Draft Water Resources Management Plan 2019

Technical Report - Options identification

Contents

1 Introduction

This report presents a summary of the options identification process and the results that have been completed by United Utilities Water Ltd (UUW) as part of the draft Water Resources Management Plan 2019 (WRMP19). The options identification process is an intrinsic part of the development of our WRMP and is required so that each water company can identify and consider all plausible options to maintain its supply-demand balance or meet other related drivers (e.g. such as enhanced demand management), whilst at the same time ensuring adequate water supply reliability for all customers up to 2045 and beyond.

Identification of all of the options considered in this report has been carried out in accordance with current regulatory and industry guidelines[1] including, but not limited to:

- Defra guiding principles[2];
- Environment Agency (EA)/Natural Resources Wales (NRW) Guideline[3] – the 'Guideline';
- UKWIR Water Resources Planning Tools report[4]; and
- Drinking Water Inspectorate guidelines[5]

By following these industry guidelines we have fulfilled a number of obligations necessary for completion of a successful WRMP:

- We have explored a full range of options, including those that seek to reduce the demand for water as well as options for new or enhanced water supplies, to ensure that our final list of options considered is comprehensive. This list includes both our own options as well as those from other organisations such as water companies and new market entrants who were invited to bid into our WRMP process with their own ideas to reduce customer demand or new supplies. Collectively, these organisations are called third parties. See Section 3.7;
- We have thought innovatively about the types of options we could use in our supply system. Our systematic approach to generating our own options and the approach to gather ideas from third parties are key to us achieving this objective. Section 3 summarises the process and the categories and types of options we have considered;
- We have considered the resilience and reliability of options including an appreciation of how they can benefit customers, the environment and their susceptibility to climate change and drought. See Section 3.2.16 for details on drought options and Section 6 for how we have approached the environmental assessment of our options;
- We have considered the environmental effects of building and operating options. This is achieved by various assessment techniques in order to discount options that could cause damage to the environment, see Section 6;
- We have considered water quality aspects in the design of certain types of options; those that provide a new, modified or enhance water resource scheme. This is not only in terms of meeting our regulatory obligations for water quality, but also ensuring that we do not expose consumers to a greater risk of exposure to unwholesome water.

This report covers supply-demand options only; resilience options are discussed further in *draft WRMP19 Technical Report – Water supply resilience.*

[1] The mapping of our submission to the different elements of these is included in the *Draft WRMP19 Technical Report – Governance and assurance.*
[2] Defra – Guiding principles for water resources planning – May 2016
[3] EA/NRW – Water Resources Planning Guideline – interim update, April 2017
[4] UKWIR - Water Resources Planning Tools (2012) Report Ref. No. 12/WR/27/6 Economics of balancing supply and demand EBSD report
[5] Guidance Note: Long term planning for the quality of drinking water supplies

2 Overview

We developed a set of internal methodologies for each of the key workstreams that make up the WRMP process. Each of these methodologies was shared with the EA to allow comment and feedback to ensure early engagement with our approach.

The options identification methodology set out:

- The proposed approach and outputs, as described in this technical report;
- Key indicative milestones through the options identification process;
- How we identified our own options as well as considering options from third parties; and
- Broad screening criteria and the application of these to all of the identified options in order to inform the final list of options used for the next stage (see *Draft WRMP19 Technical Report - Options appraisal*). To support this, a suite of environmental assessments have been completed to understand the potential impacts of the options and the environmental and social costs[6,7,8]. These assessments are discussed further in section 6.

Figure 1 Options identification processillustrates the overall options identification process which is further described in this report. There are a number of sequential activities required:

- Section 3 describes how we developed our list of unconstrained options that comprise a wide range of many different option types;
- Section 4 describes how we screened our unconstrained options in order to derive a smaller list of feasible options – called primary screening;
- Section 5 describes how we developed our list of feasible options further in order to understand costs of building and operating such options;
- Section 6 describes how we have assessed the possible environmental effects of each of the feasible options and how beneficial each of the options would be within our water supply system;
- Section 7 describes the factors that we used to further screen the feasible options in order to derive a smaller list of feasible (constrained) options – referred to from this point forwards simply as *constrained* options;
- Section 8 describes our approach to water trading exports from our supply system to other water companies; and
- Section 9 summarises the results of the options identification exercise and introduces the next part of the process, options appraisal.

[6] Strategic Environmental Assessment of the Draft Water Resources Management Plan 2019: Environmental Report
[7] Draft Water Resources Management Plan 2019: Habitats Regulations Assessment
[8] Draft Water Resources Management Plan 2019: Water Framework Directive Assessment

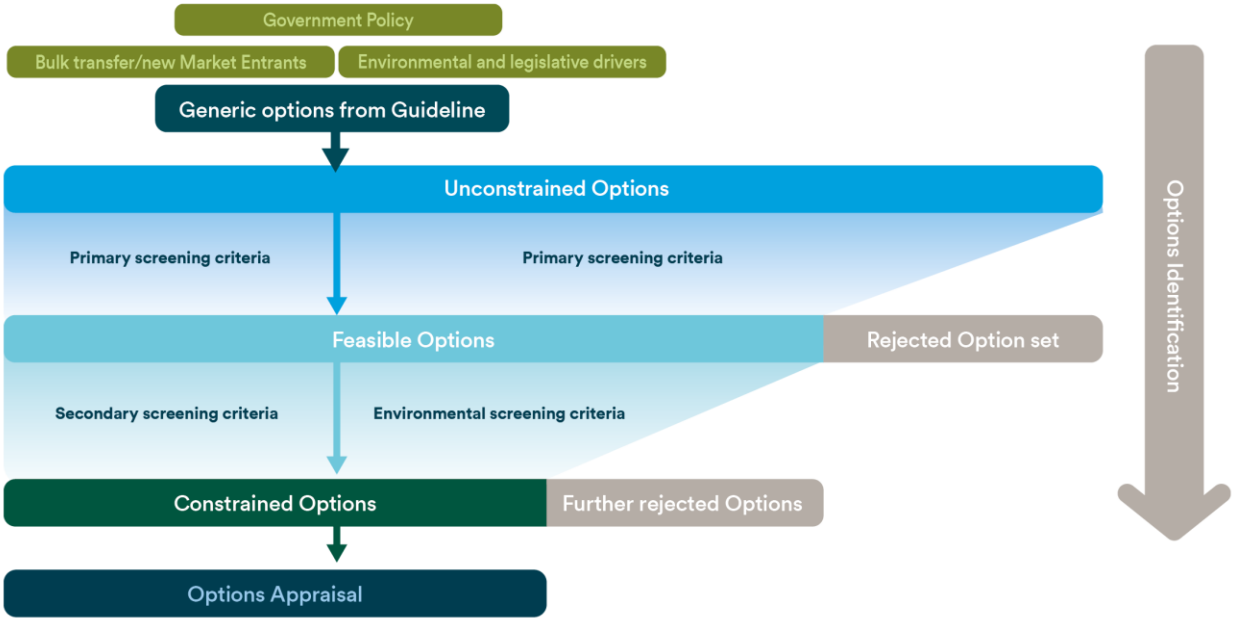

Figure 1 Options identification process

3 Unconstrained options

3.1 Overview

The first part of the options identification process, as required by the Guideline, is to develop a list of unconstrained options. Our new list of options is based on the 2015 WRMP list from which we already have a comprehensive account of options that have previously been evaluated. In developing this list further, we have considered both our own options and also those from new market entrants, termed third parties, which have been derived from a well-defined process. The WRMP options identification process needs to align with the ambition of the Ofwat Water 2020 document[9] that seeks to allow fair and equal access to the incumbent companies' water resources supply systems.

We have also engaged in bilateral discussions with water companies and water/wastewater retailers to identify opportunities to better share resources, either as imports to or exports from our water supply system. The third party options process is summarised in Section 3.7 and export options are discussed in Section 8.

In order to align with the wider Ofwat requirements of the PR19 planning process and distinct Price Controls[10], we have sought to separate our own options into Water Resources and Water Network plus options. Those options that provide raw water from our own existing or new sources become United Utilities Water Resources options. Those options that reduce the demand for water (United Utilities' own or from third parties) or that change water treatment works (WTW) or network connectivity become United Utilities Network Plus options, see Table 1. We also considered third party resource and demand management options. Together, the options are all considered in the same way and subject to the same process and tests during the options identification phase.

Figure 2 shows the various sources that have contributed to form our new set of unconstrained options.

Table 1 Option sources and generic descriptions

Option source	Description of option
United Utilities Water Resources (UUWR)	Primarily water resource options identified by our own Water Resources Price Control, but does include a small number of production side management options within this Price Control's ownership.
United Utilities Water Network Plus (UUWN+)	Primarily customer side and distribution side management options identified by our own Network Plus Price Control, but does include a small number of resource and production side management options within this Price Control's ownership.
Third party 'Resource'	Water resource or production side management options identified to us by third parties through our market engagement exercise, that also includes those options for import and export to existing water suppliers. These feed into the Network Plus Price Control to ensure parity with our own options.
Third party 'Demand'	Customer side and distribution side management options identified to us by third parties through our market engagement exercise. These feed into the Network Plus Price Control to ensure parity with our own options.

[9] http://www.ofwat.gov.uk/wp-content/uploads/2015/11/pap_tec201507markets.pdf

[10] https://064f1d25f5a6fb0868ac-0df48efcb31bcf2ed0366d316cab9ab8.ssl.cf3.rackcdn.com/wp-content/uploads/2017/07/Appendix-5-Water-resources-control.pdf

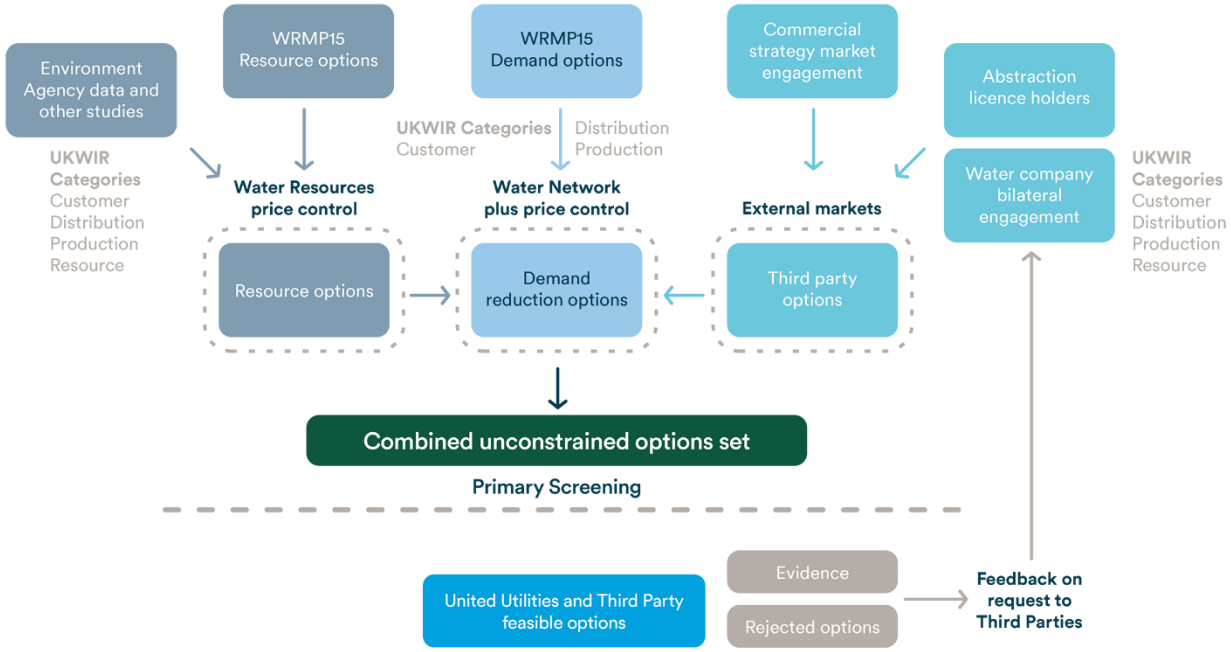

Figure 2 How the list of unconstrained options is formed

Four generic option categories have been considered when compiling the list of unconstrained options. These are the categories that are referenced within section 2.3 (Tables 2-5) of the UKWIR water resource planning tools report[4] that we have used as the basis for defining our options. The categories of options we have considered are detailed in Table 2.

Table 2 Option categories for defining unconstrained options

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

Those options (generally customer and distribution side management, but also including some production side management options) we have termed '*Demand*' options where the option provides a reduction in water consumed. This is to differentiate them from those options relating to the use of a source of water which are termed '*Resource*' options. This distinction in terminology is used from now on within this report.

Our demand management approach supports the population of the customer and distribution management options. The resource management options were assembled using the approach outlined in Section 3.2 and the production management options in Section 3.3.

Each generic option category contains within it a number of recommended option types and we have used the UKWIR report as the basis for the derivation of all of our options and, to ensure consistency of approach, 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. Therefore, our methodology 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 Guideline requirements. Appendix A shows the option types we have considered.

From the generic option types, the new unconstrained options are developed and the high level concept of what the option would entail is described. This allows the costs associated with the items to be assembled. In providing the scopes, we have not taken into account possible constraining factors such as, for example, planning restrictions (which would be considered further as part of detailed design) although risks with the option as far as possible are defined. However, a number of assumptions had to be made. For example, in the case of resource type options, the quality of the water source as well as the quantity of water the option could provide, the potential location of a new abstraction point or the amount of water that could be saved through the implementation of the options (e.g. mains leakage repair, water efficiency products). These high level assumptions are examined in more detail through the development of the option scopes and screening activities (risks are looked at further in the options identification process, in particular through the processes of Primary and secondary screening). In some cases, it was not possible to accurately ascribe an option capacity at the unconstrained option stage (e.g. unknown surface water flows or groundwater yields) and so these options remained as qualitative descriptions for primary screening.

Any options that were not technically feasible at this stage were discounted prior to becoming an unconstrained option. In effect this is a pre-screening stage and the reasons were documented as to why any decision to remove the option was made. Using the Guideline as reference, 'an unconstrained option may not be completely free from restrictions such as environmental or planning issues but should be technically feasible.'

The unconstrained options were captured separately for each of the separate Price Controls as follows:

Each option has been assigned a unique identifier reference, using the following numerical allocations in order to distinguish between the different option types. In some cases, alternative options have been subsequently identified following allocation of codes in which case sequential letters have been used to differentiate option variants. For example, options WR026 was sub-divided into WR026a and WR026b to reflect two separate but related scopes.

- United Utilities resource management options WR001 – WR180
- United Utilities resource export options WR400 – WR418
- United Utilities distribution side management options (leakage) WR500 – WR525
- United Utilities customer side management options (metering) WR600 – WR650
- United Utilities customer side management options (tariffs) WR700 – WR749
- Third party resource management options WR800 – WR849
- Third party demand management options WR900 – WR916

Using this approach, third party options are readily identified throughout the process, including within the final planning scenario, where applicable.

For all options including those offered from third parties, other than some customer management options[11], 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. We set this *de-minimis* volume to be 0.1% of our 2015/16 dry year, or critical period[12], distribution input for each water resource zone[13] (rounded to two significant figures). Options were considered if they equalled or exceeded the quantities shown in Table 3. However, we use judgement if there are options close to these volumetric amounts. Options are presented for all four current water resource zones prior to this WRMP submission (the Integrated and West Cumbria Resource Zones have now been amalgamated into the new Strategic Resource Zone).

[11] 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 an 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.

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

[13] We considered West Cumbria as an existing water resource zone for the purposes of identification of options, though the zone is due to become part of the Strategic Resource Zone following completion of the Thirlmere transfer scheme. This is immaterial to the process.

Table 3 De-minimis option capacity used as part of primary screening in 2016

Resource Zone	De minimis option capacity/demand saving benefit considered (cubic metres per day, m^3/day)	De minimis option capacity/demand saving benefit considered (Ml/day)
Carlisle	29	0.029
Integrated	1700	1.7
North Eden	5.8	0.0058
West Cumbria	52	0.052

The remainder of this section describes the process by which the unconstrained options have been derived. To accompany this, Figure 3 Schematic diagram of options that have been considered within this plan. A summary of the number of options defined at each of the stage of the process is provided in Table 6 at the end of this section. A more detailed breakdown can be found in Table 16 in Appendix A, which summarises the number of options against each type. Here, we also describe each option category and provide a summary of the main reasons why options have been screened out or retained.

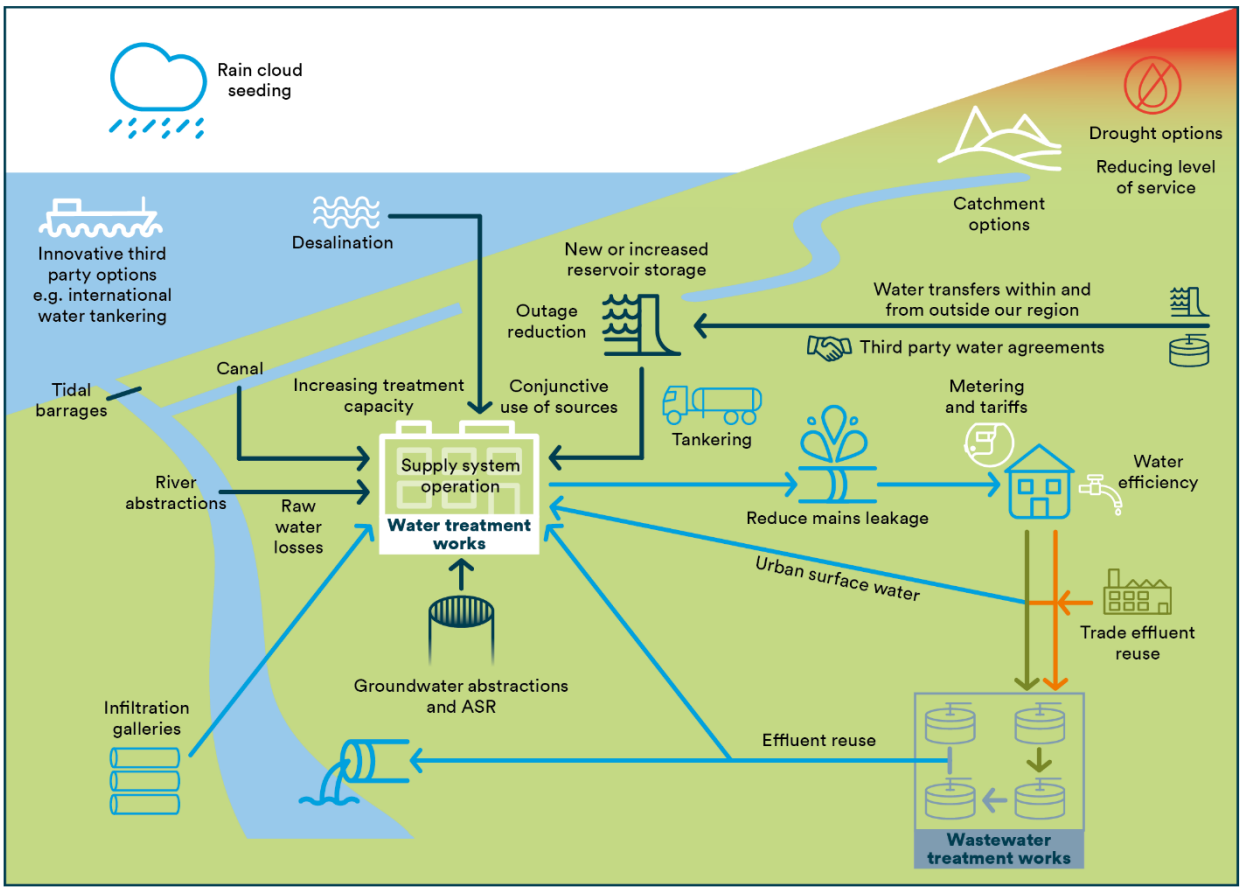

Figure 3 Schematic diagram of options that have been considered within this plan

3.2 UUWR resource management options

We developed a number of different approaches to identifying our own resource management unconstrained options. The option types as listed in Table 16 were used to derive the required categories of options that were considered and we ensured that there was representation of all option types plus the new bespoke option types not provided by the UKWIR recommendations. The processes we have followed for each type of options are described in turn below.

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 identifying possible options across the our supply area and beyond, whether these be from our existing sources of water (with or without valid abstraction licences) or potential new sources. The types of options we have considered can be split into five main categories:

- *Category 1* - Increasing the output of our existing sources – those with abstraction licences and that are currently in regular use;
- *Category 2* – Reinstate our existing sources – those with or without abstraction licences but which are not currently in use. This includes our drought contingency sources;
- *Category 3* - Increasing the storage capacity of our existing impounding reservoirs;
- *Category 4* - Construction of new impounding reservoirs; and
- *Category 5* - 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).

We used publically available Environment Agency datasets[14] in order to ensure that we considered full geographical coverage of the our supply area and to identify all of the available surface water and groundwater catchments where

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

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; 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 all of our existing abstractions to these 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 the 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 as to whether 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.

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 was 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 all of 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 10 reservoirs were developed into unconstrained options with indicative scopes provided for engineering assessment. These were attributed as RES options. We also considered the possibility of utilising other non-company reservoirs (where known to exist) and these were also included as part of this process and contact made to the reservoir owners through our third party process, see Section 3.7.

Potential new reservoirs in category (4), were considered in operational catchments where we do not have an existing impoundment structure. A preliminary hydrological assessment was made of the characteristics of the catchment to be impounded and a search of any other data/information that was available. This included previous option scopes as well as any internal or publically available information where reservoirs may have been proposed, but never constructed.

For any new abstraction locations, category (5), 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. A number of approaches were taken, using real data where available:

- For surface water options, flow data were ascribed to individual catchments either using the Environment Agency's catchment website (previously referenced) or the Centre for Ecology and Hydrology National River Flow Archive data pages[15]. In both cases, the purpose of this exercise was to ascertain the environmental

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

flow requirements in the watercourses or the flow conditions. In the example shown on Figure 4 Example of flow data derived for surface water options and used to support unconstrained options development, the low flow Q_{95} data was 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% of Q_{95} flow).

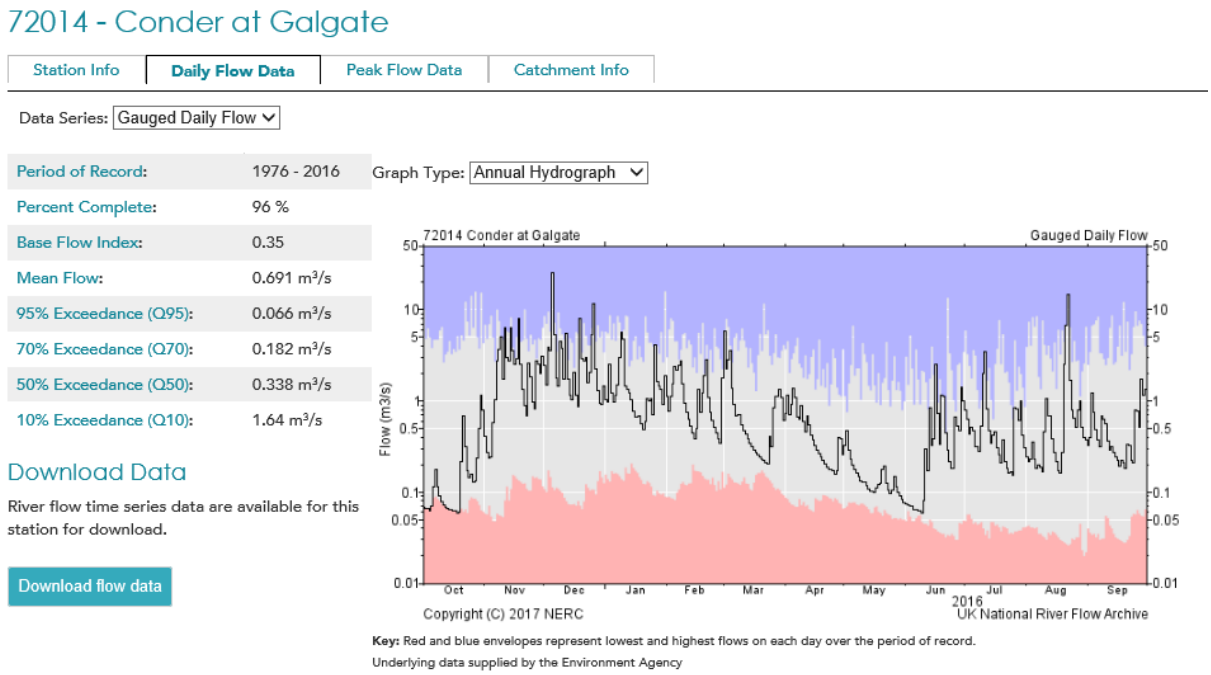

Figure 4 Example of flow data derived for surface water options and used to support unconstrained options development (as taken from Centre for Ecology and Hydrology National River Flow Archive web page)

In all cases, our own internal discussions, including with Water Asset and Network Management staff, was integral to the decision making process about the suitability of the locations of options in relation to either existing water treatment works or new water treatment works in order to best utilise the option capacity and seeking to minimise the option cost.

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 as a water resources management plan option. We completed an analysis of our wastewater network surface water catchments in order to understand which areas could generate significant flow volumes during a 1 in 30 year storm event. From this work, we highlighted five potential catchments that could generate flows up to 20 Ml/d after these type of events and we then considered where this run-off could be taken to for suitable treatment using our existing WTW locations.

There are a number of significant risks associated with development of these types of schemes:

- They are rainfall dependent and flows would be difficult to predict with any certainty. At times, flows would be low or zero and this may coincide with when the resource may most likely be required, e.g. summers. However, this could be mitigated with suitable storage;
- Water quality risks with the raw water or stored water are significant, would be difficult to predict with any certainty and therefore treat to the required water quality standards, and furthermore;
- Misconnected sanitary appliances, highway type spills, petrol service station leaks, stagnation of stored surface water prior to treatment could all present significant water quality risks.

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

In our previous WRMP, we did not develop any unconstrained options for ASR/MAR schemes. This was because we considered that they offered no significant advantage over development of new boreholes or existing unused boreholes in our supply region.

For this plan, we decided to look into the potential benefit of ASR/MAR in more detail and we have completed a feasibility study. There may be some potential for innovative operational solutions utilising ASR or MAR to support peak demands or there could be some potential water quality and hence water treatment benefits, which would in turn reduce costs. ASR/MAR are not currently used in our supply system and there are a number of potential technical/regulatory constraints that may limit their application.

The study assessed the feasibility of implementing ASR/MAR by grouping abstractions together based on their geographical proximity and hydrogeological setting. The objectives of the scope of this study were as follows:

- Assess the regulatory position in our supply region, largely associated with the Water Framework Directive (WFD) status of relevant groundwater and surface water bodies;
- Detailed hydrochemical analysis to assess the suitability of boreholes in the Cheshire area, notably from the injection of treated water from other public water supply sources. The study focused on a number of existing borehole groups in Cheshire, Merseyside and Lancashire;
- Use available hydrogeological data/information, including regional groundwater models, to review key criteria for the feasibility of ASR/MAR; and
- Summarise the above requirements into a clear ranking of suitability with recommendations for further work to reduce identified uncertainties.

The results of this 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 the implementation of the technique may lead to improvements in native groundwater quality that currently require treatment processes. 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 these types of options would lead to a successful outcome and detailed options are not suitable to be developed at this stage for inclusion as detailed unconstrained options.

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 is 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 in order 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, there is only one operational desalination plant in the UK used for public water supply purposes which is located in the River Thames estuary. Four potential locations for new desalination water treatment works were considered within our region, for both the Strategic Resource Zone and Carlisle Resource Zone. The locations 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 or 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 respect to dealing with dry year demand or drought in the region[16]. Therefore, it was concluded that there is limited potential to further connect together parts of the supply system and hence realise significant further benefits that could be considered as new unconstrained options in their own right.

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 Reductions 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 *draft WRMP19 Technical Report - Customer and stakeholder engagement.* The conclusion of this exercise was that customer preferences did not favour reduced levels of service, and demonstrated high willingness to accept valuations (to avoid deterioration) as part of our research.[17] 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 did include three proposals as unconstrained options relating to possible changes in relation to the implementation of temporary use bans, drought permit and non-essential use orders.

3.2.8 Outage reduction (OUT)

Outage is defined as a temporary loss of deployable output due to planned or unplanned events. An outage is temporary in the sense that it is retrievable and therefore deployable output can be recovered.

We have considered three 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;
2. Reduction in outages of raw water transfer systems through proactive asset condition assessment and smart operation of non-infrastructure assets; and
3. Reduction in water treatment works outage due to failure of critical assets, through criticality risk assessment, contingency planning, and asset maintenance (this is a Water Network Plus option)

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 8.

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.

[16] It should be note that this conclusion is distinct from any other needs identified under the water supply resilience assessment to hazards other than drought detailed elsewhere in the WRMP.

[17] This is particularly important to note in WRMP19, where our main need to appraise options has been driven by our exploration of water trading, which customers and stakeholders have stated should not result in deterioration of reliability or service.

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 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[18]. A generic unconstrained option was developed and presented to the primary screening process with these risks identified.

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 (reabstracted 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[19] 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[20]. 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% 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 WTW was already detailed as another unconstrained option with a new resource;

[18] 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

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

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

- The result of this work was that seven potential sites (six in the Strategic Resource Zone and one in the Carlisle Resource Zone) could be considered as unconstrained options;
- No options were selected for the existing West Cumbria Resource Zone, because there are only three existing WTW locations and once the Thirlmere transfer scheme is complete, the resource zone becomes part of the Strategic Resource Zone and there will be no proximal WwTW to WTW locations. An additional option was added to the unconstrained list to consider utilisation of final effluent from large works in West Cumbria, and;
- No options were selected for the North Eden Resource Zone which has very small WwTW locations geographically remote from existing small groundwater WTW 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 process 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.

