026	0.5
WR677a	Non-household water efficiency programme	CRZ	2,026	(40.2)

WR685a	Rainwater harvesting and water reuse (new builds)	CRZ	2,026	524.1
WR694d	Water labelling without minimum standards	CRZ	2,026	-
WR520a	DMA optimisation	CRZ	2,027	2,291.6
WR661a	Free water efficiency visits (households)	CRZ	2,028	(152.5)
WR502a	Permanent network sensors	CRZ	2,029	(342.6)
WR516a1	Mains rehabilitation/renewal/replacement	CRZ	2,038	685.7
WR659a	Free water efficiency devices (outside/external)	CRZ	2,048	(39.8)
WR755	CURRDM_VUR_CRL	CRZ	2,026	-
WR756	CURRDM_L1PRESSRED_CRL	CRZ	2,026	-
WR757	CURRDM_TUB_CRL	CRZ	2,026	-
WR758	CURRDM_L2PRESSRED_CRL	CRZ	2,026	-
WR759	CURRDM_NEUB_CRL	CRZ	2,026	-
WR760	CURRDM_L3PRESSRED_CRL	CRZ	2,026	-
WR761	CURRDM_VUR_NED	NED	2,026	-
WR762	CURRDM_L1PRESSRED_NED	NED	2,026	-
WR763	CURRDM_TUB_NED	NED	2,026	-
WR764	CURRDM_L2PRESSRED_NED	NED	2,026	-
WR765	CURRDM_NEUB_NED	NED	2,026	-
WR766	CURRDM_L3PRESSRED_NED	NED	2,026	-
WR767	CURRDM_VUR_STG	STG	2,026	-
WR768	CURRDM_L1PRESSRED_STG	STG	2,026	-
WR769	CURRDM_TUB_STG	STG	2,026	-
WR770	CURRDM_L2PRESSRED_STG	STG	2,026	-
WR771	CURRDM_NEUB_STG	STG	2,026	-
WR772	CURRDM_L3PRESSRED_STG	STG	2,026	-
WR603b	Enhanced metering of households on single supplies (smart meters)	NERZ	2,026	(642.0)
WR615b	Replace existing non-household meters with smart meters	NERZ	2,026	(606.0)
WR619b	Replace existing household meters with smart meters	NERZ	2,026	(144.0)
WR694e	Water labelling without minimum standards	NERZ	2,026	-
WR150	Castle Carrock dead water storage	CRZ	2,026	-
WR167–176 & 184	SRZ drought permits	SRZ	2,026	-
WR179a–c	NERZ drought permits	NERZ	2,026	-
WR749	SRZ Level of service change (1:20 to 1:40)	SRZ	2,031	-
				(387,556.9)

7.4 Detailed environmental assessments

The following section provides summaries of the detailed environmental assessments carried out by our environmental consultants. These comprise the Strategic Environmental Assessment (SEA), the Habitats Regulation Assessment (HRA), and the Water Framework Directive (WFD). The detailed reports accompany our

submission. In addition to this, we have provided details of our approach to our Natural Capital Assessment (NCA) and Biodiversity Net Gain (BNG).

7.4.1 Strategic Environmental Assessment (SEA)

WRMPs must comply with international, UK and national legislation related to the environment, as well as associated guidance on the development of WRMPs[76]. This includes *The Environmental Assessment of Plans and Programmes Regulations 2004* (the 'Strategic Environmental Assessment (SEA) Regulations'). The SEA Regulations require an assessment of the likely significant environmental effects of the plans and the identification of ways in which adverse effects can be avoided, minimised or mitigated and how any positive effects can be enhanced. In doing so, the SEA is used to inform the development and selection of the water resource management options that will comprise the WRMP24.

The purposes of the SEA is to:

- Identify, describe and evaluate the likely significant environmental and socio-economic effects of the WRMP24;
- Help identify appropriate measures to avoid, reduce or manage adverse effects and to enhance beneficial effects associated with the implementation of the plan wherever possible;
- Provide a framework for monitoring the potential significant effects arising from the implementation of the WRMP24; and
- Inform UUW's selection of measures to be taken forward into the final WRMP24.

Reflecting the integrated approach to the development of the Regional Plan and WRMPs and working with WRW member water companies, we developed, consulted upon, revised and applied a common, compliant and regionally consistent SEA methodology.

The SEA considered a total of 179 feasible options to inform the development of our WRMP24. This total is made up of 115 refined feasible supply options and 82 feasible demand management options (comprising 24 water efficiency options, 17 metering options and 41 leakage reduction options) across the Strategic, Carlisle and North Eden resource zones. Our drought permit options were subject to assessment as part of the SEA of the UUW Drought Plan and the findings of that assessment reported in the Drought Plan Environmental Report[77]. To ensure consistency and avoid unnecessary duplication, the previous assessments have been used as the basis for the identification, description and evaluation of the likely significant effects associated with the drought permit options.

Each option was assessed to identify the likely significant environmental effects during both construction/implementation and operation across the 17 SEA assessment objectives/topics. The options were assessed based on the nature of the effect, its timing and geographic scale, the sensitivity of the human or environmental receptor that could be affected, and how long any effect might last.

SEA findings of the refined feasible supply options and feasible demand options have been used to support decision making on the selection of the best value combination of options based on the following approach:

- SEA outputs were used in the detailed screening of options, leading to some options not being taken forward on environmental grounds e.g. adverse and unavoidable effects on international biodiversity sites, significant INNS transfer risks, significant effects on designated landscapes and cultural heritage.

[76] UK Government (2022) *Water Resource Planning Guidance* (WRPG). Available at: https://www.gov.uk/government/publications/water-resources-planning-guideline/water-resources-planning-guideline (accessed August 2022).

[77] Ricardo (2021) Strategic Environmental Assessment of United Utilities' Revised Draft Drought Plan 2022. Available at https://www.unitedutilities.com/globalassets/z_corporate-site/about-us-pdfs/water-resources/uu-revised-draft-dp-sea-er_300721v3.pdf.

- The SEA methodology has also ensured assessment outputs have been used to support the quantification of the four WRW environmental metrics used within ValueStream1, our best value decision making tool. This has helped ensure our decision making is evidence based, consistent and considers environmental effects. Broadly, options that seek to minimise demand, increase efficiencies and decrease leakage are less intrusive and have fewer adverse environmental effects. As reflected in ValueStream1, these environmental metric 'scores' were then used to inform the selection of our preferred or best value plan to meet our demand management policies, satisfy water transfer requirements and improve our resilience to drought.

  A full report of the SEA including assessment of the preferred options, preferred plan and reasonable alternative plan (including cumulative, secondary and synergistic effects) can be found in the *Water Resource Management Plan 2024 Strategic Environmental Assessment report* published alongside our plan. Summary conclusions are also included in our *Main Report, Section 9*.

7.4.2 Habitats Regulations Assessment (HRA)

WRMPs are subject to the provisions of *The Conservation of Habitats and Species Regulations 2017* (as amended) (the 'Habitats Regulations'). UUW, which has a statutory duty to prepare the WRMP, is the Competent Authority for the plan. As the Competent Authority, we are required to have regard to the requirements of the Habitats Regulations in the exercise of any of our functions.

The Regulations require the assessment of the potential impacts of plans and programmes on the Natura 2000 network of European protected sites in a process known as Habitats Regulations Assessment (HRA). The HRA determines whether there will be any 'likely significant effects' of a WRMP on any European site as a result of a plan's implementation (either on its own or 'in combination' with other plans or projects) and, if so, whether these effects will result in any adverse effects on the site's integrity.

For each option (or group of options, as appropriate), the assessment comprised:

- A 'screening' of European sites within the study area to identify those sites and features where there will self-evidently be 'no effect', 'no likely significant effects', or positive effects due to the option, and those where significant effects are likely or uncertain; and
- An 'appropriate assessment' of any European sites where significant effects cannot be excluded (this may include 'down-the-line' deferral of some options in accordance with established HRA practice, where appropriate).

The conservation objectives were taken into account at the screening and appropriate assessment stages as necessary.

The findings of the HRA have been used to inform the assessment of options as part of the SEA process, and in particular the assessment of options against the SEA biodiversity topic. A full report of the HRA including the appropriate assessments undertaken for the European sites that may be significantly affected by the preferred options can be found in the *Habitats Regulations Assessment of the Water Resource Management Plan 2024* report published alongside our plan. Summary conclusions are also included in our *Main Report, Section 9*.

7.4.3 Water Framework Directive (WFD)

The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 sets a default objective for all rivers, lakes, estuaries, groundwater and coastal water bodies to achieve 'good' status or potential by 2027 at the latest. The current (baseline) status (e.g. 2015 classification), and the measures required to achieve the 2027 status objective, are set out for each water body in the relevant River Basin Management Plans (RBMPs), prepared by the EA and NRW every six years.

UUW (for the WRMP24) must be able to demonstrate that the plan will not cause a deterioration in respect of these baseline conditions. Furthermore, for those water bodies that are not currently attaining good status, UUW must be able to confirm that it would not preclude the delivery of measures to facilitate the improvements needed to attain good status.

In line with WRPG (2022) and UKWIR (2021) guidance, the principal WFD Assessment Objectives that the WRMP (at both option level and programme level) have been tested against are:

- To prevent deterioration of any WFD element of any water body - in line with Regulation 13(2)a and 13(5)a[78].
- To prevent the introduction of impediments to the attainment of 'Good' WFD status or potential for any water body in line with Regulation 13(2)b and 13(5)c[79].
- To ensure that the planned programme of waterbody measures in RBMP2 to protect and enhance the status of water bodies are not compromised.

If an option has been assessed to definitively not comply with the above WFD Assessment Objectives, the option has been reported as WFD non-compliant and removed from the WRMP process. If an option is assessed to potentially not comply with the above objectives it has been reported as 'potentially WFD non-compliant'. If an option is reported as 'potentially WFD non-compliant' it may remain in the WRMP process as it may be appropriate to consider the option further where it is considered that additional evidence to improve confidence in the assessment and/or enhanced design could mitigate the potentially WFD non-compliance issues.

The findings of the WFD Assessment have been used to inform the assessment of options as part of the SEA process, and in particular the assessment of options against the SEA water quality and water quantity topics. A full report of the WFD Assessment including the cumulative assessment of our preferred plan can be found in the *Water Resource Management Plan Water Framework Directive compliance assessment* report published alongside our plan. Summary conclusions are also included in our *Main Report, Section 9*.

7.4.4 Natural Capital Assessment (NCA)

We have been developing our approach to Natural Capital over several years including building our first corporate account in 2018 and being the only water company in PR19 with a natural capital delivery focused ODI that had financial reward and penalty. As part of our Catchment Systems Thinking approach (CaST) we also acknowledge that a place-based approach to catchment decision making that incorporates a wide range of stakeholders across catchments is key to driving long term sustainable outcomes in terms of high-quality water resources, resilient catchments and the broader environmental outcomes that society requires.

In order to achieve this, we view a natural capital approach to be key to help develop a common understanding of requirements, align goals and prioritise investment to deliver the best results for customers. To help achieve this we have worked to with stakeholders across our region to support in the development and delivery of their natural capital assessments at a local scale. However, as these assessments have tended to be completed by local authorities based on political boundaries, which are not always reflective of how catchments operate we have also worked to develop a North West natural capital baseline to try and drive a regional approach to natural capital delivery.

In order to complete this work, we established a stakeholder group with representation from the catchment-based approach (CaBA), local authorities, key environmental regulators, major land owners, academia and local nature and enterprise partnerships. This group worked with us to develop our approach to the regional baseline, what their key priorities were and how this could most effectively be presented, as well as how this could link with existing accounts and data. The resulting account has been shared publicly through a stakeholder dissemination event with the final report being shared through our collaboration portal and the accounts themselves being availed to all stakeholders on request.

Our aspiration for the future use of this baseline is that it will unite key regional stakeholders with a common view of the state of our current natural capital and help to align activity across different organisations with a goal of maintaining and enhancing the regions natural capital. In order to achieve this, we are working on the formation of a North West Governance group, which will include the key stakeholders identified above. This will bring together these organisations regularly to discuss and agree a consistent approach to natural capital how we can link the regional accounts through to the local level assessments completed across the region, what the key

[78] The no deterioration baseline for each waterbody and element is the status reported in the RBMP. At present this is RBMP 2.

[79] WRPG (2022) states that this a test to identify any options that 'prevent the achievement of the water body status objectives in the river basin management plan'. At present this is RBMP2.

priorities and activities to drive improved natural capital can be and how we should maintain the account and use it to track progress and delivery.

In order to drive a long-term sustainable environment, protect resilient water resources and deliver on other needs such as carbon reduction, increased biodiversity and improved river water quality in a way which delivers the greatest value to customers in the long term we believe a natural capital approach will be key. We have worked with a broad range of stakeholders across the North West to develop our approach to natural capital and align it with that of other organisations and as we move forward tools such as the North West baseline will be vital to developing this approach further and achieving our long-term operational, environmental and resilience ambitions.

7.4.4.1 Biodiversity

To ensure we have a positive impact on biodiversity and in line with the requirements of the WINEP methodology, we will be assessing the impact of any proposed interventions on biodiversity in line with the Defra Metric. We have developed a decision support tool to assess the wider environmental outcomes included in the WINEP, which includes biodiversity, and this will be used to assess all interventions in the WINEP but also across the wider PR24 programme. Through this we will be able to understand our biodiversity impact and be able to ensure that we meet the requirements of net gain and exceed these to maximise the biodiversity we can deliver.

This approach will help to meet our internal targets for improvement in biodiversity such as the commitment outlined in our Better Rivers, Better North West pledges to have 100 per cent or owned SSSI land classed as favourable or unfavourable recovering by 2030 and our long-term environmental target of progressing this to 100 per cent being classed as favourable by 2050.

7.4.4.2 Natural Capital

For both our corporate natural capital account and the North West natural capital account we have undertaken the development of a natural capital asset register to understand the land types across the relevant geography and assess the benefits that flow from this. The accounts have both been produced in line with ENCA guidance to ensure consistency with national best practice and the corporate account, which is currently being updated will be assured to the British standard. This was not available at the time of completing the North West account but when this gets updated we will also seek this assurance for the North West account as well. This assurance drives consistency of approach with national best practice that all other water companies should be aspiring to and will be consistent with the British standard assured natural capital work that has been completed by Northumbrian Water.

The accounts are completed to look over a 60-year time horizon, which profiles benefits accrued over that period taking into account temporal factors that may impact on benefits flows. They will be a valuable resource to aid decision making and track performance in maintaining and enhancing the natural capital, over which we have direct influence but also the natural capital of the North West, which adds value to our operations and our customer's lives. These accounts will also be pivotal in tracking delivery against our long-term environmental target to increase the value of the North West's natural capital by ten per cent by 2050.

7.4.5 Biodiversity Net Gain (BNG)

Fundamental to biodiversity net gain at both project optioneering and design is applying the principles of the mitigation hierarchy:

(1) First do everything possible to avoid or minimise impacts to biodiversity;

(2) Compensate for losses that cannot be avoided within the development footprint where possible; and

(3) If compensation within the development footprint is insufficient to provide the required net gain and as a last resort, additional compensation should be planned elsewhere, in discussion with the relevant regulators and local groups.

To determine the biodiversity net gain requirements associated with a specific project or option, the Defra metric 3.1 is used to calculate any potential losses or gains. The metric is then used in conjunction with the Biodiversity

Net Gain Good practice principles to identify the type of any gains required (habitat type and target condition and quality) achieved through the provision of new habitats/features or the enhancement of existing habitats.

Wherever practicable, biodiversity enhancement opportunities are incorporated into solution development, such as green engineering. Where this is not possible, biodiversity opportunities are considered in hierarchy starting from within the development footprint; United Utilities land situated close by; to United Utilities owned land elsewhere in the Local Planning Authority (LPA) area. We also recognise, the best outcome for biodiversity in some situations, may include consideration of options on third-party land in agreement with local stakeholders

In determining the correct compensation strategy for each project, a number of factors are considered, including existing habitat type and condition, net gain needs, land availability and ownership. We also need to carefully consider any future development and operational requirements which may further constrain net gain potential given the anticipated 30-year habitat management commitment.

In order to ensure we identify the best outcome for biodiversity, in addition to any assessment of net gain opportunities at local/site level, we will also review potential opportunities within our land holding at LPA level. To support this review, a separate biodiversity opportunity project is underway to identify strategic sites across the United Utilities estate for BNG. We have developed a bespoke GIS tool that enables us to identify biodiversity opportunity areas. Having mapped the entire estate to UK broad habitat classification system we are able to quantify all habitats we own by type and area at regional, LPA and site level (Figure 10). The GIS tool transposes habitat data directly into the Defra metric to provide a baseline unit value for each habitat. At a coarse level this assumes moderate condition of all habitats, however, as candidate strategic BNG sites are brought forward, a full ecological appraisal will be undertaken in order to provide an accurate condition score. Furthermore, the GIS Tool will enable us to query candidate strategic BNG sites against multiple datasets (for example; United Utilities tenanted land, statutory and non-statutory designated land, Biodiversity Opportunity and Nature Recovery Networks, priority habitats, NE stewardship schemes, GCN district licensing, etc.) to ensure we align to local strategies and identify sites with as many multiple benefits as possible (Figure 11). Once agreement has been reached on strategic site selection, the project is funded to develop and prepare detailed management plans for each site. By carefully considering the risks and opportunities of each site, each plan would identify a target Biodiversity Unit and provide a detailed 30-year management plan to ensure delivery.

Figure 10 Example of the United Utilities service area mapped to UKHAB

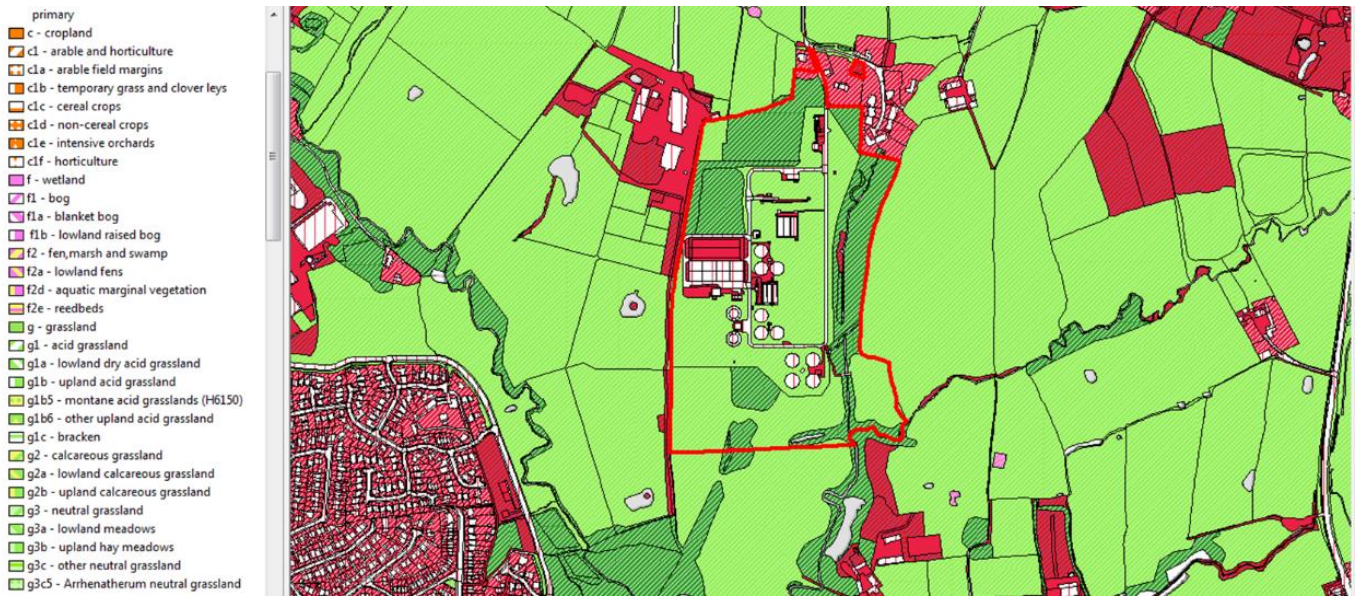
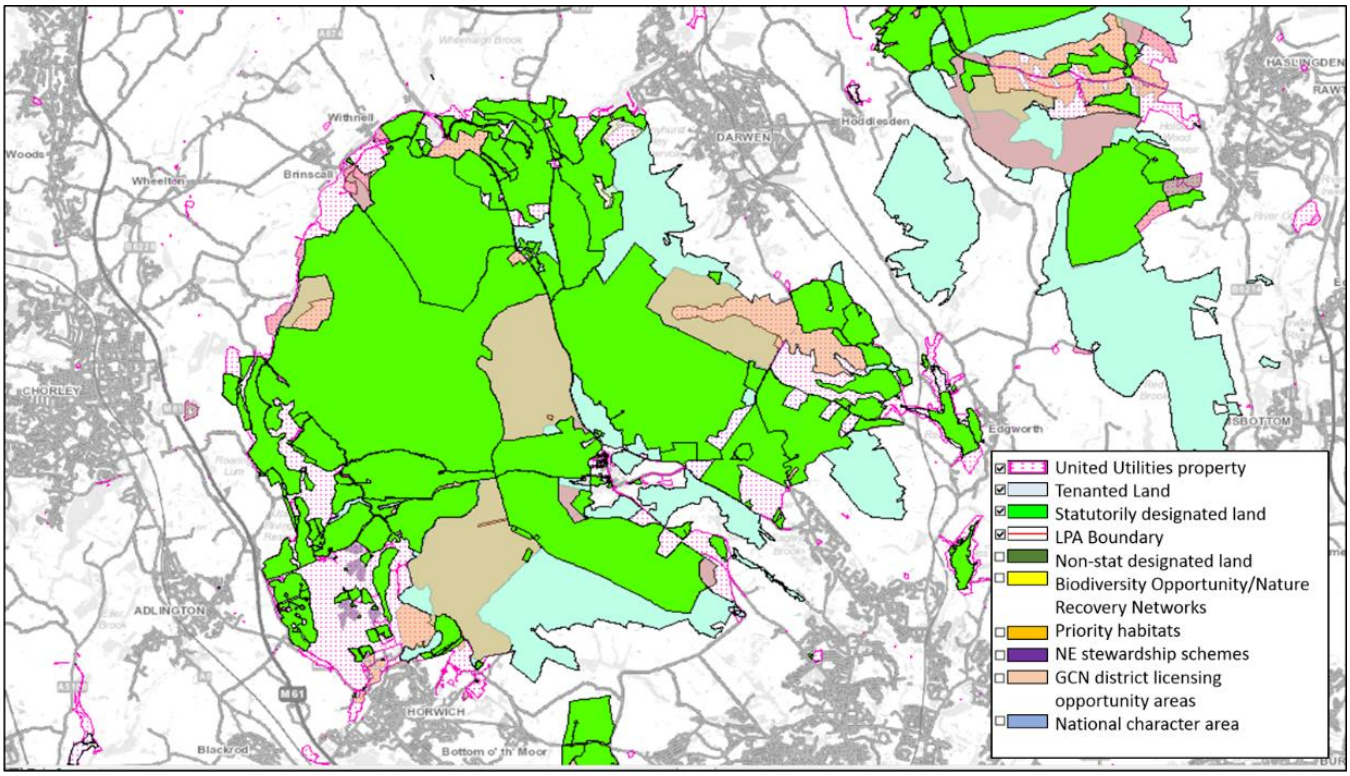


Figure 11 Example of the GIS offsetting site identification tool



An essential step in strategic site selection for BNG is a wider review of the capital programme needs within each LPA. In situations where it is appropriate to deliver gains off-site, bringing these together has the potential to deliver a greater outcome for biodiversity. Combining management activities should also provide an opportunity to deliver efficiencies including cost savings.

While completing this work, we are working with local planning authorities to understand how our strategic review aligns to their emerging local nature recovery strategies and policies. We fully recognise that as a major land owner in the North West, we can play a significant role in supporting local ambitions in nature recovery. Our intention is to ensure any sites selected for strategic BNG directly align, as far as practicable, support local nature recovery objectives. Our approach also includes an appraisal of wider biodiversity opportunities presented in local plans, diversity needs, and connectivity to support and demonstrate resilience.

We have also started engaging with local partners such as the RSPB to take their view on strategic site selection for BNG and to discuss different models for delivery.

It is acknowledged early investment in biodiversity units significantly reduces risk factors applied by the metric. In doing so, units become cheaper to create and would help streamline planning applications. Our intention, once strategic sites for BNG have been identified and agreed with key stakeholders, would, where practicable, be to commence early investment in these sites in order to create banks of units, which would be available to offset future capital work.

We understand that ultimately the delivery of the BNG specific to a project is to be determined by the local planning authority and local level concerns/opportunities may override any more strategic ambition.

7.5 Options summary

Table 28 provides a breakdown of option status at the end of the options identification process and decision making process. Options identified as unconstrained include options that were discounted during the initial primary screening exercise and options discounted during subsequent phases of the options appraisal process if the reason(s) was consistent with key primary screening criteria. Supply options that were screened out during AIC shortlisting (Section 5.7) remain feasible options. Refined feasible options that made it through detailed screening (Section 6) are constrained options and formed the pool of options considered during decision making

(Table 36). As mentioned previously, no shortlisting of feasible demand options was undertaken and all feasible demand options were considered during decision making (Table 37). Preferred options are those options selected during decision making for inclusion in our preferred plan and include our drought permit and level of service change options (Table 26).

Table 28 Final option status breakdown

Option status	Supply options	Demand options
Unconstrained	136	147
Feasible/refined feasible/constrained	123	53
Preferred	16	51
TOTAL	**275**	**251**

A full list of the final option status is provided in Appendix B.

Appendix A Option categories and options as proposed

Table 29 Resource management options

Option group	Scheme type	Sub-categories
Surface Water	Existing river abstraction (SWE)	Existing river abstraction to a new or existing water treatment works and associated increase to abstraction licence conditions, removing either pump or water treatment work constraints in order to increase the deployable output of a particular source
	New river abstraction (SWN)	New river abstraction location, new abstraction licence and transfer to either new raw water storage or new water treatment works
	Reservoir (RES)	On-stream reservoirs; pumped-storage reservoirs; flood storage reservoirs; river regulation reservoirs and/or direct supply reservoir; development of disused gravel pits (or redundant quarries) as reservoirs; raising of existing or new impoundment structures, modifications to changes in operation of existing reservoirs, e.g. compensation flows
	Urban surface water (SWU)	New abstraction from collection of surface water sewer interceptor systems, storage, treatment and transfer to either existing or new water treatment works
Groundwater	Existing groundwater source (GWE)	Existing groundwater sources, removing either pump or water treatment work constraints in order to increase the deployable output of a particular source, operating the source within the current abstraction licence limits, modifications to existing water treatment works to enable treatment of additional water availability
	New groundwater source (GWN)	New groundwater source, either standalone or extensions to existing conjunctive abstraction licence conditions, new associated water treatment works
	Artificial Storage and Recovery (ASR) includes managed aquifer recharge	Pumped storage of water in aquifers to permit abstraction during times of increased demand; treatment at either existing or new water treatment works
	Infiltration galleries (IGA)	New surface water/groundwater abstraction system at locations where the river and groundwater are in hydraulic continuity, new abstraction point and transfer to either new or existing water treatment works
Desalination	Desalination (DSL)	New desalination plant either located in a coastal or estuarine location, suitable new treatment such as membrane separation (electrodialysis reversal, reverse osmosis), thermal processes (multistage flash distillation, multiple effect distillation, mechanical vapour compression), transfer to new or existing treated water storage
Sophisticated/ Conjunctive Use	Conjunctive use of sources (CON)	Use of surface water and groundwater sources to allow abstraction from less environmentally sensitive sources and avoid surface water abstractions at times of low flows
	Reductions in level of service (LOS)	Reduced level of service offered to customers and any associated increase to deployable output
	Outage reduction (OUT)	Reduction in the calculated outage allowance by increasing the reliability of certain assets, such as the refurbishment of existing assets

Option group	Scheme type	Sub-categories
Bulk Transfers/ Imports	Raw water transfer (RWT)	New or increase to existing transfer arrangements for raw water by, for example, canal/river/pipeline from outside operational region. Source of water may be either surface water or groundwater
	Tankering of water (TAN)	Tankering of either raw or treated water from outside the existing operational region
	Intra-company transfers (ICT)	Transfer of raw or treated water from one resource zone to another
	International imports (INT)	Transfers of water into the existing supply system, from an international source (e.g. sea going vessels, icebergs, pipelines)
Innovative Techniques	Rain cloud seeding (RCS)	Changing the amount of rainfall that falls on catchments by dispersing substances into the atmosphere that assist with the condensation of water vapour into clouds
	Tidal barrage (TBA)	Using tidal barrages as impoundment structures
Licence Trading	Water industry trades (WIT)	Agreement to trade water with another incumbent water company, thereby giving greater abstraction quantity into the supply system
	Non-water industry trades (NIT)	Agreement to trade water with a third party, thereby giving greater abstraction quantity into the supply system, e.g. redundant industrial abstraction licences not currently used for public water supply, private supplies, joint ownership of assets.
Water Reuse	Wastewater treatment works effluent reuse (EFR)	New direct or indirect effluent reuse schemes to either potable standards for drinking water or for non-potable use (e.g. agricultural irrigation or industrial processes)
	Trade effluent reuse (TER)	Use of trade effluent discharges not committed to wastewater treatment works, treated to either potable standards for drinking water or for non-potable use
Catchment Management	Catchment management schemes (CAM)	The provision of catchment-based solutions that lead directly to improvements of the amount of water available for abstraction
Drought permits and orders	Drought permits and orders (DPS)	Drought permits and drought orders are drought management actions that, if granted, can allow more flexibility to manage water resources and the effects of drought on public water supply and the environment.

Table 30 Production management options

Option group	Scheme type	Sub-categories
Raw Water Efficiency	Raw water losses (RWL)	Reductions in leakage of water from raw water infrastructure assets, thereby conserving of storage or reduction in volumes of water abstracted
Water Treatment Work Improvements	Increased treatment capacity (ITC)	Modifications or improvements to the existing WTW capacity to allow treatment of more water where there is the potential to operate sources at higher volumetric output at certain times (may be linked to Resource Management options)
	Process losses (PRO)	Efficiency improvements to individual or groups of water treatment works, thereby reducing water losses
Operating Principles	Supply system operation	Alter how part of the supply network, or the network as a whole, is operated to increase deployable output.

Table 31 Customer management options

Option group	Scheme type	Sub-categories
Metering	Compulsory metering (CMT)	Fitting of compulsory meters to Industrial, commercial, public-sector premises and domestic properties, e.g. swimming pool owners, sprinkler/hose pipe users, households with an outside tap, households in water-stressed areas, households where a meter or meter box already exists, void properties
	Enhanced metering, Smart metering (EMT)	Targeted installation of water meters and a promotional campaign to increase optant rates and change of occupancy switchers
	Meter Installation policy (MIP)	Installation when premises change ownership, industrial, commercial and public sector, households, properties with excessive water use e.g. swimming pool
	Metering of sewerage flow (MSF)	In order to manage water consumption and water waste
	Customer metering (CME)	Meter installation on customer contact, enhanced promotion, blanket promotion, metering on change of occupier
	Metering without customer status change (MCS)	Meter all unmeasured properties without changing customer status to metered, better accounting for customer consumption, eventual increase in FMO uptake
Fees and Tariffs	Introduction of special fees (ISF)	Introduction of separate additional fees for: sprinkler users, hose pipe users, outside tap users, swimming pools
	Changes to existing measured tariffs (EMT)	Discontinued declining block rate tariffs, increasing the volumetric charges, introducing rising block volumetric charges, introducing summer/winter or other seasonal tariffs, introducing daily/peak/off-peak tariffs for at least some seasons, charge only above a defined subsistence level of use (to protect low income families), flow restrictor charging (tariff reduction for a restriction in domestic supply water pressure), domestic user tariffs and/or commercial user tariffs, increasing unmeasured rates, making measured rates more attractive, removing fixed standing charge
	Introduction of special tariffs for specific users (IST)	Introducing interruptible industrial supplies, Introducing lower charges for major users with significant storage. Introducing higher cost ban-free sprinkler or hose pipe licences, Introducing spot pricing for selected customers
	Refer a friend schemes (RAF)	Offer one off payment for referring a friend to have meter fitted
	Reduced bills (REB)	Company subsidy to consumers for the purchase/installation of water saving products
Water Efficiency	Water efficiency enabling activities (WEE)	Sponsoring 'waste minimisation' projects, tradable delivery entitlements, water butts, targeting gardeners for rainwater harvesting, programme of re-washing customers' taps, lobbying for tighter or company-specific water regulations, improving the enforcement of water regulations, implement water efficiency research (Waterwise) outcomes, planning restrictions preventing new development
	Water use audit and inspection for domestic or non-household customers (WUA)	Domestic property water use audit and retrofit, provision of self-audit packs, commercial property water use audit and retrofit
	Promotion of water saving appliances (WSA)	Appliance exchange programmes – washing machine, dishwasher, water closets or WCs
	Promotion of water saving devices (WSD)	E.g. water butts, saver flush, shower regulator, tap insert – through website and call centre
	Installation of water saving devices (ISD)	Water efficiency home check-ups with water saving device installation

Option group	Scheme type	Sub-categories
	Water recycling (WER)	Encouraging water recycling, (e.g. untreated grey water from households or industrial customers, fitting water recycling systems in new or existing houses, rainwater harvesting)
	Targeted water conservation information (advice on appliance water usage) (WEI)	Industrial customers/bodies, commercial customers, households, public sector (e.g. schools, hospitals, community groups), recreation facilities (parks and gardens, golf courses), designers of hot water systems, taps and water using appliances, purchasers of water-using appliances (i.e. in showrooms), labelling water consumption of appliances
	Advice and Information on direct abstraction and irrigation techniques (AIT)	Drip vs. spray irrigation, direct abstraction, other techniques for reducing evaporation
	Advice and information on leakage detection and fixing techniques (LDF)	Industrial, commercial and public sector, household, agricultural
	Partnership projects with public and third sector organisations (PPO)	e.g. Housing Associations
	Water efficiency at UUW own sites (WUUW)	Do as I do – This project focuses on water use on all UUW assets, ranging from pumping stations to large offices, all of which use water in one way or another. The process involves undertaking the following: water efficiency audit; meter check and data logging; and leakage survey.
	App for measured customers (APP)	Develop customer app to enable continued engagement with the customer, to help long-term behaviour change.
	Education programme (EDU)	Continue to deliver KS2 educational programme
	Promotion of installation of more water efficient products (WEP)	Encouraging or requiring greater use of water saving technology in new and/or existing buildings (industrial, commercial, public sector and household) – fitting of showers, low volume shower heads, limited purchase/use of power showers, low flush toilets, dual flush toilets, fitting new toilets, composting toilets, waterless urinals, retrofitting existing toilets, shallow trap toilets, flush controller for urinals, timing devices, 'people detectors', self-closing taps (i.e. push operation taps that cut off this supply after a short time, spray taps, toilet bag cistern dams (by displacing part of the cistern volume, reduce the flush volume)), hose activated by a spring loaded trigger mechanism, limited purchase/use of instantaneous water heaters/boilers, research and development into water saving technology

Table 32 Distribution management options

Option group	Scheme type	Sub-categories
Leakage	Leakage reduction – additional leakage detection (LEA)	
	Leakage reduction – pressure management (LEA)	Optimisation of existing schemes, implementation of new schemes
	Leakage reduction – mains rehabilitation (LEA)	
	Private leak repair scheme (LEA)	Free repair scheme, subsidised repair scheme, supply pipe replacement scheme

Table 33 Environment Agency option type for WRMP tables

Option type	Option group	Description
Aquifer recharge/aquifer storage recovery	Resource Options	Options that provide resource benefits through aquifer recharge/aquifer storage recovery (ASR)
Catchment management	Resource Options	Options that provide resource benefits through catchment management measures. This may be through improving the treatability of water or counteracting deteriorating water quality.
Conjunctive use	Resource Options	Options that enable different water supplies to be used in-combination to enhance overall water available for use
Desalination	Resource Options	Options that abstract and treat saline water to provide additional supply.
Drought permits/orders	Resource Options	Options that increase water available for use, through the application for and implementation of drought permits or orders.
External raw water bulk supply/transfer	Resource Options	Options involving the transfer of water from outside of the water company, within the UK.
Groundwater enhancement	Resource Options	Options to increase the deployable output of an existing groundwater source.
Internal raw water transfer	Resource Options	Options involving the transfer of water between water company zones.
International import	Resource Options	Options involving the importation of water from outside of the UK.
Licence trading	Resource Options	Options involving the trading of unused abstraction licence capacity to increase the company's water available for use.
New groundwater	Resource Options	Options involving developing a new groundwater source.
New reservoir	Resource Options	Options involving developing a new reservoir source.
New surface water	Resource Options	Options involving developing a surface water source, excluding any reservoir.
New technology	Resource Options	Options involving new technology not covered by other option types.
New water treatment works	Resource Options	Options involving the construction of new water treatment works.
Reduction of raw water losses	Resource Options	Options involving the reduction of raw water losses.
Reservoir enlargement	Resource Options	Options involving the enlargement of an existing reservoir.
Surface water enhancement	Resource Options	Options to increase the deployable output from a surface water source.
Water reuse	Resource Options	Options involving the reuse of water effluent. This can include direct and indirect reuse schemes for potable or non-potable supply.
New/enhanced pumping station	Production Options	Options to construct a new or enhance an existing pumping station.
Outage reduction	Production Options	Options to reduce outage at water company assets (note catchment options should be reported under as "catchment management").
Water treatment works capacity increase	Production Options	Options that increase the capacity of a water treatment works.
Water treatment works loss recovery	Production Options	Options that reduce losses at a water treatment works.

Option type	Option group	Description
Active leakage management	Distribution Options	Options that actively identify and target leakage directly.
External potable bulk supply/transfer	Distribution Options	Options that involve the transfer/bulk supply of potable water from another water company.
Internal potable transfer	Distribution Options	Options that involve the transfer/bulk supply of potable water within the water company.
Mains replacement (not trunk mains)	Distribution Options	Options involving the replacement of mains supply pipes, excluding trunk mains
Other leakage control	Distribution Options	Other leakage options
Pressure management	Distribution Options	Options to manage pressure in the distribution network
Trunk mains renewal/new	Distribution Options	Options involving the renewal of, or construction of trunk mains
Change in levels of service	Customer Options	Options involving a change in levels of service to increase water available for use.
Household water audit	Customer Options	Water audit options (virtual or in-person) for household properties.
Household water recycling	Customer Options	Options that increase water recycling in the home, such as the collection and reuse of greywater.
Metering change of occupancy	Customer Options	Metering options relevant to when a property has a change of occupier.
Metering compulsory	Customer Options	Compulsory metering options.
Metering optants	Customer Options	Metering options related to customers who choose to get/request a water meter.
Metering other selective	Customer Options	Other selective metering options.
Non-household water audit	Customer Options	Water audit options (virtual or in-person) for non-household properties
Other water efficiency	Customer Options	Other water efficiency options
Rainwater harvesting	Customer Options	Options that promote and increase rates of rainwater harvesting for household and/or non-household properties.
Retrofitting indoor water efficiency devices	Customer Options	Options that involve retrofitting old water devices for more efficient ones.
Supply pipe repairs / replacement	Customer Options	Options involving the repair or replacement of customer supply pipes.
Tariff	Customer Options	Options involving the use of tariffs to motivate water efficient customer behaviours.
Water efficiency customer education / awareness	Customer Options	Options involving education and awareness raising programmes to improve customer water efficiency practices.
Drought - water use restrictions	Customer Options	Options involving drought water use restrictions including the use of Temporary Use Bans (TUBs) and Non-Essential Use Bans (NUEBs).

Appendix B List of options and screening outcomes

Option ID	Option name	Option type	Option Group	Primary screening outcome	Secondary screening outcome	Detailed screening outcome	Option status	Screened out reason
STTA4	NWT_VYRNWY	External raw water bulk supply/transfer	Resource Options	IN	IN	IN	Constrained	
STT018	RES_PRESCOT	Reservoir enlargement	Resource Options	IN	OUT	N/A	Feasible	Low cost-benefit (AIC above the resource zone cut-off)
STT019	ICT_WIRRAL	New/Enhanced pumping station	Production Options	OUT	N/A	N/A	Unconstrained	No water available under dry weather conditions due to the Dee General Directions.
STT021	RES_CROASDALE	New reservoir	Resource Options	IN	OUT	N/A	Feasible	
STT022	IGA_CROASDALE	New groundwater	Resource Options	OUT	N/A	N/A	Unconstrained	Sustained yield unreliable and anticipated issues with planning, stakeholder & customer acceptability.
STT029	SWN_RIVER LUNE	New surface water	Resource Options	OUT	N/A	N/A	Unconstrained	Provides minimal WAFU benefit.
STT034	RES_HOLLINGWORTH	Surface water enhancement	Resource Options	OUT	N/A	N/A	Unconstrained	Concerns regarding water quality, available yield and potential conflict with recreational use of source.
STT041	SWN_RIVER ROCH	New surface water	Resource Options	IN	IN	IN	Constrained	
STT041b	SWN_RIVER IRWELL_ROCH	New surface water	Resource Options	IN	IN	IN	Constrained	
STT055	GWE_AUGHERTREE	Groundwater enhancement	Resource Options	OUT	N/A	N/A	Unconstrained	Unreliable summer flows and WFD status.
WR001	SWN_RIVER ALT	New surface water	Resource Options	IN	OUT	N/A	Feasible	Low cost-benefit (AIC above the resource zone cut-off)
WR002	SWN_BACK DRAIN	New surface water	Resource Options	OUT	N/A	N/A	Unconstrained	High uncertainty regarding availability particularly during summer low flows.
WR003	RES_FISHER TARN	Surface water enhancement	Resource Options	OUT	N/A	N/A	Unconstrained	Accelerated for AMP7 delivery.
WR004	RES_LONGSLEDDALE	New reservoir	Resource Options	IN	OUT	N/A	Feasible	Low cost-benefit (AIC above the resource zone cut-off)

Option ID	Option name	Option type	Option Group	Primary screening outcome	Secondary screening outcome	Detailed screening outcome	Option status	Screened out reason
WR005	SWN_DITTON BROOK	New surface water	Resource Options	IN	OUT	N/A	Feasible	Low cost-benefit (AIC above the resource zone cut-off)
WR006	SWN_GLAZE BROOK	New surface water	Resource Options	IN	IN	IN	Constrained	
WR007	SWN_SANKEY BROOK	New surface water	Resource Options	IN	OUT	N/A	Feasible	Low cost-benefit (AIC above the resource zone cut-off)
WR008	SWN_WIRRAL	New surface water	Resource Options	IN	OUT	N/A	Feasible	Low cost-benefit (AIC above the resource zone cut-off)
WR009	SWN_RIVER RAWTHEY	New surface water	Resource Options	IN	OUT	N/A	Feasible	Low cost-benefit (AIC above the resource zone cut-off)
WR010	SWN_RIVER GRETA	New surface water	Resource Options	IN	IN	IN	Constrained	
WR011	SWN_KEER	New surface water	Resource Options	OUT	N/A	N/A	Unconstrained	Relatively small flow surplus and low likelihood of being granted a new abstraction licence. Potential unmitigable impact on downstream SAC/SPA.
WR012	RES_BORROW BECK	New reservoir	Resource Options	IN	OUT	N/A	Feasible	
WR013	SWN_WENNING	New surface water	Resource Options	OUT	N/A	N/A	Unconstrained	Combined with WR010.
WR014	SWN_RIVER BOLLIN_DEAN	New surface water	Resource Options	OUT	N/A	N/A	Unconstrained	Limited water availability as waterbody is over licensed.
WR015	SWN_RIVER IRWELL	New surface water	Resource Options	IN	IN	IN	Constrained	
WR015a1	SWN_RIVER IRWELL a1	New surface water	Resource Options	IN	IN	IN	Constrained	
WR015a2	SWN_RIVER IRWELL a2	New surface water	Resource Options	IN	IN	IN	Constrained	
WR016	NIT_THIRD PARTY_22	External raw water bulk supply/transfer	Resource Options	OUT	N/A	N/A	Unconstrained	Third party has indicated that there is insufficient surplus available.
WR017	SWN_RIVER GOYT	New surface water	Resource Options	IN	IN	IN	Constrained	
WR018	NIT_THIRD PARTY_23	External raw water bulk supply/transfer	Resource Options	OUT	N/A	N/A	Unconstrained	Option screened out in favour of WR016 which is more cost effective.