3.2.15 Catchment management schemes (CAM)

We have considered whether there are any opportunities to increase the output of parts of our supply system and deployable output through improved raw water quality, reduced treatment and increased WTW outputs. This also aligns with the DWI guidance requirements to consider catchment management measures as well as the EA Guideline. Options considered are primarily for reduction in raw water colour for upland catchments, pesticides and solvents (Safeguard Zones) for lowland catchments. Table 20 in Appendix B shows where we have considered that there might be an opportunity to implement schemes on catchments/drinking water protected areas that could have a direct link to supply system benefits. Where these benefits are not yet known, but it is part of ongoing work, we will consider them for WRMP24 and have explained that the benefits cannot be ascribed as viable at this point in time.

Since 2005, we have delivered catchment solutions to address water quality issues under the banner of SCaMP (Sustainable Catchment Management Programme). In line with the Drinking Water Safety Plan methodology we routinely assess water quality risk and performance in all catchments, and where this is deteriorating we investigate. Where catchment measures are considered the most appropriate to protect supplies against long term risks of pollution, we work with the Environment Agency to designate safeguard zones for both surface and groundwater sources. Safeguard zones require voluntary action by third parties to prevent deterioration with a view to reducing the level of treatment required. We have in-house catchment teams that manage the 56,000 hectares of catchment land in our ownership as well as working with third parties to encourage the adoption of best practices on the remaining 720,000 hectares of non-owned catchment land.

We have had no exceedances since 2013 related to metaldehyde and continue to implement a programme of catchment management in the areas identified at as highest risk. Our annual reports to the Drinking Water Inspectorate on the undertakings at Huntington and Sutton Hall (UUT3236[21]) and Hurleston (UUT3235[22]) confirm that there have been no further occurrences of elevated concentrations of metaldehyde and we anticipate future compliance in relation to these parameters.

Examples of the activities we have completed to protect sources against pesticides include:

[21] DWI undertaking at Hurleston Water Treatment Works for Metaldehyde and total pesticides (UUT3235) http://dwi.defra.gov.uk/stakeholders/improvement-programmes/uu/UUT3235.pdf

[22] DWI undertaking at Huntington and Sutton Hall Water Treatment Works for Metaldehyde, mecoprop, MCPA and total pesticide parameters http://dwi.defra.gov.uk/stakeholders/improvement-programmes/uu/UUT3236.pdf

- Employment of catchment advisers to provide encouragement and support to farmers in adopting best practice;
- Subsidised metaldehyde product substitution;
- MOTs free national sprayer testing scheme and pelleter testing;
- Free services: weedwiper hire, sprayer training, pesticide amnesty, farm health checks;
- Passive and spot water quality monitoring to identify the level of risk by sub-catchment and to monitor the benefits of the interventions; and
- Use of geographical information (land use cover, erosion potential etc.) to model the highest risk areas and the potential effectiveness of mitigation measures.

In conclusion, and without greater certainty on definite benefits, new catchment based interventions are not suitable for WRMP19. Investigation work should continue through AMP6 in order to better inform WRMP24. We are working closely with other partners, such as the Environment Agency, in order to better define these benefits to our supply system.

It is worth noting that in part this conclusion reflects that we are a leading company in catchment management, e.g. with our SCaMP activities and therefore, whilst not being pursued as WRMP options in their own right, we are progressing such activities extensively to meet a wide range of business drivers and benefits which includes non-owned catchment activities as well as company owned catchments.

3.2.16 Drought Permits and Drought Orders (DPS)

Section 6.3.1 of the *Draft WRMP* 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. Whilst 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 DPS unconstrained options making sure that the supply side options, as listed in our current revised draft Drought Plan as drought management actions[23], were represented as resource management options. 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.

Please see *Draft WRMP19 Technical Report - Water supply resilience,* which documents our approach to incorporating wider water service resilience risks into our *Draft WRMP*. *Draft WRMP19 Technical Report - Supply forecasting* details an explanation of work to develop severe and extreme drought scenarios and results from testing of risk in this area. *Draft WRMP19 Technical Report – Options appraisal* explains how options appraisal and stress testing of the plan has included severe and extreme drought resilience as an integral component of decision making.

3.3 UUWR 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).

[23] https://www.unitedutilities.com/globalassets/z_corporate-site/about-us-pdfs/revised_draft_drought_plan_2017.pdf

The quantification of the losses was defined in this analysis as the losses between the abstraction meter and the WTW, 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. 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 and 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. This exercise provided two groups of options, see Table 4.

Table 4 List of reservoirs considered for improved reservoir compensation release control

Aquator reservoir group	Individual reservoirs
GROUP 1	
Mitchells	Mitchells 1&2
South Cumbria	Poaka Beck combined (Poaka Beck, Pennington & Harlock)
	Levers Water
Blackburn	Fishmoor (Total)
Macclesfield IR	Ridgegate, Trentabank
	Lamaload
Wet Sleddale	
Bolton IR's	Wayoh, Entwistle, Jumbles
	Delph
	Springs, Dingle
Rochdale	Ashworth Moor
	Greenbooth, Nadens (x2)
	Springmill, Watergrove & Cowm
Burnley	Hurstwood
	Cant Clough
	Swinden 1&2
	Laneshaw
	Coldwell Upper & Lower
	Ogden Upper & Lower
	Churnclough
Stocks	
Oldham	Piethorne, Norman Hill, Kitcliffe, Ogden Milnrow, Hanging Lees, Rooden

Aquator reservoir group	Individual reservoirs
	Warland
	Light Hazzles, Whiteholme, Blackstone edge
	Castleshaw Upper & Lower
	Readycon Dean, Crookgate, Dowry, New Years Bridge
Buckton Castle	Greenfield valley-Greenfield, Yeoman Hey, Dovestone, Chew
	Brushes, Walkerwood, Swineshaw Lower & Higher
Wybersley IR's	Kinder
	Errwood, Fernilee
	Bollinhurst, Horse Coppice
Rossendale	Calf Hey, Ogden (Grane), Holdenwood
	Cowpe, Cragg Holes
	Scout Moor
	Cloughbottom
	Clow Bridge
Longdendale & Audenshaw	Longdendale (Woodhead, Torside, Rhodeswood, Vale House, Bottoms & Arnfield) & Audenshaw 1,2 & 3
GROUP 2	
Thirlmere	
Rivington	
Haweswater	
Vyrnwy	

In response to pre-consultation feedback from stakeholders, we also defined an option that considered modifying existing operating policies to pump from strategic Lake District reservoir sources at different times (i.e. at high reservoir levels) to understand whether that would provide any additional benefit to our supply system. Subsequently, in the recent update to our Drought Plan, we have committed to pumping from Ullswater and/or Windermere when storage at Haweswater is below a specified level and subject to certain other conditions. The WRMP supply forecasts are consistent with this commitment. In parallel to the WRMP development, we are also completing a review of the Windermere abstraction licence in conjunction with the Environment Agency and the Windermere stakeholders to assess alternative operating scenarios. Therefore, with the current work to define these principles, there is not a viable new option to be assessed at this time.

3.4 UUWN+ resource 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 possible options to increase the treated water output within parts of our supply system:

- We looked at where there are 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
- Where there was the potential to remove any of these constraints.

This defined four possible options (three within the Strategic Resource Zone and one in the North Eden Resource zone which also qualified as an ICT option too).

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 2% 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 drivers for the installation of the membranes at nine treatment works was to secure water quality compliance for raw water sources that have high risk of cryptosporidium in the water or high raw water turbidity values that would be difficult to treat with gravity treatment processes. Two of these works are due to be replaced by the new Thirlmere transfer scheme. However, the requirement remains at the other locations to maintain a suitable water quality barrier to high risk raw water supplies hence there is little opportunity to seek greater water efficiency at these sites.

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, headloss 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 10% inlet flow to be recycled to the head of the works to manage risks of contamination. The remaining wash water is either thickened into a sludge and discharged to sewer/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 are currently addressing specific water loss issues at two water treatment works which includes the removal of slow sand filtration at Oswestry water treatment works which was originally designed to have “losses” of 6 Ml/d.

Having conducted a thorough review of WTW process losses and identified that they amount to less than 2% 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 UUWN+ distribution management options

We have developed distribution management options that seek to address reducing the amount of water that we have to abstract from the environment to supply our customers. Distribution management options mainly relate to reducing water mains leakage both on our own pipes, but also on the customer supply pipes. The option types can be split into four main categories:

- Leakage reduction through additional detection, repair and pressure management;
- Leakage reduction through additional network metering and meter verification;
- Leakage reduction through infrastructure replacement; and
- Reduction of customer side leakage.

Some the options are based on new activities that are not part of our business as usual process. There are, however, options that have been derived on the assumption of doing more of current business as usual activities, this is indicated in the option name descriptions.

3.5.1 Leakage reduction through additional detection, repair and pressure management (LEA)

The cost curves generated in our assessment of the economic level of leakage were used to determine costs, number of pressure management schemes, number of repairs and resources required for each stage of planned leakage reduction. The assumption is that each stage must be implemented in sequence i.e. stage 1 must be completed before stage 2. Leaks at each stage of detection and repair become harder and more expensive to ‘find and fix’. A shift from one level of leakage to another will incur both a one-off “transitional” cost to achieve the step change, and an increase in the level of annual expenditure required to maintain that new, lower level of leakage. Leakage reduction options comprise of employment of additional trained leak detection personnel and analytical resource, purchase of additional leak detection equipment, repair of the extra leaks that are detected and building or optimising a number of pressure optimisation schemes.

Information used in option costings was obtained from our Finance teams and validated with the Network Business Manager and Regional Leakage Manager to ensure that modelled costs are reasonable and reflect actual level of expenditure required to achieve proposed leakage reduction.

Five stages of leakage reduction have been modelled for each resource zone.

3.5.2 Leakage reduction through additional network metering (LEA)

An increase in the measurement of flows around the water distribution network may deliver benefits for leakage and demand management. Additional metering may be applied at several levels from distribution input, trunk mains and intermediate meters, to district areas and customer meters. In 2012, we engaged consultants to carry out a high level assessment and desktop analysis to understand the potential benefits of additional metering and the scale of investment required to bring them about. The following options were identified:

- Increased verification of existing meters;
- Increased number of continuously logged meters;
- Widespread metering using Automated Meter Reading (AMR)[24];

[24] AMR – automater meter reading

- Splitting District Meter Areas (DMAs)[25];
- Splitting large upstream tiles[26]; and
- Establishing water balance areas.

The main benefit of these schemes is to provide better information so that maximum accuracy in flow measurement is gained. Inaccurate meter or logger readings will give misleading information regarding water demand therefore making leakage calculations inaccurate. By improving the accuracy of the meter and logger readings, a more exact calculation of leakage can be assessed for upstream and district areas. As the leakage calculation improves, areas can be correctly prioritised for detection surveys to locate and repair leaks. This should result in leaks being identified more easily and quickly, resulting in a reduction of their run-time. Run-time is the time it takes to identify and fix a leak.

We have used the outputs of this analysis with refreshed costs and estimates of backlog leakage on DMAs and trunk mains to recalculate the benefits of these options.

3.5.3 Leakage reduction through infrastructure replacement (LEA)

Although infrastructure replacement is incorporated into our economic level of leakage (ELL) model, no schemes were selected for defined leakage reduction stages. For completion, and to demonstrate that we have investigated the potential of mains replacement options to further reduce leakage we have used our internal investment planning tool (PIONEER) to identify DMAs with the highest burst frequency rates, where water savings due to reduced bursts and leakage are expected to be the highest. PIONEER was also used provide costs of replacing all distribution mains in those areas with the exception of plastic pipes. Five options for infrastructure replacement have been selected for the Strategic Resource Zone and included in the unconstrained options list.

3.5.4 Reduction of customer side leakage (LEA)

We have commissioned external consultants to use the findings of the recent UKWIR report on the economics of supply pipe losses[27] and to explore the impact of changing our current policy on supply pipe repairs. The model was also used to test a number of scenarios for inclusion in the option appraisal process, these were:

- introduction of proactive monitoring for household meters;
- introduction of proactive monitoring for non-household meters;
- replace rather than repair supply pipes for households; and
- offer a free repair policy for non-households.

The model developed by UKWIR was updated with company specific information related to supply pipe leaks and used to calculate costs and benefits of these options. The approach and data requirements are covered in detail in the final report[28].

3.6 UUWN+ customer management options

These options are primarily relating to working with our customers to reduce the amount of water that they consume. This can be through metering of supplies or reducing the quantity of water through water efficiency products and techniques.

The process followed to derive the unconstrained list of options for water efficiency, tariffs and metering consisted of the following steps:

- Review of the unconstrained list of options from our 2015 WRMP. This included reassessment of options previously screened out and with the new guidance documents and learnings from AMP5 (2010-2015) in mind;

[25] DMA – district meter area, hydraulically discrete section of distribution network
[26] Upstream tiles – metered sections of trunk mains where it is possible to carry our flow balances
[27] (Crowder Consulting, 2016)
[28] Economics of Supply Pipe Leakage, Crowder Consulting, 2016.

- Review of the generic set of demand options from the previous WRMP guidance. Any identified viable options were added to the unconstrained list to take forward into the primary screening; this included targeted water conservation information (advice on appliance water usage);
- A systematic review was carried out of other water companies' WRMPs from 2014/15 plans to understand what they had done and how this may assist in defining our own unconstrained option list; we were able to compare ourselves to other water companies and see that we identified and delivered very similar options to the rest of the industry;
- All trials and research carried out in AMP5/AMP6 were also reviewed and considered as potential options for implementation in AMP7; we have a much better insight into home audits and the potential install rate for the different products currently available;
- A desktop study was completed using knowledge from the water efficiency evidence base and other relevant studies across the industry and beyond; and
- Learnings from the numerous industry steering groups we contribute to were used to enhance water efficiency research, collate evidence from around the industry and add other unconstrained options to the list.

Following completion of the above steps, numerous workshops were held with internal colleagues and subject matter experts to review options already identified and add any other proposed viable options to the unconstrained list. This included experts from different areas of our company, including domestic retail, metering, economic regulation and finance. All options were considered and added to the list for further investigation. This included looking at all relevant costs, viability and potential benefits for carrying out each option at different levels of delivery.

When reviewing the unconstrained list of options, whenever it was viable, options were rolled up together to achieve increased benefits. An example of this is in our last WRMP where we had an option to distribute shower heads, whereas this time all options that include products will aim to distribute or install as many appropriate products as possible.

Through this process we have identified 24 customer metering options, 10 tariff options and 34 water efficiency options. These are outlined below.

3.6.1 Metering

Customer metering options assume use of AMR meters and include the following options, three letter abbreviations included for reference:

- Enhanced FMO promotion – various (CME);
- Compulsory Metering (MIP);
- Metering on change of occupancy (MIP);
- Meter void properties (MIP);
- Meter remaining unmetered non households (MIP);
- Installation meters/meter boxes when premises change ownership (MIP);
- Meter all households where a meter or meter box already exists (MIP);
- Meter all properties without changing the customers unmeasured status (MCS);
- Fit meters onto all properties that have a site visit for stop tap repairs and service renewals (MIP);
- Refer a friend meter installation scheme (RAF);
- Meter all households with an outside tap (MIP);
- Compulsory metering of homes with swimming pools (MIP);
- Target and meter illegal connections e.g. problematic geographical areas (Southport, seasonal issue with market gardens) or farm troughs (MIP);
- Improve meter maintenance strategy to reduce meter under registration (MIP);
- Switch existing non household meters from 'dumb' to AMR with advise (EMT);
- Metering of sewerage flow (to manage water consumption and water wastage) (MSF); and
- Advanced Metering Infrastructure - Fixed Network (SMART meters) (EMT)

Draft WRMP19 Technical Report – Demand for water (Section 2.2) describes our policy and approach to metering and how we are looking, for example, to improve the efficiency of this process by assessing the most cost effective ways of reducing the length of time a customer will be required to wait for a meter. None of the new tariff options we considered passed the primary screening criteria. They were excluded mainly on the basis of breaching unalterable planning, regulatory, or environmental constraints or not having enough certainty that potential savings will translate into a Water Available For Use (WAFU)[29] benefit.

Due to legal constraints, metering customers without their permission is either not possible (as we are not in a water stressed area[30]) or very difficult when considering reputational impacts. Therefore, only five options passed the primary screening criteria and these were mainly focused on enhancing our current free meter option scheme with the exception of metering on change of occupier.

3.6.2 Fees and tariffs

Tariff options included the following:

- Unmeasured tariff should be a 'premium' tariff, i.e. increase unmeasured charges according to rateable value (IST);
- Introduction of special tariffs for specific user's e.g. "interruptible" industrial supplies, lower charges for major users with significant storage, higher cost "ban free" sprinkler or hosepipe licences, spot pricing for selected customers (IST);
- Introduction of special fees - charge special (additional) fees on households who use garden sprinklers, hosepipes, outside taps or swimming pools (ISF);
- Seasonal Tariffs (EMT);
- Rising Block Tariffs (EMT);
- Time of Day Tariffs (EMT);
- Reduce bill by an agreed amount if property has water efficient products fitted (REB);
- Remove fixed standing charge so customer only paying a true volumetric charge (EMT);
- Develop payment scheme to migrate customers onto measured bills (EMT); and
- Pay the lesser of tariff – customer would pay the lowest charge (between RV and meter) for the first two years and then they can decide whether they want to opt in or out (EMT).

Draft WRMP19 Technical Report – Demand for water (Section 2.2) describes our approach to setting tariffs and how we have set up schemes, as example, to support vulnerable customer groups. However, none of the new tariff options we considered passed the primary screening criteria. They were excluded mainly on the basis of breaching unalterable planning, regulatory, or environmental constraints or not having enough certainty that potential savings will translate into a Water Available For Use (WAFU)[29]. benefit.

3.6.3 Water efficiency

Water efficiency options included the following:

- Enhanced - above baseline activity - Water Efficiency Enabling Activities - offering free water butts to customers (WSD);
- Enhanced - above baseline activity - Water Efficiency Enabling Activities - offering subsidised water butts to customers (WSD);
- Enhanced - above baseline activity - Existing domestic water saving retrofit products – distribution (WSD);
- Enhanced - above baseline activity - Existing domestic water saving retrofit products - installation through smart home visits (ISD);
- Innovative technologies/products – distribution (WSD);
- Innovative technologies/products – installation (ISD);
- Enhanced education programme (EDU);

[29] The value of Ml/d calculated by the deduction from deployable output of allowable outages and planning allowances in a resource zone

[30] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/244333/water-stressed-classification-2013.pdf

- Domestic rainwater harvesting system - existing households (WEE);
- Domestic rainwater harvesting system - new build households (WEE);
- Domestic rainwater harvesting system - non-households (WEE);
- Enhanced - above baseline activity - Partnership projects with public and third sector organisations, e.g. Housing Associations (PPO);
- Do as I do - This project focuses on water use on all UU 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 (WUU);
- Fixing leaking toilets (WUA);
- Targeted water conservation information (advice on appliance water usage) (WEI);
- Intensive area / community based communications (WEI);
- Enhanced - above baseline activity - Provision of free water efficiency goods and advice to all newly metered customers (WSD);
- Develop customer app to enable continued engagement with the customer, to help long term behaviour change (APP);
- Enhanced - above baseline activity - Offering water efficiency home checks when installing a meter at a customer's property (WUA);
- Provide a financial incentive to customers who reduce their usage by 10% from the previous year (REB);
- Enhanced - above baseline activity - Targeted water efficiency advice for industrial/commercial customers (WEI);
- Enhanced - above baseline activity - Targeted water efficiency advice for public sector customers and recreation facilities (WEI);
- Targeted water efficiency advice for purchasers of water using appliances - at home/at point of purchase (WEI);
- Target shorter showers at adolescents (WEI);
- Target water consumption in university accommodation (WEI);
- Target water consumption in university private rental sector (WEI);
- Target water consumption at the community scale (WEI);
- Subsidy to customers that purchase water efficient appliances (washing machines, dishwashers, showers & WC's) (REB);
- Treated greywater reuse - existing households blanket promotion (WER);
- Treated greywater reuse - new households blanket promotion (WER);
- Treated greywater reuse - existing non-households blanket promotion (WER);
- Treated greywater reuse - new non-households blanket promotion (WER);
- Rainshare: community rainwater harvesting (WEE); and
- Gamification - creating customer water efficiency league table (WEE).

A number of the unconstrained options did not pass primary screening as they were deemed business as usual and activities that we are already using, please see *Draft WRMP19 Technical Report – Demand for water*.

As examples of how these options failed the screening process, this was due to the timing of current trials:

- A gamification trial is currently being designed and implemented, however, the timing of this means that no results will be available for this WRMP so may be considered in future plans as an option; and
- Although a completed trial on community based communications did not show any clear benefit, it is not possible to state that such approaches would not work in future taking account of lessons learnt from the trial. We therefore plan to complete more trials during in AMP6 (to 2020). We have considered other behaviour change options such as increased education visits.

Other reasons for not passing primary screening included having no current evidence of savings, activity currently planned as a trial in AMP6, not meeting the *de-minimis* threshold, see Table 3, and activity that now falls out of our remit, due to retail separation, being now the responsibility of the individual retailers.

We have combined a number of options that were treated separately in our 2015 WRMP such as the distribution or installation of individual water efficiency products to ensure these are cost beneficial.

Costs and uptake rates were gathered from numerous sources. These included, wherever possible, actual data from our previous projects and trials; data from other industry wide projects and from potential suppliers. Estimates based on internal expertise were used, where no actual costs or uptake rates were available.

3.7 Third party options

3.7.1 Seeking innovation – our approach to market engagement

The inclusion of third party options has been a priority consideration for us throughout the development of this WRMP.

Alongside our own options, we developed a commercial strategy in order to allow other water companies and new market entrants (termed third parties) an unbiased opportunity to put forward ideas (e.g. for managing demand or supply of new resources) that could be considered beneficial for customers particularly if these options are cheaper than our own alternatives. An important resource management option that has been considered in this plan relates to the bulk transfer of water into, out of and within our own supply area. Options to improve the connectivity between water companies and to better share existing abstraction licences can also potentially lead to better value for customers. Our approach to this market engagement activity is summarised on Figure 5 Our approach to considering third party options and Figure 6. The three main types of option category that have been generated are:

- *Water trading options* – transfers of water between water companies and licensed undertakers that have been formulated through distinct bilateral engagement. These could be options to import or export water from our supply system. Water imports to our region are discussed within this section; water exports from our region are discussed in Section 8;
- *Abstraction licence trading options* – this provides other individuals, companies or organisations (non-water companies) with opportunities to trade water with us, for example to sell their abstraction licence rights; and
- *Third party resource or demand options* – allowing others to provide demand reduction (e.g. leakage, water efficiency) and/or resource options, which could lead to lower costs when compared to our own options.

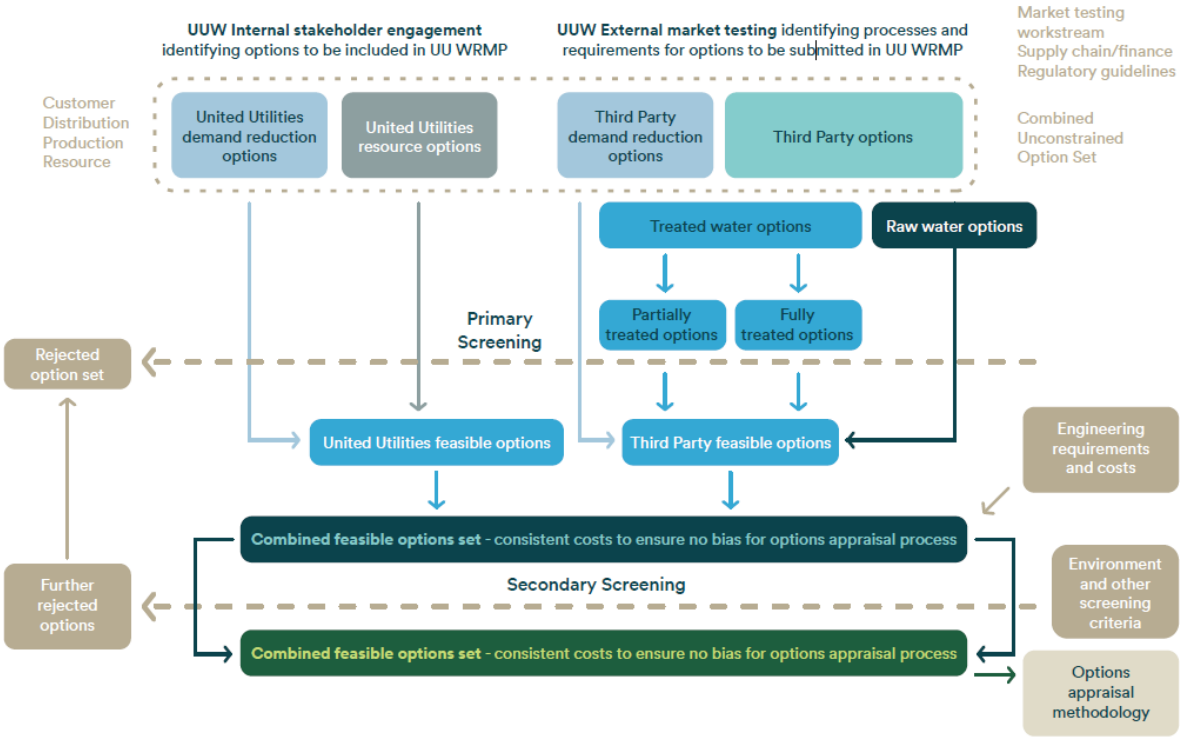

Figure 5 Our approach to considering third party options

Some of these options may have considerable uncertainty, for example an unknown yield/capacity or demand saving for a new technique or process. Where options do have uncertainty, we have accounted for this in the same way as our own options as part of the current process. However, we have ensured that any third party options that have come into our WRMP process via this route have been retained on our potential list of options for future consideration. We will also look whether pilot trials are appropriate to support baseline activity as opposed to just discrete WRMP options.

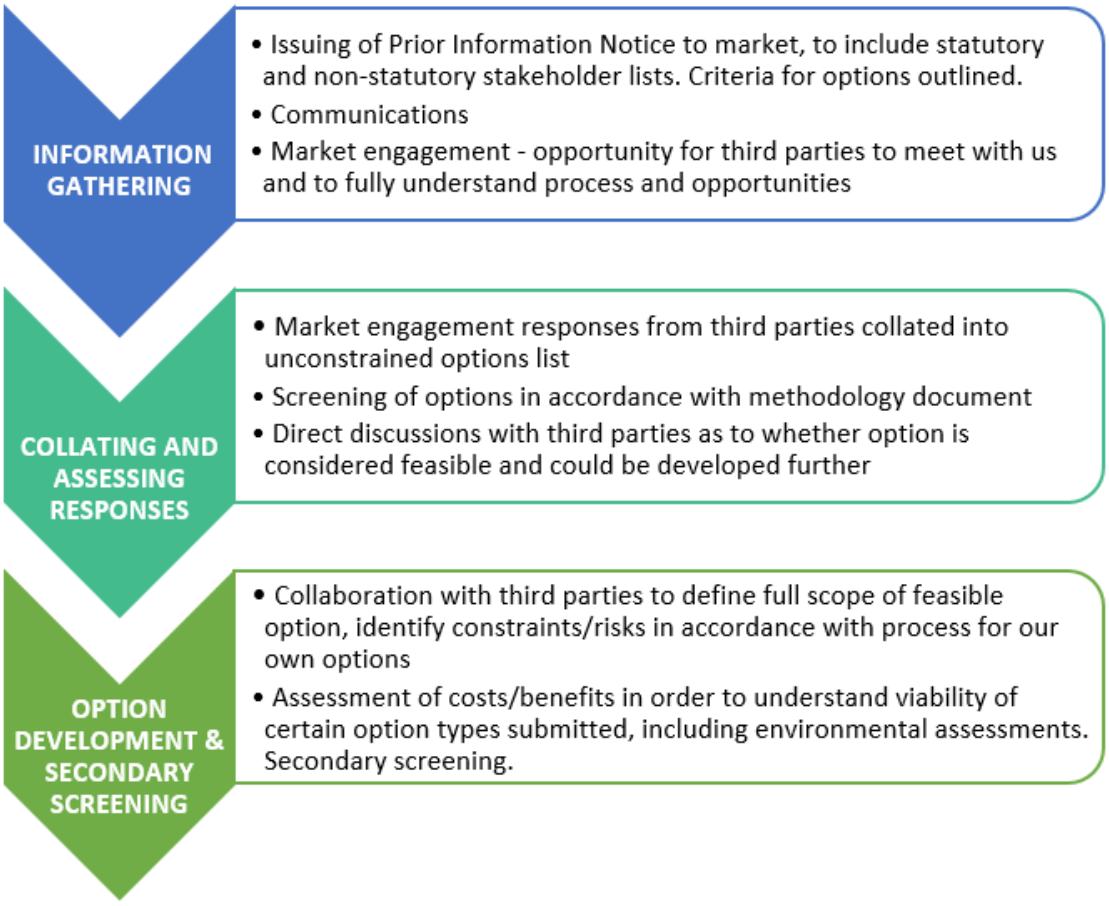

Figure 6 Our approach to engaging with third parties

3.7.2 Information gathering

Our approach to market engagement as part of the information gathering phase was completed via a number of separate activities:

- Communicating with known and potential new third parties from a contact list via direct correspondence. This list includes: water companies, water/wastewater retailers and licensees[31,32], abstraction licence holders (received following discussions with our local Environment Agency contacts), local authorities, reservoir owners and landowners, businesses known to offer demand reduction services and options from third parties who had previously expressed an interest in providing options in during our previous WRMP. Between August and September 2016, we sent out over 350 individual communications to these organisations notifying them of the WRMP process and how they could input;

[31] https://www.ofwat.gov.uk/regulated-companies/ofwat-industry-overview/licences/#wssl
http://www.open-water.org.uk/for-customers/find-a-retailer/suppliers/english-water-and-wastewater-retailers/
[32] From 1st April 2017, holders of new water supply and/or sewerage licences can provide supplies of water and sewerage services to eligible non-household premises.