Option ID	Option name	Option type	Option Group	Primary screening outcome	Secondary screening outcome	Detailed screening outcome	Option status	Screened out reason
WR025	SWN_RIBBLE UPPER	New surface water	Resource Options	OUT	N/A	N/A	Unconstrained	More feasible alternative option available in the catchment (WR049).
WR026a	SWN_RIVER RIBBLE 26a	New surface water	Resource Options	IN	IN	OUT	Refined feasible	Significant negative impacts on biodiversity (SAC, SPA and SSSI) and potentially significant INNS transfer risk.
WR026b	SWN_RIVER RIBBLE 26b	New surface water	Resource Options	IN	IN	IN	Constrained	
WR026c	SWN_RIVER RIBBLE 26c	New surface water	Resource Options	IN	IN	IN	Constrained	
WR027	SWN_SAVICK BROOK	New surface water	Resource Options	OUT	N/A	N/A	Unconstrained	Superseded by options in the main catchment (combined with (WR049).
WR028	SWN_RIVER IRT	New surface water	Resource Options	OUT	N/A	N/A	Unconstrained	No water available (river already in deficit at Q95). Compensation requirements in the catchment are under review as considered too low to support WFD Good Ecological Potential in the river.
WR029	SWN_RIVER MITE	New surface water	Resource Options	IN	OUT	N/A	Feasible	Low cost-benefit (AIC above the resource zone cut-off)
WR030	SWN_RIVER ESK	New surface water	Resource Options	IN	OUT	N/A	Feasible	Low cost-benefit (AIC above the resource zone cut-off)
WR031	SWN_RIVER ANNAS	New surface water	Resource Options	IN	OUT	N/A	Feasible	Low cost-benefit (AIC above the resource zone cut-off)
WR032	SWN_RIVER WEAVER DANE	New surface water	Resource Options	IN	OUT	N/A	Feasible	Low cost-benefit (AIC above the resource zone cut-off)
WR033	SWN_RIVER GOWY	New surface water	Resource Options	OUT	N/A	N/A	Unconstrained	Lack of availability at Q70 & Q95. Waterbody is also in 'poor' ecological status for fish.
WR034	SWN_RIVER BROCK	New surface water	Resource Options	OUT	N/A	N/A	Unconstrained	Lack of availability at Q70 & Q95. Existing surface water abstractions already considered to impact the waterbody.
WR035	SWN_THISTLETON BROOK	New surface water	Resource Options	OUT	N/A	N/A	Unconstrained	Lack of availability at Q70 & Q95. Also in 'poor' ecological status for invertebrates.
WR036	SWN_RIVER CALDEW	New surface water	Resource Options	IN	OUT	N/A	Feasible	Low cost-benefit (AIC above the resource zone cut-off)

Option ID	Option name	Option type	Option Group	Primary screening outcome	Secondary screening outcome	Detailed screening outcome	Option status	Screened out reason
WR037a	RES_HAWESWATER a	Reservoir enlargement	Resource Options	IN	IN	OUT	Refined feasible	Potentially significant negative impacts on biodiversity (SAC) and potential for deterioration in the context of the WFD.
WR037b	RES_HAWESWATER b	Reservoir enlargement	Resource Options	IN	IN	OUT	Refined feasible	Potentially significant negative impacts on biodiversity (SAC) and potential for deterioration in the context of the WFD.
WR038	SWN_RIVER EAMONT	New surface water	Resource Options	IN	IN	IN	Constrained	
WR039a	SWN_RIVER EDEN a	New surface water	Resource Options	IN	OUT	N/A	Feasible	Low cost-benefit (AIC above the resource zone cut-off)
WR039b	SWN_RIVER EDEN b	New surface water	Resource Options	IN	OUT	N/A	Feasible	Low cost-benefit (AIC above the resource zone cut-off)
WR040	SWN_EDEN UPPER	New surface water	Resource Options	OUT	N/A	N/A	Unconstrained	Combined with WR038.
WR041	SWN_RIVER IRTHING	New surface water	Resource Options	IN	IN	IN	Constrained	
WR042	SWN_RIVER ESK	New surface water	Resource Options	IN	IN	IN	Constrained	
WR043	SWN_RIVER PETTERIL	New surface water	Resource Options	IN	IN	IN	Constrained	
WR044	SWN_RIVER WAVER	New surface water	Resource Options	IN	OUT	N/A	Feasible	Low cost-benefit (AIC above the resource zone cut-off)
WR045	SWN_RIVER WAMPOOL	New surface water	Resource Options	IN	OUT	N/A	Feasible	Low cost-benefit (AIC above the resource zone cut-off)
WR046	SWE_RIVER DEE (CHESTER)	Surface water enhancement	Resource Options	OUT	N/A	N/A	Unconstrained	Significant uncertainty and practical viability issues due to SAC designations and licensing restrictions.
WR047a	SWN_MILWR TUNNEL	New groundwater	Resource Options	OUT	N/A	N/A	Unconstrained	Concerns regarding tunnel stability, water quality and ecological impacts on the receiving catchment.
WR048	SWN_RIVER LUNE LOWER	New surface water	Resource Options	OUT	N/A	N/A	Unconstrained	Combined with WR012
WR049a	SWN_RIVER RIBBLE 49a	New surface water	Resource Options	IN	IN	IN	Constrained	

Option ID	Option name	Option type	Option Group	Primary screening outcome	Secondary screening outcome	Detailed screening outcome	Option status	Screened out reason
WR049b	SWN_RIVER RIBBLE 49b	New surface water	Resource Options	IN	IN	IN	Constrained	
WR049c	SWN_RIVER RIBBLE 49c	New surface water	Resource Options	IN	IN	IN	Constrained	
WR049d	SWN_RIVER RIBBLE 49d	New surface water	Resource Options	IN	IN	IN	Constrained	
WR049e	SWN_RIVER RIBBLE 49e	New surface water	Resource Options	IN	IN	IN	Constrained	
WR050	SWE_DUDDON LOWER	Surface water enhancement	Resource Options	OUT	N/A	N/A	Unconstrained	Minor WAFU benefit indicated and sub-catchment already in deficit based on available EA data.
WR051	SWE_POAKA BECK	Surface water enhancement	Resource Options	OUT	N/A	N/A	Unconstrained	Impoundment already occurs upstream. WR100 is a surrogate groundwater option for the catchment.
WR052	SWE_EHEN LOWER	Surface water enhancement	Resource Options	OUT	N/A	N/A	Unconstrained	Minor WAFU benefit indicated and sub-catchment already in deficit based on available EA data.
WR053	SWE_CALSDER LOWER	Surface water enhancement	Resource Options	OUT	N/A	N/A	Unconstrained	Minor WAFU benefit indicated and sub-catchment already in deficit based on available EA data.
WR054	SWE_WYRE	Surface water enhancement	Resource Options	OUT	N/A	N/A	Unconstrained	Sub-catchment is in deficit based on available EA data. Waterbody graded as 'does not support good' due to existing surface water abstractions.
WR055	SWE_NORTH CUMBRIA	Surface water enhancement	Resource Options	IN	IN	IN	Constrained	
WR056a	SWE_RIVER EDEN a	Surface water enhancement	Resource Options	IN	OUT	N/A	Feasible	Low cost-benefit (AIC above the resource zone cut-off)
WR056b	SWE_RIVER EDEN b	Surface water enhancement	Resource Options	IN	OUT	N/A	Feasible	Low cost-benefit (AIC above the resource zone cut-off)
WR057	RES_RAMSDEN CLOUGH	New reservoir	Resource Options	OUT	N/A	N/A	Unconstrained	Option requires further development. Unfortunately it was not possible to progress this within WRMP24 timescales.
WR058	SWE_RIVER COCKER	Surface water enhancement	Resource Options	OUT	N/A	N/A	Unconstrained	Available data suggest that the waterbody is unable to support additional abstraction with deficits at Q70 & Q95.

Option ID	Option name	Option type	Option Group	Primary screening outcome	Secondary screening outcome	Detailed screening outcome	Option status	Screened out reason
WR059	RES_DERWENT	Surface water enhancement	Resource Options	OUT	N/A	N/A	Unconstrained	Available data suggest that the waterbody is unable to support additional abstraction with deficits at Q70 & Q95. Limited WAFU benefit also anticipated.
WR060	SWE_RIVER DERWENT	Surface water enhancement	Resource Options	OUT	N/A	N/A	Unconstrained	Available data suggest that the waterbody is unable to support additional abstraction with deficits at Q70 & Q95.
WR061	SWN_RIVER ELLEN	New surface water	Resource Options	OUT	N/A	N/A	Unconstrained	Limited WAFU benefit anticipated.
WR062a	RES_WORTHINGTON a	Surface water enhancement	Resource Options	IN	IN	OUT	Refined feasible	Water quality issues difficult and costly to treat.
WR062b	RES_WORTHINGTON b	Surface water enhancement	Resource Options	IN	IN	OUT	Refined feasible	Water quality issues difficult and costly to treat.
WR063	SWN_RIVER YARROW	New surface water	Resource Options	IN	OUT	N/A	Feasible	Low cost-benefit (AIC above the resource zone cut-off)
WR064	RES_ENTWISTLE	Reservoir enlargement	Resource Options	IN	OUT	N/A	Feasible	Low cost-benefit (AIC above the resource zone cut-off)
WR065a	RES_WATERGROVE	Reservoir enlargement	Resource Options	IN	IN	IN	Constrained	
WR065b	RES_WHITEHOLME	Reservoir enlargement	Resource Options	IN	IN	IN	Constrained	
WR066	SWN_RIVER MEDLOCK	New surface water	Resource Options	IN	OUT	N/A	Feasible	Low cost-benefit (AIC above the resource zone cut-off)
WR067	ITC_CUMBRIA	Water treatment works capacity increase	Production Options	OUT	N/A	N/A	Unconstrained	WAFU benefit is less than the de minimis threshold for the resource zone.
WR068	RES_CUMBRIA	Water treatment works capacity increase	Production Options	OUT	N/A	N/A	Unconstrained	Yield is below the de minimis threshold for the resource zone.
WR069	RES_LEVEN	Surface water enhancement	Resource Options	OUT	N/A	N/A	Unconstrained	Available data suggest that the waterbody is unable to support additional abstraction with deficits at Q70 & Q95.
WR070	SWN_RIVER CONDER	New surface water	Resource Options	OUT	N/A	N/A	Unconstrained	Uncertainty regarding water availability due to historical sustainability reduction requirements.

Option ID	Option name	Option type	Option Group	Primary screening outcome	Secondary screening outcome	Detailed screening outcome	Option status	Screened out reason
WR071	SWN_RIVER COCKER	New surface water	Resource Options	OUT	N/A	N/A	Unconstrained	Uncertainty regarding water availability due to historical sustainability reduction requirements.
WR072	SWN_PENDLE WATER	New surface water	Resource Options	OUT	N/A	N/A	Unconstrained	Superseded by WR049a & WR049b.
WR073	SWN_COLNE WATER	New surface water	Resource Options	OUT	N/A	N/A	Unconstrained	Superseded by WR049a & WR049b.
WR074	SWN_RIVER DARWEN	New surface water	Resource Options	IN	IN	IN	Constrained	
WR075	RES_STOCKS	Reservoir enlargement	Resource Options	OUT	N/A	N/A	Unconstrained	Accelerated for AMP7 delivery.
WR076	SWN_RIVER BOLLIN	New surface water	Resource Options	IN	IN	IN	Preferred	
WR077a	RES_DOVESTONE	Reservoir enlargement	Resource Options	IN	IN	IN	Constrained	
WR077b	RES_ERRWOOD	Reservoir enlargement	Resource Options	IN	IN	OUT	Refined feasible	Significant negative impacts on biodiversity (SAC and SPA) and potential for deterioration in the context of the WFD.
WR077c	RES_FERNILEE	Reservoir enlargement	Resource Options	IN	IN	IN	Constrained	
WR078	RWL_LONGDENDALE COMPENSATION	Reduction of raw water losses	Resource Options	OUT	N/A	N/A	Unconstrained	Superseded by WR159.
WR079a	RES_APPLETON a	Surface water enhancement	Resource Options	OUT	N/A	N/A	Unconstrained	Not viable as the natural yield of the catchment cannot support the required volume.
WR079b	RES_APPLETON b	Surface water enhancement	Resource Options	OUT	N/A	N/A	Unconstrained	Not viable as the natural yield of the catchment cannot support the required volume.
WR079c	RES_APPLETON c	Surface water enhancement	Resource Options	OUT	N/A	N/A	Unconstrained	Not viable as the natural yield of the catchment cannot support the required volume.
WR079d	RES_APPLETON d	Surface water enhancement	Resource Options	OUT	N/A	N/A	Unconstrained	Not viable as the natural yield of the catchment cannot support the required volume.
WR080	SWN_RIVER DANE	New surface water	Resource Options	OUT	N/A	N/A	Unconstrained	Combined with WR032.
WR081	RES_VYRNWY	Surface water enhancement	Resource Options	OUT	N/A	N/A	Unconstrained	No water available as yield is fully maximised from the existing catchment/system.

Option ID	Option name	Option type	Option Group	Primary screening outcome	Secondary screening outcome	Detailed screening outcome	Option status	Screened out reason
WR082	ICT_PADDY END	Internal raw water transfer	Resource Options	OUT	N/A	N/A	Unconstrained	Combined with WR067.
WR083	ICT_BARROW	Internal raw water transfer	Resource Options	OUT	N/A	N/A	Unconstrained	Minor WAFU benefit and sub-catchment already in deficit.
WR084	ITC_CARLISLE	Internal potable transfer	Distribution Options	IN	IN	IN	Constrained	
WR085	GWN_FLORENCE BECKERMET	New groundwater	Resource Options	OUT	N/A	N/A	Unconstrained	Uncertain and unreliable yields anticipated based on aquifer property data. Potential water quality issues relating to chemicals/mining also of concern.
WR086	GWN_LANGTHWAITE	New groundwater	Resource Options	OUT	N/A	N/A	Unconstrained	Estimated yield is less than the de minimis threshold for the resource zone. Risk of the option impacting on its linked surface water body at low flows.
WR087	GWN_PRESCOT	New groundwater	Resource Options	OUT	N/A	N/A	Unconstrained	Groundwater body is over licensed and at risk of saline intrusion.
WR088	GWN_ALSAGER	New groundwater	Resource Options	IN	OUT	N/A	Feasible	Low cost-benefit (AIC above the resource zone cut-off)
WR089	GWN_WATCHGATE	New groundwater	Resource Options	OUT	N/A	N/A	Unconstrained	Yield uncertain with abstraction likely to be compromised at low flows. Estimated yield for the assumed maximum drawdown is less than the de minimis threshold for the resource zone.
WR090	GWN_OAKMERE	New groundwater	Resource Options	OUT	N/A	N/A	Unconstrained	Groundwater body rated as 'poor' in multiple chemical aspects and the surface water body has stringent WFD objectives which means the option scores poorly.
WR091	GWN_INSKIP	New groundwater	Resource Options	OUT	N/A	N/A	Unconstrained	Limited water availability restricting yield and abstraction directly affecting surface waters.
WR092	GWN_HIGH BROWNELSON	New groundwater	Resource Options	OUT	N/A	N/A	Unconstrained	Low yield anticipated as located in a minor aquifer.
WR093	GWN_WIGTON 1	New groundwater	Resource Options	OUT	N/A	N/A	Unconstrained	Estimated yield based on assumed maximum drawdown is less than the de minimis threshold for the resource zone. Also concerns regarding water quality.

Option ID	Option name	Option type	Option Group	Primary screening outcome	Secondary screening outcome	Detailed screening outcome	Option status	Screened out reason
WR094	GWN_WIGTON 2	New groundwater	Resource Options	OUT	N/A	N/A	Unconstrained	Estimated yield based on assumed maximum drawdown is less than the de minimis threshold for the resource zone. Also concerns regarding water quality.
WR095	GWE_ROUGHTON GILL	Groundwater enhancement	Resource Options	IN	IN	IN	Constrained	
WR096	GWN_DURDAR	New groundwater	Resource Options	IN	OUT	N/A	Feasible	Low cost-benefit (AIC above the resource zone cut-off)
WR097	GWN_KIRKLINTON	New groundwater	Resource Options	IN	OUT	N/A	Feasible	Low cost-benefit (AIC above the resource zone cut-off)
WR098	GWN_THREAPWOOD	New groundwater	Resource Options	IN	OUT	N/A	Feasible	Low cost-benefit (AIC above the resource zone cut-off)
WR099a	GWE_BURNLEY a	Conjunctive use	Resource Options	IN	IN	N/A	Unconstrained	Under separate consideration for Chester Resilience supply.
WR099b	GWE_BURNLEY b	Groundwater enhancement	Resource Options	IN	IN	N/A	Unconstrained	Under separate consideration for Chester Resilience supply.
WR099c	GWE_BURNLEY c	Groundwater enhancement	Resource Options	IN	IN	N/A	Unconstrained	Under separate consideration for Chester Resilience supply.
WR100	GWE_THORNCLIFFE	Groundwater enhancement	Resource Options	OUT	N/A	N/A	Unconstrained	Screened out based on WINEP outcome. Licence will be constrained in AMP8 by new Furness group conjunctive 6 year licence cap.
WR101	GWE_FYLDE	Groundwater enhancement	Resource Options	OUT	N/A	N/A	Unconstrained	AMP7 WINEP investigations concluded no impact on surface water. However early results from the WINEP investigation on the Fylde Coast boreholes indicate there will be no additional water available for abstraction. New licence limits to be agreed during AMP8 WINEP investigations.
WR102b	GWE_WIDNES	Groundwater enhancement	Resource Options	IN	IN	IN	Constrained	
WR102f	GWE_WIDNES 2	Groundwater enhancement	Resource Options	IN	IN	IN	Constrained	
WR102e	GWE_BOLD HEATH	Groundwater enhancement	Resource Options	IN	IN	IN	Constrained	

Option ID	Option name	Option type	Option Group	Primary screening outcome	Secondary screening outcome	Detailed screening outcome	Option status	Screened out reason
WR103	GWE_CROFT	Groundwater enhancement	Resource Options	IN	OUT	N/A	Feasible	Low cost-benefit (AIC above the resource zone cut-off)
WR105a1	GWE_LYMM a1	Groundwater enhancement	Resource Options	IN	IN	IN	Feasible	
WR105a2	GWE_LYMM a2	Groundwater enhancement	Resource Options	IN	IN	IN	Constrained	
WR105b1	GWE_LYMM b1	Groundwater enhancement	Resource Options	IN	IN	IN	Constrained	
WR105b2	GWE_LYMM b2	Groundwater enhancement	Resource Options	IN	IN	IN	Constrained	
WR106a	GWE_WALTON 1	Groundwater enhancement	Resource Options	IN	IN	IN	Constrained	
WR106b	GWE_WALTON 2	Groundwater enhancement	Resource Options	IN	IN	IN	Constrained	
WR107a1	GWE_AUGHTON PARK a1	Groundwater enhancement	Resource Options	IN	IN	IN	Unconstrained	This option is no longer feasible.
WR107a2	GWE_AUGHTON PARK a2	Groundwater enhancement	Resource Options	IN	IN	IN	Unconstrained	This option is no longer feasible.
WR107b	GWE_RANDLES BRIDGE	Groundwater enhancement	Resource Options	IN	IN	IN	Unconstrained	This option is no longer feasible.
WR108	GWE_MOW COP	Groundwater enhancement	Resource Options	IN	OUT	N/A	Feasible	Low cost-benefit (AIC above the resource zone cut-off)
WR109	GWE_SWINESHAW	Groundwater enhancement	Resource Options	IN	OUT	N/A	Feasible	
WR110	GWE_RUSHTON SPENCER	Groundwater enhancement	Resource Options	OUT	N/A	N/A	Unconstrained	EA feedback is that this abstraction is likely to impact the South Pennine Moors SAC.
WR111	GWE_WOODFORD	Groundwater enhancement	Resource Options	IN	IN	IN	Unconstrained	This option is no longer feasible.
WR112	GWN_BRAMHALL	New groundwater	Resource Options	IN	OUT	N/A	Feasible	Low cost-benefit (AIC above the resource zone cut-off)
WR113	GWE_TYTHERINGTON	Groundwater enhancement	Resource Options	IN	IN	IN	Unconstrained	This option is no longer feasible.

Option ID	Option name	Option type	Option Group	Primary screening outcome	Secondary screening outcome	Detailed screening outcome	Option status	Screened out reason
WR114	GWE_PYTHON MILL	Groundwater enhancement	Resource Options	OUT	N/A	N/A	Unconstrained	Abstraction licence has been revoked and the borehole is no longer accessible.
WR115	GWE_BOLTON	Groundwater enhancement	Resource Options	OUT	N/A	N/A	Unconstrained	Borehole locations would impact two different waterbodies and neither source is considered sustainable according to operational experience with the groundwater body rated as being in 'poor' overall status.
WR116	GWE_RIBBLE VALLEY	Groundwater enhancement	Resource Options	OUT	N/A	N/A	Unconstrained	Connected surface water bodies are in deficit and the groundwater body is in 'poor' status.
WR117	GWE_GRINDLETON	Groundwater enhancement	Resource Options	OUT	N/A	N/A	Unconstrained	Accelerated for AMP7 delivery.
WR118	GWE_DARK LANE	Groundwater enhancement	Resource Options	OUT	N/A	N/A	Unconstrained	Licence revoked in 2020.
WR119a	GWE_EGREMONT 1	Groundwater enhancement	Resource Options	OUT	N/A	N/A	Unconstrained	Licence to be transferred to a third party outside the WRMP process.
WR119b	GWE_EGREMONT 2	Groundwater enhancement	Resource Options	OUT	N/A	N/A	Unconstrained	Licence to be transferred to a third party outside the WRMP process.
WR120a	GWE_CROSS HILL 1	Groundwater enhancement	Resource Options	OUT	N/A	N/A	Unconstrained	Screened out based on WINEP outcome. Licence will be constrained in AMP8 by new Wirral group 6-year rolling aggregate limit.
WR120b	GWE_CROSS HILL 2	Groundwater enhancement	Resource Options	OUT	N/A	N/A	Unconstrained	Screened out based on WINEP outcome. Licence will be constrained in AMP8 by new Wirral group 6-year rolling aggregate limit.
WR121a	GWE_EATON a	Groundwater enhancement	Resource Options	OUT	N/A	N/A	Unconstrained	Screened out based on WINEP outcome. Licence will be constrained in AMP8 by new Delamere group conjunctive 10 year licence cap.
WR121b	GWE_EATON b	Groundwater enhancement	Resource Options	OUT	N/A	N/A	Unconstrained	Screened out based on WINEP outcome. Licence will be constrained in AMP8 by new Delamere group conjunctive 10 year licence cap.
WR122	GWE_NEWTON HOLLOWS	Groundwater enhancement	Resource Options	IN	IN	IN	Constrained	
WR123	GWE_HELSBY	Groundwater enhancement	Resource Options	IN	OUT	N/A	Feasible	Low cost-benefit (AIC above the resource zone cut-off)

Option ID	Option name	Option type	Option Group	Primary screening outcome	Secondary screening outcome	Detailed screening outcome	Option status	Screened out reason
WR124	GWE_ASHTON	Groundwater enhancement	Resource Options	IN	OUT	N/A	Feasible	Low cost-benefit (AIC above the resource zone cut-off)
WR125	GWE_NORTH SHROPSHIRE	Groundwater enhancement	Resource Options	IN	IN	OUT	Refined feasible	WINEP licence reduction is equivalent to the BAU project to reinstate BH3 hence no spare capacity available.
WR126	GWN_HIGH BROWNELSON	New groundwater	Resource Options	OUT	N/A	N/A	Unconstrained	Merged with WR092.
WR127	GWE_FAIRHILL	Groundwater enhancement	Resource Options	IN	IN	IN	Constrained	
WR128	GWE_TARN WOOD	Internal raw water transfer	Resource Options	IN	IN	IN	Constrained	
WR129	GWE_NORTH CUMBRIA	Groundwater enhancement	Resource Options	IN	OUT	N/A	Feasible	Low cost-benefit (AIC above the resource zone cut-off)
WR130	DSL_CARLISLE	Desalination	Resource Options	IN	OUT	N/A	Feasible	Low cost-benefit (AIC above the resource zone cut-off)
WR131	DSL_WIRRAL	Desalination	Resource Options	IN	OUT	N/A	Feasible	Low cost-benefit (AIC above the resource zone cut-off)
WR132	DSL_LIVERPOOL	Desalination	Resource Options	IN	OUT	N/A	Feasible	Low cost-benefit (AIC above the resource zone cut-off)
WR133	DSL_WORKINGTON	Desalination	Resource Options	IN	OUT	N/A	Feasible	Low cost-benefit (AIC above the resource zone cut-off)
WR134	SWU_SKELMERSDALE	Catchment management	Resource Options	OUT	N/A	N/A	Unconstrained	Option is rainfall dependent so flows are difficult to predict and likely to be limited when most needed. Technically complex with significant unpredictable water quality risks.
WR135	SWU_APPLETON	Catchment management	Resource Options	OUT	N/A	N/A	Unconstrained	Option is rainfall dependent so flows are difficult to predict and likely to be limited when most needed. Technically complex with significant unpredictable water quality risks.
WR136	SWU_BIRCHWOOD	Catchment management	Resource Options	OUT	N/A	N/A	Unconstrained	Option is rainfall dependent so flows are difficult to predict and likely to be limited when most needed. Technically complex with significant unpredictable water quality risks.

Option ID	Option name	Option type	Option Group	Primary screening outcome	Secondary screening outcome	Detailed screening outcome	Option status	Screened out reason
WR137	SWU_LITTLE HULTON	Catchment management	Resource Options	OUT	N/A	N/A	Unconstrained	Option is rainfall dependent so flows are difficult to predict and likely to be limited when most needed. Technically complex with significant unpredictable water quality risks.
WR138	EFR_ELLESMERE	Water reuse	Resource Options	IN	OUT	N/A	Feasible	Low cost-benefit (AIC above the resource zone cut-off)
WR139	EFR_CASTLE CARROCK	Water reuse	Resource Options	IN	OUT	N/A	Feasible	Low cost-benefit (AIC above the resource zone cut-off)
WR140	EFR_HORWICH	Water reuse	Resource Options	IN	IN	IN	Constrained	
WR141	EFR_ROSSENDALE	Water reuse	Resource Options	IN	IN	IN	Constrained	
WR142	EFR_HYNDBURN	Water reuse	Resource Options	IN	OUT	N/A	Feasible	Low cost-benefit (AIC above the resource zone cut-off)
WR143	EFR_DARWEN	Water reuse	Resource Options	OUT	N/A	N/A	Unconstrained	No longer viable as the associated works is due to close in AMP7.
WR144	SWN_RIVER TAME	New surface water	Resource Options	IN	IN	IN	Constrained	
WR145	EFR_WHITEHAVEN	Water reuse	Resource Options	IN	OUT	N/A	Feasible	Low cost-benefit (AIC above the resource zone cut-off)
WR146	EFR_DAVYHULME	Water reuse	Resource Options	IN	OUT	N/A	Feasible	Low cost-benefit (AIC above the resource zone cut-off)
WR147	EFR_NON-HOUSEHOLD INDUSTRIAL	Water reuse	Resource Options	OUT	N/A	N/A	Unconstrained	Screened out due to direct involvement with non-household customers and potential interference with NHH retail.
WR148	GWN_NORTH CUMBRIA	New groundwater	Resource Options	IN	IN	IN	Constrained	
WR149	ITC_WIGAN	Water treatment works capacity increase	Production Options	IN	IN	OUT	Unconstrained	Discounted due to concerns re water quality deterioration in the wider groundwater unit, difficult to treat water quality issues and limited water availability.
WR150	DPS_CASTLE CARROCK	Surface water enhancement	Resource Options	IN	IN	IN	Preferred	

Option ID	Option name	Option type	Option Group	Primary screening outcome	Secondary screening outcome	Detailed screening outcome	Option status	Screened out reason
WR151	RWL_GENERIC	Reduction of raw water losses	Resource Options	OUT	N/A	N/A	Unconstrained	Requires further investigation to identify potential locations and anticipated reductions. Unfortunately this was not possible within WRMP24 timescales.
WR152	ASR_GENERIC	Aquifer recharge/Aquifer storage recovery	Resource Options	OUT	N/A	N/A	Unconstrained	Requires further investigation to identify potential locations and assess benefit. Unfortunately this was not possible within WRMP24 timescales.
WR153	ITC_WEST CHESHIRE 1	Water treatment works capacity increase	Production Options	OUT	N/A	N/A	Unconstrained	Screened out based on WINEP outcome. Licence will be constrained in AMP8 by new Delamere group conjunctive 10 year licence cap.
WR154	ITC_WEST CHESHIRE 2	Water treatment works capacity increase	Production Options	OUT	N/A	N/A	Unconstrained	Screened out based on WINEP outcome. Licence will be constrained in AMP8 by new Delamere group conjunctive 10 year licence cap.
WR155	CAM_GENERIC	Catchment management	Resource Options	OUT	N/A	N/A	Unconstrained	Catchment management activities form a UUW baseline activity and have been implemented over a number of years (e.g. SCaMP) to deliver a wide range of catchment benefits.
WR156	IGA_GENERIC	New technology	Resource Options	OUT	N/A	N/A	Unconstrained	Not suitable for proposed catchment. Appropriate application most likely in areas most at risk of land contamination in the lower, urbanised catchments. Unlikely to realise significant benefit.
WR157	RCS_GENERIC	New technology	Resource Options	OUT	N/A	N/A	Unconstrained	Novel option not currently in use in the UK. Further research required to determine feasibility. Unfortunately this was not possible within WRMP24 timescales.
WR158	TBA_GENERIC	New technology	Resource Options	OUT	N/A	N/A	Unconstrained	Potential site waters are either protected sites or suffer significant pollution risks from urbanisation/industry.
WR159	RWL_COMPENSATION GP 1&2	Reduction of raw water losses	Resource Options	IN	IN	N/A	Unconstrained	Under separate consideration for Chester Resilience supply.
WR160	RWL_COMPENSATION GP 2	Reduction of raw water losses	Resource Options	OUT	N/A	N/A	Unconstrained	Combined with WR159.

Option ID	Option name	Option type	Option Group	Primary screening outcome	Secondary screening outcome	Detailed screening outcome	Option status	Screened out reason
WR162	OUT_GENERIC	Outage reduction	Production Options	OUT	N/A	N/A	Unconstrained	Requires further investigation to identify specific locations and anticipated reduction in burst rate. Unfortunately this was not possible within WRMP24 timescales.
WR163	OUT_CUMBRIA	Outage reduction	Production Options	OUT	N/A	N/A	Unconstrained	Requires further investigation to identify specific locations and anticipated reduction in burst rate. Unfortunately this was not possible within WRMP24 timescales.
WR164	CON_BROUGHTON MAIN	Conjunctive use	Resource Options	OUT	N/A	N/A	Unconstrained	Combined with WR101.
WR165	SSO_CUMBRIA	Conjunctive use	Resource Options	OUT	N/A	N/A	Unconstrained	Requires further investigation to develop this option further. Unfortunately this was not possible within WRMP24 timescales.
WR166	GWN_PENRITH	New groundwater	Resource Options	IN	OUT	N/A	Feasible	Low cost-benefit (AIC above the resource zone cut-off)
WR167	DPS_DELPH	Drought permits/orders	Resource Options	IN	N/A	N/A	Preferred	
WR168	DPS_DOVESTONE	Drought permits/orders	Resource Options	IN	N/A	N/A	Preferred	
WR169	DPS_JUMBLES	Drought permits/orders	Resource Options	IN	N/A	N/A	Preferred	
WR170	DPS_LONGDENDALE	Drought permits/orders	Resource Options	IN	N/A	N/A	Preferred	
WR171	DPS_RIVER LUNE	Drought permits/orders	Resource Options	IN	N/A	N/A	Preferred	
WR172	DPS_RIVINGTON 1	Drought permits/orders	Resource Options	IN	N/A	N/A	Preferred	
WR173	DPS_RIVINGTON 2	Drought permits/orders	Resource Options	IN	N/A	N/A	Preferred	
WR174	DPS_ULLSWATER	Drought permits/orders	Resource Options	IN	N/A	N/A	Preferred	
WR175	DPS_VYRNWY	Drought permits/orders	Resource Options	IN	N/A	N/A	Preferred	

Option ID	Option name	Option type	Option Group	Primary screening outcome	Secondary screening outcome	Detailed screening outcome	Option status	Screened out reason
WR176	DPS_WINDERMERE	Drought permits/orders	Resource Options	IN	N/A	N/A	Preferred	
WR179a	DPS_TARN WOOD	Drought permits/orders	Resource Options	IN	N/A	N/A	Preferred	
WR179b	DPS_BOWSCAR	Drought permits/orders	Resource Options	IN	N/A	N/A	Preferred	
WR179c	DPS_GAMBLESBY	Drought permits/orders	Resource Options	IN	N/A	N/A	Preferred	
WR184	DPS_FERNILEE	Drought permits/orders	Resource Options	IN	N/A	N/A	Preferred	
WR185	SSO_STOCKPORT PH II	Conjunctive use	Resource Options	IN	IN	IN	Constrained	
WR186	SSO_STOCKPORT PH III	Conjunctive use	Resource Options	IN	IN	N/A	Unconstrained	Superseded by recent BAU pumping station capacity increase.
WR187	SWE_DAMAS GILL	Surface water enhancement	Resource Options	IN	IN	IN	Constrained	
WR188a1	NIT_THIRD PARTY_21a	New surface water	Resource Options	IN	IN	IN	Constrained	
WR188a2	NIT_THIRD PARTY_21b	New surface water	Resource Options	IN	IN	IN	Constrained	
WR188b1	NIT_THIRD PARTY_21c	External raw water bulk supply/transfer	Resource Options	IN	IN	IN	Constrained	
WR188b2	NIT_THIRD PARTY_21d	External raw water bulk supply/transfer	Resource Options	IN	IN	IN	Constrained	
WR189	SWN_RIVER DANE	New surface water	Resource Options	OUT	N/A	N/A	Unconstrained	Limited availability (c. Q65 in an average year).
WR190	SWN_RIVER YARROW	New surface water	Resource Options	OUT	N/A	N/A	Unconstrained	Option requires further development. Unfortunately it was not possible to progress this within WRMP24 timescales.
WR191	PRO_NORTH LANCASHIRE	Water treatment works loss recovery	Production Options	IN	IN	IN	Constrained	
WR749	LOS_TUBs 1:20 to 1:40	Change in levels of service	Customer Options	IN	N/A	N/A	Preferred	

Option ID	Option name	Option type	Option Group	Primary screening outcome	Secondary screening outcome	Detailed screening outcome	Option status	Screened out reason
WR751	LOS_NEUBs 1:80 to 1:50	Change in levels of service	Customer Options	OUT	N/A	N/A	Unconstrained	Screened out as level of service was improved from 1:35 to 1:80 in WRMP19 and we are not prepared to deteriorate level of service at any time.
WR800	NIT_THIRD PARTY_1	Licence trading	Resource Options	IN	IN	IN	Constrained	
WR801	NIT_THIRD PARTY_2	Licence trading	Resource Options	IN	OUT	N/A	Feasible	Low cost-benefit (AIC above the resource zone cut-off)
WR802	NIT_THIRD PARTY_3	Licence trading	Resource Options	IN	OUT	N/A	Feasible	Low cost-benefit (AIC above the resource zone cut-off)
WR803	NIT_THIRD PARTY_25	Licence trading	Resource Options	OUT	N/A	N/A	Unconstrained	Significant uncertainty around option aspects. Unfortunately it was not possible to resolve this within WRMP24 timescales.
WR804	INT_THIRD PARTY_26	International import	Resource Options	OUT	N/A	N/A	Unconstrained	No certainty of yield or logistics. Considered technically infeasible due to the required infrastructure and cost for what would be a short-term supply during specific events.
WR807	ITC_THIRD PARTY_27	External raw water bulk supply/transfer	Resource Options	OUT	N/A	N/A	Unconstrained	Withdrawn as service provision.
WR809	GWE_THIRD PARTY_28	Groundwater enhancement	Resource Options	OUT	N/A	N/A	Unconstrained	UUW options already consider borehole sources that can be refurbished and recommissioned.
WR810a	WIT_THIRD PARTY_4a	External raw water bulk supply/transfer	Resource Options	IN	IN	OUT	Refined feasible	Significant negative impacts on biodiversity (SAC, SPA and SSSI).
WR810b	WIT_THIRD PARTY_4b	External raw water bulk supply/transfer	Resource Options	IN	IN	OUT	Refined feasible	Significant negative impacts on biodiversity (SAC, SPA and SSSI).
WR811	WIT_THIRD PARTY_5	External raw water bulk supply/transfer	Resource Options	IN	IN	IN	Constrained	
WR812a	WIT_THIRD PARTY_6a	External raw water bulk supply/transfer	Resource Options	IN	IN	OUT	Refined feasible	Significant negative impacts on biodiversity (SAC, SPA and SSSI).
WR812b	WIT_THIRD PARTY_6b	External raw water bulk supply/transfer	Resource Options	IN	IN	OUT	Refined feasible	Significant negative impacts on biodiversity (SAC, SPA and SSSI).
WR812c	WIT_THIRD PARTY_6c	External raw water bulk supply/transfer	Resource Options	IN	IN	OUT	Refined feasible	Significant negative impacts on biodiversity (SAC, SPA and SSSI).

Option ID	Option name	Option type	Option Group	Primary screening outcome	Secondary screening outcome	Detailed screening outcome	Option status	Screened out reason
WR812d	WIT_THIRD PARTY_6d	External raw water bulk supply/transfer	Resource Options	IN	OUT	N/A	Feasible	
WR813	WIT_THIRD PARTY_7	External raw water bulk supply/transfer	Resource Options	OUT	N/A	N/A	Unconstrained	Third party has indicated that option would not be available under dry weather conditions.
WR814a	WIT_THIRD PARTY_8a	External raw water bulk supply/transfer	Resource Options	OUT	N/A	N/A	Unconstrained	No water available under dry weather conditions due to the Dee General Directions.
WR814b	WIT_THIRD PARTY_8b	External raw water bulk supply/transfer	Resource Options	OUT	N/A	N/A	Unconstrained	No water available under dry weather conditions due to the Dee General Directions.
WR814c	WIT_THIRD PARTY_8c	External raw water bulk supply/transfer	Resource Options	OUT	N/A	N/A	Unconstrained	No water available under dry weather conditions due to the Dee General Directions.
WR815	NIT_THIRD PARTY_9	External raw water bulk supply/transfer	Resource Options	OUT	N/A	N/A	Unconstrained	Yield not available when required.
WR816	NIT_THIRD PARTY_10	External raw water bulk supply/transfer	Resource Options	IN	OUT	N/A	Feasible	Low cost-benefit (AIC above the resource zone cut-off)
WR817	NIT_THIRD PARTY_11	External raw water bulk supply/transfer	Resource Options	IN	IN	IN	Constrained	
WR819	NIT_THIRD PARTY_29	External raw water bulk supply/transfer	Resource Options	OUT	N/A	N/A	Unconstrained	Lacks option detail.
WR820	NIT_THIRD PARTY_12	External raw water bulk supply/transfer	Resource Options	IN	IN	IN	Constrained	
WR821	NIT_THIRD PARTY_13	External raw water bulk supply/transfer	Resource Options	OUT	N/A	N/A	Unconstrained	No water available under dry weather conditions due to the Dee General Directions.
WR823	NIT_THIRD PARTY_14	External raw water bulk supply/transfer	Resource Options	IN	OUT	N/A	Feasible	Low cost-benefit (AIC above the resource zone cut-off)
WR824	NIT_THIRD PARTY_15	External raw water bulk supply/transfer	Resource Options	IN	IN	IN	Constrained	
WR825	NIT_THIRD PARTY_16	External raw water bulk supply/transfer	Resource Options	IN	IN	IN	Constrained	
WR826	NIT_THIRD PARTY_17	External raw water bulk supply/transfer	Resource Options	IN	OUT	N/A	Feasible	Low cost-benefit (AIC above the resource zone cut-off)

Option ID	Option name	Option type	Option Group	Primary screening outcome	Secondary screening outcome	Detailed screening outcome	Option status	Screened out reason
WR828	NIT_THIRD PARTY_30	External raw water bulk supply/transfer	Resource Options	OUT	N/A	N/A	Unconstrained	Available yield is below the de minimis threshold for the resource zone.
WR829	NIT_THIRD PARTY_31	External raw water bulk supply/transfer	Resource Options	OUT	N/A	N/A	Unconstrained	Limited resource availability with estimated yield below the de minimis threshold for the resource zone.
WR830	NIT_THIRD PARTY_32	External raw water bulk supply/transfer	Resource Options	OUT	N/A	N/A	Unconstrained	Limited resource availability with estimated yield below the de minimis threshold for the resource zone.
WR831	NIT_THIRD PARTY_18	External raw water bulk supply/transfer	Resource Options	IN	OUT	N/A	Feasible	Low cost-benefit (AIC above the resource zone cut-off)
WR833	NIT_THIRD PARTY_19	External raw water bulk supply/transfer	Resource Options	IN	OUT	N/A	Feasible	Low cost-benefit (AIC above the resource zone cut-off)
WR834	NIT_THIRD PARTY_33	External raw water bulk supply/transfer	Resource Options	OUT	N/A	N/A	Unconstrained	Expected yield is below the de minimis threshold for the resource zone. Groundwater body is already in poor condition due to mining and quarrying.
WR835	NIT_THIRD PARTY_34	External raw water bulk supply/transfer	Resource Options	OUT	N/A	N/A	Unconstrained	Expected yield is below the de minimis threshold for the resource zone. Groundwater body is already in poor condition due to mining and quarrying.
WR836	NIT_THIRD PARTY_35	External raw water bulk supply/transfer	Resource Options	OUT	N/A	N/A	Unconstrained	Third party has indicated that the option should not be considered further.
WR837	NIT_THIRD PARTY_36	External raw water bulk supply/transfer	Resource Options	OUT	N/A	N/A	Unconstrained	Third party has indicated that very little data available and the option presents too much uncertainty for inclusion in this WRMP.
WR838	NIT_THIRD PARTY_37	External raw water bulk supply/transfer	Resource Options	OUT	N/A	N/A	Unconstrained	Third party has indicated that very little data available and the option presents too much uncertainty for inclusion in this WRMP.
WR839	NIT_THIRD PARTY_38	External raw water bulk supply/transfer	Resource Options	OUT	N/A	N/A	Unconstrained	Third party has indicated that very little data available and the option presents too much uncertainty for inclusion in this WRMP.
WR840	NIT_THIRD PARTY_39	External raw water bulk supply/transfer	Resource Options	OUT	N/A	N/A	Unconstrained	Third party has indicated that very little data available and the option presents too much uncertainty for inclusion in this WRMP.

Option ID	Option name	Option type	Option Group	Primary screening outcome	Secondary screening outcome	Detailed screening outcome	Option status	Screened out reason
WR841	NIT_THIRD PARTY_40	External raw water bulk supply/transfer	Resource Options	OUT	N/A	N/A	Unconstrained	Third party has indicated that water may not be available under drought conditions.
WR842	NIT_THIRD PARTY_41	External raw water bulk supply/transfer	Resource Options	OUT	N/A	N/A	Unconstrained	Third party has indicated that water may not be available under drought conditions.
WR843	NIT_THIRD PARTY_42	External raw water bulk supply/transfer	Resource Options	OUT	N/A	N/A	Unconstrained	Third party has indicated that very little data available and the option presents too much uncertainty for inclusion in this WRMP.
WR844	WIT_THIRD PARTY_43	External raw water bulk supply/transfer	Resource Options	OUT	N/A	N/A	Unconstrained	Third party has indicated that water will not be available under drought conditions.
WR845	NIT_THIRD PARTY_20	External raw water bulk supply/transfer	Resource Options	IN	OUT	N/A	Feasible	Low cost-benefit (AIC above the resource zone cut-off)
WR846	WIT_THIRD PARTY_44	External raw water bulk supply/transfer	Resource Options	OUT	N/A	N/A	Unconstrained	Third party has indicated that the transfer is no longer available as deficits are greater than at WRMP19.
WR847	WIT_THIRD PARTY_45	External raw water bulk supply/transfer	Resource Options	OUT	N/A	N/A	Unconstrained	Third party has indicated that the transfer is no longer available as deficits are greater than at WRMP19.
WR855	NIT_THIRD PARTY_24	Licence trading	Resource Options	IN	OUT	N/A	Unconstrained	Under separate consideration for WINEP.
WR856	NIT_THIRD PARTY_46	Licence trading	Resource Options	OUT	N/A	N/A	Unconstrained	Significant issues anticipated regarding political and social acceptability.
WR863	NIT_THIRD PARTY_47	Licence trading	Resource Options	OUT	N/A	N/A	Unconstrained	Available yield is below the de minimis threshold for the resource zone.
WR864a	NIT_THIRD PARTY_48	Licence trading	Resource Options	OUT	N/A	N/A	Unconstrained	Uncertainty regarding licence holder and use (apparently earmarked for industry use).
WR864b	NIT_THIRD PARTY_49	Licence trading	Resource Options	OUT	N/A	N/A	Unconstrained	Uncertainty regarding licence holder and use (apparently earmarked for industry use).
WR877	WIT_THIRD PARTY_50	External raw water bulk supply/transfer	Resource Options	OUT	N/A	N/A	Unconstrained	Third party has indicated that the surplus will be required for own use.
WR500	LEA-SRZ5_Find and fix	Other leakage control	Distribution Options	OUT	N/A	N/A	Unconstrained	Considered a baseline activity.

Option ID	Option name	Option type	Option Group	Primary screening outcome	Secondary screening outcome	Detailed screening outcome	Option status	Screened out reason
WR501	Increase lift and shift to acoustic logging	Other leakage control	Distribution Options	OUT	N/A	N/A	Unconstrained	Incorporated into option WR500.
WR502a	LEA-CRZ10_Permanent network sensors	Other leakage control	Distribution Options	IN	N/A	N/A	Preferred	
WR502b	LEA-NERZ10_Permanent network sensors	Other leakage control	Distribution Options	IN	N/A	N/A	Feasible	
WR502c	LEA-SRZ5_Permanent network sensors	Other leakage control	Distribution Options	IN	N/A	N/A	Preferred	
WR502d	LEA-SRZ10_Permanent network sensors	Other leakage control	Distribution Options	IN	N/A	N/A	Feasible	
WR502e	LEA-SRZ12_Permanent network sensors	Other leakage control	Distribution Options	IN	N/A	N/A	Feasible	
WR502f	LEA-SRZ15_Permanent network sensors	Other leakage control	Distribution Options	IN	N/A	N/A	Feasible	
WR503	Non-acoustic leak detection	Other leakage control	Distribution Options	OUT	N/A	N/A	Unconstrained	Incorporated into option WR500.
WR504	Permanent acoustic & transient logging of strategic mains	Other leakage control	Distribution Options	OUT	N/A	N/A	Unconstrained	Incorporated into options WR502 and WR532.
WR505	Pinpoint repairs	Other leakage control	Distribution Options	OUT	N/A	N/A	Unconstrained	Incorporated into option WR510.
WR506	Repair customer reported leaks within one day	Other leakage control	Distribution Options	OUT	N/A	N/A	Unconstrained	Prioritising leak investigations and repairs purely based on how they are reported (rather than, for instance, also considering size of leak) can detriment leakage levels.
WR507	Excavation vac	Other leakage control	Distribution Options	OUT	N/A	N/A	Unconstrained	Incorporated into option WR510.
WR508	Reduce repair times	Other leakage control	Distribution Options	OUT	N/A	N/A	Unconstrained	Incorporated into option WR510.
WR509	Specialist repair teams	Other leakage control	Distribution Options	OUT	N/A	N/A	Unconstrained	Incorporated into option WR510.