- Looking for expressions of interest by publishing a Prior Information Notice (PIN) within the Official Journal of the European Union (OJEU)[33]. This provided a summary of the WRMP process and a response template of required information/data of how third parties could contact us with any ideas they wished to submit. We also communicated to the contact database providing notification of the PIN publication and response deadline. This PIN was active for a period of six weeks between August and September 2016. Appendix C and Appendix D show the PIN document and response templates.
- Publishing a market engagement request '*Can you help us …*' on our external website with response forms. We had 20 expressions of interest submitted via this route; and
- Holding a market engagement event to discuss the process with interested third parties that responded to the communications. Fourteen individuals and organisations attended this event in September 2016.

3.7.3 Collating and assessing responses

Following the separate lines of communication and the market engagement event, those parties that remained interested were asked to develop their options to a sufficient level of detail, if this was not done so already. This was completed by correspondence on a one to one basis. Those options as provided from third parties, water companies and abstraction licence holders were assembled alongside our own unconstrained options. Discussions regarding water export options took place concurrently.

The respondents varied greatly in their understanding of what they could offer, from large water companies with detailed understanding of their supplies, to small abstraction licence holders with minimal knowledge of water quality for their source or how to price the water that they may have available, to companies working in the demand management field keen to offer to work with us with a new product or technique. We have made effort to ensure that all interested parties had the opportunity to provide the necessary detail and all third party options submitted were included in the unconstrained options list.

The process of assessing the responses was the same for all options that being the unconstrained to feasible options stage, through the process of primary screening. Primary screening was completed by an external organisation (Amec Foster Wheeler) that we appointed to ensure all options were considered equitably (see Section 0). Our liaison continued with those organisations who had tabled options up to and after primary screening to at least the point of closure on the activity log and will remain on file for potential future consideration, to be contacted as part of the next WRMP.

In this way, we consider that we have ensured that as many third party options as possible are included in our unconstrained options list. We have invited/considered third party collaborations using a defined procedure and used a multi-platform approach to ensure that we reached as many third parties as possible. Through the process of option scope development, we have provided a clear explanation of why these types of options have or have not been included in our list of feasible options. Within this process, there has been an emphasis on engaging third parties to identify and help deliver solutions at lower cost, and consequently a number of third party options have been considered relating to upstream services, leakage detection and demand management.

3.7.4 Third party options – summary

Overall, the processes we followed resulted in the development of 67 third party unconstrained options (both resource and demand management). These covered a variety of different categories and we have provided a summary of the options in Table 5 and Appendix E. A summary of these option types is detailed below. The options that were provided were discussed with the third party and in some cases, did not progress through to primary screening by mutual agreement, e.g. where it was agreed that the original option as tabled was a process change that would not lead to a discernible output with certainty. The remaining options and provisional scopes were all progressed to primary screening.

[33] It is a legal requirement for companies operating in many sectors to publish their tenders in the OJEU, e.g. water utilities, gas, oil, electricity, railway, postal services, port and airport related activities. 160,000 tenders a year are published through OJEU of which about 14,000 are from the UK and so the journal is used extensively by potential suppliers of services.

Table 5 Summary of third party options considered as unconstrained options

Third party option category	Scheme types	Number of options submitted
Customer management	APP, SWE, WEI, WEP	4
Distribution management	LDF, LEA	13
Production management	APP, PRO	2
Resource management	INT, ITC, NIT, RWT/NIT, RWT/WIT, WIT	48

Categories and types of third party options considered are as follows:
Customer management

(APP) Customer awareness and smart metering thereby reducing water demand; enhanced metering using an innovative programme based on the experience from the energy sector.

(SWE) Variable river abstraction charges to promote reduced abstraction - based on real-time river flow modelling.

(WEI) Water efficiency gains through customer behaviour change pilot programmes.

(WEP) Whether changes to Local Authority plans, in the context of new residential development targets for water consumption, could see reduced demands for water in certain areas.

Distribution management

(LDF) Water Efficiency. Reduction of customer side leakage at non-household properties.

(LEA) Leakage reduction services, data analysis, network optimisation, intelligent identification of leaks.

Production management

(APP) A new water supply planning tool and whether this could see benefits in water.

(PRO) Identification and reduction of process losses using benchmarking tools.

Resource management

(INT) The third party offered to ship water from locations in Europe into our supply region. The practice of bulk supplying water has been documented to have been proposed in other parts of the world, most notably from Canada and Alaska to the USA and Asian markets, but has never materialised into actual trades as far as we know.

(ITC) Monitoring of incoming water to secure quality, leading to increased abstraction; future network resilience.

(NIT) Making abstraction licences or capacity from sources available: surface water, groundwater, mine water discharges.

(RWT/NIT) New abstraction licences or utilisation of disused abstractions, principally from canal systems.

(RWT/WIT) Trading of existing abstraction licences from reservoirs and groundwater, both untreated and treated water.

(WIT) Sourcing and bulk supplies of water at standardised prices, reduction in non-potable supplies thereby releasing water for us to reabstract and utilise within our supply system.

Table 6 Summary of total number of options considered at unconstrained, feasible, constrained stages#

Option category	Unconstrained options	Feasible options (after primary screening)	Constrained options (after secondary screening)
CUSTOMER	**72**	**88**	**27**
Third Party	4	1	1
United Utilities	68	87	26
DISTRIBUTION	**34**	**54**	**32**
Third Party	12	15	14
United Utilities	22	39	18
PRODUCTION	**10**	**7**	**3**
Third Party	2	0	0
United Utilities	8	7	3
RESOURCE	**223**	**160**	**78**
Third Party	48	26	10
United Utilities	162	121	55
United Utilities drought permits and orders	13	13	13
TOTAL	**339**	**309**	**140**
United Utilities Export options	18	18	12

It is important to highlight that in some cases, the number of feasible options is higher than the number of unconstrained options because a generic unconstrained option has been sub-divided following primary screening to allow for a robust cost estimate for option delivery. This is particularly relevant for the demand management options. Also, the numbers of options presented to Amec Foster Wheeler for the primary screening process (See Section 4.4) differ slightly from these numbers here in that individual options originally identified as separate unconstrained options in this table, were sometimes consolidated together for the purposes of screening and to expedite the process.

4 Primary screening

4.1 Overview

The principles for the primary screening are to ensure that:

- all options have been subjected to the same scrutiny and testing. It is our priority that these criteria have been applied consistently across all unconstrained options, both our own and those received from third parties thereby achieving a balance between the number of feasible options and the availability of realistic choices; and
- the screening criteria applied provide an initial consideration of environmental impacts. In doing so, all possible and discarded options consider the potential to have unacceptable impacts that cannot be overcome, noting that more detailed environmental assessment is completed on feasible, constrained and preferred options at subsequent stages of options identification and options appraisal.

Our original methodology for the options identification workstream considered three key questions[34] that were required for the primary screening process:

- Whether the option had the ability to increase deployable output or reduce the demand for water;
- Whether implementation of the option could fail due to unalterable planning, regulatory and environmental constraints and regulations; and
- Whether there was a risk of failure or inherent uncertainty if the option was implemented, e.g. unproven technology, poor data to provide the necessary evidence that the option would succeed.

Using these questions, we worked with Amec Foster Wheeler to develop a more detailed approach and methodology so that they could complete primary screening of the unconstrained options set. They were also appointed to complete the suite of environmental assessment work for the options identification phase and to audit the secondary screening process, the results of which are summarised in Section 7.2.

The primary screening criteria and methodology were developed jointly between ourselves and Amec Foster Wheeler, but we did not apply the screening criteria to the unconstrained options. In doing so, and allowing Amec Foster Wheeler to complete this exercise, this provides evidence of a systematic, rigorous and consistent approach to evaluate all unconstrained options together and to produce the list of feasible options.

This core screening criteria was supported by additional tests/sub-criteria as appropriate to the nature of the options being screened (i.e. whether resource management options or demand management options). This is discussed in the following section.

4.2 Resource Management options

For resource management options, the underlying principle at the primary screening stage was to identify those unconstrained options that would be significantly problematic or fundamentally infeasible. The screening methodology for these types of options comprised two stages:

- Quantitative numerical testing; and
- Qualitative clarifications and revision to determine the appropriate outcome.

The level of information describing the resource management options was sufficiently consistent to enable a range of numerical (quantitative) analyses to be undertaken thereby reducing the subjectivity associated with option screening. Whilst this type of quantitative analysis provided an initial view of primary screening outcome, additional qualitative intelligence on localised catchment issues and an appreciation of the sensitivity of data was required to help inform and refine the screening process and validate the results of the quantitative testing.

[34] The UKWIR methodology discussed five separate screening questions, which have been amalgamated here into the three principal screening criteria questions

4.2.1 Stage 1 - Quantitative testing

All water resources options were screened to determine their hydrological performance including in respect of impacts on flows, compliance against environmental flow objectives and related impacts on the quality of water dependent habitats. Eight specific tests were designed to interrogate different aspects of the options, as follows:

- Test 1: *Does the expected capacity of the option provide a significant contribution?* This allowed for the *de-minimis* threshold to be applied per option for the relevant resource zone;
- Test 2: Availability of water - *does the proposed source indicate an 'environmental surplus' sufficient to provide the expected option capacity under scenario conditions?;*
- Test 3: *Does the proposed source (surface water) currently contain high status biological Water Framework Directive (WFD) elements? Is pristine biology at risk?;*
- Test 4: *Does the proposed source have WFD objectives to improve to good or high by 2021 or 2027? Will statutory WFD objectives be put at risk?;*
- Test 5: *Is the proposed source potentially connected to, or upstream of, a protected area or designated site (Habitats Directive sites (HD), Special Protection Areas (SPA), Special Areas of Conservation (SAC) and/or Sites of Special Scientific Interest (SSSI)? Are key designated sites at risk?;*
- Test 6: Availability of water - *does the proposed source indicate an 'environmental surplus' sufficient to provide the expected option capacity under low flow conditions?;*
- Test 7: *Is the proposed source currently impacted by a United Utilities held abstraction licence categorised by the Environment Agency as potentially causing, or at risk of causing, serious damage or deterioration to the environment? Has the source already been flagged as a risk by the Environment Agency?; and*
- Test 8: *Does the current WFD status present a risk of deterioration in the water environment within the worst status class? Is abstraction already contributing to a poor environment?*

Environmental data sources were used to support these tests, in particular the Catchment Data Explorer website (previously referenced in Section 3.2.1) and also water resources data, both used specifically to understand possible issues relating to Water Framework Directive objectives.

A simple scoring system 1 to 5 (where 1 represents best performance) was applied to each test, with the exception of Test 4. Where an individual test result indicated a potential severe impact, this was flagged specifically. The purpose of this process was to assimilate the results of the numerical tests in a straightforward way and to provide an indication of performance, rather than to create prescriptive thresholds. The results of the quantitative numerical assessment were used to rank the options in order to evaluate the range and scale of the results. The resource management options were then initially awarded a colour coded (red, amber, green) result in terms of their likely feasibility; likely out (red), borderline (amber), likely in (green).

It should be noted that not all tests were applicable to all options and so the proportion of tests completed was calculated. Typically, most options completed the majority of these tests. It was found that for a small number of options, numerical screening was not possible, usually because the nature of the option did not align with existing hydrological datasets (for example, options to utilise the canal network, or the reuse of final effluent). These options and those where less than 73% of the tests could be applied were automatically taken forward to Stage 2 qualitative assessment.

4.2.2 Stage 2 - Qualitative testing

The qualitative assessment enabled further examination and testing of the unconstrained resource management options in order to verify, or revise as appropriate, the findings of the quantitative testing. This stage sought to:

- ensure that options identified as being potentially infeasible at Stage 1 had not been unduly ruled out;
- further test and examine options identified as being 'borderline' at Stage 1;
- identify other information that may indicate options identified as being potentially feasible at Stage 1 were in fact not likely to be feasible; and
- enable an assessment of those options for which numerical testing at Stage 1 was not possible.

Therefore, each option was reviewed in more detail using professional knowledge and additional information of catchment issues and WFD sensitivities within our region in order to identify valid overrides to the Stage 1 results. For example, a typical issue encountered during the screening process related to the difference in scale between the numerical WFD/catchment data available to support the Stage 1 tests. In many cases, this suggested that water bodies were too constrained to yield sufficient reliable water for an option whereas local investigations and intelligence demonstrated that the likely location of a new source of water would have little or no impact on the WFD status assessments. Furthermore, not all technical issues could be identified within the tests at Stage 1, for example, the raw water quality exceeding the current treatment capacity of the water treatment works.

4.3 Demand management options

Both our own and third party demand management options were screened simultaneously and these fell into the broad categories as already identified; network metering/system analysis; leakage management; water efficiency; customer metering; tariffs.

All of the unconstrained demand management options identified were screened against the three core criteria listed in Section 4.1. In contrast to the resource management options, numerical testing was not considered to be applicable to these types of demand management options. In order to screen these options, four individual questions were therefore developed and against which the likely performance of each option was assessed. These questions were designed to derive a yes/no answer.

1. *Option impact on the supply resource base (additional Deployable Output) or the demand for water*
    a. Does the option work technically (if implemented/installed will it save water?)
2. *Breach of unalterable planning, regulatory, or environmental constraints*
    a. Is the option politically acceptable (or does it conflict with national or local Government policy?
    b. Is the option socially and economically acceptable to United Utilities' customers? (Is it fair? Is it promotable?)
3. *Risk of failure or inherent uncertainty*
    a. Can United Utilities have confidence that potential savings will translate into a reduction in water demand?

Based on the response to the screening questions, it was possible to determine the feasibility of each option; any option receiving a 'No' to any question was screened out.

The third party demand management options were assessed using the same criteria and screening questions. However, in advance, an additional examination was made to confirm that the options submitted adequately fall within the definition of demand options. A number of submissions were queried and withdrawn at this point; typically, these submissions were to provide services, e.g. such as monitoring equipment, rather than to provide a demand reduction service that could be implemented as an option.

Whilst the demand management options were not subject to a formalised second stage review (as for the resource management options), the initial assessments included commentary justifying the assessment and highlighting borderline responses. These issues were then scrutinised further to describe the proposed option, or further interrogated the third party submission details.

4.4 Primary screening results

The results of the primary screening of the resource management options are shown on Table 7 and described below.

Table 7 Summary of primary screening of resource management options

	Stage 1: Numerical (quantitative) test outcome		Stage 2: Qualitative review outcome (final screening result)	
	United Utilities	Third Parties	United Utilities	Third Parties
Total number of options assessed	168	43	168	43

Most likely feasible - 'in'	70	16	38	0
Borderline, probably feasible - 'in'	39	3	81	23
Most likely infeasible - 'out'	44	1	48	19
Numerical tests / qualitative review not possible	*15*	*23*	*1*	*1*
Options withdrawn (3rd party)	-	-	-	*4*
No. options tested / screened	*153*	*20*	*167*	*42*
Water resources options taken forward for Secondary Screening	**142 (119 United Utilities' options and 23 third party options)**			

- Application of the Stage 1 numerical tests to the 211 water resources options identified a total of 86 feasible options and a further 42 borderline feasible options (128 options in total). A total of 45 options were assessed as likely to be infeasible; for 38 options, application of the numerical tests was not possible and a further four third party options were withdrawn;
- As a result of the qualitative review (Stage 2), the number of potentially feasible options increased to 142 (comprising 38 likely feasible options and 104 borderline feasible options). The Stage 2 review identified a total of 67 options that were considered likely to be infeasible whilst for two options, screening was not possible. The rationale for screening out options following Stages 1 and 2 varied and included (inter alia): lack of water resource availability; likely adverse impacts on the achievement of WFD objectives/existing water quality issues within catchments; potential for impacts on designated nature conservation sites; and uncertainty including in respect of yield reliability/potential benefit; and
- In total, of the 215 unconstrained water resources options identified, 67 options were removed/withdrawn as a result of the primary screening process. A total of 142 water resources options were taken forward for secondary screening (comprising 119 United Utilities' options and 23 third party options).

The results of the primary screening of the demand management options are shown on Table 8.

Table 8 Summary of primary screening of demand management options

	Primary screening outcome
Total number of options identified	111
Failed at least one question 'out'	52 (44 United Utilities options and 8 third party options)
Removed as not a legitimate demand management option	*3*
Removed as duplicate	*3*
Successfully passed all questions 'in' – Demand management options taken forward for secondary screening	53 (44 United Utilities options and 9 third party options)

- Primary screening of the 111 unconstrained demand management options identified a total of 53 likely feasible options (i.e. those options that had successfully passed all of the primary screening questions), comprising 44 United Utilities' options and nine third party options; and
- A total of 52 options failed at least one primary screening question and were therefore screened out. Over half of these options (35 options) were screened out due to identified risks of failure or inherent uncertainty (Criteria 3) whilst 20 options were judged not to be socially and economically acceptable to United Utilities' customers (Criteria 2, question b). A smaller number of options failed Criteria 1 (9 options) and Criteria 2 (question a) (17 options). A further six options were removed as they were considered either not to be a

legitimate demand management option or were duplicate options. Overall, 58 demand management options were screened out as a result of primary screening.

It is worth noting here that some unconstrained options were not presented for primary screening; the 18 water resource export options. This is because they were not considered as options in our WRMP. These have been completed separately through the bilateral discussions where we contacted the other water companies. The feasible options include some unconstrained options that have been sub-divided (e.g. by resource zone and/or varying 'campaign' durations for demand reduction options).

Reference to Table 6 is made to show the number of options that passed primary screening and were retained as feasible options. Feasible options also exclude some unconstrained options that have been combined into other options. This can be seen on the data in Table 6 which shows the unconstrained, feasible and constrained option numbers.

For some option scheme types the number of feasible options is higher than the number of unconstrained options because a generic unconstrained option has been sub-divided following primary screening to allow for a robust cost estimate for option delivery.

After primary screening was completed, we continued the dialogue with all third parties notifying them, where appropriate, of the primary screening outcome for the option/s that they had submitted. Those third parties whose options were screened out were given an opportunity to challenge the primary screening conclusion and their option/s remain on file in the rejected options register for potential future consideration or to be recontacted during future WRMP cycles.

It is important to note that our third party engagement is an ongoing process. Those third parties who remain in the process may choose to withdraw at any stage. The Water 2020 framework has been introduced by Ofwat to promote efficiency so that industry challenges can be met at an affordable price for customers. Of particular relevance is the promotion of efficiency and innovation. For water resources it recognises that in order to meet future national water resources challenges there are potentially significant savings for customers resulting from consideration of water trading and third party options. Ofwat have outlined steps to promote competition in this area, including the need for companies to publish market information and a bid assessment framework[35] for water resources options. However, in this plan we have already taken steps in this direction with a view to identifying all possible options and driving innovation by initiating a market engagement process as part of this WRMP.

All options that passed through primary screening have been included in the feasible options. The development of these options is summarised in the next section. Appendix G to this report provides a summary of the primary screening.

[35] The purpose of the bid assessment framework is to support a future bidding market for water resources, demand management, and leakage services that Ofwat are seeking to develop. The market information is required to support the development and operation of this market.

5 Feasible options

5.1 Overview

This section discusses how we have developed the feasible options following the completion of primary screening of the unconstrained options. Figure 7 shows the numbers of feasible options by category, the option categories are defined further in Appendix A and the description of all feasible options is provided in Appendix F. Here, we include a descriptive name and location of the option along with the capacity and principal components of each of the schemes. Due to security and, for third party commercial considerations, we are not able to publish all information regarding options publically. However, should a consultee have specific questions about any of the options, we can provide further details. We have provided a more detailed map based conceptual diagram for the Preferred plan options which is shown on Figure 38 of the *Draft WRMP19* document.

This stage of the process involves taking each of the feasible options and developing defined scopes that allow them to be costed to a sufficient and consistent level of details. A number of assumptions are required at this stage and these are discussed, with examples.

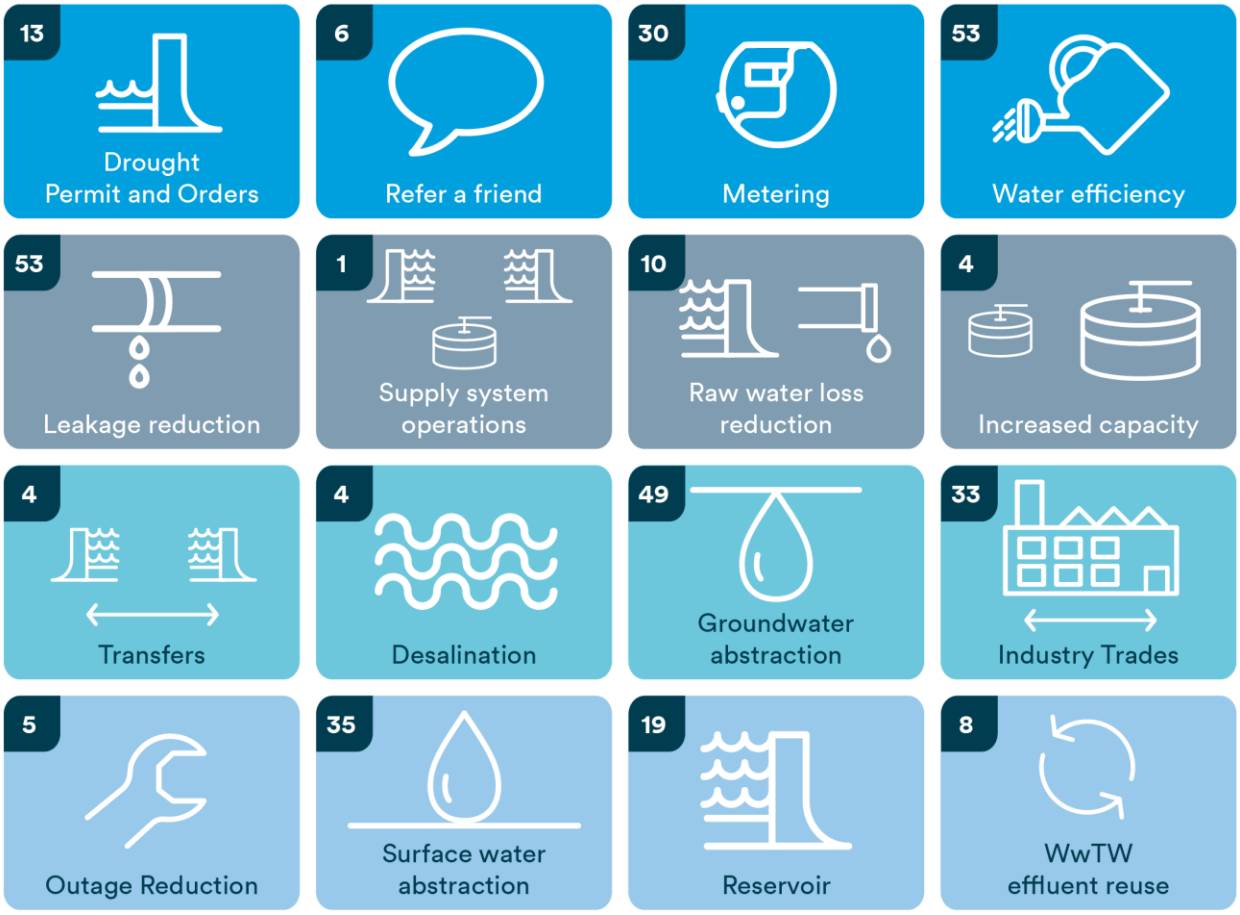

Figure 7 Summary of number of feasible options in each category

The resource management options for new sources contain indicative geographical locations based on the best available information (such as the availability of a potential new resource) and the capacity of the option that might be available for abstraction.

It is difficult to assess the exact capacity of options that would be required to satisfy any predicted supply-demand deficit given the range of possible uncertainties that are being considered in our plan, e.g. climate change, scenarios that involve national water trading. Therefore, a range of option capacities were developed and in some cases multiple versions of the same option were derived with a different number of sources, different capacities and also different points of water transfer, treatment and storage to potentially realise different supply-demand benefits. This was done in conjunction with United Utilities Asset Managers and Network Managers to ensure, as far as

possible, that proposed options were workable. This supported the requirement to understand the benefits of options and also the risks, for example, how options could impact on customer perception of a change in water type such as from soft to hard, and how these issues could be mitigated.

Building on this, we are mindful of the requirement for water companies to consider water quality as well as quantity in the development of water resource management plans. This is a outlined by the Drinking Water Inspectorate[36] and highlights, amongst other aspects, the obligations of the Water Industry Act (1991) and the need for water companies to avoid deterioration in the quality of water supplied alongside meeting our existing obligations for water quality compliance[37]. Furthermore, consumers should not face a greater risk of exposure to unwholesome water and that water companies must always plan to meet their water quality obligations. In considering the development of the scope of certain option types, we have been mindful of the need to protect the consistency of water quality supplied to customers and have included, for example, additional stages of water treatment process where water supplies may periodically change (i.e. from the normal source of supply to a different source of supply, such as from surface water sources to groundwater sources, which typically have more dissolved minerals and where hardness could become an aesthetic or taste related issue). This is in addition to our other obligations that we should not expose consumers to a greater risk of unwholesome water and that we must always plan to meet our water quality obligations.

For resource management options that proceed beyond primary screening to the feasible/constrained options stage and subsequently selected for implementation, the water supply system (either as a raw, partially or fully-treated source), will be subject to the Water Supply (Water Quality) Regulations 2016[38] and future amendments or revisions. 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 & 28) relates to the risk assessment requirements. The risk assessment process and the associated requirements for water sampling will vary depending on the type of water source. We expect to apply higher frequency water quality sampling and analysis to those sources of water supply where there are known greater risks or uncertainty. Guidance notes on the Regulations are provided by the DWI[39].

Water supplied under resource management options can be broadly categorised as follows:

- The water resource provider offers no guarantee with regard to the quality of water provided – should such options become part of the constrained options list and subsequently selected for implementation, then we will have full responsibility for Water Supply Regulations compliance and will take this into account in costing the option, including costs of undertaking and documenting the risk assessment, the cost of appropriate water quality sampling, the cost of supply shutdown/isolation, treatment etc. It is assumed that the cost of this water 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 options become part of the constrained options list and subsequently selected for implementation, then the supplier would carry a contractual obligation to meet the guaranteed standards and have obligations under the Water Supply Regulations. Notwithstanding this, we will have responsibility for Water Supply Regulations compliance from the point of transfer, and will take this into account in costing the option, including costs of undertaking and documenting a risk assessment, the cost of appropriate water quality sampling, the cost of supply shutdown/isolation, treatment etc.; and
- The water resource provider supplies potable water directly into our network (e.g. at a bulk supply point) - should such options become part of the constrained options list and subsequently selected for implementation, then the supplier would carry a contractual obligation to meet the guaranteed standards and have obligations under the Water Supply Regulations. Notwithstanding this, we will have the responsibility for Water Supply Regulations compliance from the point of transfer and will take this into

[36] Drinking Water Inspectorate: Guidance Note: Long term planning for the quality of drinking water supplies, September 2017
[37] The Water Supply (Water Quality) Regulations 2016 (as amended)
[38] http://www.legislation.gov.uk/uksi/2016/614/contents/made
[39] http://www.dwi.gov.uk/stakeholders/guidance-and-codes-of-practice/wswq/index.html

account in costing the option, including costs of undertaking and documenting a risk assessment, the cost of appropriate water quality sampling (e.g. tap samples), etc.

In all cases it is envisaged that we and the water resource provider would meet with the DWI to confirm the appropriateness of the supply option, and the relevant safeguards, with regard to Water Supply Regulations prior to implementation. We would carry out Regulation 27 risk assessments where appropriate and submit Regulation 15 applications.

Some option types and demand saving techniques have uncertainties so assumptions have to be made about, for example, water efficiency volumetric savings and or customer uptake rates.

A number of individual assumptions are required for both the engineering inputs to the development of feasible options and also in terms of how the costs are built up to define the overall scope costs. We have worked with other areas of our business to support us with this activity. We have also validated the approach used for our central estimating of costs associated with resource type options and the demand reduction options to ensure that there is consistency between how all options have been costed.

As well as our regulatory requirements, we have sought to explore and build innovation into the designs of option scopes. A good example is where we have received guidance from the Environment Agency of the need to prevent the transfer of invasive non-native species (INNS) as part of scheme design. We have considered new treatment technologies to maintain the viability of options given these requirements. Risk mitigation for INNS is not discussed further in this report, please see *draft WRMP19 Technical Report – Options appraisal* for further details of how we have considered risk of INNS transfers in our plan.

We have discussed our feasible options with our environmental regulators (Environment Agency/Natural Resources Wales/Natural England) through the development of our plan through review workshops, data shares and meetings. This has involved both discussion on the options identification process as well as sharing detailed lists of options at the key stages of development. A workshop to review the feasible options was held in April 2017 and was attended by representatives from the Environment Agency and Natural Resources Wales. Natural England were unable to attend, but were kept informed and were issued a copy of the workshop notes. A further update meeting on options and screening processes was held in October 2017 with the data on options and accompanying environmental assessments shared the previous month. We have also engaged with the Drinking Water Inspectorate on the process to developing our overall WRMP and a view of the preferred plan options was presented at a meeting in November 2017.

5.2 Option scopes and assumptions

Options scopes were developed for all feasible options. This enabled us to:

- assess the costs of building and operating each option. We did this using our own internal engineering and cost estimating systems and this was applied consistently across all feasible options and is documented. Assumption had to be made about aspects of certain schemes, for example water quality (see below).
- complete a systematic assessment of the related environmental and social costs (E&S) for each option. E&S costs are an intrinsic part of the analysis of options and are described later in Section 7.2; and
- complete a number of separate environmental assessments which are required in order to assess the potential risks of building and operating the feasible options – a requirement to support secondary screening, also see Section 7.2.

As already mentioned, we also checked to ensure that our processes for estimating resource management schemes were consistent with those for demand management schemes.

For our own resource management options and third party resource management options, a consistent approach was used. We described a scope for each option and this was detailed in a document that describes the location of the required assets, the expected capacity, the main operational features and assumptions around where the water would be treated and utilised within our supply system. Assumptions have to be made at this stage as to where the new water resource could be of most benefit. In some cases, it was very difficult to ascertain the exact benefit

without understanding the modelled benefits in our water resources modelling software. Scopes were sometimes modified based on some high level computational analysis or in other cases, multiple scopes were derived in order to allow options to provide water to different parts of our supply system. During this process, we were cognisant of the need to protect customers interests by using an efficient scope of work, so for example utilising existing water treatment work sites, for example, rather than building new ones was considered. All of the assumed new or existing infrastructure requirements were detailed within the scope, such as service reservoirs and pumping stations 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 existing schemes where these are known.

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

- *the location of the abstraction was selected*. This could be either an existing point of abstraction or a new site. In these cases, the location was only indicative for costing purposes;
- *the capacity of the option was provided*. This could be either existing/known abstraction licence quantities or an assessment of what the likely quantities available for abstraction might be. Where few 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, for example, the British Geological Survey '*The physical properties of minor aquifers in England and Wales*'[40]. In the case of third parties, discussions allowed us to ascertain the likely capacity of any option;
- the water quality of the option was provided and possible risks. For our own existing sources of water, historical raw water quality data were provided, where known. For new sites, assumptions were made about the likely water quality in order 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 to ensure 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 because we are required to quantify the costs and potential risks in exactly the same way to ensure parity between all options during the appraisal stage. The third party was involved with the definition of the scope as they were asked to provide indicative information.

For our own demand management options, the costs were derived from the existing known and projected business costs (e.g. leakage repair and detection). For third party customer and distribution options, we worked with the third party to understand the components of their proposals in order to the costs 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.

We have utilised the expertise within our Estimating teams to provide option costs for the resource management options and to cross-check with them our approach for calculating demand management option costs. The estimating of the costs to build and operate options is consistent with our wider PR19 assumptions and there is no distinction for the WRMP options that would differentiate them from estimates provided for other areas of the business. We did complete a piece of work to validate the specific WRMP option costs (for the preferred plan options) and this was found to be within the quoted range of uncertainty for the high level desk study scopes. Lastly, the implementation timescales for resource management options was assumed to be five years; for demand management options, the implementation duration of the options was assumed to be 5 and 10 years depending on the option type. This has been factored into the options appraisal exercise when calculating whole life costs.

[40] http://nora.nerc.ac.uk/12663/

Following the definition of the project scopes and associated costs, the feasible options were considered to understand the possible environmental impacts of building and operating them. This is discussed in the next section.

6 Environmental assessments

This section provides a summary of our approach to assessing the environmental impacts of the feasible options, preferred options and the overall plan that are critical to support the process of secondary screening. Our WRMP has a statutory requirement to carry out a Strategic Environmental Assessment (SEA) and a Habitats Regulation Assessment (HRA) and we have used these pieces of work to examine each feasible option in turn and to determine significant risks. We have also completed assessments to ensure that options in the plan do not result in deterioration of catchments and waterbodies linked to Water Framework Directive (WFD) objectives; and calculated the environmental and social (E&S) costs of each feasible option. These non-monetised costs are used to understand the whole life costs associated with options.

These assessments have been completed in parallel to ensure that there an integrated approach. In this way, as the plan evolved, we sought to ensure that any schemes proposed do not cause any effects on European designated sites and that any options proposed fully account for non-monetised E&S costs.

This work has been completed in parallel to ensure an integrated approach to environmental assessment. In this way, as the plan has evolved, we have sought to ensure that any schemes proposed or taken forward do not cause unacceptable adverse environmental effects including likely significant effects on European designated sites, that the WRMP is compliant with the WFD, that beneficial effects are enhanced and that any options proposed fully account for non-monetised E&S costs.

Alongside the details presented in this section of the report, there are also a number of associated documents that have been prepared by Amec Foster Wheeler working on our behalf which should be referenced alongside the summary discussions presented in this section:

- *Strategic Environmental Assessment of the Draft Water Resources Management Plan 2019: Environmental Report*
- *Draft Water Resources Management Plan 2019: Habitats Regulations Assessment*
- *Draft Water Resources Management Plan 2019: Water Framework Directive Assessment*

6.1 Environmental & Social (E&S) costs

As well as ascertaining the capital costs of building and operating feasible options, we also evaluated their E&S impacts. This is completed in a systematic way using industry wide guidance[41].

The E&S costs of each option are non-monetary costs which consider a wide range of issues, as appropriate for each particular option, such as:

- environmental impacts of water supply schemes, during construction and/or during scheme operation. Examples of impacts considered include those on aquatic flora and fauna, other water abstractors, heritage, archaeology and landscape;
- social impacts of water supply schemes, during construction and/or during scheme operation. Examples of impacts considered include those of informal recreation activities such as cycling or birdwatching, in-stream recreational activities such as boating, canoeing or rowing, walking noise, dust, odour, or time delays to people's journeys as a result of work in highways to lay or repair pipelines; and
- increases or reductions in carbon emissions that could result from the abstraction, treatment and distribution of water. Examples of impacts considered include: fuel consumption of vehicles used in construction, leakage management, installation of water meters or water efficiency devices, energy use at work sites, emissions from road traffic as a result of diversions or disruptions, embodied carbon in materials used, changes in water use (and thus changes in energy use) within the home.

As part of this work, Amec Foster Wheeler also completed a literature review and comparison of different approaches to E&S impact assessment, namely: a) traditional E&S costing; b) an ecosystem services approach; and

[41] Environment Agency - Environmental Valuation in Water Resources Planning - Additional Information (2016); Benefits Assessment Guidance (2012)

c) a natural capital approach. This was in order to identify gaps, complementarities and overlaps as well as potential benefits and limitations of adopting a Natural Capital/Ecosystem Services approach for this WRMP and for future planning rounds.

We are currently trialling a Natural Capital Approach in the River Petteril catchment in Cumbria to appraise options at a catchment level from a WFD perspective, specifically related to nitrates, phosphates, bacterial load, flooding and operational carbon footprint.

Natural Capital forms a component part in the development of our Catchment Systems Thinking Approach, aimed at integrated, sustainable and innovative catchment planning in partnership with localised environmental and community stakeholders. A primary deliverable of this project is a generic decision support tool to provide a platform to balance and optimise the Natural Capital value of asset solutions and catchment interventions in addressing statutory and non-statutory needs. We will be using the Natural Capital decision support tool and opportunity mapping methodology to assess the River Irwell catchment in collaboration with our partners in Natural Course. This assessment will be used to develop our plans for PR19 (drivers including Safeguard Zones, WFD and flood resilience) and the prioritisation and delivery of actions in AMP7 and beyond. As we continue to mature in our use of a Natural Capital approach, we aim to develop a better understanding of how this can be applied to water resource management planning for future plans.

For this WRMP, we have decided not to implement the Natural Capital/Ecosystems Services Approach for a number of reasons, mainly based around the current uncertainty of the approach and the lack of a defined framework from which to make decisions. For example,

- Trials and case study work is ongoing (e.g. Petteril, Irwell catchments). These will provide lessons learnt that can understand and build on for the next WRMP;
- We require a greater understanding of how the benefits and liabilities of Natural Capital will be incorporated within our corporate accounts;
- Collaborative projects and scheme development using Natural Capital requires time to work with partners on this economic approach to avoid the potential pitfall of it being a 'black box' decision making process; and

This aligns with Ofwat's expectation is that the Natural Capital approach would be trialled in PR19 (AMP7) and potentially form the basis for environmental planning in PR24.

Therefore, through our adopted approach of examining the E&S costs of feasible options, we have assessed impacts using a method that is proportionate to the scale of the problem and have fully justified our approach.

Information from the previous WRMP E&S costs assessment (also undertaken by Amec Foster Wheeler) was interrogated to establish which BAG categories dominated the E&S costs of options. This analysis concluded that E&S costs are heavily dominated by carbon related impacts during the construction and operation of schemes (approximately 80%). Using this information, we completed the E&S cost analysis in two phases. An initial assessment termed '*E&S lite*' was used as a way of quickly understanding the E&S cost profiles for feasible options. This was required for the first part of secondary screening in order to reduce the number of feasible options to a more manageable number of possible constrained options and to support the requirements for the options appraisal workstream which required this initial view in order to commence its analysis. The presentation of full E&S costings, which took considerably more time given the number of feasible options, was completed later on in the process.

The E&S costs and benefits were combined with the whole life financial costs of each feasible option to derive a term called Average Incremental Social Cost (AISC)[42]. The AISC values for each option were used to generate a ranked assessment of overall option costs, represented as pence per cubic metre. AISC values have been calculated in accordance with the Guideline and are discussed further in Section 2.2 of *draft WRMP19 Technical Report - Options appraisal*.

[42] The average unit cost of a particular scheme that represents its whole life cost and includes environmental and social costs

Our approach primarily used a monetary assessment to ensure that E&S costs are properly accounted for within our options screening and subsequent options appraisal stages.

Amec Foster Wheeler have used the best available evidence and data in the assessment, as detailed in their reporting, ensuring that the conclusions drawn are robust, locally valid and justifiable. The reports have provided a clear audit trail of our appraisal of E&S costs and explained the data used. The results and recommendations from the E&S cost appraisal have been assessed alongside other screening criteria as part of secondary screening, which is described in Section 7.

Further discussion about the generation of the AISC outputs and ranking assessment are discussed in *draft WRMP19 Technical Report – Options appraisal*.

6.2 Strategic Environmental Assessment (SEA)

6.2.1 Overview

European Union Directive 2001/42/EC on the assessment of the effects of certain plans and programmes on the environment (the SEA Directive), which is transposed into legislation through the Environmental Assessment of Plans and Programmes Regulations 2004 (known as the 'SEA Regulations') aim to "*provide for a high level of protection of the environment and to contribute to the integration of environmental considerations into the preparation and adoption of plans and programmes with a view to contributing to sustainable development*". Undertaking and reporting a Strategic Environmental Assessment is a statutory requirement for our WRMP.

Throughout the course of the development of a plan or programme, the SEA seeks to identify, describe and evaluate the likely significant effects on the environment of implementing the plan or programme and propose measures to avoid, manage or mitigate any significant adverse effects and to enhance any beneficial effects. The purposes of the SEA of the draft WRMP are to:

- identify the potentially significant environmental effects of the draft WRMP in terms of the feasible and preferred water resource management options that we are considering;
- help identify appropriate measures to avoid, reduce or manage adverse effects and to enhance beneficial effects associated with the implementation of the draft WRMP wherever possible;
- give the statutory SEA bodies, stakeholders and the wider public the ability to see and comment upon the effects that the draft WRMP may have on them, their communities and their interests, and encourage them to make responses and suggest improvements to the plan; and
- inform our selection of water management options to be taken forward into the final WRMP.

The SEA has assessed the likely economic, social and environmental effects of feasible options and of the Preferred plan pathways and has identified ways in which adverse effects can be minimised and positive effects enhanced. We have also considered The Well-being of Future Generations (Wales) Act 2015[43] and The Environment (Wales) Act 2016[44] when developing our plans. A high level analysis of the impact that the draft WRMP will have on the achievement of the well-being goals for Wales and the objective for sustainable management of natural resources has been completed and is presented in the *Strategic Environmental Assessment of the Draft Water Resources Management Plan 2019: Environmental Report.*

6.2.2 Approach

The SEA process comprises five key stages:

- Stage A: Scoping;
- Stage B: Develop and refine alternatives and assess effects;
- Stage C: Prepare Environmental Report;
- Stage D: Consult on the Draft Plan and Environmental Report and prepare the post adoption (SEA) statement; and

[43] Available from http://www.legislation.gov.uk/anaw/2015/2/contents/enacted
[44] Available from http://www.legislation.gov.uk/anaw/2016/3/contents/enacted

- Stage E: Monitoring of environmental effects.

For Stage A, before we commenced the SEA of the WRMP, we completed a consultation exercise on the intended approach[45]. The consultation documents were issued to the Environment Agency, Natural England, Historic England, Natural Resources Wales, Cadw[46] and the Welsh Government and ran from 7th November to 12th December 2016 (five weeks). The scoping stage comprised five tasks that are listed below:

- Review of other relevant policies, plans, programmes and strategies (hereafter referred to as 'plans and programmes');
- Collation and analysis of baseline information;
- Identification of key sustainability issues;
- Development of the assessment framework; and
- Consultation on the scope of the SEA (the Scoping Report).

Based on the review of other plans and programmes, baseline analysis and identification of key sustainability issues, the Scoping Report set out the proposed framework to be used to assess the likely significant environmental effects of the draft WRMP. During this process, we ensured that the Environment Agency's requirements of the River Basin Management Plans were considered, particularly in relation to the guide questions that were formulated as part of the assessment framework. Following the conclusion of scoping consultation, two minor amendments were made to the assessment framework guide questions to take into account the consultation responses, but this did not fundamentally change the overall approach proposed.

The revised assessment framework has been used to assess the effects of potential water resources management options (Stage B) and used as one of the components of secondary screening.

During Stage B, the draft WRMP has been assessed in accordance with the approach set out in the Scoping Report (as amended to reflect the consultation responses received). This has comprised:

- an initial high level assessment of all feasible (constrained) water management options;
- a high level assessment of alternative plans; and
- a more detailed assessment of the preferred plan including the constituent preferred options.

The Environmental Report submitted alongside our draft WRMP forms Stage C. The draft WRMP and accompanying documents including the Environmental Report have been published for consultation, Stage D. Following consultation, we will amend the draft WRMP as required, and following direction from the Secretary of State, will publish the Final WRMP and implement it accordingly. We will then issue a Post Adoption Statement, which will set out the results of the consultation and SEA processes and the extent to which the findings of the SEA have been accommodated in the Final WRMP. The SEA then requires monitoring of any resulting environmental effects of the WRMP (Stage E).

An assessment framework has been developed to assess the economic, social and environmental effects of the draft WRMP. This framework includes 12 assessment objectives and associated guide questions that reflect the topics contained in Annex I of the SEA Directive and have been informed by:

- the SEA objectives and guide questions developed as part of the SEA of the 2015 WRMP;
- a review of relevant plans and programmes and the associated key policy objectives and messages;
- baseline information and key sustainability issues; and
- responses received to consultation on the SEA Scoping Report.

By assessing each option against the SEA objectives, it is more apparent where the draft WRMP will contribute to sustainability, where it might have a negative effect and where enhancements could be made. Guide questions focus the assessment on specific aspects of the objective that reflect issues identified from the review of baseline and contextual information relating to our supply area.

[45] United Utilities Strategic Environmental Assessment of the Water Resources Management Plan 2019 Scoping Report, November 2016, Amec Foster Wheeler Environment and Infrastructure UK Ltd

[46] Cadw is the Welsh Government's historic environment service

The assessment framework that has been used to assess the draft WRMP is shown in Table 9.

Table 9 Key sustainability issues applied in the SEA framework

Topic	Key sustainability issues taken into account when assessing the WRMP
Biodiversity	• Will the option protect and enhance where possible the most important sites for nature conservation (e.g. internationally or nationally designated conservation sites such as SACs, SPAs, Ramsar and SSSIs)? • Will the option protect and enhance non-designated sites and local biodiversity? • Will the option provide opportunities for new habitat creation or restoration and link existing habitats as part of the development process? • Will the option lead to a change in the ecological quality of habitats due to changes in groundwater/river water quality and/or quantity? • Will the option protect, and enhance where appropriate, coastal and marine habitats and species? • Will the option prevent the spread/introduction of invasive non-native species?
Geology and Soils	• Will additional land be required for the development or implementation of the option or will the option require below ground works leading to land sterilisation? • Will the option utilise previously developed land? • Will the option protect and enhance protected sites designated for their geological interest and wider geodiversity? • Will the option minimise the loss of best and most versatile agricultural land? • Will the option minimise conflict with existing land use patterns? • Will the option minimise land contamination? • Will the option affect geomorphology?
Water quantity and quality	• Will the option minimise the demand for water resources? • Will the option protect and improve surface, groundwater, estuarine and coastal water quality? • Will the option result in changes to river flows? • Will the option result in changes to groundwater levels? • Will the option prevent the deterioration of Water Framework Directive (WFD) waterbody status (or potential)? • Will the option support the achievement of protected area objectives? • Will the option support the achievement of environmental objectives set out in River Basin Management Plans? • Will the option ensure a new activity or new physical modification does not prevent the future achievement of good status for a water body?
Water - Flood Risk	• Will the option have the potential to cause or exacerbate flooding in the catchment area now or in the future? • Will the option have the potential to help alleviate flooding in the catchment area now or in the future? • Will the option be at risk of flooding now or in the future?
Air Quality	• Will the option adversely affect local air quality as a result of emissions of pollutant gases and particulates? • Will the option exacerbate existing air quality issues (e.g. in Air Quality Management Areas)? • Will the option maintain or enhance ambient air quality, keeping pollution below Local Air Quality Management thresholds? • Will the option reduce the need to travel or encourage sustainable modes of transport?
Climate Change	• Will the option reduce or minimise greenhouse gas emissions? • Will the option have new infrastructure that is energy efficient or make use of renewable energy sources? • Will the option reduce vulnerability to the effects of climate change by appropriate adaptation? • Will the option increase environmental resilience to the effects of climate change?
Human Environment-Health	• Will the option ensure the continuity of a safe and secure drinking water supply? • Will the option affect opportunities for recreation and physical activity? • Will the option maintain surface water and bathing water quality within statutory standards? • Will the option adversely affect human health by resulting in increased nuisance and disruption (e.g. as a result of increased noise levels)?

Topic	Key sustainability issues taken into account when assessing the WRMP
	• Will the option ensure sufficient infrastructure is in place for predicted population increases?
Human Environment -Social and Economic Well-Being	• Will the option ensure sufficient infrastructure is in place to sustain a seasonal influx of tourists? • Will the option help to meet the employment needs of local people? • Will the option ensure that an affordable supply of water is maintained and vulnerable customers protected? • Will the option improve access to local services and facilities (e.g. sport and recreation)? • Will the option contribute to sustaining and growing the local and regional economy? • Will the option avoid disruption through effects on the transport network? • Will the option be resilient to future changes in resources (both financial and human)?
Material Assets and Resource Use – Water Resources	• Will the option lead to reduced leakage from the supply network? • Will the option improve efficiency in water consumption?
Material Assets and Resource Use – Waste and Resource Use	• Will the option source and use recycled aggregates/materials in construction, ahead of using 'new' materials? • Will the option promote the re-use and recycling of waste materials and reduce the proportion of waste sent to landfill? • Will the option encourage the use of sustainable design and materials? • Will the option reduce or minimise energy use?
Cultural Heritage	• Will the option conserve or enhance the historic environment, including heritage assets such as historic buildings, conservation areas, features, places and spaces, and their settings? • Will the option avoid or minimise damage to archaeologically important sites? • Will the option avoid damage to important wetland areas with potential for palaeoenvironmental deposits? • Will the option affect public access to, or enjoyment of, features of cultural heritage?
Landscape	• Will the option avoid adverse effects on, and enhance where possible, protected/designated landscapes (including woodlands) such as National Parks or AONBs? • Will the option protect and enhance landscape character, townscape and seascape? • Will the option affect public access to existing landscape features? • Will the option minimise adverse visual impacts?

The SEA has assessed the effects of the draft WRMP in two stages. The first stage was the assessment of all feasible options against the 12 SEA objectives followed by a more detailed assessment of the preferred plan options identified in the draft WRMP. An important part of the SEA process is the assessment of reasonable alternatives. For the purposes of the SEA of the draft WRMP, the feasible options have been assessed as reasonable alternatives to the preferred options that comprise the preferred plan. In addition, reasonable alternatives that operate at the plan level have also been considered, specifically the four alternative plans identified (as outlined above).

The potential effects (positive, negative or neutral) and the significance of the effects of each of the preferred options against each of the SEA objectives have been recorded, along with commentary setting out the reasons for the assessment results. The resulting assessment has been written up into the Environmental Report along with commentary on the likely magnitude and timing of the effect. Cumulative effects and potential mitigation measures are also considered. The results of this assessment have been used to support our selection of water management options to be taken forward into the draft WRMP.

Details of the assessment process used are documented in full in the accompanying report *Strategic Environmental Assessment of the Draft Water Resources Management Plan 2019: Environmental Report* and the results of the SEA of the feasible options completed as part of secondary screening are discussed further in Section 7.2.

6.3 Habitats Regulations Assessment (HRA)

6.3.1 Overview

Regulation 61 of the *Conservation of Habitats and Species Regulations 2017*[47] (the 'Habitats Regulations') states that if a plan or project is "(a) is likely to have a significant effect on a European site[48] or a European offshore marine site[49] (either alone or in combination with other plans or projects); and (b) is not directly connected with or necessary to the management of the site" then the plan making authority must "…make an appropriate assessment of the implications for the site in view of that site's conservation objectives" before the plan is given effect. The process by which Regulation 61 is met is known as an HRA[50]. An HRA determines whether there will be any 'likely significant effects' (LSE) 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.

WRMPs are not explicitly included within this legislation, although Natural England and Natural Resources Wales have previously stated that this requirement should extend to them and in this context, an HRA of our current draft WRMP is required. The Habitats Regulations require every Competent Authority, in the exercise of any of its functions, to have regard to the requirements of the Habitats Directive. Water companies have a statutory duty to prepare WRMPs and are therefore the Competent Authority for the related HRA.

Current European Commission guidance[51] suggests a four-stage process for HRA, although not all stages will be necessarily required. These are shown in Table 10.

Table 10 Summary of the four stages of the HRA assessment process

Stages of Habitats Regulations Assessment
Stage 1 – Screening This stage identifies the likely impacts upon a European Site of a project or Plan, either alone or 'in combination' with other projects or plans, and considers whether these impacts are likely to be significant.
Stage 2 – Appropriate assessment Where there are likely significant impacts, this stage considers the impacts of the Plan or project on the integrity of the relevant European Sites, either alone or 'in combination' with other projects or plans, with respect to the sites' structure and function and their conservation objectives. Where there are adverse impacts, it also includes an assessment of the potential mitigation for those impacts.
Stage 3 – Assessment of alternative solutions Where adverse impacts are predicted, this stage examines alternative ways of achieving the objectives of the project or Plan that avoid adverse impacts on the integrity of European Sites.
Stage 4 – Assessment where no alternative solutions exist and where adverse impacts remain This stage assesses compensatory measures where it is deemed that the project or Plan should proceed for imperative reasons of overriding public interest (IROPI). The guidance does not deal with the assessment of IROPI.

The Guideline has recommended that all WRMPs should be subject to the first stage of the HRA process to assess the LSE, that Stage 2 would be needed if an option included could affect any designated European site and that companies must clearly test their plans using Habitats Regulations Assessment where applicable. For the draft

[47] Recently updated from the previous Regulations from 2010 (as amended)

[48] Strictly, 'European sites' are: any Special Area of Conservation (SAC) from the point at which the European Commission and the UK Government agree the site as a 'Site of Community Importance' (SCI); any classified Special Protection Area (SPA); any candidate SAC (cSAC); and (exceptionally) any other site or area that the Commission believes should be considered as an SAC but which has not been identified by the Government. However, the term is also commonly used when referring to potential SPAs (pSPAs), to which the provisions of Article 4(4) of Directive 2009/147/EC (the 'new wild birds directive') apply; and to possible SACs (pSACs) and listed Ramsar Sites, to which the provisions of the Habitats Regulations are applied a matter of Government policy (NPPF para. 118) when considering development proposals that may affect them. "European site" is therefore used in this report in its broadest sense, as an umbrella term for all of the above designated sites.

[49] 'European offshore marine sites' are defined by Regulation 15 of The Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2007 (as amended); these regulations cover waters over 12 nautical miles from the coast.

[50] The term 'Appropriate Assessment' has been historically used to describe the process of assessment; however, the process is now more usually termed 'Habitats Regulations Assessment' (HRA), with the term 'Appropriate Assessment' limited to the specific stage within the process; see Section 2.

[51] *Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC* (EC 2002).

WRMP, we have completed activities to support the first stage by examining the potential effects of the feasible options as well as the preferred plan.

At the 'screening' stage, the plan would be considered 'likely' to have an effect if the competent authority is unable (on the basis of objective information) to exclude the possibility that it could have significant effects on any European site, either alone or in combination with other plans or projects; an effect will be 'significant' if it could undermine a site's conservation objectives. This stage is therefore a relatively low bar: 'significant effects' can generally be interpreted as any effects that are not negligible or inconsequential. If a significant effect is likely, or if this is uncertain, then 'appropriate assessment' is required; the scale and scope of such an assessment is not defined and will depend on the type of plan and the effects that require assessment.

The Regulations essentially provides a test that a final plan or project must pass; there is no statutory requirement for HRA to be undertaken on draft plans or similar developmental stages (e.g. of the 'unconstrained options' in the context of WRMPs). However, as with SEA, it is accepted current best practice for strategy level HRAs to be run as an iterative process alongside the development of the plan, with the emerging policies or options continually assessed for their possible effects on European sites and modified or abandoned (as necessary) to ensure that any plan that is adopted is not likely to result in significant effects on any European sites, either alone or 'in combination' with other plans. We have undertaken our assessments in consultation with Natural England, Natural Resources Wales and other appropriate consultees such as the Environment Agency to ensure a proportionate approach.

The approach in Table 10 works well at the project level where the scheme design is established and possible effects on European sites can be quantitatively assessed with the benefit of detailed survey data. However, the nature of our WRMP has presented a number of distinct challenges for completion of a strategic level HRA. It has been important to understand as the plan has been developed, how it would be operated in practice (the preferred plan and alternatives) and hence how it might consequently affect European sites. In particular, there is a potential conflict between the specific nature of the feasible options; the requirement that the options (and hence the plan) have no LSE or no adverse effects; the level of certainty that can be established at the strategic level; and the desirability of not excluding every potential solution which cannot be conclusively investigated within our plan development timescales.

It should also be recognised that the staged approach suggested can be difficult to apply to evolving plans. The HRA is ultimately a test that the final document must pass, and there is no statutory requirement for the developmental phases of the WRMP (e.g. 'feasible options' or the subsequent 'preferred options') to undergo HRA themselves. Therefore, it is important to recognise that our strategic HRA has been as much about guiding the development of the plan (and demonstrating that this has been done) as it has been about assessing its effects. It should also be recognised that the HRA 'test' (as opposed to the process) applies to the finished plan and therefore the screening or appropriate assessment stages (e.g. feasible options) has been applied with this in mind.

The options assessed could affect European sites through their implementation (for example, construction of new pipelines) or operation (e.g. new abstractions), and these effects can broadly be categorised as:

- **direct** (for example, construction of a new water abstraction within a designated reservoir; discharges to a Special Area of Conservation (SAC) from a desalination plant; new borehole abstractions causing drawdown in a groundwater dependent terrestrial ecosystems (GWDTE));
- **indirect** (for example, construction affecting a downstream SAC through sediment release, or a new abstraction entraining SAC fish species away from the SAC itself); or
- **consequential** (for example, adjusting or stopping a bulk transfer between water resource zones, or between water companies, may have indirect 'consequential' effects on distant European sites if this results in additional abstraction to make up a shortfall; this is more typically a type of 'in combination' effect).

The iterative stage of the HRA approach we have adopted identifies likely outcomes of each option, its zone of influence, and the European sites that could potentially be affected. This information has then been used to assess, as far as possible, the likely effects of these options, and to identify the most suitable (from an HRA perspective). Any avoidance measures or mitigation are also identified.

The HRA of the WRMP has considered any European sites that could be affected by the implementation of our preferred plan, whether they are within the geographical boundaries of our supply area or not. When determining this, we have also considered potential in combination effects; these are possible cumulative effects on European sites caused by the WRMP, together with the effects of any existing or proposed projects or plans. However, it must be recognised that many of the possible 'in combination effects (particularly with respect to water resources and land use plans) are explicitly considered and accounted for as part of the development of the plan and the processes involved.

Some other key points about the HRA process of the feasible options are as follows:

- The HRA of the WRMP does not review the effects of existing abstraction regimes. These changes are already accounted for in the development of the plan with direction from the Environment Agency/Natural Resources Wales/Natural England. This means that the plan should be compliant with any current needs for sustainability reductions to abstractions, and therefore will only affect European sites through any new resource and production management options advocated as part of the Preferred plan and not through the existing granted permissions;
- The WFD Assessment of the WRMP has aimed to ensure that there is no serious damage to, or alteration of, waterbodies. This has been used to support the HRA; and
- There are uncertainties within the WRMP due to its strategic nature and long term outlook. There is also uncertainty with regard to options and the quantification of possible effects on European sites even though the potential effects might be well known. These may only be known during the implementation of options. As a result, the HRA has considered and assessed the specific options, whilst at the same time recognising (and mitigating) the inherent uncertainties within those options (i.e. the absence of a detailed design for the Preferred plan) and within the plan itself (i.e. so that the WRMP as a whole is compliant with the Habitats Regulations even if some residual uncertainty persists with some options). It is considered acceptable if uncertainty exists to leave such options within the plan, but to complete the assessment where uncertainty persists at a later stage if the options in the Preferred plan are adopted.