Option ID	Option name	Option type	Option Group	Primary screening outcome	Secondary screening outcome	Detailed screening outcome	Option status	Screened out reason
WR510	LEA-SRZ15_In-pipe repairs and lining technologies	Other leakage control	Distribution Options	IN	N/A	N/A	Preferred	
WR511a	LEA-CRZ5_Pressure management	Pressure management	Distribution Options	IN	N/A	N/A	Preferred	
WR511b	LEA-CRZ10_Pressure management	Pressure management	Distribution Options	IN	N/A	N/A	Feasible	
WR511c	LEA-CRZ15_Pressure management	Pressure management	Distribution Options	IN	N/A	N/A	Feasible	
WR511d	LEA-NERZ5_Pressure management	Pressure management	Distribution Options	IN	N/A	N/A	Feasible	
WR511e	LEA-NERZ10_Pressure management	Pressure management	Distribution Options	IN	N/A	N/A	Feasible	
WR511f	LEA-NERZ15_Pressure management	Pressure management	Distribution Options	IN	N/A	N/A	Feasible	
WR511g	LEA-SRZ5_Pressure management	Pressure management	Distribution Options	IN	N/A	N/A	Preferred	
WR511h	LEA-SRZ5_Pressure management	Pressure management	Distribution Options	IN	N/A	N/A	Feasible	
WR511i	LEA-SRZ10_Pressure management	Pressure management	Distribution Options	IN	N/A	N/A	Feasible	
WR511j	LEA-SRZ15_Pressure management	Pressure management	Distribution Options	IN	N/A	N/A	Feasible	
WR512	PRV maintenance	Pressure management	Distribution Options	OUT	N/A	N/A	Unconstrained	Asset maintenance of this type is considered to be a baseline (i.e. base maintenance) activity.
WR513	High-rise building pumps	Pressure management	Distribution Options	OUT	N/A	N/A	Unconstrained	Incorporated into option WR511.
WR514	Single property boosters	Pressure management	Distribution Options	OUT	N/A	N/A	Unconstrained	Incorporated into option WR511.
WR515	Continue mains renewal at current rates	Mains replacement (not trunk mains)	Distribution Options	OUT	N/A	N/A	Unconstrained	Asset maintenance of this type is considered to be a baseline (i.e. base maintenance) activity.

Option ID	Option name	Option type	Option Group	Primary screening outcome	Secondary screening outcome	Detailed screening outcome	Option status	Screened out reason
WR516a	LEA-SRZ5_Mains rehabilitation/renewal/ replacement	Mains replacement (not trunk mains)	Distribution Options	IN	N/A	N/A	Feasible	
WR516a1	LEA-CRZ15_Mains rehabilitation/renewal/ replacement	Mains replacement (not trunk mains)	Distribution Options	IN	N/A	N/A	Preferred	
WR516b	LEA-SRZ5_Mains rehabilitation/renewal/ replacement	Mains replacement (not trunk mains)	Distribution Options	IN	N/A	N/A	Feasible	
WR516c	LEA-SRZ5_Mains rehabilitation/renewal/ replacement	Mains replacement (not trunk mains)	Distribution Options	IN	N/A	N/A	Feasible	
WR516d	LEA-SRZ5_Mains rehabilitation/renewal/ replacement	Mains replacement (not trunk mains)	Distribution Options	IN	N/A	N/A	Feasible	
WR516e	LEA-SRZ5_Mains rehabilitation/renewal/ replacement	Mains replacement (not trunk mains)	Distribution Options	IN	N/A	N/A	Feasible	
WR516f	LEA-SRZ5_Mains rehabilitation/renewal/ replacement	Mains replacement (not trunk mains)	Distribution Options	IN	N/A	N/A	Feasible	
WR516g	LEA-SRZ10_Mains rehabilitation/renewal/ replacement	Mains replacement (not trunk mains)	Distribution Options	IN	N/A	N/A	Feasible	
WR516h	LEA-SRZ10_Mains rehabilitation/renewal/ replacement	Mains replacement (not trunk mains)	Distribution Options	IN	N/A	N/A	Feasible	
WR516h1	LEA-SRZ10_Mains rehabilitation/renewal/ replacement	Mains replacement (not trunk mains)	Distribution Options	IN	N/A	N/A	Preferred	
WR516h2	LEA-SRZ25_Mains rehabilitation/renewal/ replacement	Mains replacement (not trunk mains)	Distribution Options	IN	N/A	N/A	Preferred	

Option ID	Option name	Option type	Option Group	Primary screening outcome	Secondary screening outcome	Detailed screening outcome	Option status	Screened out reason
WR516i	LEA-SRZ10_Mains rehabilitation/renewal/ replacement	Mains replacement (not trunk mains)	Distribution Options	IN	N/A	N/A	Feasible	
WR516j	LEA-SRZ10_Mains rehabilitation/renewal/ replacement	Mains replacement (not trunk mains)	Distribution Options	IN	N/A	N/A	Feasible	
WR516k	LEA-SRZ10_Mains rehabilitation/renewal/ replacement	Mains replacement (not trunk mains)	Distribution Options	IN	N/A	N/A	Feasible	
WR516l	LEA-SRZ15_Mains rehabilitation/renewal/ replacement	Mains replacement (not trunk mains)	Distribution Options	IN	N/A	N/A	Feasible	
WR516m	LEA-SRZ15_Mains rehabilitation/renewal/ replacement	Mains replacement (not trunk mains)	Distribution Options	IN	N/A	N/A	Feasible	
WR517	Right size mains to enable improved pressure management	Mains replacement (not trunk mains)	Distribution Options	OUT	N/A	N/A	Unconstrained	Incorporated into option WR511.
WR518	Asset condition surveys	Mains replacement (not trunk mains)	Distribution Options	OUT	N/A	N/A	Unconstrained	Asset maintenance of this type is considered to be a baseline (i.e. base maintenance) activity.
WR519	Meter maintenance	Other leakage control	Distribution Options	OUT	N/A	N/A	Unconstrained	Asset maintenance of this type is considered to be a baseline (i.e. base maintenance) activity.
WR520a	LEA-CRZ5_DMA optimisation	Other leakage control	Distribution Options	IN	N/A	N/A	Preferred	
WR520b	LEA-NERZ5_DMA optimisation	Other leakage control	Distribution Options	IN	N/A	N/A	Feasible	
WR520c	LEA-SRZ5_DMA optimisation	Other leakage control	Distribution Options	IN	N/A	N/A	Preferred	
WR521	Valve status monitoring technology	Other leakage control	Distribution Options	OUT	N/A	N/A	Unconstrained	Incorporated into option WR532.
WR522	Large users	Other leakage control	Distribution Options	OUT	N/A	N/A	Unconstrained	Incorporated into option WR615.

Option ID	Option name	Option type	Option Group	Primary screening outcome	Secondary screening outcome	Detailed screening outcome	Option status	Screened out reason
WR523	Temporary customer metering with high speed logging capability	Other leakage control	Distribution Options	OUT	N/A	N/A	Unconstrained	Incorporated into options WR601 and WR603.
WR524a	LEA-CRZ5_Upstream tile optimisation	Other leakage control	Distribution Options	IN	N/A	N/A	Feasible	
WR524b	LEA-NERZ5_Upstream tile optimisation	Other leakage control	Distribution Options	IN	N/A	N/A	Feasible	
WR524c	LEA-SRZ5_Upstream tile optimisation	Other leakage control	Distribution Options	IN	N/A	N/A	Feasible	
WR524d	LEA-SRZ10_Upstream tile optimisation	Other leakage control	Distribution Options	IN	N/A	N/A	Preferred	
WR525	Tile optimisation - primary DMA meters	Other leakage control	Distribution Options	OUT	N/A	N/A	Unconstrained	Incorporated into option WR525.
WR526	RAW water balances	Other leakage control	Distribution Options	OUT	N/A	N/A	Unconstrained	UUW carries out raw water balances to understand the scale of raw water and process/treatment losses, so this is considered to be a baseline activity.
WR527	Upstream meter maintenance	Other leakage control	Distribution Options	OUT	N/A	N/A	Unconstrained	Asset maintenance of this type is considered to be a baseline (i.e. base maintenance) activity.
WR528	DI meter verification	Other leakage control	Distribution Options	OUT	N/A	N/A	Unconstrained	Asset maintenance of this type is considered to be a baseline (i.e. base maintenance) activity.
WR529	Upstream leakage detection resource	Other leakage control	Distribution Options	OUT	N/A	N/A	Unconstrained	Incorporated into option WR524.
WR530	Overflow monitoring	Other leakage control	Distribution Options	OUT	N/A	N/A	Unconstrained	UUW monitors service reservoir levels and, therefore, this is considered to be a baseline activity.
WR531	Adoption of leak free networks	Other leakage control	Distribution Options	OUT	N/A	N/A	Unconstrained	UUW continually reviews our standards and processes to ensure we only adopt "ultra-low loss new networks" and therefore, this is considered to be a baseline activity.
WR532	LEA-SRZ15_Dynamic network management	Other leakage control	Distribution Options	IN	N/A	N/A	Feasible	

Option ID	Option name	Option type	Option Group	Primary screening outcome	Secondary screening outcome	Detailed screening outcome	Option status	Screened out reason
WR533	New CSL detection technologies and support to customers	Other leakage control	Distribution Options	OUT	N/A	N/A	Unconstrained	UUW is running a pilot/trial into customer-side/private leakage technologies to determine the most appropriate technology and approach for different situations (depending on factors such as access, pipe material, pressure and size of leak).
WR534	New CSL repair technologies and support to customers	Other leakage control	Distribution Options	OUT	N/A	N/A	Unconstrained	UUW is running a pilot/trial into customer-side/private leakage technologies to determine the most appropriate technology and approach for different situations (depending on factors such as access, pipe material, pressure and size of leak).
WR535	Provide support to customers to detect customer side leakage	Other leakage control	Distribution Options	OUT	N/A	N/A	Unconstrained	UUW continually seeks to refine the advice regarding customer-side/private leakage offered via various communication channels - therefore, this is considered a baseline activity.
WR536	Provide support to customers to repair customer side leakage	Other leakage control	Distribution Options	OUT	N/A	N/A	Unconstrained	UUW has a "private leak investigation scheme" that offers free supply pipe repairs for households when the property owner does not have insurance to cover supply pipe issues (scheme does not cover leaks underneath the property, a conservatory or other permanent structure).
WR537	Supply pipe ‘adoption’ for leakage - free identification and repair of leaks on metered customer supply pipes, between meter and wall of house	Other leakage control	Distribution Options	OUT	N/A	N/A	Unconstrained	UUW has a "private leak investigation scheme" that offers free supply pipe repairs for households when the property owner does not have insurance to cover supply pipe issues (scheme does not cover leaks underneath the property, a conservatory or other permanent structure).
WR538	Supply pipe ‘adoption’ for leakage - free replacement of supply pipe for metered customer supply pipes between meter and wall of house.	Other leakage control	Distribution Options	OUT	N/A	N/A	Unconstrained	UUW has a "private leak investigation scheme" that offers free supply pipe repairs for households when the property owner does not have insurance to cover supply pipe issues (scheme does not cover leaks underneath the property, a conservatory or other permanent structure).

Option ID	Option name	Option type	Option Group	Primary screening outcome	Secondary screening outcome	Detailed screening outcome	Option status	Screened out reason
WR539	Supply pipe 'adoption' for leakage - provision of free / subsidised insurance of supply pipe for metered customers	Other leakage control	Distribution Options	OUT	N/A	N/A	Unconstrained	UUW has a "private leak investigation scheme" that offers free supply pipe repairs for households when the property owner does not have insurance to cover supply pipe issues (scheme does not cover leaks underneath the property, a conservatory or other permanent structure).
WR540	Offer free repair for supply pipe leak	Other leakage control	Distribution Options	OUT	N/A	N/A	Unconstrained	UUW has a "private leak investigation scheme" that offers free supply pipe repairs for households when the property owner does not have insurance to cover supply pipe issues (scheme does not cover leaks underneath the property, a conservatory or other permanent structure).
WR541	Increase pressure logging coverage per DMA	Other leakage control	Distribution Options	OUT	N/A	N/A	Unconstrained	Incorporated into option WR532.
WR542	Increase permanent pressure transient logging within DMAs	Other leakage control	Distribution Options	OUT	N/A	N/A	Unconstrained	Incorporated into option WR532.
WR543	Increase DMA covered by permanent acoustic logging	Other leakage control	Distribution Options	OUT	N/A	N/A	Unconstrained	Incorporated into option WR502.
WR544	Increase flow monitoring - waste meters	Other leakage control	Distribution Options	OUT	N/A	N/A	Unconstrained	Incorporated into option WR520.
WR545	Remote control PRVs	Pressure management	Distribution Options	OUT	N/A	N/A	Unconstrained	Incorporated into option WR532.
WR546	Remote sensor control pumps	Other leakage control	Distribution Options	OUT	N/A	N/A	Unconstrained	Incorporated into option WR532.
WR547	Dynamic boundary valves	Other leakage control	Distribution Options	OUT	N/A	N/A	Unconstrained	Incorporated into option WR532.
WR548	Source to tap pressure management	Pressure management	Distribution Options	OUT	N/A	N/A	Unconstrained	Incorporated into option WR511.
WR549	Upstream alarm analytics	Other leakage control	Distribution Options	OUT	N/A	N/A	Unconstrained	Incorporated into option WR525.

Option ID	Option name	Option type	Option Group	Primary screening outcome	Secondary screening outcome	Detailed screening outcome	Option status	Screened out reason
WR550	Operational dashboards	Other leakage control	Distribution Options	OUT	N/A	N/A	Unconstrained	UUW continually seeks to improve the visualisation of asset, customer, environmental and operational data to ensure data-driven decision making - therefore, this is considered a baseline activity.
WR551	Optical fibres	Other leakage control	Distribution Options	OUT	N/A	N/A	Unconstrained	Incorporated into options WR502 and WR532.
WR552	Live modelling / leak identification	Other leakage control	Distribution Options	OUT	N/A	N/A	Unconstrained	Incorporated into options WR502 and WR532.
WR553	Cellular occupancy	Other leakage control	Distribution Options	OUT	N/A	N/A	Unconstrained	UUW continually seeks to improve the visualisation of asset, customer, environmental and operational data to ensure data-driven decision making - therefore, this is considered a baseline activity.
WR600	Compulsory metering of households	Metering compulsory	Customer Options	OUT	N/A	N/A	Unconstrained	The area supplied by UUW is not classified as an area of serious water stress and therefore, the option of charging by metered volume for all customers is not available.
WR601a	EMT-CRZ10_Enhanced metering of households (smart meters)	Metering other selective	Customer Options	IN	N/A	N/A	Feasible	
WR601b	EMT-NERZ10_Enhanced metering of households (smart meters)	Metering other selective	Customer Options	IN	N/A	N/A	Feasible	
WR601c	EMT-SRZ10_Enhanced metering of households (smart meters)	Metering other selective	Customer Options	IN	N/A	N/A	Feasible	
WR601d	EMT-SRZ15_Enhanced metering of households (smart meters)	Metering other selective	Customer Options	IN	N/A	N/A	Feasible	
WR601e	EMT-SRZ15_Enhanced metering of households (smart meters)	Metering other selective	Customer Options	IN	N/A	N/A	Feasible	
WR601a_Incremental	EMT-CRZ10_Enhanced metering of households (smart meters)	Metering other selective	Customer Options	IN	N/A	N/A	Feasible	

Option ID	Option name	Option type	Option Group	Primary screening outcome	Secondary screening outcome	Detailed screening outcome	Option status	Screened out reason
WR601b_Incremental	EMT-NERZ10_Enhanced metering of households (smart meters)	Metering other selective	Customer Options	IN	N/A	N/A	Feasible	
WR601c_Incremental	EMT-SRZ10_Enhanced metering of households (smart meters)	Metering other selective	Customer Options	IN	N/A	N/A	Feasible	
WR602	Meter all non-households	Metering compulsory	Customer Options	OUT	N/A	N/A	Unconstrained	Non-household metering penetration in the UUW area is over 90% - therefore, the demand management/reduction benefits of this activity are likely to be extremely marginal.
WR603a	EMT-CRZ5_Enhanced metering of households on single supplies (smart meters)	Metering other selective	Customer Options	IN	N/A	N/A	Preferred	
WR603b	EMT-NERZ5_Enhanced metering of households on single supplies (smart meters)	Metering other selective	Customer Options	IN	N/A	N/A	Preferred	
WR603c	EMT-SRZ5_Enhanced metering of households on single supplies (smart meters)	Metering other selective	Customer Options	IN	N/A	N/A	Feasible	
WR603d	EMT-SRZ10_Enhanced metering of households on single supplies (smart meters)	Metering other selective	Customer Options	IN	N/A	N/A	Feasible	
WR603e	EMT-SRZ15_Enhanced metering of households on single supplies (smart meters)	Metering other selective	Customer Options	IN	N/A	N/A	Preferred	
WR604	Enhanced FMO promotion	Metering other selective	Customer Options	OUT	N/A	N/A	Unconstrained	UUW continually seeks out opportunities to increase the uptake of the Free Meter Option (FMO) - therefore, this is considered a baseline activity.

Option ID	Option name	Option type	Option Group	Primary screening outcome	Secondary screening outcome	Detailed screening outcome	Option status	Screened out reason
WR605	Install meter / meter box on change in occupier	Metering change of occupancy	Customer Options	OUT	N/A	N/A	Unconstrained	Incorporated into options WR601 and WR603.
WR606	Target by area based on potential benefit	Metering other selective	Customer Options	OUT	N/A	N/A	Unconstrained	Incorporated into options WR601 and WR603.
WR607	Target based on rolling area by area approach	Metering other selective	Customer Options	OUT	N/A	N/A	Unconstrained	Incorporated into options WR601 and WR603.
WR608	Fit meters/meter boxes during mains renewal	Metering other selective	Customer Options	OUT	N/A	N/A	Unconstrained	This is considered a baseline activity.
WR609	Fit meters/meter boxes as part of stop tap repairs, lead renewal / service renewal programmes and service splits programmes	Metering other selective	Customer Options	OUT	N/A	N/A	Unconstrained	This is considered a baseline activity.
WR610	Install meter in existing meter boxes	Metering other selective	Customer Options	OUT	N/A	N/A	Unconstrained	Incorporated into options WR601 and WR603.
WR611	Achieve full meter coverage of North Eden WRZ by 2030	Metering other selective	Customer Options	OUT	N/A	N/A	Unconstrained	Incorporated into options WR601 and WR603.
WR612	SMART meter DMZ	Metering other selective	Customer Options	OUT	N/A	N/A	Unconstrained	Incorporated into options WR601 and WR603.
WR613	Compulsory metering of all households with outside tap	Metering compulsory	Customer Options	OUT	N/A	N/A	Unconstrained	Incorporated into options WR601 and WR603.
WR614	Compulsory metering of all homes with swimming pools	Metering compulsory	Customer Options	OUT	N/A	N/A	Unconstrained	Incorporated into options WR601 and WR603.

Option ID	Option name	Option type	Option Group	Primary screening outcome	Secondary screening outcome	Detailed screening outcome	Option status	Screened out reason
WR615a	EMT-CRZ5_Replace existing non-household meters with smart meters	Metering other selective	Customer Options	IN	N/A	N/A	Preferred	
WR615b	EMT-NERZ5_Replace existing non-household meters with smart meters	Metering other selective	Customer Options	IN	N/A	N/A	Preferred	
WR615c	EMT-SRZ5_Replace existing non-household meters with smart meters	Metering other selective	Customer Options	IN	N/A	N/A	Preferred	
WR616	Upgrade existing non-household meters to AMR with advice	Metering other selective	Customer Options	OUT	N/A	N/A	Unconstrained	Incorporated into option WR615.
WR617	Increase sample of logged non-household users	Metering other selective	Customer Options	OUT	N/A	N/A	Unconstrained	Incorporated into option WR615.
WR618	Upgrade existing household meters to AMR with advice	Metering other selective	Customer Options	OUT	N/A	N/A	Unconstrained	Incorporated into option WR619.
WR619a	EMT-CRZ10_ Replace existing household meters with smart meters	Metering other selective	Customer Options	IN	N/A	N/A	Preferred	
WR619b	EMT-NERZ10_ Replace existing household meters with smart meters	Metering other selective	Customer Options	IN	N/A	N/A	Preferred	
WR619c	EMT-SRZ10_ Replace existing household meters with smart meters	Metering other selective	Customer Options	IN	N/A	N/A	Preferred	

Option ID	Option name	Option type	Option Group	Primary screening outcome	Secondary screening outcome	Detailed screening outcome	Option status	Screened out reason
WR619d	EMT-SRZ15_ Replace existing household meters with smart meters	Metering other selective	Customer Options	IN	N/A	N/A	Feasible	
WR620	Metered unmeasured communal use / joint supplies	Metering other selective	Customer Options	OUT	N/A	N/A	Unconstrained	Incorporated into option WR601.
WR621	Meter all home based businesses	Metering other selective	Customer Options	OUT	N/A	N/A	Unconstrained	Incorporated into options WR601 and WR603.
WR622	Meter all void properties	Metering other selective	Customer Options	OUT	N/A	N/A	Unconstrained	Incorporated into options WR601 and WR603.
WR623	Compulsory meter of all troughs, target illegal use in problematic areas and seasons	Metering compulsory	Customer Options	OUT	N/A	N/A	Unconstrained	Incorporated into option WR615.
WR624	Increase coverage of cul-de-sac monitors	Metering other selective	Customer Options	OUT	N/A	N/A	Unconstrained	Incorporated into options WR601 and WR603.
WR625	Develop sample of fully customer meter cul-de-sacs with AMR meters	Metering other selective	Customer Options	OUT	N/A	N/A	Unconstrained	Incorporated into options WR601 and WR603.
WR626	Develop sample of fully customer meter cul-de-sacs with SMART meters	Metering other selective	Customer Options	OUT	N/A	N/A	Unconstrained	Incorporated into options WR601 and WR603.
WR627	Install 'smart home' technologies in sample of properties - R&D	Metering other selective	Customer Options	OUT	N/A	N/A	Unconstrained	Incorporated into options WR601 and WR603.
WR628	Refer a friend scheme	Metering other selective	Customer Options	OUT	N/A	N/A	Unconstrained	UUW continually seeks out opportunities to increase the uptake of the Free Meter Option (FMO) - therefore, this is considered a baseline activity.
WR629	Standpipe hire and metering system	Metering other selective	Customer Options	OUT	N/A	N/A	Unconstrained	UUW continually seeks out opportunities to better manage standpipe hire - therefore, this is considered a baseline activity.