Within the HRA Report (Appendix G)[52] are included appropriate site- and feature-specific avoidance measures and development criteria. These will be employed at the project level unless project-level HRAs or scheme-specific environmental studies demonstrate that they are not required (i.e. the anticipated effect will not occur), not appropriate, or that alternative or additional measures are more appropriate/required.

6.3.2 Approach

The HRA Stage 1 screening has been completed iteratively alongside the development of our WRMP and is aligned with the stages within it (i.e. from the unconstrained list, to feasible, to constrained options). Therefore, the results have assisted us in development of the preferred plan and the options within it. The HRA has considered the effects from all resource management options as these are more likely to have infrastructure requirements which could impact on European sites.

Our approach has identified whether each feasible option (either alone or in combination with other projects or plans) is likely to have significant effects on European designated sites. The HRA is based on the precautionary principle. Where uncertainty remains, impacts are assumed which triggers the requirement for Stage 2 (Appropriate Assessment) of the options, scheme or plan if this remains.

We have also considered whether there are likely to be any in-combination effects that would result from the various schemes within the plan, or from implementation of the plan in-combination with other plans and projects and whether these would adversely affect the integrity of a European site.

If likely significant effects are identified against options, then we have had to decide whether the specific option should be retained as a constrained options or rejected. If the option is retained and selected as part of the Preferred plan, an Appropriate Assessment would need to be completed to determine whether it could adversely

[52] Draft Water Resources Management Plan 2019: Habitats Regulations Assessment

affect the integrity of the European site(s), either alone or in combination with other plans and projects, taking into account available mitigation measures.

The details of the assessment process used are documented in full within the Amec Foster Wheeler report as previously referenced. We have used the results of the HRA assessment of feasible options as part of our approach to secondary screening and this is described later in Section 7.2.

6.4 Water Framework Directive (WFD)

6.4.1 Overview

The WFD Assessment (and its outputs) comprise two principal components which we have used to help inform the selection of options for the draft WRMP. This is primarily through secondary screening. However, the findings of the assessment have also been used to inform the Strategic Environmental Assessment. The two approaches we have used are:

- a review of our proposals for existing abstraction licences; and
- an assessment of feasible options.

The review of the existing licences is not covered directly in this section, but has been completed as part of the assessment of our supply position. This can be found in Section 7 of *Draft WRMP19 Technical Report – Supply forecasting* and further detail is also presented in *Draft Water Resources Management Plan 2019: Water Framework Directive Assessment*. The assessments of the data provided by the EA and ourselves regarding the current abstraction licences indicate that although there is some residual risk, overall the operation of the licences, the reductions noted by the EA and the schemes identified for AMP6 should be enough to mitigate against any significant risks to the WFD water bodies and they are therefore compliant with the requirements of the WFD.

The assessments of potential new feasible options are discussed here.

Each new feasible option has been assessed to identify if they will comply with the WFD by seeking to understand potential impacts from the construction and operational phases. Separate assessments have been undertaken for each waterbody or Protected Area[53] which could be impacted by the options.

The WFD assessment has considered the following key questions in respect of the construction and operational phase of each feasible WRMP option:

- At the water body scale, would the option result in a deterioration of any of the WFD classification components from one status class to the next, (e.g. from good to moderate), irrespective of whether or not it results in the lowering of overall status?
- Would the option prevent any water bodies from achieving good overall status or, where relevant, an alternate objective?

Following the assessment of each feasible WRMP option, an assessment was made of the following for each of the Preferred plan options:

- Would the cumulative effects of multiple WRMP options impact on the objectives of individual WFD water bodies?
- Would the cumulative effects of multiple WRMP options impact on the objectives of multiple water bodies that are hydrologically linked (i.e. operational catchments)?
- Would the cumulative effects of multiple WRMP options affect protected areas and their associated objectives?

If the answer to all of the above five questions is ‘no’ then the option can be considered to be WFD compliant.

[53] The Water Framework Directive specifies that areas requiring special protection under other EC Directives and waters used for the abstraction of drinking water are identified as protected areas.
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/300528/genw0910bsrk-e-e.pdf

6.4.2 Approach

A two staged approach was used:

- Level 1 initial screening - a strategic level assessment was completed to determine whether the feasible option could potentially have a significant negative impact on WFD waterbodies. This entailed identifying all water bodies that the option could impact on and reviewing the activities that will be undertaken as part of each option. Options that could have a significant impact on waterbodies (e.g. new or altered abstractions) proceed to a detailed assessment, whilst options that are unlikely to have a significant impact (e.g. new transfer pipelines) would be highlighted not to be at risk and screened out[54] of the process. The results of the initial screening for all options have been recorded in a single table; and
- Level 2 detailed assessment – for those options not 'screened out' from further assessment, a detailed assessment was completed against WFD evidence and objectives. This entailed reviewing in more detail the activities proposed within the screened-in waterbodies for relevant options and then assessing the potential impacts from construction and operational phase activities.

The Level 1 assessments were completed on all feasible options. The review was a high level risk assessment based on the details of options as provided. The aim was to identify if there is the potential for an option to have a significant impact on a WFD waterbody and, therefore, if it requires a more detailed assessment. Options were classified as either 'In' (the option could have a significant impact on a waterbody and therefore requires a detailed assessment) or 'Out' (the option is unlikely to have a significant WFD impact and therefore does not require a detailed assessment). The results of the screening have been recorded in a single table, along with the justification for why an option is 'In' or 'Out'.

The Level 2 assessments used data provided by ourselves for each of the options (e.g. engineering details) and looked at the potential WFD impacts from construction and operational activities. The assessments were informed by expert judgement and detailed evidence where available (e.g. hydrological assessments and documented investigations/discussions with the Environment Agency).

The assessment of the waterbodies that may be impacted by each option comprised identification of the waterbody classification and the risk of deterioration. Once all of the risks during construction and operation were identified, an overall risk was provided. This assumed that there should not be deterioration of any waterbody element and the approach used by the Environment Agency for classifying water bodies was used; a '*one out, all out*' approach. The overall risk to a water body has been based on the highest risk noted for each option. This process was repeated for each waterbody which could be impacted by an option. Any specific assumptions and sources of evidence used to identify the risks are noted within each assessment table. Where a risk to WFD objectives was highlighted from a scheme, a confidence level (i.e. low, medium or high) in the assessment was provided. The confidence level was set based on the amount of evidence available (e.g. sufficient evidence will lead to high confidence or limited evidence will mean low or medium confidence).

Where two or more preferred options were located in the same waterbody or catchment, a high level assessment was completed to determine if there are any potential cumulative effects on WFD objectives, should all the options be implemented (e.g. does the risk of deterioration to the fish classification increase if two new abstractions start on the same river but in different water bodies). A significant risk was noted where there is deemed to be a risk of deterioration in at least one waterbody.

Where a cumulative impact is deemed likely, the reason and level of impact was recorded in a central table along with the justification for the outcomes.

The findings of the WFD Assessment have been used to inform the assessment of options as part of the Strategic Environmental Assessment process, and in particular the assessment of options against Strategic Environmental

[54] In this context, screening is referring to the WFD assessment process and not primary or secondary screening as applied to the unconstrained and feasible options.

Assessment Objective 3: *To protect and enhance the quantity and quality of surface and groundwater resources and the ecological status of water bodies*.

Once the risks to relevant water bodies and to protected areas were identified, the options that feature in the Preferred plan as detailed in the WRMP were also considered. This comprised an overarching assessment of likely cumulative impacts on WFD status and objectives for entire catchments or Water Resource Zones included within the WRMP, when all preferred options are implemented (see *draft WRMP19 Technical Report – Options appraisal*). The assessment considered beneficial and adverse effects and also the overall impact(s). This includes assessments between individual WRMP options and/or between WRMP options and RBMP measures on individual water bodies and elements. Cumulative effects between WRMP options could lead to a greater risk of deterioration in water bodies or conflict with RBMP measures which could affect the proposed schemes and what mitigation is possible. This will also provide information for the SEA.

6.5 Integrating the environmental assessment results into the options identification process

The assessments described in Sections 6.1 to 6.4 have been used as components of secondary screening in order to determine the final list of constrained options. This will be discussed in detail in Section 7.

It is important to recognise the relationship between the E&S, SEA, HRA and WFD assessments as part of our integrated approach to environmental assessment. The assessments were conducted in parallel throughout the development of the WRMP and data is shared across the assessments. This approach ensures that the assessments are robust/informed by the best available evidence which significantly reduces the risk of any of the final constrained options that are selected during options appraisal leading to unacceptable or unmitigatable environmental damage either alone or in combination.

In summary, the three phases of the assessment process we have followed are:

1. *Feasible options assessment.* The feasible options have been screened (secondary screening) using the HRA and WFD assessments as part of the data to support the SEA topic questions. This has ensured that:
    a. construction and operational effects assessed in relation to WFD objectives have been assessed;
    b. screening of options in relation to likely significant effects on designated European sites are assessed for the HRA; and
    c. in-combination effects between options are completed as part of the SEA assessment.

2. *Preferred plan assessment*. All of the required constrained options are appraised taking account of the separate HRA, WFD and SEA option assessments to identify a programme of options to maintain the supply-demand balance in each Water Resource Zone along with the requirement for any scenarios, such as water trading. This is discussed in *Draft WRMP19 Technical Report – Options appraisal.* This has ensured that:
    a. the delivery of the preferred plan has not led to deterioration in the WFD status of waterbodies or compromised the achievement of good ecological status, either alone or in combination with other plans;
    b. as part of HRA screening, delivery of the preferred plan has not led to likely significant effects on European designated sites either alone or in combination with other programmes, plans or projects; and
    c. in-combination effects between options have been assessed as part of the SEA assessment. This is used to understand whether any iterations of the options included in the preferred plan are required.

3. *Water Resource Management Plan assessment*. HRA, WFD and SEA screening has been completed on the WRMP as a whole to assess that when implemented, it would not lead to any likely significant effect on designated European sites either alone or in combination with other programmes, plans or projects. This has ensured that:
    a. the delivery of the overall plan has not led to deterioration in the WFD status of waterbodies or compromise achievement of good ecological status, either alone or in combination with other plans.

The assessment has taken account any identified mitigation measures to offset adverse effects and/or mitigation measures to meet WFD objectives;

b. as part of HRA screening, delivery of the overall plan has not led to likely significant effects on European designated sites either alone or in combination with other programmes, plans or projects; and
c. the plan as a whole has considered the in-combination effects with other plans with a need to refine the overall WRMP as appropriate (see *draft WRMP19 Technical Report – Options appraisal*).

7 Secondary screening

7.1 Overview

The purpose of the secondary round of screening was to reduce the number of feasible options to a more manageable number of feasible (constrained) options that could be fed into options appraisal, see Figure 1. With so many options, this enabled us to (with reference to the Guideline) 'find a balance in our feasible list between having a manageable number of options and having the greatest choice for assessment. The feasible list includes sufficient options to allow real choices when assessing the preferred programme.'

Secondary screening has been an iterative approach, using various data sets in order make decisions where it was felt there was too great a risk or an unmitigatable risk for options to be considered any further in the process. These risks were assessed by ourselves and also Amec Foster Wheeler who completed the environmental assessments of options on our behalf.

The overriding principles for the secondary screening are similar to those for primary screening, which has been to ensure:

- that all options have been subjected to the same scrutiny and testing. It has been our priority that that these criteria have been applied consistently across all feasible options to achieve a balance between the number of constrained options and availability of realistic choices; and
- that those secondary screening criteria applied provide consideration of a wide range of potential impacts and issues such that the discarded feasible options have the potential for unacceptable impacts at the planning stage that cannot be or are difficult to overcome.

The screening criteria we developed were based on the outline approach to secondary screening in our original Options Identification methodology that we developed and shared with the Environment Agency before commencement of the WRMP. This methodology outlined some key criteria to consider and questions for the secondary screening process to answer:

- **Environmental and Social Costs (E&S):** Does the feasible option have a very high implementation cost with an associated small Deployable Output or WAFU benefit?;
- **Significant and unalterable planning or environmental constraints:** On completion of the environmental assessments for each feasible option, is there new evidence as to why a feasible option should not progress to the constrained options list?;
- **Risk of failure or inherent uncertainty:** Is there new evidence from the engineering assessments that demonstrates there are unacceptable risks for options moving from the feasible to constrained lists?; and
- **Flexibility of the option to deliver required benefit:** How flexible is the option to changing circumstances in demand? Could we include climate change risk uncertainty as a valid reason for excluding options for further consideration?

Therefore, we developed a suite of screening criteria that allowed us to consider a wide range of issues in order to systematically apply the questions to the feasible options. This included the environmental assessments discussed in Section 6 plus two additional assessments. In total , we developed six separate screening criteria. These criteria were not applied sequentially but there was a natural order to the assessment process even though some of the outputs were being defined concurrently. The six screening criteria we used were:

- Environmental and Social Costs (E&S) and generation of Average Incremental Social Costs (AISC) in order to rank feasible options, Section 6.1 and 7.2.1;
- Water Available for Use Assessment (WAFU), see Section 7.2.2;
- An assessment of Climate Change risk, resource management options only, see Section 7.2.3;
- Habitats Regulation assessments (HRA), resource management options only, Section 6.3 and 7.2.4;
- Strategic Environmental Assessments (SEA), Section 6.2 and 7.2.5; and
- Water Framework Directive assessments (WFD), resource management options only, Section 6.4 and 7.2.6.

These assessments can be directly related to the original methodology questions as shown in Table 11[55].

Table 11 Relationship between secondary screening criteria and original methodology

Criteria used in the secondary screening	Outline approach: screening criteria
Environmental and Social Costs (E&S) assessment	Environmental and Social Costs (E&S)
Water Available for Use assessment (WAFU)	Risk of failure or inherent uncertainty
Strategic Environmental Assessment (SEA)	Significant and unalterable planning or environmental constraints
Habitats Regulations Assessment (HRA)	Significant and unalterable planning or environmental constraints
Water Framework Directive (WFD) Assessment	Significant and unalterable planning or environmental constraints
Climate Change risk assessment	Flexibility of the option to deliver required benefit Risk of failure or inherent uncertainty (?)

In broad terms, the screening process proceeded as follows:

- E&S and WAFU assessments were completed concurrently. This was completed by ourselves in conjunction with support from Amec Foster Wheeler;
- The options were ranked based on the calculated AISC values. The first 100 options were selected to enter the Options Appraisal workstream (discussed further in *draft WRMP19 Technical Report – Options appraisal);*
- If the WAFU analysis indicated that the option had insignificant benefit within the supply system (relating to the *de-minimis* thresholds), then the option was screened out and not taken forward to the environmental assessments;
- The environmental assessments (HRA/SEA/WFD) were completed on the feasible options;
- The climate change assessments were also completed on feasible resource management options; and
- Based on the results of the completed secondary screening, options were flagged as either 'open' or 'closed' to signify to the options appraisal workstream of the current status.

There was some reiteration of the results throughout the process as updated evidence was provided.

The components of secondary screening are explained further below in Section 7.2.

7.2 Screening criteria

7.2.1 Environmental and Social Costs (E&S) and AISC ranking

As outlined, our approach to assessing E&S costs was completed in two phases; 'E&S lite' being completed ahead of the 'E&S full' of the feasible options. The E&S costs and benefits were combined with the whole life financial costs of each option to derive Average Incremental Social Cost (AISC) in accordance with the Guideline. This then allowed us to rank the options using the derived AISC values.

For the Strategic Resource Zone, the first 100 options as ranked by 'E&S lite' were considered for immediate Options Appraisal. This ranking gave a maximum AISC value of 79 pence per m^3 of water which was then also applied to the Carlisle and North Eden Resource Zones in order to determine the number of options that should progress to Options Appraisal for those zones too. At the point the decision was made, it was known that the first 100 options had a cumulative deployable output total much greater than the requirement of the preferred plan being considered by the options appraisal and so this decision was pragmatic and justifiable.

[55] Including this relationship within this report was a recommendation of the audit of the secondary screening that was completed by Amec Foster Wheeler, see Section 7.2.

The AISC ranking approach using 'E&S lite' (see Section 6.1) was our first stage assessment at deciding that point in time). Failure of this criteria (i.e. outside the ranked list based on the above criteria) resulted in the option being screened out at that point and therefore not considered for the other secondary screening criteria, such as the suite of supporting environmental assessments.

Resource management options have not been considered been for the North Eden Resource Zone on the basis that this zone has no deficit risk. However, demand management options have been retained in case any be elevated to baseline activity in future. Appendix G to this report provides a summary of the secondary screening including the results of this test. Further details on the derivation of AISC values (which are not part of the options identification phase) are provided in *draft WRMP19 Technical Report – Options appraisal*.

7.2.2 WAFU

The feasible options were assessed within our water resource models to determine its water available for use benefit (WAFU) figure or, in the case of demand options, supply-demand balance benefit under various scenarios, which includes baseline conditions and water trading. This was to identify the usefulness of each option within our supply system to meet certain scenarios of demand, rather than just the option capacity values alone. WAFU was estimated as the change in resource zone deployable output with the option operating with no constraints (i.e. maximum use of the option). As part of this work, we considered whether the option WAFU was greater than the resource zone *de-minimis* criteria that we had previously used for definition of the unconstrained options, see Table 3. Appendix G to this report provides a summary of the secondary screening including the results of this test.

7.2.3 Climate Change

For resource management options, we considered whether the option was at risk of being affected by climate change impacts and therefore whether there was a risk of the option not delivering its intended capacity output and supply system benefit. This assessment was made using high level assumptions about the likely impact of climate change and was completed using our water resources models. We examined the natural watercourse flows and gauging station summary data from the national river flow archive (NRFA) website for options that close to an existing gauging station.

The key assumptions that we made for the climate change screening are as follows:

- Existing groundwater sources have already been examined for climate change risk. This is documented in the draft WRMP*19 Technical Report - Yield and supply capability*. We have assumed that climate change impacts will be incorporated into the design of new groundwater options (GWN) and for existing groundwater sources (GWE) we have assumed no impact unless similar geographically based aquifer systems have been highlighted as a problem from our existing sources;
- For reservoir options (RES) we have used the median climate change scenario to represent climate change;
- Engineering options can still be delivered under climate change (e.g. raw water losses, outage);
- For effluent reuse schemes (EFR) the option capacity is 50% of the dry-weather flow. If demand increases due to higher temperatures then the dry-weather flow may increase. Potential issues with dilution if the river flow decreases, but does not affect the available water for the option;
- For desalination (DSL), no issues with availability of water have been considered;
- Third party options are assessed by the supplier and ourselves, and we have assumed that water will be available under the contractual arrangements at this stage (not yet agreed);
- For resource management (non-river abstraction) options (all types except SWE and SWN), it is assumed that new options (e.g. boreholes or new reservoirs) will be designed to account for climate change. Most options are unlikely to be sensitive to climate change (i.e. the capacity will still be available);
- Surface water abstractions are potentially influenced by climate change. Flow factors for the median climate change scenario have been derived. These have the largest impact in August (60 to 90% reduction in flow) and are available for all existing water supply catchments. These types of options were initially screened against the available water for abstraction on that reach from Environment Agency data. These data are available at a reach scale rather than for each individual abstraction point. For abstractions some distance upstream of the relevant assessment point this method has over-estimated the available water. The

estimates of available flow have not accounted for existing abstractions on the reach and assumptions about hands-off flows and environmental flow; and
- The SEA has flagged that some options are on river reaches where there is no water available for additional abstraction.

The potential impact of climate change on the regional availability of water has been categorised for each option. This approach allows the impact of climate change on different size options to be compared in terms of their influence on regional DO and using a range acknowledges the uncertainty in the available information. The high category (>20 Ml/d is approximately 1% of the regional base deployable output value). The categories used are shown in Table 12. Appendix G to this report provides a summary of the secondary screening including the results of this test.

Table 12 Assessment of climate change risk and categories used

Impact	Category
Very Low	<1 Ml/d
Low	1 to 5 Ml/d
Medium	> 5 to 20 Ml/d
High	>20 Ml/d

7.2.4 Habitats Regulations Assessment (HRA)

The feasible options HRA assessment has been completed by Amec Foster Wheeler and has aimed to identify those options which have a risk of 'significant' or 'adverse' effects on a European site which are unlikely to be avoidable or mitigatable at either the strategy or scheme-level. The outputs from their work were utilised here and, although it has not been possible to exhaustively consider the possible effects of each feasible option on every European site, this assessment provides a very good way of considering such potential risks and screening out high risk options.

Accordingly, the screening exercise completed for the feasible options that uses the HRA results aimed to identify:

- those European sites which are **likely** to be significantly affected by an option (i.e. effects are likely and not negligible);
- those European sites where effects are **uncertain** as the result of an option;
- those European sites which are **unlikely** to be significantly affected by an option; and
- those **options** that are unlikely to affect any European site due to their nature or location.

For each feasible option, we developed a semi-quantitative scoring system which we simplified into a single score and then ascribed as either red (likely to be significantly affected), amber (uncertain) and green (unlikely to affect/unlikely to be significantly affected). The highest score from the HRA assessment was used and options that are likely to significantly affect a European designated site were screened out. Appendix G to this report provides a summary of the secondary screening including the results of this test.

7.2.5 Strategic Environmental Assessment (SEA)

The SEA assessment has been completed by Amec Foster Wheeler and has assessed the likely economic, social and environmental effects of the individual options and identified ways in which adverse effects can be avoided and positive effects enhanced. The SEA has assessed the effects of the draft WRMP in two stages. The first stage comprised a high level assessment of all feasible options (including resource management and demand management options). A more detailed assessment has then been completed of the options that form the preferred plan and alternatives as identified in the draft WRMP.

We used the SEA assessment results, to identify the potentially significant effects for the feasible options and we translated the results from each assessment into a simple scoring system that could be applied to the secondary screening. We did this by counting where significant negative effects (- -) were reported against constructing and operating the option as a way of indicating a potential significant risk. We decided not to use the minor negative effect scores (-) as there were many more of these which might be possible to be overcome with mitigation. We were cognisant of the potential benefits of significant positive effects (+ +) but these were not used as part of the

screening assessment. An example of an SEA matrix output is shown in Figure 8 with the key to the scoring system in Figure 9. In this example, the sum of the significant negative effects is a count of three.

It is important to realise that the purpose of the SEA scoring matrix is not to quantify and compare different SEA objectives but the count of the significant negative effect scores was seen as an appropriate way to use the SEA output results to inform the secondary screening process.

Option	Stage	1. Biodiversity	2. Geology and Soils	3. Water Quantity and Quality	4. Flood Risk	5. Air Quality	6. Climate Change	7. Health	8. Wellbeing	9. Water Resources	10. Waste and Resources	11. Cultural Heritage	12. Landscape
WR037b: Haweswater Reservoir (Raise Embankment Structure)	Construction	--/?	+	0	--	-	-	-	++/-	0	-	-	--
	Operation	--	0	-	0	0	-/?	++	++	0	-/?	0	-

Construction

This option would involve the raising of Haweswater IR Dam by 1.0m to increase water storage. It is assumed that an increase of 1.0m would result in an increased storage capacity of 3,900Ml with a use benefit of 23 Ml/d. Ancillary refurbishments and structural modifications would be required to accommodate the increased storage capacity of the reservoir including: raising of the reservoir's inlet tower and access bridge; installation of a new steelwork platform at the spillway; increase in the size of the existing stilling pools downstream of the dam; a new road bridge; minor perimeter works to the reservoir (7.5km); and remedial works to the proposed site compound (1000m²).

The western and eastern boundary of the reservoir falls within the Naddle Forest SAC/SSSI designation. There is an additional SSSI (Blea Water) 500m to the south-west, from which water flows into the reservoir. The land to the immediate east of the reservoir is an RSPB Reserve where Golden Eagles have been recorded. Haweswater Beck is a tributary of the River Eden SAC, however, impacts as a result of construction activities can be avoided with established measures although the proximity of the SAC will require that this be clearly established at the scheme level. The most direct impact would be on the Naddle Forest SAC regarding the increased reservoir levels. Precise effects cannot be determined without micro-topographical analysis, but a 0.5m increase in levels at minimum would likely reduce the SAC area by at least 0.13 ha, and potentially more at 1m depending on local topography as reported by the HRA. Should this option be taken forward to the preferred options stage, impacts on those features of designated sites that may be significantly affected will be considered in more detail and mitigation measures identified. There is the potential for suspended sediment to enter Haweswater Reservoir and Haweswater Beck which would affect the ecology (i.e. smothering, reduction in light) including fish, macrophytes/phytobenthos and invertebrates; however, any impacts would be temporary, and potentially negligible under established mitigation measures. Furthermore, no long term or extensive changes to the hydrological regime of the Haweswater Beck are expected, as it is assumed that compensation flows from the reservoir would be maintained during construction. Overall, this option has been assessed as having a significantly negative effect on Objective 1 though this remains uncertain.

Construction would take place on existing dam infrastructure which has been assessed as having a positive effect on land use/soils.

It is not expected that construction of this option would affect water quality or water resources, provided best practices are adhered to and mitigation implemented (such as dust suppression, soil containment and emergency response procedures).

Construction would not cause or exacerbate flooding in the area although the site itself and its waterway network are within a Flood Zone 3, and therefore construction may be liable to flooding depending on the timing of work.

The option would generate a large number of vehicle movements (18,682) during the 2 year construction period which, in addition to emissions from plant and machinery, would have minor negative effects on local air quality.

Figure 8 Example SEA matrix output showing the scores for each assessment criteria

Score	Description	Symbol
Significant Positive Effect	Significant positive effect of the Water Resources Management Plan option on this objective	++
Minor Positive Effect	Positive effect of the Water Resources Management Plan option on this objective	+
Neutral	Overall neutral effect of the Water Resources Management Plan option on this objective	0
Minor Negative Effect	Negative effect of the Water Resources Management Plan option on this objective	-
Significant Negative Effect	Significant negative effect of the Water Resources Management Plan option on this objective	--
No Relationship	There is no clear relationship between the Water Resources Management Plan option and the achievement of the objective or the relationship is negligible.	~
Uncertain	The Water Resources Management Plan option has an uncertain relationship to the objective or the relationship is dependent on the way in which the aspect is managed. In addition, insufficient information may be available to enable an assessment to be made.	?
Mixed Effect	Mixed positive and negative effect of the Water Resources Management Plan option on this objective	+/-

Figure 9 Qualitative scoring system used for the SEA assessment

For each feasible option, the results of this exercise were simplified into a single score and then ascribed as a low, medium or high count: Low count (0-2); Medium count (3-5); High count (6-9). Only options with a high count were screened out. The other options as low or medium count remained. Appendix G to this report provides a summary of the secondary screening including the results of this test.

7.2.6 Water Framework Directive (WFD)

The WFD assessment has been completed by Amec Foster Wheeler and has aimed to identify the potential level of WFD impact associated with each feasible option and has considered the following key questions in respect of the construction and operational phase of each feasible option:

- At the waterbody scale, would the option result in a deterioration of any of the WFD classification components from one status class to the next, (e.g. from good to moderate), irrespective of whether or not it results in the lowering of overall status?

- Would the option prevent any water bodies from achieving good overall status or, where relevant, an alternate objective?

Accordingly, the screening exercise completed for the feasible options that uses the WFD results aimed to identify no or minimal impacts, minor level of impact, medium level of impact and high level of impact. The definitions of these impact assessment are shown in Figure 10.

Level of impact	Description of impact
No or minimal impacts	No measurable change in the quality of the water environment or the ability for target WFD objectives to be achieved.
Minor level of impact	Impacts from the option when taken on their own have the potential to lead to a minor localised, short-term and fully reversible effect on the quality of the water environment that would not result in the lowering of WFD status. Impacts would be very unlikely to prevent any target WFD objectives from being achieved.
Medium level of impact	Impacts when taken on their own have the potential to lead to a widespread or prolonged effect on the quality of the water environment that may result in the temporary lowering of WFD status. Impacts have the potential to prevent target WFD objectives from being achieved.
High level of impact	Impacts when taken on their own have the potential to lead to a significant effect and permanent deterioration of WFD status. Impacts have a high risk of preventing target WFD objectives from being achieved.

Figure 10 Impact classification categories for WFD assessments

Only options with a 'high level of impact' were screened out. The other options as low or medium count remained. Appendix G to this report provides a summary of the secondary screening including the results of this test.

7.3 Results

Table 13 below shows a summary of the screening criteria we have used, rationale and results.