Option ID	Option name	Option type	Option Group	Primary screening outcome	Secondary screening outcome	Detailed screening outcome	Option status	Screened out reason
WR650	Offer free water audit by request	Household water audit	Customer Options	OUT	N/A	N/A	Unconstrained	Incorporated into option WR661.
WR651	Proactively offer free water audit to existing metered customers	Household water audit	Customer Options	OUT	N/A	N/A	Unconstrained	Incorporated into option WR661.
WR652	Proactively offer free water audit to newly metered customers	Household water audit	Customer Options	OUT	N/A	N/A	Unconstrained	Incorporated into option WR661.
WR653	Partnership projects with energy suppliers to promote combined water and energy efficiency savings	Non-household water audit	Customer Options	OUT	N/A	N/A	Unconstrained	Incorporated into option WR661.
WR654	Partnership projects with public and third party sector organisations	Non-household water audit	Customer Options	OUT	N/A	N/A	Unconstrained	Incorporated into option WR677.
WR655	Tailor messaging to CACI segments	Water efficiency customer education / awareness	Customer Options	OUT	N/A	N/A	Unconstrained	UUW uses demographic data to tailor messaging as a matter of course - therefore, this is considered a baseline activity.
WR656	Continuously review meter data for high consumption, leak alarms or usage in void properties	Non-household water audit	Customer Options	OUT	N/A	N/A	Unconstrained	UUW has internal processes for properties with a high measured/metered bill and continuous flow/leak alarms/alerts - therefore, this is considered a baseline activity.
WR657	Develop water efficiency customer app	Water efficiency customer education / awareness	Customer Options	OUT	N/A	N/A	Unconstrained	Incorporated into options WR601 and WR603.
WR658a	WSD-CRZ10_Free water efficiency devices (inside/internal)	Retrofitting indoor water efficiency devices	Customer Options	IN	N/A	N/A	Preferred	
WR658b	WSD-NERZ10_Free water efficiency devices (inside/internal)	Retrofitting indoor water efficiency devices	Customer Options	IN	N/A	N/A	Feasible	

Option ID	Option name	Option type	Option Group	Primary screening outcome	Secondary screening outcome	Detailed screening outcome	Option status	Screened out reason
WR658c	WSD-SRZ10_Free water efficiency devices (inside/internal)	Retrofitting indoor water efficiency devices	Customer Options	IN	N/A	N/A	Preferred	
WR659a	WER-CRZ15_Free water efficiency devices (outside/external)	Rainwater harvesting	Customer Options	IN	N/A	N/A	Preferred	
WR659b	WER-NERZ15_Free water efficiency devices (outside/external)	Rainwater harvesting	Customer Options	IN	N/A	N/A	Feasible	
WR659c	WER-SRZ15_Free water efficiency devices (outside/external)	Rainwater harvesting	Customer Options	IN	N/A	N/A	Preferred	
WR660	Subsidised water efficiency devices (outside/external)	Rainwater harvesting	Customer Options	OUT	N/A	N/A	Unconstrained	Incorporated into option WR659.
WR661a	WUA-CRZ15_Free water efficiency audits (households)	Household water audit	Customer Options	IN	N/A	N/A	Preferred	
WR661b	WUA-NERZ15_Free water efficiency audits (households)	Household water audit	Customer Options	IN	N/A	N/A	Feasible	
WR661c	WUA-SRZ15_Free water efficiency audits (households)	Household water audit	Customer Options	IN	N/A	N/A	Preferred	
WR662	Provision and fitting of free water efficiency goods and advice to all newly metered customers	Retrofitting indoor water efficiency devices	Customer Options	OUT	N/A	N/A	Unconstrained	Incorporated into option WR661.
WR663	Free supply and installation of external household water efficiency devices	Rainwater harvesting	Customer Options	OUT	N/A	N/A	Unconstrained	Incorporated into option WR659.

Option ID	Option name	Option type	Option Group	Primary screening outcome	Secondary screening outcome	Detailed screening outcome	Option status	Screened out reason
WR664	Innovative technologies/products – distribution (WSD)	Other water efficiency	Customer Options	OUT	N/A	N/A	Unconstrained	Incorporated into option WR658.
WR665	Innovative technologies/products – installation (ISD)	Other water efficiency	Customer Options	OUT	N/A	N/A	Unconstrained	Incorporated into option WR661.
WR666	Water efficient appliances subsidy	Other water efficiency	Customer Options	OUT	N/A	N/A	Unconstrained	Incorporated into option WR694.
WR667	Rebate customers for replacing leaky loos	Other water efficiency	Customer Options	OUT	N/A	N/A	Unconstrained	Incorporated into option WR661.
WR668	Customer service PRVs	Other water efficiency	Customer Options	OUT	N/A	N/A	Unconstrained	Incorporated into option WR669.
WR669a	ISD-SRZ15_Flow regulators	Other water efficiency	Customer Options	IN	N/A	N/A	Feasible	
WR669b	ISD-CRZ15_Flow regulators	Other water efficiency	Customer Options	IN	N/A	N/A	Preferred	
WR669c	ISD-NERZ15_Flow regulators	Other water efficiency	Customer Options	IN	N/A	N/A	Feasible	
WR670	Water audits of UU offices, sites and supply chain	Non-household water audit	Customer Options	OUT	N/A	N/A	Unconstrained	UUW continually seeks out opportunities to reduce company own water use - therefore, this is considered a baseline activity.
WR671	Optimise water use / recycling in processes at water treatment works & wastewater treatment works	Other water efficiency	Customer Options	OUT	N/A	N/A	Unconstrained	UUW continually seeks out opportunities to reduce company own water use - therefore, this is considered a baseline activity.
WR672	R&D - understand how to optimise operational water use	Other water efficiency	Customer Options	OUT	N/A	N/A	Unconstrained	UUW continually seeks out opportunities to reduce company own water use - therefore, this is considered a baseline activity.

Option ID	Option name	Option type	Option Group	Primary screening outcome	Secondary screening outcome	Detailed screening outcome	Option status	Screened out reason
WR673	Discounts for developers to deliver target PCC of 110 l/hd/d within all new build properties (2020) and 100 l/hd/d from April 2021	Other water efficiency	Customer Options	OUT	N/A	N/A	Unconstrained	UUW has recently altered its developer incentive threshold to incentivise developers to achieve a per capita consumption (PCC) of 100 litres per person per day for new builds/dwellings.
WR674	Enhanced education programme	Water efficiency customer education / awareness	Customer Options	OUT	N/A	N/A	Unconstrained	UUW continually seeks out opportunities to improve the education offering - therefore, this is considered a baseline activity.
WR675	Intensive area / community based communications	Water efficiency customer education / awareness	Customer Options	OUT	N/A	N/A	Unconstrained	UUW continually seeks out opportunities to engage with communities regarding water efficiency - therefore, this is considered a baseline activity
WR676	Financial / non-financial incentive to reduce PCC and report leakage	Water efficiency customer education / awareness	Customer Options	OUT	N/A	N/A	Unconstrained	UUW continually seeks out opportunities to encourage and/or incentivise water efficient behaviours - therefore, this is considered a baseline activity.
WR677a	WUA-CRZ15_Non-household water efficiency programme	Non-household water audit	Customer Options	IN	N/A	N/A	Preferred	
WR677b	WUA-NERZ15_Non-household water efficiency programme	Non-household water audit	Customer Options	IN	N/A	N/A	Feasible	
WR677c	WUA-SRZ5_Non-household water efficiency programme	Non-household water audit	Customer Options	IN	N/A	N/A	Preferred	
WR678	Targeted water efficiency at public sector customers and recreation facilities	Water efficiency customer education / awareness	Customer Options	OUT	N/A	N/A	Unconstrained	Incorporated into option WR677.

Option ID	Option name	Option type	Option Group	Primary screening outcome	Secondary screening outcome	Detailed screening outcome	Option status	Screened out reason
WR679	Targeted water efficiency advice for purchasers of water using appliances - at home / at point of purchase	Water efficiency customer education / awareness	Customer Options	OUT	N/A	N/A	Unconstrained	Incorporated into option WR694.
WR680	Target shorter showers at adolescents	Water efficiency customer education / awareness	Customer Options	OUT	N/A	N/A	Unconstrained	UUW uses demographic data to tailor messaging as a matter of course - therefore, this is considered a baseline activity.
WR681	Target water consumption in university accommodation	Water efficiency customer education / awareness	Customer Options	OUT	N/A	N/A	Unconstrained	Incorporated into option WR677.
WR682	Target water consumption in university private rental sector	Water efficiency customer education / awareness	Customer Options	OUT	N/A	N/A	Unconstrained	Incorporated into option WR677.
WR683	Gamification of WE	Water efficiency customer education / awareness	Customer Options	OUT	N/A	N/A	Unconstrained	UUW continually seeks out opportunities to gamify water efficiency - therefore, this is considered a baseline activity.
WR684	Domestic rainwater harvesting system - existing households	Rainwater harvesting	Customer Options	OUT	N/A	N/A	Unconstrained	In option WR685, UUW has included a pilot/trial of implementing rainwater harvesting and water reuse at new builds. This option will increase understanding of the installation, operation and maintenance of these systems (testing different ownership models etc.). However, generally, more clarity is required on how these systems should be monitored for performance and regulated.
WR685a	WER-CRZ5_Rainwater harvesting and water reuse (new builds)	Rainwater harvesting	Customer Options	IN	N/A	N/A	Preferred	
WR685b	WER-NERZ15_Rainwater harvesting and water reuse (new builds)	Rainwater harvesting	Customer Options	IN	N/A	N/A	Feasible	

Option ID	Option name	Option type	Option Group	Primary screening outcome	Secondary screening outcome	Detailed screening outcome	Option status	Screened out reason
WR685c	WER-SRZ15_Rainwater harvesting and water reuse (new builds)	Rainwater harvesting	Customer Options	IN	N/A	N/A	Feasible	
WR686	Rainwater harvesting system - non-households	Rainwater harvesting	Customer Options	OUT	N/A	N/A	Unconstrained	Incorporated into option WR677.
WR687	Target rainwater harvesting to agriculture, sports & council run facilities	Rainwater harvesting	Customer Options	OUT	N/A	N/A	Unconstrained	Incorporated into option WR677.
WR688	Rain share - community rainwater harvesting	Rainwater harvesting	Customer Options	OUT	N/A	N/A	Unconstrained	In option WR685, UUW has included a pilot/trial of implementing rainwater harvesting and water reuse at new builds. This option will increase understanding of the installation, operation and maintenance of these systems (testing different ownership models etc.). However, generally, more clarity is required on how these systems should be monitored for performance and regulated.
WR689	Treated greywater reuse - existing households blanket promotion	Other water efficiency	Customer Options	OUT	N/A	N/A	Unconstrained	In option WR685, UUW has included a pilot/trial of implementing rainwater harvesting and water reuse at new builds. This option will increase understanding of the installation, operation and maintenance of these systems (testing different ownership models etc.). However, generally, more clarity is required on how these systems should be monitored for performance and regulated.
WR690	Treated greywater reuse - new households blanket promotion	Other water efficiency	Customer Options	OUT	N/A	N/A	Unconstrained	In option WR685, UUW has included a pilot/trial of implementing rainwater harvesting and water reuse at new builds. This option will increase understanding of the installation, operation and maintenance of these systems (testing different ownership models etc.). However, generally, more clarity is required on how these systems should be monitored for performance and regulated.

Option ID	Option name	Option type	Option Group	Primary screening outcome	Secondary screening outcome	Detailed screening outcome	Option status	Screened out reason
WR691	Treated greywater reuse - existing non-households blanket promotion	Other water efficiency	Customer Options	OUT	N/A	N/A	Unconstrained	In option WR685, UUW has included a pilot/trial of implementing rainwater harvesting and water reuse at new builds. This option will increase understanding of the installation, operation and maintenance of these systems (testing different ownership models etc.). However, generally, more clarity is required on how these systems should be monitored for performance and regulated.
WR692	Treated greywater reuse - new non-households blanket promotion	Other water efficiency	Customer Options	OUT	N/A	N/A	Unconstrained	In option WR685, UUW has included a pilot/trial of implementing rainwater harvesting and water reuse at new builds. This option will increase understanding of the installation, operation and maintenance of these systems (testing different ownership models etc.). However, generally, more clarity is required on how these systems should be monitored for performance and regulated.
WR693	Incentivise new builds to include rain harvesting / grey water systems to collect water for irrigation of gardens	Rainwater harvesting	Customer Options	OUT	N/A	N/A	Unconstrained	Incorporated into option WR685.
WR694a	WSA-CRZ15_Government intervention (water labelling, standards)	Other water efficiency	Customer Options	IN	N/A	N/A	Feasible	
WR694b	WSA-NERZ15_Government intervention (water labelling, standards)	Other water efficiency	Customer Options	IN	N/A	N/A	Feasible	
WR694c	WSA-SRZ15_Government intervention (water labelling, standards)	Other water efficiency	Customer Options	IN	N/A	N/A	Feasible	

Option ID	Option name	Option type	Option Group	Primary screening outcome	Secondary screening outcome	Detailed screening outcome	Option status	Screened out reason
WR694d	WSA-CRZ15_Government intervention (water labelling, standards)	Other water efficiency	Customer Options	IN	N/A	N/A	Preferred	
WR694e	WSA-NERZ15_Government intervention (water labelling, standards)	Other water efficiency	Customer Options	IN	N/A	N/A	Preferred	
WR694f	WSA-SRZ15_Government intervention (water labelling, standards)	Other water efficiency	Customer Options	IN	N/A	N/A	Preferred	
WR700	Premium unmeasured tariff	Tariff	Customer Options	OUT	N/A	N/A	Unconstrained	Concerns/issues related to fairness of billing/charging.
WR701	Special tariffs for specific users	Tariff	Customer Options	OUT	N/A	N/A	Unconstrained	Concerns/issues related to fairness of billing/charging.
WR702	Special fees	Tariff	Customer Options	OUT	N/A	N/A	Unconstrained	Concerns/issues related to fairness of billing/charging.
WR703	Flow rate based tariffs	Tariff	Customer Options	OUT	N/A	N/A	Unconstrained	Concerns/issues related to fairness of billing/charging, as well as requirement for full metering before introduction, as this may impact customers opting to be billed/charged on a meter.
WR704	Seasonal tariffs	Tariff	Customer Options	OUT	N/A	N/A	Unconstrained	Concerns/issues related to fairness of billing/charging, as well as requirement for full metering before introduction, as this may impact customers opting to be billed/charged on a meter.
WR705	Rising block tariffs	Tariff	Customer Options	OUT	N/A	N/A	Unconstrained	Concerns/issues related to fairness of billing/charging, as well as requirement for full metering before introduction, as this may impact customers opting to be billed/charged on a meter.
WR706	Time of day tariffs; reduce bill by an agreed amount if property has water efficient products fitted	Tariff	Customer Options	OUT	N/A	N/A	Unconstrained	Concerns/issues related to fairness of billing/charging, as well as requirement for full metering before introduction, as this may impact customers opting to be billed/charged on a meter.

Option ID	Option name	Option type	Option Group	Primary screening outcome	Secondary screening outcome	Detailed screening outcome	Option status	Screened out reason
WR707	Remove fixed standing charge so customer only pays a true volumetric charge	Tariff	Customer Options	OUT	N/A	N/A	Unconstrained	Concerns/issues related to fairness of billing/charging.
WR708	Develop payment scheme to migrate customers onto measured bills	Tariff	Customer Options	OUT	N/A	N/A	Unconstrained	To encourage optant metering, UUW offers a lowest bill guarantee that lasts for two years and allows customers to switch back to unmeasured/unmetered billing/charging.
WR709	Develop payment scheme to migrate customers onto measured bills	Tariff	Customer Options	OUT	N/A	N/A	Unconstrained	To encourage optant metering, UUW offers a lowest bill guarantee that lasts for two years and allows customers to switch back to unmeasured/unmetered billing/charging.
WR710	Drought triggered tariffs	Tariff	Customer Options	OUT	N/A	N/A	Unconstrained	Concerns/issues related to fairness of billing/charging, as well as requirement for full metering before introduction, as this may impact customers opting to be billed/charged on a meter.
WR752a	Later and less frequent appeals for restraint (drought measure)	Drought - water use restrictions	Customer Options	OUT	N/A	N/A	Unconstrained	Does not give the response or timing required before achieving more severe restrictions.
WR752b	Earlier and more frequent appeals for restraint (drought measure)	Drought - water use restrictions	Customer Options	OUT	N/A	N/A	Unconstrained	Less effective as customers are likely to become less receptive/desensitised to the message.
WR753a	Increase level of pressure reduction (drought measure)	Pressure management	Distribution Options	OUT	N/A	N/A	Unconstrained	This would not work at average zonal pressure and maximum property height. Will disproportionately impact customer level of service. Related to WR513 and WR514.
WR753b	Decrease level of pressure reduction (drought measure)	Pressure management	Distribution Options	OUT	N/A	N/A	Unconstrained	Would not realise potential savings.

Option ID	Option name	Option type	Option Group	Primary screening outcome	Secondary screening outcome	Detailed screening outcome	Option status	Screened out reason
WR754a	Less enhanced leakage detection and repair (drought measure)	Other leakage control	Distribution Options	OUT	N/A	N/A	Unconstrained	This type of activity effectively forms part of our base allowance. Rather than reducing leakage it prevents leakage from increasing during dry weather. We have a range of other options for reducing leakage.
WR754b	More enhanced leakage detection and repair (drought measure)	Other leakage control	Distribution Options	OUT	N/A	N/A	Unconstrained	This type of activity effectively forms part of our base allowance. Rather than reducing leakage it prevents leakage from increasing during dry weather. We have a range of other options for reducing leakage.
WR900	Third party - data cleansing and data improvement	Other leakage control	Distribution Options	OUT	N/A	N/A	Unconstrained	This option was not formally proposed by a third party for WRMP24, but we continue to work with third parties on demand management/reduction via Innovation Lab, various pilots/trials and other commercial routes (frameworks etc.).
WR901	Third party - customer behaviour change pilots	Other water efficiency	Customer Options	OUT	N/A	N/A	Unconstrained	This option was not formally proposed by a third party for WRMP24, but we continue to work with third parties on demand management/reduction via Innovation Lab, various pilots/trials and other commercial routes (frameworks etc.).
WR902	Third party - leakage reduction service	Other leakage control	Distribution Options	OUT	N/A	N/A	Unconstrained	This option was not formally proposed by a third party for WRMP24, but we continue to work with third parties on demand management/reduction via Innovation Lab, various pilots/trials and other commercial routes (frameworks etc.).
WR903	Cheshire West and Chester - Local Plan Policy	Other leakage control	Distribution Options	OUT	N/A	N/A	Unconstrained	UUW is engaging with local authorities to evidence the requirement for the optional standard of a per capita consumption (PCC) of 110 litres per person per day for new builds/dwellings.
WR904	Third party smart water network	Other leakage control	Distribution Options	OUT	N/A	N/A	Unconstrained	This option was not formally proposed by a third party for WRMP24, but we continue to work with third parties on demand management/reduction via Innovation Lab, various pilots/trials and other commercial routes (frameworks etc.).

Option ID	Option name	Option type	Option Group	Primary screening outcome	Secondary screening outcome	Detailed screening outcome	Option status	Screened out reason
WR905	Third party asset condition assessment products and software	Other leakage control	Distribution Options	OUT	N/A	N/A	Unconstrained	Asset maintenance of this type is considered to be a baseline (i.e. base maintenance) activity.
WR906	Third party pressure management products and software	Pressure management	Distribution Options	OUT	N/A	N/A	Unconstrained	This option was not formally proposed by a third party for WRMP24, but we continue to work with third parties on demand management/reduction via Innovation Lab, various pilots/trials and other commercial routes (frameworks etc.).
WR907	Third party upstream network monitoring products and software	Other leakage control	Distribution Options	OUT	N/A	N/A	Unconstrained	This option was not formally proposed by a third party for WRMP24, but we continue to work with third parties on demand management/reduction via Innovation Lab, various pilots/trials and other commercial routes (frameworks etc.).
WR908	Third party distribution network monitoring products and software	Other leakage control	Distribution Options	OUT	N/A	N/A	Unconstrained	This option was not formally proposed by a third party for WRMP24, but we continue to work with third parties on demand management/reduction via Innovation Lab, various pilots/trials and other commercial routes (frameworks etc.).
WR909	Third party customer flow monitoring and software	Other leakage control	Distribution Options	OUT	N/A	N/A	Unconstrained	This option was not formally proposed by a third party for WRMP24, but we continue to work with third parties on demand management/reduction via Innovation Lab, various pilots/trials and other commercial routes (frameworks etc.).
WR910	Third party distribution repair products and techniques	Other leakage control	Distribution Options	OUT	N/A	N/A	Unconstrained	This option was not formally proposed by a third party for WRMP24, but we continue to work with third parties on demand management/reduction via Innovation Lab, various pilots/trials and other commercial routes (frameworks etc.).
WR911	Third party distribution detection products and techniques	Other leakage control	Distribution Options	OUT	N/A	N/A	Unconstrained	This option was not formally proposed by a third party for WRMP24, but we continue to work with third parties on demand management/reduction via Innovation Lab, various pilots/trials and other commercial routes (frameworks etc.).

Option ID	Option name	Option type	Option Group	Primary screening outcome	Secondary screening outcome	Detailed screening outcome	Option status	Screened out reason
WR912	Third party upstream repair products and techniques	Other leakage control	Distribution Options	OUT	N/A	N/A	Unconstrained	This option was not formally proposed by a third party for WRMP24, but we continue to work with third parties on demand management/reduction via Innovation Lab, various pilots/trials and other commercial routes (frameworks etc.).
WR913	Third party upstream detection products and techniques	Other leakage control	Distribution Options	OUT	N/A	N/A	Unconstrained	This option was not formally proposed by a third party for WRMP24, but we continue to work with third parties on demand management/reduction via Innovation Lab, various pilots/trials and other commercial routes (frameworks etc.).
WR914	Third party customer demand management and water efficiency products	Other leakage control	Distribution Options	OUT	N/A	N/A	Unconstrained	This option was not formally proposed by a third party for WRMP24, but we continue to work with third parties on demand management/reduction via Innovation Lab, various pilots/trials and other commercial routes (frameworks etc.).
WR915	Third party - meter maintenance	Other leakage control	Distribution Options	OUT	N/A	N/A	Unconstrained	Asset maintenance of this type is considered to be a baseline (i.e. base maintenance) activity.
WR916	Third party - PRV maintenance	Other leakage control	Distribution Options	OUT	N/A	N/A	Unconstrained	Asset maintenance of this type is considered to be a baseline (i.e. base maintenance) activity.
WR917	Third party option to provide services to renew or rehabilitate mains to reduce leakage and bursts	Mains replacement (not trunk mains)	Distribution Options	OUT	N/A	N/A	Unconstrained	This option was not formally proposed by a third party for WRMP24, but we continue to work with third parties on demand management/reduction via Innovation Lab, various pilots/trials and other commercial routes (frameworks etc.).
WR755	**CURRDM_VUR_CRL**	Drought - water use restrictions	Customer Options	IN	N/A	N/A	Preferred	
WR756	CURRDM_L1PRESSRED_CRL	Pressure management	Distribution Options	IN	N/A	N/A	Preferred	
WR757	CURRDM_TUB_CRL	Drought - water use restrictions	Customer Options	IN	N/A	N/A	Preferred	

Option ID	Option name	Option type	Option Group	Primary screening outcome	Secondary screening outcome	Detailed screening outcome	Option status	Screened out reason
WR758	CURRDM_L2PRESSRED_CRL	Pressure management	Distribution Options	IN	N/A	N/A	Preferred	
WR759	CURRDM_NEUB_CRL	Drought - water use restrictions	Customer Options	IN	N/A	N/A	Preferred	
WR760	CURRDM_L3PRESSRED_CRL	Pressure management	Distribution Options	IN	N/A	N/A	Preferred	
WR761	CURRDM_VUR_NED	Drought - water use restrictions	Customer Options	IN	N/A	N/A	Preferred	
WR762	CURRDM_L1PRESSRED_NED	Pressure management	Distribution Options	IN	N/A	N/A	Preferred	
WR763	CURRDM_TUB_NED	Drought - water use restrictions	Customer Options	IN	N/A	N/A	Preferred	
WR764	CURRDM_L2PRESSRED_NED	Pressure management	Distribution Options	IN	N/A	N/A	Preferred	
WR765	CURRDM_NEUB_NED	Drought - water use restrictions	Customer Options	IN	N/A	N/A	Preferred	
WR766	CURRDM_L3PRESSRED_NED	Pressure management	Distribution Options	IN	N/A	N/A	Preferred	
WR767	CURRDM_VUR_STG	Drought - water use restrictions	Customer Options	IN	N/A	N/A	Preferred	

Option ID	Option name	Option type	Option Group	Primary screening outcome	Secondary screening outcome	Detailed screening outcome	Option status	Screened out reason
WR768	CURRDM_L1PRESSRED_STG	Pressure management	Distribution Options	IN	N/A	N/A	Preferred	
WR769	CURRDM_TUB_STG	Drought - water use restrictions	Customer Options	IN	N/A	N/A	Preferred	
WR770	CURRDM_L2PRESSRED_STG	Pressure management	Distribution Options	IN	N/A	N/A	Preferred	
WR771	CURRDM_NEUB_STG	Drought - water use restrictions	Customer Options	IN	N/A	N/A	Preferred	
WR772	CURRDM_L3PRESSRED_STG	Pressure management	Distribution Options	IN	N/A	N/A	Preferred	

Appendix C UUW options screening

Table 34 Screening of groundwater sources

Option ID	Name	GW waterbody name	Description	Capacity (Ml/d)	Risk of deterioration (short term) – licence capping	Risk of deterioration – Environmental destination (long term)	CAMS status
WR095	GWE_ROUGHTON GILL	Derwent and West Cumbria Lower Palaeozoic and Carboniferous Aquifers	Rehabilitate and recommission existing groundwater source in the Lower Palaeozoic and Carboniferous aquifer, treatment to potable standards at a new WTW and transfer to existing treated water storage in SRZ.	1.5	Low	At risk based on current evidence	Water available
WR099a	GWE_BURNLEY a	Douglas, Darwen and Calder Carboniferous Aquifers	Rehabilitate and recommission existing groundwater source in the Douglas, Darwen and Calder Carboniferous aquifers and transfer to the Calder catchment as a compensation flow.	4	Low	No risk based on current evidence	Restricted water available – saline intrusion risk
WR099b	GWE_BURNLEY b	Douglas, Darwen and Calder Carboniferous Aquifers	Rehabilitate and recommission existing groundwater source in the Douglas, Darwen and Calder Carboniferous aquifers and new raw water transfer to existing raw water storage in SRZ.	4	Low	No risk based on current evidence	Restricted water available – saline intrusion risk
WR099c	GWE_BURNLEY c	Douglas, Darwen and Calder Carboniferous Aquifers	Rehabilitate and recommission existing groundwater abstraction in the Douglas, Darwen and Calder Carboniferous aquifers and treatment to potable standards at upgraded WTW (process).	4	Low	No risk based on current evidence	Restricted water available – saline intrusion risk

Option ID	Name	GW waterbody name	Description	Capacity (Ml/d)	Risk of deterioration (short term) – licence capping	Risk of deterioration – Environmental destination (long term)	CAMS status
WR102b	GWE_WIDNES	Lower Mersey Basin and North Merseyside Permo-Triassic Sandstone Aquifers	Rehabilitate and recommission existing groundwater sources in the Lower Mersey Basin and North Merseyside Permo-Triassic sandstone aquifers, treatment to potable standards at a new WTW and upgraded WTW (capacity) and transfer to the Liverpool and Warrington DMZs.	17	High – if abstraction up to licence limit – subject to groundwater model update	No risk based on current evidence	Restricted water available – over licenced on water balance and saline intrusion risk. However, GWMU is over abstracted
WR102e	GWE_BOLD HEATH	Lower Mersey Basin and North Merseyside Permo-Triassic Sandstone Aquifers	Rehabilitate and recommission existing groundwater source in the Lower Mersey Basin and North Merseyside Permo-Triassic sandstone aquifers and new raw water transfer to existing raw water storage in SRZ.	9	High – if abstraction up to licence limit – subject to groundwater model update	At risk based on current evidence – however, new licence, therefore, assuming same risk to nearby existing boreholes	Restricted water available – over licenced on water balance and saline intrusion risk. However, specific GWMU is over abstracted
WR107b	GWE_RANDLES BRIDGE	Lower Mersey Basin and North Merseyside Permo-Triassic Sandstone Aquifers	Rehabilitate and recommission existing groundwater sources in the Lower Mersey Basin and North Merseyside Permo-Triassic sandstone aquifers, new raw water transfer to upgraded WTW (phase two capacity increase) and treated water transfer to the Southport and Liverpool DMZs.	11	Medium – if abstraction up to licence limit – further investigation required	At risk based on current evidence	Restricted water available – over licenced on water balance and saline intrusion risk
WR111	GWE_WOODFORD	Manchester and East Cheshire Carboniferous Aquifers	Increased groundwater abstraction from the Manchester and East Cheshire Permo-Triassic Sandstone aquifers, treatment to potable standards at a new WTW and transfer to existing treated water storage in SRZ.	9	Medium – if abstraction up to licence limit – subject to groundwater model update	At risk based on current evidence	Restricted water available – over licenced on water balance

Option ID	Name	GW waterbody name	Description	Capacity (Ml/d)	Risk of deterioration (short term) – licence capping	Risk of deterioration – Environmental destination (long term)	CAMS status
WR113	GWE_TYTHERINGTON	Manchester and East Cheshire Carboniferous Aquifers	Replacement of existing treated water main at groundwater source WTW to allow transfer of additional water from the Manchester and East Cheshire Permo-Triassic Sandstone aquifers to existing treated water storage in SRZ.	3	Medium – if abstraction up to licence limit – subject to groundwater model update	At risk based on current evidence	Water available
WR122	GWE_NEWTON HOLLOWS	Wirral and West Cheshire Permo-Triassic Sandstone Aquifers	Rehabilitate and recommission existing groundwater source in the Wirral and West Cheshire Permo-Triassic Sandstone aquifers, treatment to potable standards at a new WTW and transfer to treated water storage in SRZ via a recommissioned treated water main.	9	High – if abstraction up to licence limit – Recent AMP7 WINEP investigation concluded significant licence capping required from used sources therefore Newton Hollow BH will potentially be revoked. Investigation will conclude March 2023	At risk based on current evidence	Restricted water available – over licenced on water balance and saline intrusion risk
WR127	GWE_FAIRHILL	Eden and Esk Lower Palaeozoic and Carboniferous Aquifers	Increased groundwater abstraction from the Eden Valley and Carlisle Basin Permo-Triassic Sandstone aquifers, treatment to potable standards at upgraded WTW (capacity) and new treated water transfer to existing treated water storage in SRZ.	2	Low	No risk based on current evidence	Water available
WR128	GWE_TARN WOOD	Eden and Esk Lower Palaeozoic and Carboniferous Aquifers	Increased groundwater abstraction from the Eden Valley and Carlisle Basin Permo-Triassic Sandstone aquifers, new raw water main to transfer water from NERZ to existing WTW in CRZ.	2	Low	No risk based on current evidence	Water available

Option ID	Name	GW waterbody name	Description	Capacity (Ml/d)	Risk of deterioration (short term) – licence capping	Risk of deterioration – Environmental destination (long term)	CAMS status
WR148	GWN_NORTH CUMBRIA	Eden Valley and Carlisle Basin Permo-Triassic sandstone aquifers	New groundwater abstraction from the Eden Valley and Carlisle Basin Permo-Triassic sandstone aquifers, treatment at upgraded WTW (capacity and process) and transfer to existing treated water storage in the SRZ.	6.5	Low	No risk based on current evidence	Water available
WR149	ITC_WIGAN	Lower Mersey Basin and North Merseyside Permo-Triassic Sandstone Aquifers	Rehabilitate and recommission groundwater sources in the Lower Mersey Basin and North Merseyside Permo-Triassic Sandstone aquifers, treatment to potable standards at upgraded WTW (capacity) and transfer to existing treated water storage in SRZ.	13	High – groundwater management unit in Abstraction Management strategy is over-abstracted. Subject to groundwater model update for STT	At risk based on current evidence	Restricted water available – over licenced on water balance and saline intrusion risk

Table 35 Screening of surface water sources

Option ID	Name	Waterbody name (GW/SW)	Catchment	Description	Capacity (Ml/d)	CAMS status	Approximate volume available at restriction (Ml/d)	CAMs HoF (Ml/d)	CAMs HoF percentile) – natural	CAMs HoF (percentile) – actual	Risk of deterioration – Environmental destination (long term)
WR006	SWN_GLAZE BROOK	Glaze	Lower Mersey	New river abstraction from the Glaze catchment, treatment to potable standards at upgraded WTW (process) and transfer to existing treated water storage in SRZ.	15	Water available	42.4	13	99	below lowest historical flows	Low risk
WR010	SWN_RIVER GRETA	Greta	Lune	New river abstraction from the Greta and Rawthey catchment, treatment to potable standards at upgraded WTW (process) and transfer to existing treated water storage in SRZ.	15	Restricted water available	39.3	126.5	50	50	Low risk
WR026a	SWN_RIVER RIBBLE 26a	Ribble DS Stock Beck/ Stocks IR	Ribble	New river abstraction from the Middle Ribble catchment and transfer to existing raw water storage in SRZ.	10	Water available	22	38.2	99	<99.9	Low risk
WR026b	SWN_RIVER RIBBLE 26b	Ribble DS Stock Beck	Ribble	New river abstraction from the Middle Ribble catchment, treatment to potable standards at a new WTW and transfer to existing treated water storage in SRZ.	6.5	Water available	22	38.2	99	<99.9	Low risk

Option ID	Name	Waterbody name (GW/SW)	Catchment	Description	Capacity (Ml/d)	CAMS status	Approximate volume available at restriction (Ml/d)	CAMs HoF (Ml/d)	CAMs HoF percentile) – natural	CAMs HoF (percentile) – actual	Risk of deterioration – Environmental destination (long term)
WR038	SWN_RIVER EAMONT	Eamont (Upper)	Eden and Esk	New river abstraction from the Eamont catchment, treatment to potable standards at a new WTW and transfer to existing treated water storage in NERZ.	5	Water Available	193.2	828.5	22	9	Low risk
WR041	SWN_RIVER IRTHING	Irthing DS Crammel Linn Waterfall	Eden and Esk	New river abstraction from the Esk and Irthing catchment, treatment to potable standards at upgraded WTW (capacity) and transfer to existing treated water storage in CRZ.	6.5	Restricted water available	10.7	64.9	99	99	Low risk
WR042	SWN_RIVER ESK	Esk (Eden and Esk)	Eden and Esk	New river abstraction from the Esk and Irthing catchment, treatment to potable standards at upgraded WTW (capacity) and transfer to existing treated water storage in CRZ.	6.5	Water available	51.2	205	99	99	Low risk

Option ID	Name	Waterbody name (GW/SW)	Catchment	Description	Capacity (Ml/d)	CAMS status	Approximate volume available at restriction (Ml/d)	CAMs HoF (Ml/d)	CAMs HoF percentile) – natural	CAMs HoF (percentile) – actual	Risk of deterioration – Environmental destination (long term)
WR043	SWN_RIVER PETTERIL	Petterill d/s Blackrack Beck	Eden and Esk	New river abstraction from the Petteril catchment, treatment to potable standards at upgraded WTW (capacity) and transfer to existing treated water storage in CRZ.	5	Water available	3.9	15.8	<99.9	<99.9	Low risk
WR049a	SWN_RIVER RIBBLE 49a	Ribble – conf Calder to tidal/ Anglezarke IR	Ribble	New river abstraction from the Big Ribble catchment, primary treatment at a new WTW and transfer to existing WTW for further treatment.	30	Water available	58.5	183.4	99	99.8	Low risk
WR049b	SWN_RIVER RIBBLE 49b	Ribble – conf Calder to tidal/ Anglezarke IR	Ribble	New river abstraction from the Big Ribble catchment, treatment to potable standards at existing WTW and transfer to treated water storage in SRZ.	30	Water available	58.5	183.4	99	99.8	Low risk
WR049c	SWN_RIVER RIBBLE 49c	Ribble – conf Calder to tidal/ Anglezarke IR	Ribble	New river abstraction from the Big Ribble catchment, treatment to potable standards at existing WTW and transfer to treated water storage in SRZ.	40	Water available	58.5	183.4	99	99.8	Low risk

Option ID	Name	Waterbody name (GW/SW)	Catchment	Description	Capacity (Ml/d)	CAMS status	Approximate volume available at restriction (Ml/d)	CAMs HoF (Ml/d)	CAMs HoF percentile) – natural	CAMs HoF (percentile) – actual	Risk of deterioration – Environmental destination (long term)
WR055	SWE_NORTH CUMBRIA	Eden – Eamont to tidal	Eden and Esk	Modify existing abstraction licence in the Eden Lower catchment, treatment to potable standards at upgraded WTW (capacity) and transfer to existing treated water storage in CRZ.	5	Restricted water available	113.4	462.5	99	99.9	Low risk
WR074	SWN_RIVER DARWEN	Darwen – conf Roddleswor th to tidal	Ribble	New river abstraction from the Darwen catchment, treatment to potable standards at existing WTW and transfer to treated water storage in SRZ.	10	Water Available	12.5 – 117.6	18.5	99	99.9	Low risk
WR076	SWN_RIVER BOLLIN	Bollin (Ashley Mill to Manchester Ship Canal)	Upper Mersey	New river abstraction from the Bollin-Dean-Upper Mersey catchment, treatment to potable standards at a new WTW and new treated water transfer to Manchester DMZ.	25	Water available	46.4	23.2	<Q99.9	Below lowest historical flows	Low risk

Option ID	Name	Waterbody name (GW/SW)	Catchment	Description	Capacity (Ml/d)	CAMS status	Approximate volume available at restriction (Ml/d)	CAMs HoF (Ml/d)	CAMs HoF percentile) – natural	CAMs HoF (percentile) – actual	Risk of deterioration – Environmental destination (long term)
STT041	SWN_RIVER ROCH	Roch (Spodden to Irwell)	Irwell	New river abstraction from the Roch Irk Medlock catchment, new raw water main to transfer to upgraded raw water storage (new liner) and treatment to potable standards at a new WTW.	18	Restricted water available	53.8	32.4	99	below lowest historical flows	Low risk

Appendix D Options available for decision making

Table 36 Constrained supply options

Option ID	Option name (secure)	EA option type	Option description	Resource Zone	Capacity (Ml/d)	Option status
STTA4	NWT_VYRNWY	External raw water bulk supply/transfer	Pumping stations, mains replacement and rehabilitation, WTW upgrades (capacity and process) and improvement of hydraulic controls to facilitate transfer of bulk surface water supply to external water companies.	SRZ	205.00	Constrained
STT041	SWN_RIVER ROCH	New surface water	New river abstraction from the Roch Irk Medlock catchment, new raw water main to transfer to upgraded raw water storage (new liner) and treatment to potable standards at a new WTW.	SRZ	18.00	Constrained
STT041b	SWN_RIVER IRWELL_ROCH	New surface water	New river abstractions from the Irwell and Roch Irk Medlock catchments, two new raw mains to transfer to upgraded raw water storage (new liner) and treatment to potable standards at a new WTW.	SRZ	58.00	Constrained
WR006	SWN_GLAZE BROOK	New surface water	New river abstraction from the Glaze catchment, treatment to potable standards at upgraded WTW (process) and transfer to existing treated water storage in SRZ	SRZ	15.00	Constrained
WR010	SWN_RIVER GRETA	New surface water	New river abstraction from the Greta and Rawthey catchment, treatment to potable standards at upgraded WTW (process) and transfer to existing treated water storage in SRZ.	SRZ	15.00	Constrained
WR015	SWN_RIVER IRWELL	New surface water	New river abstraction from the Croal Irwell Canals catchment, treatment to potable standards at a new WTW and transfer to existing treated water storage in SRZ.	SRZ	40.00	Constrained
WR017	SWN_RIVER GOYT	New surface water	New river abstraction from the Dane Canals and SWT catchment, treatment to potable standards at existing WTW and transfer to existing treated water storage in SRZ.	SRZ	5.00	Constrained
WR026b	SWN_RIVER RIBBLE 26b	New surface water	New river abstraction from the Middle Ribble catchment, treatment to potable standards at a new WTW and transfer to existing treated water storage in SRZ.	SRZ	6.50	Constrained
WR026c	SWN_RIVER RIBBLE 26c	New surface water	New river abstraction from the Middle Ribble catchment, treatment to potable standards at a new WTW and transfer to existing treated water storage in SRZ.	SRZ	4.00	Constrained

Option ID	Option name (secure)	EA option type	Option description	Resource Zone	Capacity (Ml/d)	Option status
WR038	SWN_RIVER EAMONT	New surface water	New river abstraction from the Eamont catchment, treatment to potable standards at a new WTW and transfer to existing treated water storage in NERZ.	NERZ	5.00	Constrained
WR041	SWN_RIVER IRTHING	New surface water	New river abstraction from the Esk and Irthing catchment, treatment to potable standards at upgraded WTW (capacity) and transfer to existing treated water storage in CRZ.	CRZ	6.50	Constrained
WR042	SWN_RIVER ESK	New surface water	New river abstraction from the Esk and Irthing catchment, treatment to potable standards at upgraded WTW (capacity) and transfer to existing treated water storage in CRZ.	CRZ	6.50	Constrained
WR043	SWN_RIVER PETTERIL	New surface water	New river abstraction from the Petteril catchment, treatment to potable standards at upgraded WTW (capacity) and transfer to existing treated water storage in CRZ.	CRZ	5.00	Constrained
WR049a	SWN_RIVER RIBBLE 49a	New surface water	New river abstraction from the Big Ribble catchment, primary treatment at a new WTW and transfer to existing WTW for further treatment.	SRZ	30.00	Constrained
WR049b	SWN_RIVER RIBBLE 49b	New surface water	New river abstraction from the Big Ribble catchment, treatment to potable standards at existing WTW and transfer to treated water storage in SRZ.	SRZ	30.00	Constrained
WR049c	SWN_RIVER RIBBLE 49c	New surface water	New river abstraction from the Big Ribble catchment, treatment to potable standards at existing WTW and transfer to treated water storage in SRZ.	SRZ	40.00	Constrained
WR049d	SWN_RIVER RIBBLE 49d	New surface water	New river abstraction from the Big Ribble catchment, treatment to potable standards at upgraded WTW (process and capacity) and transfer to existing treated water storage in SRZ.	SRZ	40.00	Constrained
WR055	SWE_NORTH CUMBRIA	Surface water enhancement	Modify existing abstraction licence in the Eden Lower catchment, treatment to potable standards at upgraded WTW (capacity) and transfer to existing treated water storage in CRZ.	CRZ	5.00	Constrained
WR065a	RES_WATERGROVE	Reservoir enlargement	Raise the top level of existing reservoir in the Roch Irk Medlock catchment to increase raw water storage in SRZ.	SRZ	2.10	Constrained
WR065b	RES_WHITEHOLME	Reservoir enlargement	Restore the previous top level of existing reservoir in the Roch Irk Medlock catchment to increase raw water storage in SRZ.	SRZ	2.30	Constrained
WR074	SWN_RIVER DARWEN	New surface water	New river abstraction from the Darwen catchment, treatment to potable standards at existing WTW and transfer to treated water storage in SRZ.	SRZ	10.00	Constrained

Option ID	Option name (secure)	EA option type	Option description	Resource Zone	Capacity (Ml/d)	Option status
WR076	SWN_RIVER BOLLIN	New surface water	New river abstraction from the Bollin-Dean-Upper Mersey catchment, treatment to potable standards at a new WTW and new treated water transfer to Manchester DMZ.	SRZ	25.00	Preferred
WR077a	RES_DOVESTONE	Reservoir enlargement	Raise the top level of existing reservoir in the Goyt-Etherow-Tame catchment to increase raw water storage in SRZ.	SRZ	2.00	Constrained
WR077c	RES_FERNILEE	Reservoir enlargement	Raise the top level of existing reservoir in the Goyt-Etherow-Tame catchment to increase raw water storage in SRZ.	SRZ	1.90	Constrained
WR084	ITC_CARLISLE	Internal potable transfer	New treated water main from existing WTW in CRZ to existing treated water storage in NERZ.	NERZ	3.00	Constrained
WR095	GWE_ROUGHTON GILL	Groundwater enhancement	Rehabilitate and recommission existing groundwater source in the Lower Palaeozoic and Carboniferous aquifer, treatment to potable standards at a new WTW and transfer to existing treated water storage in SRZ.	CRZ	1.50	Constrained
WR102b	GWE_WIDNES	Groundwater enhancement	Rehabilitate and recommission existing groundwater sources in the Lower Mersey Basin and North Merseyside Permo-Triassic sandstone aquifers, treatment to potable standards at a new WTW and upgraded WTW (capacity) and transfer to the Liverpool and Warrington DMZs.	SRZ	17.00	Constrained
WR102e	GWE_BOLD HEATH	Groundwater enhancement	Rehabilitate and recommission existing groundwater source in the Lower Mersey Basin and North Merseyside Permo-Triassic sandstone aquifers and new raw water transfer to existing raw water storage in SRZ.	SRZ	9.00	Constrained
WR105a1	GWE_LYMM a1	Groundwater enhancement	Decommission existing groundwater source WTW, construct new WTW (without softening) and treated water transfer to Manchester DMZ using existing infrastructure.	SRZ	4.50	Constrained
WR105a2	GWE_LYMM a2	Groundwater enhancement	Decommission existing groundwater source WTW, construct new WTW (with softening) and treated water transfer to Manchester DMZ using existing infrastructure.	SRZ	4.50	Constrained
WR105b1	GWE_LYMM b1	Groundwater enhancement	Decommission existing groundwater source WTW, construct new WTW (with softening) and treated water transfer to Warrington DMZ using existing infrastructure.	SRZ	4.50	Constrained
WR105b2	GWE_LYMM b2	Groundwater enhancement	Decommission existing groundwater source WTW, construct new WTW (without softening) and treated water transfer to Warrington DMZ using existing infrastructure.	SRZ	4.50	Constrained