Table 13 Secondary screening criteria

Secondary screening criteria and purpose	Question/s	Rationale and decision
Environmental and Social Costs (E&S) assessment To identify those feasible options with high E&S cost components in order to determine their likely appropriateness as feasible (constrained) options. This criterion was applied to all four option categories.	Does the feasible option have a high E&S cost component and, when also considering the actual costs of constructing and operating the scheme, is the Average Incremental Social Cost (AISC) sufficiently high to consider the option not viable for further consideration?	A ranking of calculated AISC values was used to determine which feasible options were unlikely to be considered further as constrained options. Whilst these were still considered for other components of secondary screening, an initial view of 'unlikely' was taken based on this ranking approach. Out of 187 options assessed, 106 were considered as high AISC values, 39 as uncertain and 42 as low

Secondary screening criteria and purpose	Question/s	Rationale and decision
Water Available for Use assessment (WAFU) To identify those feasible options with small WAFU benefits that can be discounted from the constrained options. This criterion was applied to all four option categories.	Does the feasible option give a discernible WAFU benefit in the water resources models which is above the *de-minimis* criteria identified for the Water Resource Zone?	Any calculated WAFU less than the *de-minimis* criteria threshold for the individual water resource zones was screened out. 56 feasible options failed this screening test and were moved into the rejected options register.
Climate Change assessment To identify the sensitivity of the feasible options to the effects of climate change. Individual options were assessed and the potential impact (in Ml/d) was categorised. This criterion was applied to resource type options only.	What is the potential impact due to the effects of climate change? Very Low/No impact: <1 Ml/d Low Impact: 1 to 5 Ml/d Medium Impact: > 5 to 20 Ml/d High Impact: > 20 Ml/d (represents approximately 1% of regional DO) The use of Ml/d (rather than % impacts) allows different size options to be compared (for example a 50% impact on a large option has a bigger regional DO impact than a similar % impact on a small option). Categorising within a range of impacts acknowledges that there is uncertainty associated with this high level screening process.	Any high impact climate change results that failed this screening test were screened out as the impact of climate change on these options could potentially reduce the SRZ DO by 1% or more. All other options with Very Low/No impact to Medium impact were not screened out. Out of 149 options assessed, only 3 options failed this screening test and were moved into the rejected options register. The other scores Very Low/No impact = 1 Very Low = 104 Very Low/Low = 2 Low = 20 Low/Medium = 6 Medium = 13 High Impact = 3
Strategic Environmental Assessment (SEA) To identify the potentially significant environmental effects for feasible options using the SEA assessment criteria. The adverse and beneficial effects are assessed for each option against a broad range of environmental and social topics. This criterion was applied to all four option categories.	Based on the decision framework questions for the 12 SEA topic areas, is there sufficient evidence as to why a feasible option should not progress to the constrained options list? In order to use the SEA outputs objectively to support secondary screening, it was decided to use the count of the significant negative effects (- -) that have been derived as an indicator of risk of failure of the option if implemented. For each feasible option, the results of this exercise were simplified into a single score and then ascribed as a low, medium or high count: Low count (0-2); Medium count (3-5); High count (6-9). Only options with a high count were screened out.	A three tier scoring system was used in order to understand the potential risk of the option failing if implemented. Low count (0-2) Medium count (3-5) High count (6-9) Any high count was considered to be at significant risk of failure if implemented and the option was screened out. All other options with Low impact to Medium impact were not screened out. Out of 138 options assessed, only 3 options failed this screening test and were moved into the rejected options register. High = 3 Medium = 12 Low = 123
Habitats Regulations Assessment (HRA) To identify whether the feasible options if implemented could potentially lead to likely significant effects on a European designated site.	Is there a risk that if implemented, the feasible option could have a significant or adverse effect on a European site which are unlikely to be avoidable or mitigatable? For each feasible option, we developed a semi-quantitative scoring system which we simplified into a single score and then ascribed as either red (Likely to be significantly affected), amber (Uncertain) and green (Unlikely to affect/unlikely to be significantly affected). The highest score	A three tier scoring system, consistent with the HRA environmental report was used to understand the potential risk of the option failing if implemented. The highest score from the HRA assessment (separate construction/operational effects) was used:

Secondary screening criteria and purpose	Question/s	Rationale and decision
This criterion was applied to resource type options only.	from the HRA assessment was used and options that are likely to significantly affect a European designated site were screened out. Those options that are unlikely to affect any European site due to their nature or location.	Unlikely to affect/unlikely to be significantly affected Uncertain Significantly affected Any option that could significantly affect a European designated site was screened out. All other options were not screened out. Out of 154 options assessed, only 6 options failed this screening test and were moved into the rejected options register. Out 6 Uncertain 69 In 79
Water Framework Directive (WFD) Assessment To identify whether the feasible options if implemented could cause a deterioration at element or waterbody level; prevent the achievement of River Basin Management Plan objectives; and/or prevent the achievement of Protected Area objectives. This criterion was applied to resource type options only.	Does the option potentially lead to the deterioration of waterbody status or impede the achievement of good status through construction or operational effects?	A four tier scoring system, consistent with the WFD environmental report was used to understand the potential risk of the option failing if implemented. The highest score from the WFD assessment (separate construction/operational effects) was used: • No/minimal impact • Minor impact • Medium impact • High Impact Only options with a 'high level of impact' were screened out. The other options as low or medium count remained. Out of 81 options assessed, only 5 options failed this screening test and were moved into the rejected options register. High 4 Medium 35 Minimal 5 Minor 37

Those options that failed the secondary screening have been placed into the list of rejected options which at this stage, have not been considered further. However, if new evidence becomes available in the future, then they can be reconsidered. However, with such a large number of options, this has been considered an unlikely requirement.

7.4 Audit of secondary screening

The results of the secondary screening were issued to Amec Foster Wheeler in order for them to complete an audit of the screening process. This was to ensure that all of our feasible options were considered equally.

The result of this review showed that (with the exception of a few comments and suggestions that we subsequently took on board), the secondary screening criteria that we developed and have presented in this technical report have been applied consistently and clearly across different options (both in terms of the category and in terms of our own and third party options). It was recognised that while there remains an inherent uncertainty and the need to ensure consistency in underlying environmental assessments (e.g. climate change risk and WFD assessments, in particular), using the outputs from established types of assessments (SEA & HRA) facilitates transparency and consistent treatment of different options in the secondary screening process.

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One of the recommendations of this review was to provide a clearer link between the screening categories and the six screening criteria used in the secondary screening phase. This relationship was added into this report as Table 11.

8 United Utilities export options

8.1 Introduction

In Section 3.7, we summarised how we went about generating third party options to be included in our WRMP as potential imports. This process generated a large number of potential options that we have considered and assessed in the same way as our own options.

At the same time, we also contacted other water companies and organisations whether there was any potential to export water from our supply system to improve other areas of the country supply-demand position or resilience improvements. This exercise was included within the options identification workstream but adopted a different approach.

Water companies and other organisations were contacted directly by us to discuss these export opportunities. We also took the opportunity at the same time to notify the organisations of the market engagement process that were undertaking in order to generate third party import options in an effort to consider all reasonable cross-company and third party options. This was done as early as possible to give opportunity for neighbouring companies to bid into our plan.

Bilateral discussions were held with the water companies who responded to our initial correspondence. Any potential export options were given a unique identification in line with the system we adopted for the other options under consideration. Details of our export option process is out outlined in the sections below.

Following the publication of the water company *Draft WRMP* document in December 2017, potential importers and exporters will have an opportunity to review their costs and continue discussions. Any further changes in proposals will be considered in our *Revised Draft WRMP* due for publication in summer 2018.

8.2 Process to define export opportunities

We identified water companies and licensees to approach regarding potential water trading opportunities, these included neighbouring companies and companies that share resources with ourselves. Other export options that have been considered, particularly those with non-water company providers, arose through the PIN process which has been outlined in Section 3.7.

The *first stage* of the export option process involved contacting other water companies to initiate discussions. We initially contacted the companies identified in Table 14 below and arranged initial discussions to establish the likely need and potential of water trading options between the two water company regions. It was deemed in these meetings whether discussions should progress further to stage two.

The *second stage* took place if both parties agreed a potential to trade after initial discussions and more detailed discussions were then held. These meetings consisted of an open information exchange relating to likely water quantity required and the possible points for potable and non-potable supply connections. These discussions included both possibilities for permanent and temporary trades of water, e.g. dry year requirements or for resilience related requirements. This has resulted in an unconstrained[56] set of water trading options between the parties for further consideration, in some cases it was appropriate for the first two stages to occur at the same time due to either time constraints or speed of progress having been made in discussions.

During a *third stage* we determined whether the options identified were technically feasible, promotable and for any import options considered, whether they would provide a deployable output benefit to our supply system. For feasible options, further information exchange was required to ensure the scope of the options were suitable for both parties prior to any costs being incurred to estimate option scopes. At this stage of further information sharing

[56] Although the export options have not been processed officially through the primary and secondary screening phases (because they are not options feeding into our WRMP19 process and there was uncertainty on need), we have adopted the same terminology of unconstrained and feasible.

we provided a Non-Disclosure Agreement for both parties to review and sign prior to sharing any commercially confidential information.

The process of assessing the feasibility of the unconstrained list consisted of modelling the proposed options in our water resources models to test whether the options provide a benefit to the deployable output of the resource zone. This, alongside an assessment of the criteria set out in the Guideline determined whether each option was included in the feasible options list.

Where options have not progressed, this has been clearly documented and final status fed back to the potential importer or exporter. This continued communication also included seeking confirmation of the option status, either an import and export, from the providing or receiving water company and if the third party or water company no longer deemed the option feasible themselves, withdrawing it from our considered list of options. A list of the unconstrained options identified during discussions is shown in Table 15 below including each option status after further investigation at stage three. Table 15 Unconstrained export options identified for WRMP19 during engagement with other organisations and the current status of these options the options that have been progressed which are tailored to confirmation of the need through the WRMP19 process. Appendix H contains the details of the options that were considered.

Table 14 Water companies contacted by United Utilities in relation to water export trading

Name	Meeting date	Outcome
Albion Water	Meeting held 28/11/2016	One new unconstrained import option to UU from Albion Water
Bristol Water	Teleconference held 21/11/2016	One export option to be considered from UU to Bristol water
Canal & Rivers Trust	Canal and Rivers trust responded to PIN process. First meeting held 09/06/2016, second meeting held 29/11/2016. UU export costs letter sent 06/10/2017	Two export options to the Canal and River Trust. Seven import options to UU with one additional option under consideration from Yorkshire Water via Canal and River trust infrastructure.
Dee Valley Water	Joint meeting between UU, Dee Valley and Severn Trent held 07/06/2017	Two export options to be considered from UU to Dee Valley Water
Northumbrian Water	Teleconference held 14/11/2016	Three unconstrained import options to UU from Northumbrian Water
Peel Holdings	Peel Holdings submit two options via PIN process. No meeting held	Two import options to UU from Peel holdings considered in unconstrained list, both options withdrawn by third party prior to screening process
Scottish Water	Information request sent to Scottish Water retail arm, no follow up meetings held	One export option reconsidered from WRMP14 from UU to Scottish Water
Severn Trent Water	First meeting held 07/06/2016. Second meeting held 09/12/2016. Joint meeting between UU, Dee Valley and Severn Trent held 07/06/2017. UU export costs letter sent 06/10/2017	Six export options considered from UU to Severn Trent Water
South Staffordshire Water	Meeting held 11/11/2016	One export option to be considered from UU to South Staffordshire Water
Thames Water	Joint working to develop options already underway prior to WRMP19	Export options considered from UU to Thames Water, this option has been considered in Draft WRMP19 Section 7 Preferred plan and alternatives. See Section 8.4 for further details.
Dŵr Cymru Welsh Water	Teleconference meeting held 20/02/2017	One export option considered from UU to Dŵr Cymru Welsh Water, this has since been withdrawn as Dŵr Cymru Welsh Water confirm there is currently no requirement to further pursue option.
Yorkshire Water	Meeting held 27/10/2016. UU export costs letter sent 06/10/2017	Three options to be considered for export from UU to Yorkshire Water including one involving transfer via Canal and River Trust infrastructure.

Table 15 Unconstrained export options identified for WRMP19 during engagement with other organisations and the current status of these options

Company	Option reference	Resource Zone	Proposed export volume (Ml/d)	Status at Draft WRMP submission	Comment
Thames Water	WR400	SRZ	Up to 180	Feasible option	Discussions currently ongoing
Bristol Water	WR401	SRZ	30	Not progressed beyond unconstrained	Option not progressed beyond stage 1 by either party
Yorkshire Water l	WR402	SRZ	2.3	Feasible option	Option costed, discussions currently ongoing
	WR403	SRZ	1	Feasible option	Option costed, discussions currently ongoing
	WR404	SRZ	1	Feasible option	Option costed, discussions currently ongoing
Canal and Rivers Trust	WR405	SRZ	10	Feasible option	Option costed, discussions currently ongoing
	WR406	SRZ	3	Feasible option	Option costed, discussions currently ongoing
South Staffordshire Water	WR407	SRZ	30	Feasible option	Discussions currently ongoing
Dŵr Cymru Welsh Water	WR408	SRZ	8	Not progressed beyond unconstrained	Option not progressed beyond stage 1 by either party
Scottish Water	WR409	CRZ	2	Not progressed beyond unconstrained	Option not progressed beyond stage 1 by either party
Severn Trent Water	WR410	SRZ	60	Feasible option	Option costed, discussions currently ongoing
	WR411	SRZ	30	Feasible option	Discussions ongoing as part of Thames trade option
	WR412	SRZ	2	Feasible option	Option costed, discussions currently ongoing
	WR413a, WR413b & WR413c	SRZ	10	Feasible option	Option costed, discussions currently ongoing

Company	Option reference	Resource Zone	Proposed export volume (Ml/d)	Status at Draft WRMP submission	Comment
	WR415	SRZ	20	Not progressed beyond unconstrained	Option not progressed through WRMP process as negotiations already ongoing
	WR416	SRZ	10	Feasible option	Option costed, discussions currently ongoing
Dee Valley Water	WR417	SRZ	1	Not progressed beyond unconstrained	Option not progressed through WRMP process as negotiations already ongoing
	WR418	SRZ	1	Not progressed beyond unconstrained	Option not progressed as third party confirmed not needed for WRMP, however still under consideration for future resilience

8.3 Export costs

Feasible options were costed by us using the same approach as our own and third party import options. These costs have been analysed and we have developed consistent pricing for each option and these have been shared with the receiving water companies in order for them to consider the viability of these United Utilities export options alongside their own options. Not all options that progressed to the feasible stage have been costed and developed via this route. Some water trading opportunities were already being discussed alongside the WRMP process and were at a higher level of maturity before the bilateral engagement started. These options have however been included in the WRMP record of options to bring visibility to these currently under consideration as some have progressed to a stage to be considered as part of the WRMP Preferred plan and alternatives. Specific export options that have been costed by ourselves have been outlined in Table 15 above.

8.4 Potential export to Thames Water

In our 2015 WRMP, we considered a scenario with an export of 180 Ml/d from Vyrnwy Reservoir. This export was to support abstraction downstream on the River Severn by Thames Water or other abstractors. Although it wasn't selected in Thames Water's preferred plan in 2014, Thames indicated that transferring water from Lake Vyrnwy could be a viable option in the future. In Thames Water's 2014 WRMP it set out to undertake detailed studies to examine the longer term large water resource options to ensure the best 'value' solution is selected in time for WRMP19. These studies included transfers, including potential third party water supply options.

During the period since then we have worked with Thames Water to progress the assessment of the Vyrnwy export. As well as development of options and assessments of the impact of the export on our supply system, we have:

- Submitted indicative prices to Thames Water for their option appraisal, for different sized trades (60 Ml/d, 148 Ml/d and 180 Ml/d);
- Worked with Thames Water to set out a 'heads of terms' which could form the basis of future contractual protections for both parties;
- Commissioned, jointly with Thames Water, appraisals using stochastic hydrology to further assess the coincidence of drought in different areas of the;

- Worked with Severn Trent Water to identify potential joint options to supply Thames Water via the River Severn, and jointly submitted indicative prices for two options (12 Ml/d and 30 Ml/d);
- Commissioned, jointly with Severn Trent Water, an illustrative cost assessment by Atkins for a Severn-Thames interconnector pipeline and submitted this to Thames Water to support their plan development;
- Established, with other abstractors including Severn Trent Water and Thames Water, and the environmental regulators, a River Severn working group to coordinate assessment and evaluation of strategic planning matters related to the River Severn; and
- Developed (with Severn Trent Water and Thames Water) the concept of system operator in the water sector, focussing on how it might: facilitate the development of new interconnector projects (including securing necessary regulatory approvals and assurances to underpin financing); facilitate access to the interconnector (once built) and facilitate broader water trading (that affects usage of the interconnector).

The export is proposed to be in the form of a raw water bulk supply agreement. This would give Thames Water the right to receive volumes of raw water up to the agreed reliable yield of Vyrnwy as a discharge from the reservoir. Based on assessments of the need for the water in the South East, the export would operate relatively infrequently (less than 15% of the time). However, by making this water available for export there would be implications for the drought resilience in the North West. This is discussed further in the *Draft WRMP*. Therefore an extended methods appraisal has been used to assess this and select options designed to maintain resilience in the event of a trade. Revenues from Thames Water under the bulk supply agreement would cover the costs of these options, and make a contribution to the general running costs of United Utilities which are shared proportionately between all customers. Therefore, as a result of the export there would be a small contribution to lowering the bills of customers in the North West.

The technical assessments that were used to develop this plan assume that an export from Vyrnwy would be required in 2035. This is intended to be indicative of a trade sometime in the 2030's. Due to all water companies developing their WRMPs at the same time, it was necessary to adopt a working assumption to progress the technical assessments. As we were finalising this *Draft WRMP*, Thames Water advised us that in the current Water Resources South East regional strategy the water would instead be needed from the late 2040s onwards.

9 Conclusions

Our approach to options identification for WRMP19 as documented in this Technical Report has been completed in accordance with the Environment Agency Water Resources Planning Guideline. We have documented our approach to assessing options to be considered within our WRMP, defining a clear process of how we have:

- Assembled our list of unconstrained options from a variety of sources. This includes both our own options (resource management and demand management options) but also those from third parties;
- Engaged the market to try and identify as many unconstrained options as possible from third parties that could be considered within our plan. We have used a variety of platforms to do this including the issuing of a Prior Information Notice within the Official Journal of the European Union alongside web-site publication and contacting third parties directly. These third parties included other water companies and abstraction licence holders amongst others;
- Consistently assessed all of our 350+ unconstrained options through a first filter of primary screening to define a list of feasible options, thereby ensuring our own and third party options were considered equitably. We appointed an external organisation to complete this work to ensure this process was fully transparent;
- Developed scopes and costs (both the costs of constructing and operating the feasible options and also the Environmental and Social costs) using a recognised assessment framework;
- Assessed the potential environmental impacts of constructing and operating these options. This has been achieved through a number of lines of reporting; a Habitats Regulation Assessment, a Water Framework Directive assessment and a Strategic Environmental Assessment. In doing so, we have considered a wide variety of legislative drivers including, for example, River Basin Management Plan objectives;
- Used the outputs of the environmental assessments, plus other criteria (whole life costs, risk of climate change and analysis of supply-system benefit) to apply a consistent second filter of screening to determine an appropriate set of feasible (constrained) options to be considered in the next phase of Options Appraisal. This work was completed by ourselves but the process we followed was audited by the external organisation who completed the primary screening. The conclusion of this work was that the design of the secondary screening phase provided a clear basis for consistent and transparent screening assessment of feasible options.

We have also explored opportunities for United Utilities to be water resource donors to other water companies to support their WRMP activities and resilience requirements. Some of this work was already in progress prior to us starting the development of our plan and has involved bi-lateral engagement discussions with many different organisations.

Therefore, we consider that our Options Identification process, with the breadth and type of the options categories we have considered and the accompanying assessments, represents a robust process that will ultimately lead to the benefit of customers and the environment. This is discussed further in the next phase of the process and is documented in *draft WRMP19 Technical Report – Options appraisal*.

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Appendix A – Option categories

Table 16 Final resource management option categories and options as proposed

RESOURCE MANAGEMENT OPTIONS			Summary of key points		
Option Group	**Scheme Type**	**Sub-Categories**	**Unconstrained**	**Feasible**	**Constrained**
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.	12	4	0
			Most options were screened out due to very low or no water availability with some due to licence changes such as the revocation of the Ennerdale Licence in 2022 and other licensing restrictions such as the legal inability to adjust reservoir compensation flows to facilitate some options. Options failed secondary screening due to either having no WAFU benefit, or being flagged at E&S lite and AISC ranking.		
	New river abstraction (SWN)	New river abstraction location, new abstraction licence and transfer to either new raw water storage or new water treatment works.	54	31	8
			11 options were third party options that were not screened, they were amalgamated with series 800 third party options. One option WR027 was merged into option WR049. A further nine options were screened out at primary screening, with six screened out during the first assessment due to failing WFD assessments and low water availability. The further three screened out during second assessment due to low water availability and uncertainty around environmental risks.		
	Reservoir (RES) – includes one RES_ITC combined unconstrained option	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; improved reservoir compensation release control	16	19	7
			Options failed primary screening because of lack of water availability, abstraction limitations, impacts on protected areas and flood storage reservoirs. The majority of remaining options were split into multiple options for secondary screening. Eight were screened out at E&S Lite and AISC ranking, two due to HRA with a further two screened out on HRA, SEA and WFD.		
	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.	4	0	0
			The approach to these options is untested and may require further study, there is currently a lack of evidence to determine a clear supply benefit so these options so they all failed primary screening.		
GROUNDWATER	Existing groundwater source (GWE)	Existing groundwater sources, removing either pump or water treatment work constraints in order to increase the	32	41	33

RESOURCE MANAGEMENT OPTIONS			Summary of key points		
Option Group	**Scheme Type**	**Sub-Categories**	**Unconstrained**	**Feasible**	**Constrained**
		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.	Four Options failed primary screening due to no water available due to water resource deficits, commitments to DWI to de-commission sources and one option failed due to elements already under construction as Part of AMP6 projects. Some remaining options were split into multiple options. Six Options failed E&S Lite and AISC ranking. One due to no WAFU benefit and one due to the NERZ supply-demand surplus requiring no new options.		
	New groundwater source (GWN)	New groundwater source, either standalone or extensions to existing conjunctive abstraction licence conditions, new associated water treatment works..	16	8	2
			Options were screened out at primary screening due to limited availability to abstract from sites, one due to saline intrusion and one due to water quality concerns. Five Options failed E&S Lite and AISC ranking at secondary screening. One had no WAFU benefit.		
	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.	1	0	0
			Only one ASR unconstrained option, this option was screened out during primary screening due to further work needing to be done to assess its viability making it unavailable for this WRMP.		
	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.	1	0	0
			One unconstrained IGA option, this failed primary screening as it was not considered suitable.		
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 (multi stage flash distillation, multiple effect distillation, mechanical vapour compression), transfer to new or existing treated water storage.	4	4	0
			All unconstrained options passed primary screening. All options failed secondary screening due to being flagged at E&S lite and AISC ranking.		
SOPHISTICATED/ CONJUNCTIVE USE OF SOURCES	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.	1	0	0
			Option merged with WR101 before primary screening.		
	Reductions in level of service (LOS)	Reduced level of service offered to customers and any associated increase to deployable output.	3	3	0
			Options not screened at primary screening. Options removed based on customer research.		
			3	2	0

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RESOURCE MANAGEMENT OPTIONS			Summary of key points		
Option Group	**Scheme Type**	**Sub-Categories**	**Unconstrained**	**Feasible**	**Constrained**
	Outage reduction (OUT)	Reduction in the calculated outage allowance by increasing the reliability of certain assets, such as the refurbishment of existing assets.	Two options were merged ahead of primary screening, the merged option passed secondary screening, one option was not screened. The unscreened option was merged with the remaining option as potential demand reduction alone was low. The remaining option failed E&S lite.		
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.	13	10	4
			Two third party options were withdrawn prior to primary screening by the third party. One third party option was not taken forward after primary screening due to a lack of detail and pollution risks to the abstraction source. Six third party options were not taken forward after secondary screening, four due to a lack of costs including no price for water, one due to a licence having been revoked, one due to the third party not being aware it had been carried over from WRMP15 and was removed with their consent. Three options still considered viable were export options and did not take part in the screening process.		
	Tankering of water (TAN)	Tankering of either raw or treated water from outside the existing operational region.	No options in this category.		
	Intra-company transfers (ICT)	Transfer of raw or treated water from one resource zone to another.	3	1	0
			One option merged with WR067 prior to primary screening, one option screened out at primary screening due to significant deficits in environmental flow and zero WAFU benefit. Remaining option screened out due to NERZ not requiring supply-demand options due to resource zone surplus.		
	International imports (INT)	Transfers of water into the existing supply system, from an international source (e.g. sea going vessels, icebergs, pipelines).	1	0	0
			One third Party option not taken forward after primary screening due to uncertainty of yield and logistics.		
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.	1	0	0
			Option screened out at primary screening as further work is needed to develop option so unavailable for WRMP19.		
	Tidal barrage (TBA)	Using tidal barrages as impoundment structures.	1	0	0
			One option screened out at primary screening due to proposed locations impacting protected sites or suffering significant pollution risk.		
LICENCE TRADING	Water industry trades (WIT)	Agreement to trade water with another incumbent water company, thereby giving greater abstraction quantity into the supply system.	17	18	12
			Two third party supply options, one withdrawn before primary screening due to not being considered a suitable WRMP option, further discussions with the third party taking place independently of the WRMP process. Remaining option split into 3 for costing. Remaining 15 options are UU export options and do not undergo options screening process. Three of these		

RESOURCE MANAGEMENT OPTIONS			Summary of key points		
Option Group	**Scheme Type**	**Sub-Categories**	**Unconstrained**	**Feasible**	**Constrained**
			export options have not been taken forward due to no approach for negotiations from the Third party or negotiations ceasing. A further two export options have not been taken forward due to negotiations already being underway ahead of the WRMP process.		
	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.	32	15	6
			All options third party supply. 14 options not taken forward from primary screening due to overlap with existing UU options, poor water quality and limited yields and significant uncertainty around option details, especially for eight mine water options that have not yet been constructed by the third party. A further 8 options were not taken forward after secondary screening, two merging with WR826 and the remaining 6 whose costings did not include a price for water so were flagged at E&S lite and AISC ranking.		
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).	10	8	5
			Two options failed primary screening, one due to no proposed location having been put forward and one due to it being located in a WTW due to close in 2021. A further three failed secondary screening due to being flagged at E&S lite and AISC ranking, with one also having no WAFU benefit.		
	Trade effluent reuse (TER)	Use of trade effluent discharges not committed to waste water treatment works, treated to either potable standards for drinking water or for non-potable use.	No options in this category.		
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.	1	0	0
			One option failed primary screening due to there being no specific water supply benefit.		

Table 17 Final production management option categories and options as proposed

PRODUCTION MANAGEMENT OPTIONS			Option Details		
Option Group	**Scheme Type**	**Sub-Categories**	**Unconstrained**	**Feasible**	**Constrained**
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	3	3	2
			One raw water loss option passed primary screening, it was screened out at secondary screening due to being flagged at E&S lite and AISC ranking. Two RWL_SSO options at all stages.		
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)	6	4	1
			Two options were not taken forward after primary screening, one of which was a third party supply option that was considered to be a service provision rather than a WR option, the other due to ongoing catchment issues with water quality and availability. A further two options were screened out at secondary screening, one at E&S lite and the other having no WAFU benefit. One third party supply option was withdrawn due to being considered a service provision with talks with third party proceeding externally to the WRMP process.		
	Process losses (PRO)	Efficiency improvements to individual or groups of water treatment works, thereby reducing water losses	1	0	0
			One third party supply option was not taken forward after primary screening due to it being considered a service provision rather than a WRMP option.		
OPERATING PRINCIPLES	Supply system operation (SSO)	Alter how part of the supply network, or the network as a whole, is operated to increase deployable output. As we already apply an operating principle of maximising deployable output whilst avoiding disproportionate cost (in line with UKWIR methodologies) this would represent a fundamental shift in behaviour. It would significantly increase operating costs and could have other negative effects. However, we feel that it could be a worthwhile addition to our overall suite of options to consider in the unconstrained options identification, informed by model sensitivity testing.	2	1	0
			One option was superseded by DPS options before secondary screening. The remaining option was screened out at secondary screening due to being flagged at E&S lite and AISC ranking.		