Option ID	Option name (secure)	EA option type	Option description	Resource Zone	Capacity (Ml/d)	Option status
WR106a	GWE_WALTON 1	Groundwater enhancement	Rehabilitate and recommission existing groundwater sources in the Lower Mersey Basin and North Merseyside Permo-Triassic sandstone aquifers, treatment to potable standards at a new WTW (with softening) and transfer to existing treated water storage in SRZ.	SRZ	8.45	Constrained
WR106b	GWE_WALTON 2	Groundwater enhancement	Rehabilitate and recommission existing groundwater sources in the Lower Mersey Basin and North Merseyside Permo-Triassic sandstone aquifers, treatment to potable standards at a new WTW (without softening) and transfer to existing treated water storage in SRZ.	SRZ	8.45	Constrained
WR122	GWE_NEWTON HOLLOWS	Groundwater enhancement	Rehabilitate and recommission existing groundwater source in the Wirral and West Cheshire Permo-Triassic Sandstone aquifers, treatment to potable standards at a new WTW and transfer to treated water storage in SRZ via a recommissioned treated water main.	SRZ	9.00	Constrained
WR127	GWE_FAIRHILL	Groundwater enhancement	Increased groundwater abstraction from the Eden Valley and Carlisle Basin Permo-Triassic Sandstone aquifers, treatment to potable standards at upgraded WTW (capacity) and new treated water transfer to existing treated water storage in SRZ.	SRZ	2.00	Constrained
WR128	GWE_TARN WOOD	Internal raw water transfer	Increased groundwater abstraction from the Eden Valley and Carlisle Basin Permo-Triassic Sandstone aquifers, new raw water main to transfer water from NERZ to existing WTW in CRZ.	CRZ	2.00	Constrained
WR140	EFR_HORWICH	Water reuse	New indirect final effluent reuse scheme with abstraction from the Douglas catchment downstream existing WwTW, treatment at upgraded WTW (process) and transfer to existing distribution network.	SRZ	5.00	Constrained
WR141	EFR_ROSSENDALE	Water reuse	New indirect final effluent reuse scheme with abstraction from the Croal Irwell catchment downstream existing WwTW, treatment at a new WTW and transfer to existing treated water storage in SRZ.	SRZ	10.00	Constrained
WR144	SWN_RIVER TAME	New surface water	New river abstraction from the Goyt Etherow Tame catchment, treatment to potable standards at a new WTW and transfer to existing treated water storage in SRZ.	SRZ	5.00	Constrained
WR148	GWN_NORTH CUMBRIA	New groundwater	New groundwater abstraction from the Eden Valley and Carlisle Basin Permo-Triassic sandstone aquifers, treatment at upgraded WTW (capacity and process) and transfer to existing treated water storage in the SRZ.	CRZ	6.50	Constrained

Option ID	Option name (secure)	EA option type	Option description	Resource Zone	Capacity (Ml/d)	Option status
WR150	DPS_CASTLE_CARROCK	Surface Water Enhancement	Installation of temporary pumps to access Castle Carrock dead water storage.	CRZ	2.0	Preferred
WR167	DPS_DELPH	Drought permits/orders	Reservoir drought permit to temporarily reduce compensation flows to the Croal Irwell catchment.	SRZ	1.14	Preferred
WR168	DPS_DOVESTONE	Drought permits/orders	Reservoir drought permit to temporarily reduce compensation flows to the Goyt Etherow Tame catchment.	SRZ	2.53	Preferred
WR169	DPS_JUMBLES	Drought permits/orders	Reservoir drought permit to temporarily reduce compensation flows to the Croal Irwell catchment.	SRZ	5.24	Preferred
WR170	DPS_LONGDENDALE	Drought permits/orders	Reservoir drought permit to temporarily reduce compensation flows to the Goyt Etherow Tame catchment.	SRZ	5.19	Preferred
WR171	DPS_RIVER LUNE	Drought permits/orders	Drought permit to temporarily reduce prescribed flows to the Lune catchment and allow abstraction from existing conjunctive use scheme.	SRZ	12.48	Preferred
WR172	DPS_RIVINGTON 1	Drought permits/orders	Reservoir drought permit to temporarily reduce compensation flows to the Douglas catchment.	SRZ	0.91	Preferred
WR173	DPS_RIVINGTON 2	Drought permits/orders	Reservoir drought permit to temporarily reduce compensation flows to the Douglas catchment.	SRZ	1.32	Preferred
WR174	DPS_ULLSWATER	Drought permits/orders	Drought permit to temporarily reduce hands-off flow and relax 12-month rolling abstraction licence limit in the Eden and Esk catchment.	SRZ	13.8	Preferred
WR175	DPS_VYRNWY	Drought permits/orders	Drought permit to temporarily reduce compensation flows to the Vyrnwy catchment.	SRZ	3.28	Preferred
WR176	DPS_WINDERMERE	Drought permits/orders	Drought permit to temporarily reduce hands-off flow and relax 12-month rolling abstraction licence limit in the Kent and Leven catchment.	SRZ	24.37	Preferred
WR179a	DPS_TARN WOOD	Drought permits/orders	Drought permit to temporarily increase annual licence limit at groundwater source to enable continuation of abstraction at the maximum daily abstraction rate.	NERZ	0.75	Preferred
WR179b	DPS_BOWSCAR	Drought permits/orders	Drought permit to temporarily increase annual licence limit at groundwater source to enable continuation of abstraction at the maximum daily abstraction rate	NERZ	1.67	Preferred
WR179c	DPS_GAMBLESBY	Drought permits/orders	Drought permit to temporarily increase annual licence limit at groundwater source to enable continuation of abstraction at the maximum daily abstraction rate	NERZ	0.23	Preferred

Option ID	Option name (secure)	EA option type	Option description	Resource Zone	Capacity (Ml/d)	Option status
WR184	DPS_FERNILEE	Drought permits/orders	Reservoir drought permit to temporarily reduce compensation flows to the Goyt Etherow Tame catchment.	SRZ	1.73	Preferred
WR185	SSO_STOCKPORT PH II	Conjunctive use	Phase II supply system network improvements in Stockport including new inline pumping stations and localised network changes to transfer more water to existing treated water storage.	SRZ	11.50	Constrained
WR187	SWE_DAMAS GILL	Surface water enhancement	Reinstate river abstraction in the Wyre and Calder catchment, transfer to existing raw water storage and transfer to existing WTW as required.	SRZ	3.36	Constrained
WR188a1	NIT_THIRD PARTY_21a	New surface water	New river abstraction from the Goyt Etherow Tame catchment, transfer to third party source for downstream re-abstraction, treatment to potable standards at a new WTW and transfer to existing treated water storage in SRZ.	SRZ	5.00	Constrained
WR188a2	NIT_THIRD PARTY_21b	New surface water	New river abstraction from the Goyt Etherow Tame catchment, transfer to third party source for downstream re-abstraction, treatment to potable standards at a new WTW and transfer to existing treated water storage in SRZ.	SRZ	5.00	Constrained
WR188b1	NIT_THIRD PARTY_21c	External raw water bulk supply/transfer	New canal abstraction from third party source in the Goyt Etherow Tame catchment, treatment to potable standards at a new WTW and transfer to existing treated water storage in SRZ.	SRZ	2.00	Constrained
WR188b2	NIT_THIRD PARTY_21d	External raw water bulk supply/transfer	New canal abstraction from third party source in the Goyt Etherow Tame catchment, treatment to potable standards at a new WTW and transfer to existing treated water storage in SRZ.	SRZ	2.00	Constrained
WR191	PRO_NORTH LANCASHIRE	Water treatment works loss recovery	New washwater treatment system at an existing WTW to treat filtered process washwater.	SRZ	3.50	Constrained
WR800	NIT_THIRD PARTY_1	Licence trading	Third party non-water industry abstraction licence trade in the Bela catchment to allow new river abstraction and transfer to existing raw water storage in SRZ.	SRZ	4.50	Constrained
WR811	WIT_THIRD PARTY_5	External raw water bulk supply/transfer	New intake, pumping station and raw water main to transfer water from third party water company raw water storage in the Tess Upper catchment to new river source in the Eden and Esk catchment for downstream re-abstraction, treatment to potable standards at existing WTW and transfer to existing treated water storage in CRZ.	CRZ	10.00	Constrained

Option ID	Option name (secure)	EA option type	Option description	Resource Zone	Capacity (Ml/d)	Option status
WR817	NIT_THIRD PARTY_11	External raw water bulk supply/transfer	New canal abstraction from third party source in the North West AWB catchment, treatment to potable standards at a new WTW and transfer to existing treated water storage in SRZ via new pumping station and treated water main.	SRZ	16.00	Constrained
WR820	NIT_THIRD PARTY_12	External raw water bulk supply/transfer	New canal abstraction from third party source in the North West AWB catchment, treatment to potable standards at upgraded WTW (capacity and process) and transfer to existing treated water storage in SRZ.	SRZ	15.50	Constrained
WR824	NIT_THIRD PARTY_15	External raw water bulk supply/transfer	New minewater abstraction from third party source in the South Tyne Lower catchment, new raw water transfer to existing raw water collection main, treatment to potable standards at existing WTW and transfer to existing treated water storage in CRZ.	CRZ	1.30	Constrained
WR825	NIT_THIRD PARTY_16	External raw water bulk supply/transfer	New minewater abstraction from third party source in the Croal Irwell catchment, treatment to potable standards at existing WTW and transfer to existing treated water storage in SRZ.	SRZ	2.50	Constrained

Table 37 Feasible demand options

Option ID	Option name (secure)	EA option type	Option Description	Resource Zone	Demand reduction (Ml/d)	Programme duration (yrs)	Option status
WR502a	LEA-CRZ10_Permanent network sensors	Other leakage control	Increased permanent installation and maintenance of acoustic loggers in DMAs based on perceived benefit.	CRZ	0.51	10	Preferred
WR502b	LEA-NERZ10_Permanent network sensors	Other leakage control		NERZ	0.35	10	Feasible
WR502c	LEA-SRZ5_Permanent network sensors	Other leakage control		SRZ	20.00	5	Preferred
WR502d	LEA-SRZ10_Permanent network sensors	Other leakage control		SRZ	40.00	10	Feasible
WR502e	LEA-SRZ12_Permanent network sensors	Other leakage control		SRZ	48.00	12	Feasible
WR502f	LEA-SRZ15_Permanent network sensors	Other leakage control		SRZ	52.84	15	Feasible
WR510	LEA-SRZ15_In-pipe repairs and lining technologies	Other leakage control	Use of pinpoint repairs, in pipe repairs or pipe lining technologies to resolve leakage issues and reduce repair times.	SRZ	4.47	15	Preferred
WR511a	LEA-CRZ5_Pressure management	Pressure management		CRZ	0.10	5	Preferred

Option ID	Option name (secure)	EA option type	Option Description	Resource Zone	Demand reduction (Ml/d)	Programme duration (yrs)	Option status
WR511b	LEA-CRZ10_Pressure management	Pressure management	Delivery of pressure management schemes including but not limited to scheme types such as new PMV, PMV modulation, pump modulation, right sizing mains to reduce headloss, pumps for high rise buildings, single property boosters, duel feed PMV areas, etc. as long as the solution delivers leakage savings through the optimisation of pressure.	CRZ	0.25	10	Feasible
WR511c	LEA-CRZ15_Pressure management	Pressure management		CRZ	0.50	15	Feasible
WR511d	LEA-NERZ5_Pressure management	Pressure management		NERZ	0.10	5	Feasible
WR511e	LEA-NERZ10_Pressure management	Pressure management		NERZ	0.25	10	Feasible
WR511f	LEA-NERZ15_Pressure management	Pressure management		NERZ	0.50	15	Feasible
WR511g	LEA-SRZ5_Pressure management	Pressure management		SRZ	1.00	5	Preferred
WR511h	LEA-SRZ5_Pressure management	Pressure management		SRZ	2.50	5	Feasible
WR511i	LEA-SRZ10_Pressure management	Pressure management		SRZ	5.00	10	Feasible
WR511j	LEA-SRZ15_Pressure management	Pressure management		SRZ	10.00	15	Feasible
WR516a	LEA-SRZ5_Mains rehabilitation/renewal/replacement	Mains replacement (not trunk mains)	Increased rate of mains renewal. Undertake mains renewal based on outputs of our mains/pipe deterioration/failure model to achieve different leakage saving volumes over different implementation periods.	SRZ	10.00	5	Feasible
WR516a1	LEA-CRZ15_Mains rehabilitation/renewal/replacement	Mains replacement (not trunk mains)		CRZ	1.19	15	Preferred
WR516b	LEA-SRZ5_Mains rehabilitation/renewal/replacement	Mains replacement (not trunk mains)		SRZ	20.00	5	Feasible
WR516c	LEA-SRZ5_Mains rehabilitation/renewal/replacement	Mains replacement (not trunk mains)		SRZ	30.00	5	Feasible
WR516d	LEA-SRZ5_Mains rehabilitation/renewal/replacement	Mains replacement (not trunk mains)		SRZ	40.00	5	Feasible
WR516e	LEA-SRZ5_Mains rehabilitation/renewal/replacement	Mains replacement (not trunk mains)		SRZ	50.00	5	Feasible
WR516f	LEA-SRZ5_Mains rehabilitation/renewal/replacement	Mains replacement (not trunk mains)		SRZ	60.00	5	Feasible
WR516g	LEA-SRZ10_Mains rehabilitation/renewal/replacement	Mains replacement (not trunk mains)		SRZ	80.00	10	Feasible
WR516h	LEA-SRZ10_Mains rehabilitation/renewal/replacement	Mains replacement (not trunk mains)		SRZ	100.00	10	Feasible
WR516h1	LEA-SRZ10_Mains rehabilitation/renewal/replacement	Mains replacement (not trunk mains)		SRZ	49.12	10	Preferred

Option ID	Option name (secure)	EA option type	Option Description	Resource Zone	Demand reduction (Ml/d)	Programme duration (yrs)	Option status
WR516h2	LEA-SRZ25_Mains rehabilitation/renewal/replacement	Mains replacement (not trunk mains)		SRZ	50.80	25	Preferred
WR516i	LEA-SRZ10_Mains rehabilitation/renewal/replacement	Mains replacement (not trunk mains)		SRZ	120.00	10	Feasible
WR516j	LEA-SRZ10_Mains rehabilitation/renewal/replacement	Mains replacement (not trunk mains)		SRZ	140.00	10	Feasible
WR516k	LEA-SRZ10_Mains rehabilitation/renewal/replacement	Mains replacement (not trunk mains)		SRZ	160.00	10	Feasible
WR516l	LEA-SRZ15_Mains rehabilitation/renewal/replacement	Mains replacement (not trunk mains)		SRZ	180.00	15	Feasible
WR516m	LEA-SRZ15_Mains rehabilitation/renewal/replacement	Mains replacement (not trunk mains)		SRZ	200.00	15	Feasible
WR520a	LEA-CRZ5_DMA optimisation	Other leakage control	DMA optimisation based on splitting large DMAs to help identify smaller outbreaks and leaks and improve targeting.	CRZ	0.48	5	Preferred
WR520b	LEA-NERZ5_DMA optimisation	Other leakage control		NERZ	0.20	5	Feasible
WR520c	LEA-SRZ5_DMA optimisation	Other leakage control		SRZ	2.00	5	Preferred
WR524a	LEA-CRZ5_Upstream tile optimisation	Other leakage control	Tile optimisation - upstream meters. End to end verification of existing meters to enable repair or replacement of broken meters to help improve RZ balances of the upstream system.	CRZ	0.003	5	Feasible
WR524b	LEA-NERZ5_Upstream tile optimisation	Other leakage control		NERZ	0.02	5	Feasible
WR524c	LEA-SRZ5_Upstream tile optimisation	Other leakage control		SRZ	2.99	5	Feasible
WR524d	LEA-SRZ10_Upstream tile optimisation	Other leakage control		SRZ	5.78	10	Preferred
WR532	LEA-SRZ15_Dynamic Network Management	Other leakage control	Develop a dynamic network utilising monitoring and control technologies supported by improved analytics to spot leaks and other network issues faster, to enable the network to manage itself or enable manual intervention through actionable insight based on more informed decisions.	SRZ	31.15	15	Feasible
WR601a	EMT-CRZ10_Enhanced metering of households (smart meters)	Metering other selective		CRZ	1.38	10	Feasible

Option ID	Option name (secure)	EA option type	Option Description	Resource Zone	Demand reduction (Ml/d)	Programme duration (yrs)	Option status
WR601b	EMT-NERZ10_Enhanced metering of households (smart meters)	Metering other selective	Proactive metering of all unmetered household properties (including voids) for leakage by 2040.	NERZ	0.38	10	Feasible
WR601c	EMT-SRZ10_Enhanced metering of households (smart meters)	Metering other selective		SRZ	39.44	10	Feasible
WR601d	EMT-SRZ15_Enhanced metering of households (smart meters)	Metering other selective		SRZ	66.94	15	Feasible
WR601e	EMT-SRZ15_Enhanced metering of households (smart meters)	Metering other selective		SRZ	66.94	15	Feasible
WR601a_Incremental	EMT-CRZ10_Enhanced metering of households (smart meters)	Metering other selective		CRZ	0.30	10	Feasible
WR601b_Incremental	EMT-NERZ10_Enhanced metering of households (smart meters)	Metering other selective		NERZ	0.08	10	Feasible
WR601c_Incremental	EMT-SRZ10_Enhanced metering of households (smart meters)	Metering other selective		SRZ	16.77	10	Feasible
WR603a	EMT-CRZ5_Enhanced metering of households on single supplies (smart meters)	Metering other selective	Proactive metering of all unmetered household properties (excluding voids) on single supplies for leakage by 2040.	CRZ	0.83	5	Preferred
WR603b	EMT-NERZ5_Enhanced metering of households on single supplies (smart meters)	Metering other selective		NERZ	0.27	5	Preferred
WR603c	EMT-SRZ5_Enhanced metering of households on single supplies (smart meters)	Metering other selective		SRZ	17.18	5	Feasible
WR603d	EMT-SRZ10_Enhanced metering of households on single supplies (smart meters)	Metering other selective		SRZ	39.68	10	Feasible
WR603e	EMT-SRZ15_Enhanced metering of households on single supplies (smart meters)	Metering other selective		SRZ	60.46	15	Preferred

Option ID	Option name (secure)	EA option type	Option Description	Resource Zone	Demand reduction (Ml/d)	Programme duration (yrs)	Option status
WR615a	EMT-CRZ5_Replace existing non-household meters with smart meters	Metering other selective	Replace existing non-household meters from AMR to SMART meters as standard.	CRZ	0.20	5	Preferred
WR615b	EMT-NERZ5_Replace existing non-household meters with smart meters	Metering other selective		NERZ	0.09	5	Preferred
WR615c	EMT-SRZ5_Replace existing non-household meters with smart meters	Metering other selective		SRZ	10.44	5	Preferred
WR619a	EMT-CRZ10_Replace existing household meters with smart meters	Metering other selective	Replace existing household meters from AMR to SMART meters as standard.	CRZ	0.15	10	Preferred
WR619b	EMT-NERZ10_Replace existing household meters with smart meters	Metering other selective		NERZ	0.02	10	Preferred
WR619c	EMT-SRZ10_Replace existing household meters with smart meters	Metering other selective		SRZ	10.24	10	Preferred
WR619d	EMT-SRZ15_Replace existing household meters with smart meters	Metering other selective		SRZ	15.36	15	Feasible
WR658a	WSD-CRZ10_Free water efficiency devices (inside/internal)	Retrofitting indoor water efficiency devices	Free supply of internal household water efficiency devices to be ordered via the UU website then posted to customers to fit themselves.	CRZ	0.11	10	Preferred
WR658b	WSD-NERZ10_Free water efficiency devices (inside/internal)	Retrofitting indoor water efficiency devices		NERZ	0.01	10	Feasible
WR658c	WSD-SRZ10_Free water efficiency devices (inside/internal)	Retrofitting indoor water efficiency devices		SRZ	4.60	10	Preferred
WR659a	WER-CRZ15_Free water efficiency devices (outside/external)	Rainwater harvesting	Free supply of external household water efficiency devices to be ordered via the UU website then posted to customers to fit themselves.	CRZ	0.08	15	Preferred
WR659b	WER-NERZ15_Free water efficiency devices (outside/external)	Rainwater harvesting		NERZ	0.01	15	Feasible
WR659c	WER-SRZ15_Free water efficiency devices (outside/external)	Rainwater harvesting		SRZ	4.00	15	Preferred
WR661a	WUA-CRZ15_Free water efficiency audits (households)	Household water audit	Undertake water audits on metered customers (existing or newly metered) and provide and fit free water saving devices (e.g. fix leaking toilets, etc.).	CRZ	0.27	15	Preferred
WR661b	WUA-NERZ15_Free water efficiency audits (households)	Household water audit		NERZ	0.03	15	Feasible

Option ID	Option name (secure)	EA option type	Option Description	Resource Zone	Demand reduction (Ml/d)	Programme duration (yrs)	Option status
WR661c	WUA-SRZ15_Free water efficiency audits (households)	Household water audit		SRZ	12.98	15	Preferred
WR669a	ISD-SRZ15_Flow regulators	Other water efficiency	R&D Customer Flow Restrictors. Undertake a controlled trial of both customer flow restrictor and customer service PRVs to understand benefits and cost to implement.	SRZ	7.40	15	Feasible
WR669b	ISD-CRZ15_Flow regulators	Other water efficiency		CRZ	0.15	15	Preferred
WR669c	ISD-NERZ15_Flow regulators	Other water efficiency		NERZ	0.01	15	Feasible
WR677a	WUA-CRZ15_Non-household water efficiency programme	Non-household water audit	Targeted water efficiency at industrial/commercial customers. Review and provide free water audits, provide and fit water efficiency devices at commercial properties.	CRZ	0.39	15	Preferred
WR677b	WUA-NERZ15_Non-household water efficiency programme	Non-household water audit		NERZ	0.07	15	Feasible
WR677c	WUA-SRZ5_Non-household water efficiency programme	Non-household water audit		SRZ	12.94	5	Preferred
WR685a	WER-CRZ5_Rainwater harvesting and water reuse (new builds)	Rainwater harvesting	Domestic rainwater harvesting system - new build households. Work with a developer to trial rainwater harvesting and greywater systems within a select number of new build properties to understand the true cost and benefits of such systems within new build properties on household demand.	CRZ	0.06	5	Preferred
WR685b	WER-NERZ15_Rainwater harvesting and water reuse (new builds)	Rainwater harvesting		NERZ	0.01	15	Feasible
WR685c	WER-SRZ15_Rainwater harvesting and water reuse (new builds)	Rainwater harvesting		SRZ	5.77	15	Feasible
WR694a	WSA-CRZ15_Government intervention (water labelling, standards)	Other water efficiency	Government intervention to help consumers find water efficient products.	CRZ	1.26	15	Feasible
WR694b	WSA-NERZ15_Government intervention (water labelling, standards)	Other water efficiency		NERZ	0.14	15	Feasible
WR694c	WSA-SRZ15_Government intervention (water labelling, standards)	Other water efficiency		SRZ	75.98	15	Feasible
WR694d	WSA-CRZ15_Government intervention (water labelling, standards)	Other water efficiency		CRZ	0.60	15	Preferred
WR694e	WSA-NERZ15_Government intervention (water labelling, standards)	Other water efficiency		NERZ	0.06	15	Preferred

Option ID	Option name (secure)	EA option type	Option Description	Resource Zone	Demand reduction (Ml/d)	Programme duration (yrs)	Option status
WR694f	WSA-SRZ15_Government intervention (water labelling, standards)	Other water efficiency		SRZ	36.27	15	Preferred
WR749	LOS_TUBs 1:20 to 1:40	Change in levels of service	Change in level of service from 1:20 to 1:40	SRZ	-100.00	N/A	Preferred

United Utilities Water Limited
Haweswater House
Lingley Mere Business Park
Lingley Green Avenue
Great Sankey
Warrington
WA5 3LP

unitedutilities.com

United Utilities

Water for the North West