Table 18 Final customer management option categories and options as proposed

CUSTOMER MANAGEMENT OPTIONS			Option Details		
Option Group	**Scheme Type**	**Sub-Categories**	**Unconstrained**	**Feasible**	**Constrained**
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	1	0	0
			One demand option was screened out at primary screening due to UU having no legal powers to implement due to no regional water scarcity and the political and social acceptability of compulsory metering.		
	Enhanced metering, Smart metering (EMT)	Targeted installation of water meters and a promotional campaign to increase optant rates and change of occupancy switchers	9	3	0
			6 options were screened out at primary screening due to no obvious water savings, schemes only being applicable to certain customers leading to perceived unfair billing and complexity and lack of transparency with changing bill composition and conflicts with existing UU policy. The remaining three options were screened out at secondary screening due to demand saving being unlikely and two due to not enough evidence to make them available for WRMP19, with one due to be incorporated into business as usual if an ongoing trial is successful		
	Meter Installation policy (MIP)	Installation when premises change ownership, industrial, commercial and public sector, households, properties with excessive water use e.g. swimming pool	10	6	0
			Options failed primary screening due to difficulties in metering such as the complexity of the proposed sites, legal uncertainty around access to void properties and regional public perception of meters due to no issues of water scarcity and legal constraints on compulsory metering. The remaining option was split into six options, all of which were flagged at secondary screening by E&S lite and AISC ranking		
	Metering of sewerage flow (MSF)	In order to manage water consumption and water waste	1	0	0
			The option was screened out at primary screening due to significant uncertainty surrounding the option and no evidence that it would drive a reduction in demand		

CUSTOMER MANAGEMENT OPTIONS			Option Details		
Option Group	**Scheme Type**	**Sub-Categories**	**Unconstrained**	**Feasible**	**Constrained**
	Customer metering (CME)	Meter installation on customer contact, enhanced promotion, blanket promotion, metering on change of occupier	7	21	2
			Three options failed primary screening due to lack of investment needed making it unsuitable to define as a WRMP option, one option already being targeted as a baseline activity and no targeting of specific customers to provide benefit. The remaining options were split into multiple options. 19 options were screened out at secondary screening, six due to being BAU activities, four due to being flagged as E&S lite and AISC ranking and eight due to negligible benefits.		
	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	1	0	0
			Option did not pass primary screening as UU customer awareness about compulsory metering is limited as would likely generate a strong negative reaction.		
FEES AND TARIFFS	Introduction of special fees (ISF)	Introduction of separate additional fees for: sprinkler users, hose pipe users, outside tap users, swimming pools	1	0	0
			Option screened out at primary screening due to customers being unlikely to accept special tariffs, particularly as UU does not have universal metering.		
	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	9	3	0
			Six options were screened out at primary screening due to no obvious water savings from options, change in tariffs likely to be seen as unfair billing and conflicts with existing UU policy. Three remaining options were screened out at secondary screening, due to not having enough information available for use in WRMP19 with trials underway, one if successful would become BAU and the other for inclusion in the next WRMP, the third option was screened out as it was unlikely to offer any demand savings.		
	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	2	0	0
			Two options were screened out at primary screening due to one likely to result in negativity due to perceived unfair tariffs and one due to being unlikely to trigger lower consumption		

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CUSTOMER MANAGEMENT OPTIONS			Option Details		
Option Group	**Scheme Type**	**Sub-Categories**	**Unconstrained**	**Feasible**	**Constrained**
	Refer a friend schemes (RAF)	Offer one off payment for referring a friend to have meter fitted	1	6	0
			Option split into six after passing primary screening. All six options failed secondary screening after getting flagged at E&S lite and AISC ranking and some also offering negligible benefits.		
	Reduced bills (REB)	Company subsidy to consumers for the purchase / installation of water saving products	3	0	0
			All three options were screened out at primary screening, two due to unfairness between metered customers and unmeasured customers and unfairness between customers already using water efficiently and those incentivised to do so, the third option was screened out due to UU having no direct control of how appliances and fittings are used, the same savings could be achieved with educational advice on water efficiency without the expense of subsidies.		
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	5	1	0
			Four options failed primary screening due to option only benefiting a limited range of customers who are interested and able to sign up to scheme, lack of willingness to pay evidence and concern over property development rates, lack of UU wholesale control on wholesale customers and limited benefits to SDB. The remaining option was screened out at secondary screening due to no evidence of savings and no results available from studies to indicate benefit.		
	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	2	12	10
			The two initial options were split into 12 after primary screening. Two options were screened out at secondary screening due to being flagged at E&S lite and AISC ranking		
	Promotion of water saving appliances (WSA)	Appliance exchange programmes - washing machine, dishwasher, water closets or WCs	No options in this category.		
			6	19	4

CUSTOMER MANAGEMENT OPTIONS			Option Details		
Option Group	**Scheme Type**	**Sub-Categories**	**Unconstrained**	**Feasible**	**Constrained**
	Promotion of water saving devices (WSD)	E.g. water butts, saver flush, shower regulator, tap insert - through website and call centre	Two options were screened out at primary screening due to being poorly defined and a lack of reliability. Three of the remaining options were split into multiple options ahead of secondary screening. 15 of the remaining options were screened out during secondary screening, 14 due to being flagged at E&S lite and one due to a lack of data on savings and uptake rates		
	Installation of water saving devices (ISD)	Water efficiency home check-ups with water saving device installation	1	6	4
			One option split into six ahead of secondary screening. Two options screened out due to being flagged at E&S lite.		
	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	4	0	0
			Four options failed primary screening due to too many barriers to implementation and insignificant customer take up on scheme to significantly support the supply-demand balance.		
	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	11	4	0
			Seven options failed primary screening. Two removed due to being duplicates of other options, the remaining due to uncertainty around benefits requiring further investigation and making them unsuitable for this WRMP and limited influence in customers homes to bring about substantial behavioural changes. The remaining four options were screened out at secondary screening due to there being no evidence of savings or uptake figures and ambiguity around being allowed to contact public sector customers.		
	Advice and Information on direct abstraction and irrigation techniques (AIT)	Drip vs. spray irrigation, Direct abstraction, Other techniques for reducing evaporation	No options in this category.		
	Advice and information on leakage detection and fixing techniques (LDF)	Industrial, commercial and public sector, household, agricultural	1	1	1
			The only option in this category passed primary and secondary screening and has gone forward to options appraisal		
	Partnership projects with public and third sector organisations (PPO)	e.g. housing associations	1	6	4
			All options passed primary screening 2 options were screened out at secondary screening due to being flagged at E&S lite and AISC ranking.		
	Water efficiency at UU own sites (WUU)	*'Do as I do'* - This project focuses on water use on all UU 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.	1	1	0
			One option was screened out at secondary screening due to there being no evidence of savings.		
			3	1	1

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CUSTOMER MANAGEMENT OPTIONS			Option Details		
Option Group	**Scheme Type**	**Sub-Categories**	**Unconstrained**	**Feasible**	**Constrained**
	App for measured customers (APP)	Develop customer app to enable continued engagement with the customer, to help long term behaviour change.	Two options failed primary screening, one due to the lack of confidence of an app on its own to achieve water savings benefits and one due it being considered a process tool rather than a WRMP option.		
	Education programme (EDU)	Continue to deliver Key Stage 2 educational programme	1	2	2
			One option was split into two after primary screening, the remaining two options passed secondary screening and went forward to options appraisal		
	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	1	0	0
			One third party option was not taken forward after primary screening due to it being considered to create inequality across UU customer due to unfairness of those customers outside of the subsidised are not benefiting.		

Table 19 Final distribution management option categories and options as proposed

DISTRIBUTION MANAGEMENT OPTIONS			Option Details		
Option Group	**Scheme Type**	**Sub-Categories**	**Unconstrained**	**Feasible**	**Constrained**
LEAKAGE	Leakage reduction - additional leakage detection (LEA)	N/A	33	53	31
	Leakage reduction - pressure management (LEA)	optimisation of existing schemes, implementation of new schemes	Three third party options were not taken forward past primary screening due to regulatory restriction on what constitutes a WRMP option, no direct water savings and issues with requiring customer permission which could be seen as being intrusive. One further option was screened out at primary screening due to being too difficult to monitor and being vulnerable to fraud. Six options were split into multiple options after primary screening. 27 further options were screened out at secondary screening, 14 due to being flagged at E&S lite and AISC ranking, two due to being merged with other options, two due to offering negligible benefits and three likely to cause an increase in leakage or showing no benefit. Four options were third party leakage options and were not taken forward from secondary screening two due to third parties failing to provide costing detail within the timeframe for the options to be considered, one being withdrawn by the third party and one due to them acknowledging a lack of quantifiable information for the screening process.		
	Leakage reduction - mains rehabilitation (LEA)	N/A			
	Private leak repair scheme (LEA)	free repair scheme, subsidised repair scheme, supply pipe replacement scheme			

Appendix B – Catchment options

Table 20 Potential catchment options considered as unconstrained options

Option Name	Water Resource zone	Possible Ml/d	Water Resources Management Plan Option				Feasible?	Supporting evidence for screening
			Supply system benefit	Promotability	Constraints	Risk of failure		
Pocket Nook boreholes Identify sources of solvent pollution and implement measures to reduce it, which could include educating the polluters to change their usage patterns.	Strategic resource Zone (SRZ)	Up to 17 Ml/d in licensed volume (assuming that the sources became non-operational due to water quality deterioration)	Yes	Yes	No	Yes	No	Safeguard zone investigation AMP6 has been inconclusive as to the sources of solvents and the trajectory for the increasing trend of solvents. Even if the sources could be identified, this option relies on behaviour change, which has an uncertain outcome. The lag time for this option to take effect could be up to 20 years (no "time of travel" study has been conducted for this site). If the pollution source is historic then catchment activities will not be effective.
Haweswater reservoir (colour) Expand the area of moorland restoration carried out during SCaMP in AMPs 5 & 6. Activities include grip blocking and rewetting of blanket bog to reduce the increase in colour (DOC) of raw water, which limits the through-put of the WTW (filters).	SRZ	Unable to be quantified at the current time	No	Yes	No	Yes	No	Work is on-going up to 2020. Using Durham University's colour model we have be able to demonstrate a reduction in the rate of increase in colour, which has bought an additional 20 years before the WTW filters need to be upgraded.
Thirlmere reservoir (colour) Expand the area of moorland restoration carried out during SCaMP in AMP5. Activities include revegetating areas of bare peat and planting on steep slopes to stabilise them.	SRZ	TBC	No	Yes	Yes common land	Yes	No	An investigation is underway in AMP6 to provide evidence as to the source of colour in Thirlmere reservoir and demonstrate to the Commoners that further moorland restoration is required.

Option Name	Water Resource zone	Possible Ml/d	Water Resources Management Plan Option				Feasible?	Supporting evidence for screening
			Supply system benefit	Promotability	Constraints	Risk of failure		
Longdendale reservoirs (colour) Expand the area of moorland restoration carried out during SCaMP in AMPs 4, 5 & 6. Activities include grip blocking and rewetting of blanket bog to reduce the increase in colour (DOC) of raw water, which limits the through-put of the WTW (filters).	SRZ	TBC	No	Yes	Yes common land	Yes	No	SCaMP monitoring data shows little improvement over the last 10 years in raw water quality at the reservoir, despite large scale vegetation improvements in the catchment. This is owing to the very poor status of the moorland prior to work commencing in 2005. A PhD study with Manchester University has shown that colour cycling within reservoirs has a large effect on raw water colour.
River Dee (pesticides) Continue to engage with farmers (c. 5000) in the catchment to promote best practice use of pesticides and alternative products.	SRZ	0	No	Yes	Yes	Yes	No	Activities are ongoing in AMP6 and evidence is being collected as to their effectiveness, which will inform our plans for AMP7 and beyond.
Llangollen canal (pesticides) Continue to engage with farmers in the catchment to promote best practice use of pesticides and alternative products.	SRZ	0	No	Yes	Yes	Yes	No	Activities are ongoing in AMP6 and evidence is being collected as to their effectiveness, which will inform our plans for AMP7 and beyond.

Appendix C – PIN document

This is a copy of the document that was issued by the PIN process, as described in Section 3.7.

1. Introduction

As part of its next Water Resources Management Plan (Water Resources Management Plan), United Utilities is committed to consider opportunities for sharing water resources, at lowest cost and to reduce our customers' consumption of water. We want to get the best deal for our customers by investigating possibilities for: new bulk supply contracts, shared asset ownership, share or trade water with water company/non-water company providers, other users of water and to reduce demand through for example, water efficiency, water reuse, leakage technologies.

Suppliers of water resources could be:

- Licensed undertakers located within or geographically outside the United Utilities supply area
- Organisations or individuals located within or geographically outside the United Utilities supply area that have abstraction licences that by working together we could use as new or replacement water sources for United Utilities, e.g. industrial, agricultural users. These suppliers may be currently using their abstraction licence, only partly use their licence or no longer have a need for their licence. There could be an opportunity to trade water either wholly or in part from such licences
- Similar, organisations or individuals located within, or geographically outside the United Utilities supply area that wish to be considered as potential new abstractors and who could apply to the Environment Agency for new abstraction licences that could be used by United Utilities
- Companies that could offer water recycling or re-use services/technologies that could be adopted by United Utilities

It is important to note that potential suppliers of water resources could provide us with just the raw/untreated water (for it to be treated at either an existing or new water treatment works), or it could be the provision of a treated water supply which meets the current regulations for drinking water quality standards. We are also keen to explore opportunities for development of shared use schemes where costs can be split between United Utilities and a new market entrant. We also want to hear from organisations that can offer innovation to improve the operation of our supply system e.g. catchment focussed solutions to improve water availability.

Suppliers of solutions to reduce customers' demands for water could be from organisations or individuals that could provide:

(1) Innovative solutions to how our customers can reduce consumption through metering
(2) New technologies or devices that can be installed in our supply system or customer's properties to reduce water consumption or losses of water
(3) Other demand management activities such as customer education or audits of water consumption
(4) Innovative approaches to leakage, pressure and network management of our supply system

We also want to hear from Water Supply Licensees', operating in the United Utilities Water region, who may be able to contribute to reducing demand for water:

(1) If they can consider the implementation of new or further water efficiency initiatives to offer water savings to their customers
(2) If there are opportunities to reduce demand on the amount of water used from the potable supply system, by assessing customer acceptability of an alternative source of non-potable supply for specific industrial processes. An example of this type of alternative could be from a bespoke effluent reuse scheme.

All of these options will be considered in the development of our next Water Resources Management Plan which will cover the period from 2020 to 2045 and potentially beyond.

2. Statement of requirements

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As outlined in the PIN Notice. Appendix A to this document details the specific option types that the Environment Agency's Water Resources Planning Guidelines (WRPG) asks each water company to consider in the development of their Water Resource Management Plan. This list is not exhaustive and we would welcome other ideas that could be considered to supplement this list.

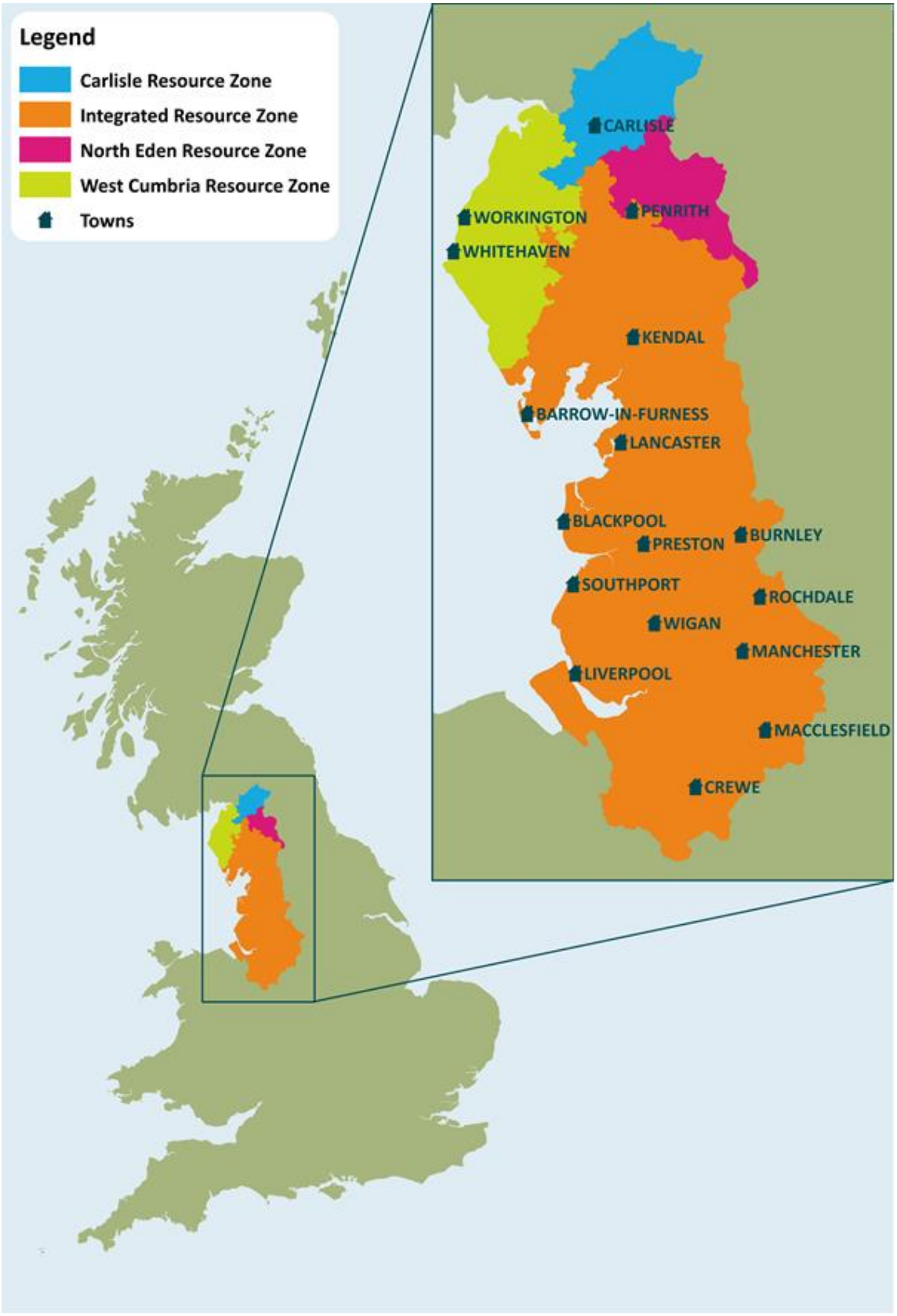
We have decided to set a minimum figure (a *de minimis* limit) on the quantity of water supply/saving offered in order to discount options that are trivial in the context of water resources in the United Utilities region. We have decided to set this *de minimis* volume to be 0.1% of our 2015/16 critical period distribution input (the peak demand expected over a two to three month period) for each water resource zone rounded to two significant figures.

Therefore, as guidance, interested parties should please note these *de-minimis* values and consider whether a proposed option is equal to or greater than the following quantities. We will exercise discretion for options proposed that are close to these figures or where it is uncertain of the exact size of the option proposed.

Resource Zone	De-minimis option capacity/demand saving benefit considered (cubic metres per day, m^3/day)
Carlisle	29
Integrated	1700
North Eden	5.8
West Cumbria	52

The area covered by the United Utilities Water Resources Management Plan is shown in Figure 1.

Figure 1 Overview of United Utilities Water Resources Management Plan area



3. Guidance on submitting a response to the PIN notice

Organisations wishing to submit a response to the PIN Notice should use the response template provided. Wherever possible, responses should be submitted by email to water.resources@uuplc.co.uk with the wording **Water Resources Management Plan19PIN** in the subject title and subject field. An automated response will be sent to confirm receipt. We are happy to discuss potential options with organisations or individuals prior to submission of a response. The same email address can be used for this purpose, again using the wording Water Resources Management Plan19PIN in the subject title and field. We will endeavour to respond to queries within 3 working days or receipt.

If an organisation is unable to submit by email then a hard copy of the response template should be posted to the address and contact detailed in the PIN Notice.

No other documentation should be submitted at this stage.

Respondents should complete the response template as fully as possible. Where there are uncertainties or required information cannot be provided, this does not mean that the option will be discounted at this stage. Wherever possible, United Utilities will subsequently work with respondents to better describe the option and to provide support to fill in gaps in knowledge/data.

The information requested on the response template is as follows:

1. Organisational information

a) Company Name
b) Address
c) Telephone Number
d) Email Address
e) Company registration Number
f) Up to date accounts rating (using Equifax or similar approved?)
g) Name of contact
h) Is option being offered in collaboration with any other company/entity?

2. Option Information

a) The name of the option that is proposed
b) Whether the option is for provision of water resource management or for water demand management (customer side management, distribution side management or production side management)
c) If the option is for water resource management, we will require:
    i. a brief description (200 words) of the option with details of the location of sources/assets/etc., either within or without the United Utilities Water Resources Management Plan area, and if applicable, envisaged transfer routes. If possible including a schematic map to visually illustrate the proposed option.
    ii. the type of water (surface water, groundwater) and the name of any source waterbody, where applicable (10 words)
    iii. a conceptual design of the option outlining the principal operational features, including details on the quantities of water that the option would provide, at its full capacity. You should indicate whether the option is available all of the time and whether there are any limitations that could restrict its use (200 words)
    iv. water quality data at point of supply, if available
    v. information relating to any abstraction licences currently held or required. For speculative new licences, you should also indicate whether you have held any discussions with the Environment Agency/Natural Resources Wales and what the outcome of these meetings was (100 words)
    vi. details of how this water resource could be transported into our supply system. The specific aspects of this information can be discussed in further detail if the option is considered to be feasible (100 words)

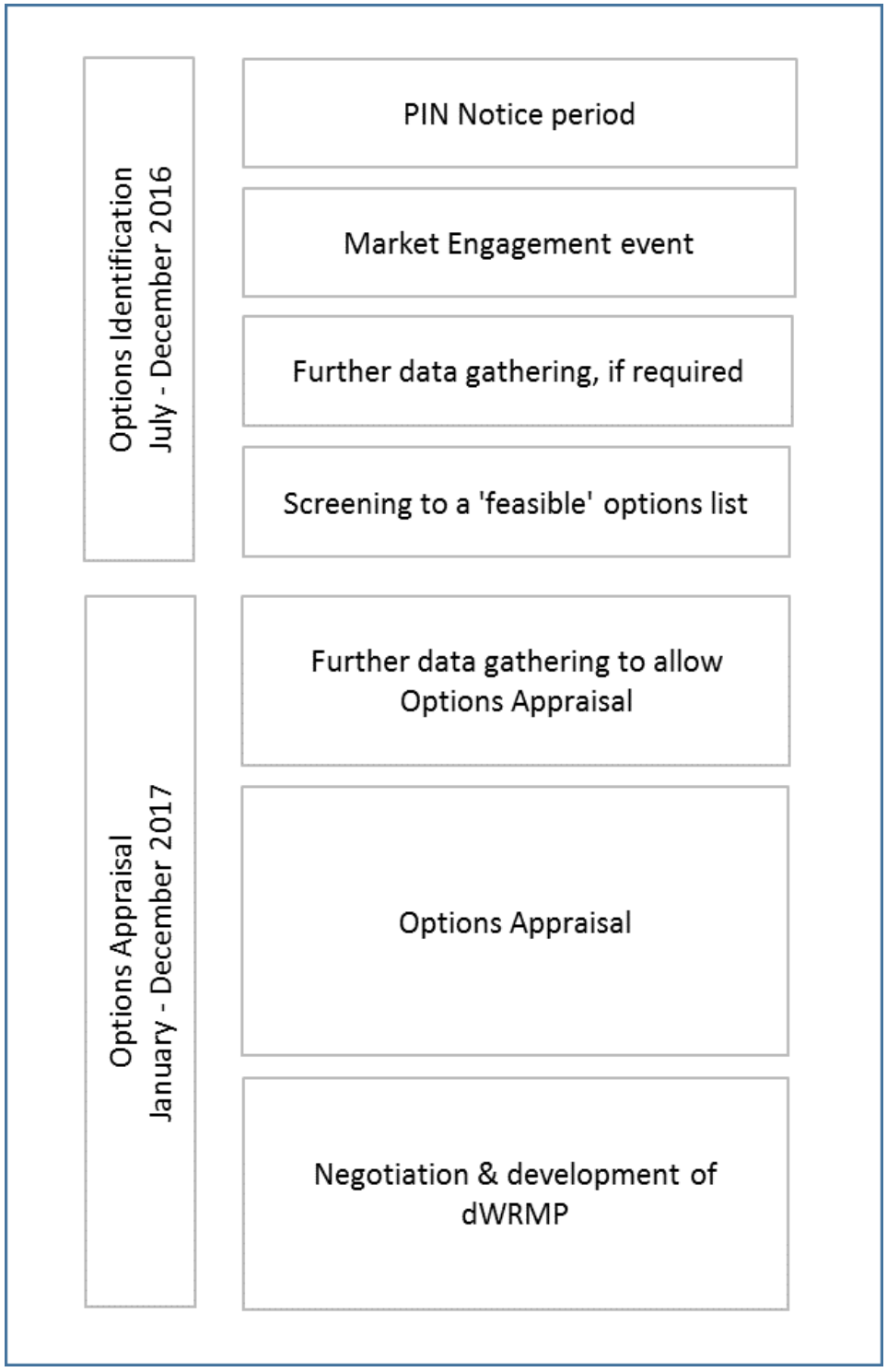
vii. an estimate of the likely lead time to investigate and implement the option and when the water would be available from (20 words)

d) If the option involves water demand management, we will require:
   i. the area intended to be covered (20 words)
   ii. a brief description of the option, explaining the type of water demand service being offered such as water efficiency promotion, use of alternative non-potable supplies for use (e.g. water reuse to industrial customers) (200 words)
   iii. the amount of water savings that could be gained from implementation of the option at its full capacity (50 words)
   iv. any limitations to the above maximum water saving (50 words)
   v. an estimate of the likely lead time to investigate and implement the option (20 words)
e) What further work is required to investigate the feasibility of the option, if so required (100 words)
f) Whether you have assessed any of the costs associated with the option and if so, what these are. Where possible, the method used to derive the scheme costs or any guidance followed should be described (100 words)
g) Details of risks and uncertainties associated with the option (100 words)
h) Constraining factors that could limit the implementation of the option, for example an indication of any potential environmental impacts. e.g. for water resource options these could be where abstractions may cause deterioration of a water body that contravenes the Water Framework Directive status or where the abstraction may cause damage to a Habitats Directive designated site (100 words)

4. Indicative guidance on the timescale and process for considering options

Figure 2 below shows the outline process that United Utilities intend to follow to explore opportunities for sharing water resources and to reduce our customers' consumption of water within the next Water Resources Management Plan.

Figure 2



Interested parties should please note the key indicative timescales associated with this PIN notice as follows:

- All options will be subject to consistent screening and selection criteria at a number of stages in the same way as options developed by United Utilities are

- This screening and selection aligns to the Environment Agency's requirements as part of the Water Resources Planning Guidelines, national guidance followed by all companies that are required to prepare a Water Resources Management Plan
- **No option identified will be implemented until 2020 at the earliest**
- **The PIN deadline is 12.00 on 16/09/2016**
- Following the PIN Notice deadline, United Utilities will organise a market engagement event. This is proposed to take place on **23 September 2016**. All respondents will receive an invitation to this event, where more detailed information on the timescale and process for considering options will be presented. Whilst attendance is likely to be beneficial, it is not obligatory for ongoing consideration.
- Following the market engagement event, United Utilities will, wherever possible, work with respondents to fill in gaps in responses, as required, to allow screening of the options. The primary screening criteria have been developed by United Utilities from criteria defined within the WRPG and are listed in Section 5 below. The purpose of this screening is to ensure that only potentially feasible options progress forwards to be developed further.
- United Utilities will undertake this primary screening in **November 2016** and we will discuss with respondents the process that is being applied. We will inform all respondents as to whether the option(s) they have submitted have been successful in making it through to the feasible options list for further development. We will be open and transparent about this procedure.
- For those options passed forward to the 'feasible' options list, United Utilities will request more detailed data on each option to allow a scope of the option to be developed. A secondary screening exercise will be completed, building on those criteria as defined in the primary screening to further screen options for their feasibility as more data and information becomes available. The subsequent constrained list of options will be appraised in line with the WRPG.
- The period for submission of more detailed data will be **December 2016 to April 2017**.
- The options appraisal stage will assess benefits, 'whole' costs and environmental impacts of each feasible option, thereby providing further screening against environmental requirements, and ranking options on cost benefit. 'Whole' costs of an option are:
    - Capital charges, including initial costs as well as maintenance / replacement
    - Fixed annual costs (reservation charges) £/year and volumetric charges in £/megalitre
    - Environmental and social (fixed/variable)
    - Carbon (fixed/variable, in tonnes of CO2e)
- We will also need to understand the costs of operating an option
- Options Appraisal is expected to take place in **June 2017**.
- United Utilities will select the more cost beneficial options as 'preferred' options for inclusion within the Draft Water Resources Management Plan, and will notify all 'feasible' options respondents accordingly.
- United Utilities will then continue to engage with 'preferred' option respondents in order to confirm the inclusion of their option(s) within the Draft Water Resources Management Plan, including seeking to establish an 'agreement in principle' for the option by **September 2017**
- The draft Water Resources Management Plan is then published in **December 2017**, for public consultation and subsequent modification, as required, prior to finalisation in **2019**.

5. Primary screening criteria

United Utilities will develop a list of 'unconstrained' options. Any options submitted will form part of this list. These options are then filtered (termed screening) to remove implausible options that may not actually work and deliver a benefit; respondents will be involved in discussions during this period. The resultant feasible options will be further assessed to appraise the costs of construction and operation of the option alongside an appraisal of the environmental and social impacts of the option. The primary screening criteria will fall into particular categories:

- ***Whether the option can provide either a supply demand benefit or reduce demand for water***. We will not discount any options based on uncertainty or the quantification of benefit at this stage and will work with providers of information to fully understand the option if the benefits are not clear at this stage.
- ***Whether the option could breach unalterable planning or environmental constraints?***
  Specific questions in relation to this criterion are:

- Are there any specific reasons why an unconstrained option would unlikely be able to progress?
- Is it technically deliverable or could it face political or regulatory complications that can be quantified?
- Is the option (with mitigation measures) likely to result in significant adverse effects on any of the following:
    - European designated site (SAC/SPA/Ramsar)?
    - Nationally designated site (SSSI/NNR/National Park/Ancient Woodland)?
    - Site with significant heritage or visual amenity value (e.g. Scheduled Ancient Monument or AONB)?
    - Is there is a risk that the option could cause a risk of flooding that cannot be mitigated?
    - Is there evidence that the option could cause deterioration of any of the waterbodies classified under the Water Framework Directive?
- We will also consider whether implementation of the option could breach unalterable legislative requirements or could be illegal
- We will also consider how the option could be perceived by our stakeholders and customers.

- ***Whether the option has a high risk of failure or inherent uncertainty.*** We will consider for example:
    - Are there aspects of the option that present a risk that is too great for further consideration as a feasible option?
    - where technology remains unproven or that the benefits of implementation benefits are very uncertain
    - there are poor data to provide evidence that a particular option type could succeed, e.g. this could include lack of catchment, hydrological, hydrogeological data

6. Secondary screening criteria

The secondary screening criteria will be applied to the feasible options in order to develop a constrained list of options. The secondary criteria are broadly similar to the primary criteria and will also include further analysis of the risks of implementation of an option, how resilient the option is to meet the requirements of United Utilities supply system and the suitability of the respondent to become a supplier to United Utilities. The secondary criteria are outlined below:

- Whether there is a high cost of implementation of an option and that there is a limited associated benefit
- Whether there are new environmental impacts that have been determined, that were not apparent when the primary screening was applied
- Whether the engineering assessment of the option has indicated that there is a high risk of failure in implementing an option, for example, if it apparent that certain water quality parameters in the raw water that cannot be adequately treated could put our customers' at risk
- How flexible is the option to changing circumstances in demand? Limited flexibility, e.g. in terms of its output in order to meet demands for water at certain times, may make the option not suitable

Appendix D – PIN response template

3. Organisational information

Question	*Guidance*
a) Company Name	
b) Address	
c) Telephone Number	
d) Email Address	
e) Company registration Number	
f) Company details including registration number and contact details	
g) Up to date accounts rating using Equifax or similar approved?	
h) Is option being offered in collaboration with any other company/entity?	

4. Option information

i) The name of the option that is proposed	
j) Whether the option is for provision of water resource or for water demand services	
k) If the option is for water resource management, we will like information relating to the following: i. a brief description of the option with details of the location of sources/assets/etc., either within or without the United Utilities Water Resources Management Plan area, and if applicable, envisaged transfer routes. If possible including a schematic map to visually illustrate the proposed option.	*200 words + image no larger than A4*
ii. the type of water (surface water, groundwater) and the name of any source waterbody, where applicable	*10 words*
iii. a conceptual design of the option outlining the principal operational features, including details on the quantities of water that the option could provide, at its full capacity. You should indicate whether the option is available all of the time and whether there are any limitations that could restrict its use that you know about at this stage	*200 words*
iv. water quality data at point of supply, if available	*100 words*
v. information relating to any abstraction licences currently held or required. For speculative new	*100 words*

licences, you should also indicate whether you have held any discussions with the Environment Agency/Natural Resources Wales and what the outcome of these meetings was	
vi. details of how this water resource could be transported into our supply system. The specific aspects of this information can be discussed in further detail if the option is considered to be feasible	*100 words*
vii. the likely lead time to investigate and implement the option and when the water would be available from	*20 words*
l) If the option involves water demand management, we will require:	
i. the area intended to be covered	*20 words*
vi. a brief description of the option, explaining the type of water demand service being offered (such as water efficiency promotion, use of alternative non-potable supplies for use (e.g. water reuse to industrial customers), etc.)	*200 words*
vii. the amount of water savings that could be gained from implementation of the option at its full capacity	*50 words*
viii. any limitations to the above maximum water saving	*50 words*
ix. the indicative lead time to investigate and implement the option	*20 words*
m) What further work you think is required to investigate the feasibility of the option	*100 words*
We would also like to understand the costs of any options proposed, but we appreciate these may not be known. If you cannot provide cost details at this stage, we will still consider the option. n) Whether you have assessed any of the costs associated with the option and if so, what these are? Where possible, the method used to derive the scheme costs or any guidance followed should be described.	*100 words*
o) Details of risks and uncertainties associated with the option	*100 words*
p) Constraining factors that could limit the implementation of the option, for example an indication of any potential environmental impacts. E.g. for water resource options these could be where abstractions may cause	*100 words*

deterioration of a water body that contravenes the Water Framework Directive status or where the abstraction may cause damage to a Habitats Directive designated site.	

Appendix E – Third party unconstrained options

Due to commercial confidentiality reasons, we are not able to publish the names of the third party organisations or individuals.

Option ID	Option Long Name	Option Group	Option Type	WRZ	Option Capacity (Ml/d)
WR800	New third party abstraction licence trade (River Bela), new 4.5 Ml/d pumping station and raw water main to discharge into Thirlmere aqueduct, treatment at Lostock WTW	3rd-party Resource Mgt	NIT	SRZ	4.5
WR801	Abstraction trade from existing non-water industry abstraction licence holder, transfer from lagoon Farm with unused abstraction licence of 1M gallons/day to Watchgate WTW and transfer to treated water storage	3rd-party Resource Mgt	NIT	SRZ	5
WR802	Abstraction trade from 3 existing boreholes at Bromborough from existing non-water industry abstraction licence holder	3rd-party Resource Mgt	NIT	SRZ	8.49
WR803	Abstraction Licence Trading. Possibility in trading abstraction licences. Saline water from the River Wyre	3rd-party Resource Mgt	NIT	SRZ	Not Defined
WR804	Transportation of water on a ship. Procurement and the movement of bulk water from multiple sources (e.g. Scotland, Ireland, Iceland, Norway) to the North West, by ship	3rd-party Resource Mgt	INT	SRZ	Not Defined
WR805	Source and supply bulk water at a standardised price	3rd-party Resource Mgt	WIT	SRZ	Not Defined
WR806	Third party monitoring of incoming water to secure quality. Potentially increased abstraction through better water quality monitoring	3rd-party Resource Mgt	ITC	SRZ	Not Defined
WR807	We recognise that a number of organisations within the WRMP area have significant water supplies (sometimes in more remote locations) and one of the key considerations in accessing these supplies will be current and future network infrastructure/resilience.	3rd-party Resource Mgt	ITC	SRZ	Not Defined
WR808	Optimisation Services at Water and Wastewater WTW. Identification and reduction of process losses using benchmarking tools	3rd-party Production Mgt	PRO	SRZ	Not Defined
WR809	Remediation to existing borehole sources. In the majority of cases bringing existing sources back to their original and full capacity	3rd-party Resource Mgt	GWE	SRZ	Not Defined
WR810	New third party abstraction from Cow Green Reservoir (Northumbrian Water), new 40 Ml/d pumping station and raw water main, discharge into Heltondale aqueduct and into Haweswater IR, existing WTW	3rd-party Resource Mgt	RWT/WIT	SRZ	40

Option ID	Option Long Name	Option Group	Option Type	WRZ	Option Capacity (Ml/d)
WR811	Transfer water (40 Ml/d) from Cow Green IR to discharge 40 Ml/d into Heltondale aqueduct and hence discharge into Haweswater for use in SRZ, and to discharge 10 Ml/d into R. Eden to be re-abstracted downstream, treated and transferred into Carlisle WRZ	3rd-party Resource Mgt	RWT/WIT	SRZ & CRZ	40 (& 10 in CRZ)
WR812	New third party abstraction from Kielder Reservoir (Northumbrian Water), new 100 Ml/d pumping stations and raw water main, discharge into Heltondale aqueduct and into Haweswater IR, existing WTW	3rd-party Resource Mgt	RWT/WIT	SRZ	100
WR813	New third party abstraction from Scammonden Reservoir (Yorkshire Water), new 5 Ml/d pumping station and raw water main, discharge into Huddersfield Canal, new abstraction at Mossley, new pumping station and raw water main to Buckton Castle WTW	3rd-party Resource Mgt	RWT/WIT	SRZ	5
WR814	Reduced third party non-potable abstraction by 24 Ml/d from River Dee (Chester), allowing increased volume of abstraction for UU from existing River Dee abstraction and treatment at Huntington WTW	3rd-party Resource Mgt	WIT	SRZ	24
WR815	New abstraction from the Lancaster Canal and transfer into Thirlmere Aqueduct for subsequent treatment	3rd-party Resource Mgt	NIT	SRZ	
WR816	New third party 5.2 Ml/d abstraction (revised down from 10 Ml/d) from Elton Reservoir (Bury), part of Manchester/Bolton/Bury canal, new WTW, new treated water main to treated water storage (Bury)	3rd-party Resource Mgt	NIT	SRZ	5.2
WR817	New third party 16 Ml/d abstraction (revised down from 23 Ml/d) from Carr Mill Dam (St Helens), part of St Helens canal, new WTW, new treated water main to treated water storage	3rd-party Resource Mgt	NIT	SRZ	16

Option ID	Option Long Name	Option Group	Option Type	WRZ	Option Capacity (Ml/d)
WR818	Existing disused abstraction licence (historic industrial use to chemical works no longer in use), made available for UU abstraction use from Ashton Canal, new WTW and transfer to existing treated water storage	3rd-party Resource Mgt	RWT/NIT	SRZ	Not Defined
WR819	Possible small disused abstraction licences that could be made available for UU use for abstraction from Peak and Pennine Canal, new WTW and transfer to treated water storage in SRZ	3rd-party Resource Mgt	RWT/NIT	SRZ	
WR820	New third party 15.5 Ml/d abstraction from Shropshire Union Canal at Hurleston (Nantwich), increased WTW capacity at Hurleston WTW, new treated water main to connect into Mid Cheshire Main	3rd-party Resource Mgt	NIT	SRZ	15.5
WR821	New third party 30 Ml/d abstraction from Shropshire Union Canal at Hurleston (Nantwich), increased WTW capacity at Hurleston WTW, new treated water main to connect into Mid Cheshire Main	3rd-party Resource Mgt	NIT	SRZ	30
WR822	New abstraction from the Manchester Ship Canal, new WTW and transfer to existing treated water storage	3rd-party Resource Mgt	RWT/NIT	SRZ	Not Defined
WR822	New abstraction from the Manchester Ship Canal, new WTW and transfer to existing treated water storage	3rd-party Resource Mgt	RWT/NIT	SRZ	Not Defined
WR823	Third party mine water abstraction from Aspull Sough Mine (Built), new WTW to treat to potable standard, transfer to treated water storage	3rd-party Resource Mgt	NIT	SRZ	2.2
WR824	New third party mine water abstraction from Blenkinsopp Mine, new 2.2 Ml/d pumping station and new raw water main to Castle Carrock WTW	3rd-party Resource Mgt	NIT	CRZ	2.2
WR825	Third party mine water abstraction from Bridgewater Canal (Built), 3 Ml/d, treatment to potable standard, new connection to Manchester ring main system at Worsley basin	3rd-party Resource Mgt	NIT	SRZ	3

Option ID	Option Long Name	Option Group	Option Type	WRZ	Option Capacity (Ml/d)
WR826	New third party mine water abstraction from Clough Foot mine (includes previous WR827 and WR832), 1.8 Ml/d, modified treatment through existing Clough Bottom WTW	3rd-party Resource Mgt	NIT	SRZ	1.8
WR827	Third party mine water abstraction from Deerplay mine (Built) 2 Ml/d, new WTW and transfer to existing treated water system	3rd-party Resource Mgt	NIT	SRZ	2
WR828	Third party mine water abstraction Down Brook (Built)	3rd-party Resource Mgt	NIT	SRZ	Not Defined
WR829	Third party mine water abstraction Ewanrigg (Built)	3rd-party Resource Mgt	NIT	SRZ	Not Defined
WR830	Third party mine water abstraction Great Clifton (Built)	3rd-party Resource Mgt	NIT	SRZ	Not Defined
WR831	Third party mine water abstraction from Hockery Brook mine(Built), 1.8 Ml/d, new WTW with WTW, transfer to treated water storage, new pumping station required	3rd-party Resource Mgt	NIT	SRZ	Not Defined
WR832	Third party mine water abstraction from Old Meadows (Built) 3.4 Ml/d	3rd-party Resource Mgt	NIT	SRZ	3.4
WR833	Third party mine water abstraction from Silverdale mine (Built), 2.7 Ml/d, new PS transfer to treated water storage, new WTW	3rd-party Resource Mgt	NIT	SRZ	2.7
WR834	Third party mine water abstraction Mine Water: Smithy Brook / Pemberton (Built)	3rd-party Resource Mgt	NIT	SRZ	Not Defined
WR835	Third party mine water abstraction Mine Water: Summersales (Built)	3rd-party Resource Mgt	NIT	SRZ	Not Defined
WR836	Third party mine water abstraction Mine Water: Agecroft (Proposed)	3rd-party Resource Mgt	NIT	SRZ	Not Defined
WR837	Third party mine water abstraction Mine Water: Aspen Valley (Proposed)	3rd-party Resource Mgt	NIT	SRZ	Not Defined
WR838	Third party mine water abstraction Mine Water: Bradley Brook (Proposed)	3rd-party Resource Mgt	NIT	SRZ	Not Defined
WR839	Third party mine water abstraction Mine Water: Brindley Ford (Proposed)	3rd-party Resource Mgt	NIT	SRZ	Not Defined

Option ID	Option Long Name	Option Group	Option Type	WRZ	Option Capacity (Ml/d)
WR840	Third party mine water abstraction Mine Water: Carr Wood (Proposed)	3rd-party Resource Mgt	NIT	SRZ	Not Defined
WR841	Third party mine water abstraction Mine Water: Hawarden (Proposed)	3rd-party Resource Mgt	NIT	SRZ	Not Defined
WR842	Third party mine water abstraction Mine Water: Haydock Sough (Proposed)	3rd-party Resource Mgt	NIT	SRZ	Not Defined
WR843	Third party mine water abstraction Mine Water: Towneley Park (Proposed)	3rd-party Resource Mgt	NIT	SRZ	Not Defined
WR844	Third party bulk transfer of treated water from Dee Valley Water to the Helsby area 3 Ml/d	3rd-party Resource Mgt	RWT/WIT	SRZ	3
WR845	Third Party transfer and treatment of water from Dalston borehole to treated water storage 1 Ml/d	3rd-party Resource Mgt	NIT	CRZ	1
WR846	Third Party transfer and treatment of water from Dalston borehole to Brownelson reservoir 60 Ml/d	3rd-party Resource Mgt	RWT/WIT	SRZ	60
WR847	Third party disused reservoir near Goosnargh, Lancashire	3rd-party Resource Mgt	NIT	SRZ	Not Defined
WR900	Third Party - Real-time water availability and abstraction cost model	3rd-party Customer Mgt	SWE	SRZ	Not Defined
WR901	Third Party - Data Cleansing	3rd-party Distribution Mgt	LEA	SRZ	Not Defined
WR902	Third Party - Customer behaviour change pilots	3rd-party Customer Mgt	WEI	SRZ	Not Defined
WR903	Third Party 24.7 Ml/d Leakage Reduction Service for SRZ	3rd-party Distribution Mgt	LEA	SRZ	24.7
WR904	Cheshire West and Chester - Local Plan Policy	3rd-party Customer Mgt	WEP	SRZ	Not Defined
WR905	Third party 1.341 Ml/d reduction via new application	3rd-party Customer Mgt	APP	SRZ	1.341
WR906	Third Party Smart Water Network	3rd-party Distribution Mgt	LEA	SRZ	Not Defined
WR907	Third Party 108 Ml/d Leakage Reduction Service for SRZ	3rd-party Distribution Mgt	LEA	SRZ	108
WR908	Third Party Leakage Reduction Service for SRZ	3rd-party Distribution Mgt	LEA	SRZ	Not Defined
WR909	Third party - Water demand and supply planning (WDASP)	3rd-party Production Mgt	APP	SRZ	Not Defined
WR910	Third Party provide a family of PIPEMINDER products	3rd-party Distribution Mgt	LEA	SRZ	Not Defined
WR911	Third Party 5 Ml/d Leakage Reduction Service for SRZ	3rd-party Distribution Mgt	LEA	SRZ	5

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Option ID	Option Long Name	Option Group	Option Type	WRZ	Option Capacity (Ml/d)
WR911	Third Party 5 Ml/d Leakage Reduction Service for SRZ	3rd-party Distribution Mgt	LEA	SRZ	5
WR912	Third Party 5 Ml/d Leakage Reduction via advice and information service for SRZ	3rd-party Distribution Mgt	LDF	SRZ	5
WR913	Third party application 4.52 Ml/d reduced leakage	3rd-party Distribution Mgt	LEA	SRZ	4.52
WR914	Third party 4 Ml/d leakage reduction	3rd-party Distribution Mgt	LEA	SRZ	4
WR915	Third party network optimisation through smart networks	3rd-party Distribution Mgt	LEA	SRZ	Not Defined
WR916	Third party 60 Ml/d leakage reduction through identification, find and fix of trunk mains leakage	3rd-party Distribution Mgt	LEA	SRZ	60

Appendix F – List of all feasible options

Option ID	Category	WRZ	Scope
WR001	SWN	SRZ	New 13.5 Ml/d abstraction from River Alt, new raw water main to Prescot WTW, modifications to existing treatment works if required
WR003	RES	SRZ	Reinstate Fisher Tarn Reservoir, new raw water main to discharge 5 Ml/d into Thirlmere Aqueduct, raw water transfer to Lostock WTW
WR004	RES	SRZ	New impounding reservoir at Longsleddale, new 25 Ml/d pumping station and raw water main to Watchgate WTW
WR005	SWN	SRZ	New 5 Ml/d abstraction from Ditton Brook (Widnes), new WTW, new treated water main to treated water storage (Liverpool)
WR006	SWN	SRZ	New 15 Ml/d abstraction from Glaze Brook, new pumping station and raw water main to Lightshaw WTW, new WTW process, transfer to treated water storage
WR007	SWN	SRZ	New 10 Ml/d abstraction from Sankey Brook, new raw water main to new WTW at Hill Cliffe, new treated main to treated water storage
WR008	SWN	SRZ	New 1.7 Ml/d abstraction from Arrowe Brook/Birket (Wirral), new raw water main to Grange WTW (West Kirkby), new WTW, new treated water main to treated water storage
WR009	SWN	SRZ	New 15 Ml/d abstraction from River Rawthey, new pumping stations and raw water main to Watchgate WTW, modified WTW process
WR010_ WR013	SWN	SRZ	New 10 Ml/d abstractions from the Rivers Greta (Burton in Lonsdale) and River Wenning (Low Bentham), new raw water mains to existing Lancaster WTW, modified WTW no increase in capacity
WR012	RES	SRZ	New impounding reservoir at Borrow Beck, new 60 Ml/d pumping station and raw water main to Watchgate WTW
WR026a	SWN	SRZ	New 10 Ml/d abstraction from River Ribble near Clitheroe, new pumping main and raw water main to Stocks IR, treatment at Hodder WTW
WR026b	SWN	SRZ	New 6.5 Ml/d abstraction from the River Ribble (Clitheroe), new WTW, new pumping station and treated water mains to treated water storage
WR029	SWN	SRZ	New 6 Ml/d abstraction from the River Mite catchment (near Ravenglass, West Cumbria), new WTW, new water mains to potable storage reservoir
WR030	SWN	SRZ	New 10 Ml/d abstraction from the River Esk catchment (near Eskdale, West Cumbria), new WTW, new water mains to potable storage reservoir
WR031	SWN	SRZ	New 3 Ml/d abstraction from the River Annas catchment (near Bootle, West Cumbria), new WTW, new water mains to potable storage reservoir
WR032_ WR080	SWN	SRZ	New 10 Ml/d abstractions from the Rivers Dane, Wheelock (5 Ml/d) and Weaver (5 Ml/d); new pumping stations and raw water mains to new WTW at Nanneys Bridge; new connection to Mid Cheshire Main
WR036	SWN	CRZ	New 5 Ml/d abstraction from the River Caldew (South Carlisle); new pumping station and raw water main to High Brownelson; new WTW; new treated water connection to treated water storage
WR037a	RES	SRZ	Raised impoundment structure by 0.5 metres on Haweswater IR dam, existing raw water transfer to Watchgate WTW, option capacity 8 Ml/d
WR037b	RES	SRZ	Raised impoundment structure by 1.0 metres on Haweswater IR dam, existing raw water transfer to Watchgate WTW, option capacity 23 Ml/d
WR038_ WR040	SWN	NERZ	New 5 Ml/d abstraction from the River Eamont (East Penrith); new WTW at Barbary Plains; new pumping station and treated water main to treated water storage
WR039a	SWN	SRZ	New 50 Ml/d abstraction from River Eden at Temple Sowerby, new pumping station and raw water main to Watchgate WTW
WR039b	SWN	SRZ	New 16 Ml/d abstraction from River Eden at Temple Sowerby, new WTW and pumping station, new treated water main to treated water storage
WR041	SWN	CRZ	New 6.5 Ml/d abstraction from River Irthing, new raw water main to Cumwhinton WTW, new treated water main to treated water storage
WR042	SWN	CRZ	New 6.5 Ml/d abstraction from the River Esk, new raw water main to Cumwhinton WTW, modifications to existing Cumwhinton WTW, treated water main to treated water storage
WR043	SWN	CRZ	New 6.5 Ml/d abstraction from the River Petteril (Carleton, Penrith), new raw water main to Cumwhinton WTW, modifications to existing Cumwhinton WTW process, treated water main to treated water storage
WR044	SWN	SRZ	New 5 Ml/d abstraction from the River Waver (Wigton), new pumping station and raw water main to treated water storage, new WTW
WR045	SWN	CRZ	New 5 Ml/d abstraction from the River Wampool (Powhill), new pumping station and raw water main to treated water storage, new WTW

Option ID	Category	WRZ	Scope
WR047a	SWN	SRZ	New 70 Ml/d abstraction from Milwr mine tunnel at Bagillt, North Wales, new pumping station and raw water main to discharge into River Alyn, reabstract from River Dee at Huntington WTW
WR047b	SWN	SRZ	New abstraction from the outfall of the Milwr tunnel at Bagillt, new c.18km raw water transfer main, new raw water pumping main to inlet of Sutton Hall WTW
WR049a	SWN	SRZ	New abstraction from the Big Ribble catchment, treatment to potable standards and transfer to treated water storage in SRZ
WR049b	SWN	SRZ	New 40 Ml/d abstraction from River Ribble at Salmesbury, new pumping station and raw water main to Anglezarke IR, treatment at Rivington WTW
WR051	SWE	SRZ	Increased abstraction from the Duddon catchment, treatment to potable standards and transfer to treated water storage in SRZ
WR055	SWE	CRZ	Increased abstraction from River Eden at Cumwhinton or new location, modification to existing treatment and transfer to existing treated water storage in Carlisle
WR056a	SWE	SRZ	Increased abstraction from River Eden at Cumwhinton or new location, modification to existing treatment and transfer to existing treated water storage
WR056b	SWE	SRZ	Increased abstraction from River Eden at Cumwhinton or new location, modification to existing treatment and transfer to existing treated water storage
WR061	SWN	SRZ	New abstraction from the Ellen catchment, treatment to potable standards and transfer to treated water storage in SRZ
WR062a	RES	SRZ	Reinstate Worthington IR, reinstate Worthington WTW at 12 Ml/d, new pumping station and existing treated water main to treated water storage
WR062b	RES	SRZ	Reinstate Worthington IR, new 12 Ml/d pumping station and raw water main to Rivington WTW
WR063	SWN	SRZ	New abstraction from the Yarrow and Lostock catchment, treatment to potable standards and transfer to treated water storage in SRZ
WR064	RES	SRZ	Increased abstraction from the Croal Irwell catchment, treatment to potable standards and transfer to treated water storage in SRZ
WR065a	RES	SRZ	Increased abstraction from the Roch Irk Medlock catchment, treatment to potable standards and transfer to treated water storage in SRZ
WR065b	RES	SRZ	Increased abstraction from the Roch Irk Medlock catchment, treatment to potable standards and transfer to treated water storage in SRZ
WR066	SWN	SRZ	New abstraction from the Roch Irk Medlock catchment, treatment to potable standards and transfer to treated water storage in SRZ
WR074	SWN	SRZ	New 10 Ml/d abstraction from River Darwen, new pumping station and raw water main to Fishmoor IR, treatment at Fishmoor WTW
WR075	RES	SRZ	Increased abstraction from the Hodder/Loud catchment, treatment to potable standards and transfer to treated water storage in SRZ
WR076	SWN	SRZ	New 25 Ml/d abstraction from River Bollin near Lymm, new WTW, new pumping station and treated water main to treated water storage
WR077a	RES	SRZ	Increased abstraction from the Goyt, Etherow, Tame catchment, treatment to potable standards and transfer to treated water storage in SRZ
WR077b	RES	SRZ	Increased abstraction from the Goyt, Etherow, Tame catchment, treatment to potable standards and transfer to treated water storage in SRZ
WR077c	RES	SRZ	Increased abstraction from the Goyt, Etherow, Tame catchment, treatment to potable standards and transfer to treated water storage in SRZ
WR079a	RES	SRZ	Reinstatement of Appleton Reservoir, Warrington, new pumping station and raw water main, new WTW (3 Ml/d) at treated water storage
WR079b	RES	SRZ	Reinstatement of Appleton Reservoir, Warrington, new pumping station and raw water main, new WTW (6 Ml/d) at treated water storage
WR079c	RES	SRZ	Reinstatement of Appleton Reservoir, Warrington, new pumping station and raw water main, new WTW (9 Ml/d) at treated water storage
WR079d	RES	SRZ	Reinstatement of Appleton Reservoir, Warrington, new pumping station and raw water main, new WTW (12.5 Ml/d) at treated water storage
WR084	ICT	NERZ	Transfer from CRZ to NERZ
WR088	GWN	SRZ	New abstraction from the South Cheshire and North Staffordshire Permo-Triassic aquifers, treatment to potable standards and transfer to treated water storage in SRZ
WR092_ WR126	GWN	CRZ	New abstraction from Carlisle Basin Triassic and Jurassic aquifer system, treatment to potable standards and transfer to treated water storage in Carlisle
WR095	GWE	CRZ	Reinstate Roughton Gill mine abstraction, reinstate raw water main to new 1.5 Ml/d WTW at treated water storage, new treated water main to treated water storage
WR096	GWN	CRZ	New abstraction from Eden Valley and Carlisle Basin Permo-Triassic Sandstone aquifers, treatment to potable standards and transfer to treated water storage in CRZ

Option ID	Category	WRZ	Scope
WR097	GWN	CRZ	New abstraction from Eden Valley and Carlisle Basin Permo-Triassic Sandstone aquifers, treatment to potable standards and transfer to treated water storage in CRZ
WR098	GWE	SRZ	Increased abstraction from the Dee GW catchment, treatment to potable standards and transfer to treated water storage in SRZ
WR099a	GWE	SRZ	Reinstate abstraction from Worsthorne borehole (Burnley), new 4 Ml/d capacity raw water main to discharge into River Brun as compensation
WR099b	GWE	SRZ	Reinstate abstraction from Worsthorne borehole (Burnley), new 4 Ml/d capacity raw water main to discharge into Hurstwood IR
WR099c	GWE	SRZ	Reinstate abstraction from Worsthorne borehole (Burnley), reinstate raw water main to Worsthorne WTW, modified WTW process for additional 4 Ml/d
WR100	GWE	SRZ	New 4.5 Ml/d borehole at Thorncliffe Road, Barrow in Furness, new WTW process, new inlet to treated water storage, reduced abstraction from Schneider Road boreholes
WR101	GWE	SRZ	Reinstate 18 Ml/d abstraction from Franklaw Z site boreholes (Garstang), reinstate raw water transfer main to Franklaw WTW, increased abstraction of 12 Ml/d from other Franklaw boreholes, modified WTW process for additional 30 Ml/d
WR102a	GWE	SRZ	Reinstate abstraction from 11 Widnes boreholes, reinstate Cronton Booster, new raw water main to Prescot WTW, modified WTW process for additional 52.3 Ml/d
WR102ai	GWE	SRZ	Reinstate abstraction from 11 Widnes boreholes, reinstate Cronton Booster, new raw water main to Prescot WTW, modified WTW process (including water softening) for additional 52.3 Ml/d
WR102b	GWE	SRZ	Reinstate abstraction from 11 Widnes boreholes, reinstate Netherley WTW for partial flow, new treated water main between Netherley and treated water storage (Liverpool), reinstate Pex Hill WTW for partial flow, new slip lined raw water main between Stockswell and Pex Hill, abandonment of Cronton Booster, total capacity 55.3 Ml/d (annual average 46.6 Ml/d)
WR102c	GWE	SRZ	Reinstate abstraction from 11 Widnes boreholes, new raw water main, new Hale Bank WTW, new pumping station (30-48 Ml/d) treated water main to treated water storage. Reinstate Pex Hill borehole, new WTW for local demands (6-9 Ml/d) Total capacity 55 Ml/d (annual average 46.6 Ml/d)
WR102d	GWE	SRZ	Reinstate Eccleston Hill boreholes (St Helens) at 5 Ml/d, new raw water main to Prescot raw water reservoir
WR102e	GWE	SRZ	Reinstate Bold Heath boreholes (Warrington) at 9 Ml/d maximum capacity, new raw water main to Prescot raw water reservoir
WR103	GWE	SRZ	Increased abstraction from the LMB and NM Permo-Triassic sandstone aquifers, treatment to potable standards and transfer to treated water storage in SRZ
WR105a	GWE	SRZ	Decommission existing Lymm WTW, utilise both existing boreholes at Lymm at 9.1 Ml/d, convert treated water main to raw water main to new WTW located at Sow Brook (near Lymm), utilise existing treated water main to Manchester DMZ
WR105ai	GWE	SRZ	Decommission existing Lymm WTW, utilise both existing boreholes at Lymm at 9.1 Ml/d, convert treated water main to raw water main to new WTW located at Sow Brook (near Lymm), including water softening, utilise existing treated water main to Manchester DMZ
WR105b	GWE	SRZ	Decommission existing Lymm WTW, utilise both existing boreholes at Lymm at 9.1 Ml/d, new raw water main between Lymm and new WTW located at existing treated water storage (Warrington)
WR105bi	GWE	SRZ	Decommission existing Lymm WTW, utilise both existing boreholes at Lymm at 9.1 Ml/d, new raw water main between Lymm and new WTW located at existing treated water storage (Warrington), including water softening
WR106	GWE	SRZ	Reinstate Walton and Darebsury boreholes (Warrington) at 8.45 Ml/d, new raw water main to new WTW located at treated water storage
WR107a	GWE	SRZ	Reinstate Aughton Park and Moss End boreholes (Bickerstaffe) at 10 Ml/d, new raw water main to existing Royal Oak WTW, modified WTW to allow for additional volume
WR107ai	GWE	SRZ	Reinstate Aughton Park and Moss End boreholes (Bickerstaffe) at 10 Ml/d, new raw water main to existing Royal Oak WTW, modified WTW to allow for additional volume, including water softening
WR107b	GWE	SRZ	Reinstate Randles Bridge, Knowsley boreholes (Croxteth) and Primrose Hill borehole (Ormskirk) at 12 Ml/d combined, new raw water mains to existing Royal Oak WTW, modified WTW process
WR108	GWE	SRZ	Increased abstraction from the M&EC Carboniferous aquifers, treatment to potable standards and transfer to treated water storage in SRZ
WR109	GWE	SRZ	Reinstate three Swineshaw boreholes (Buckton Castle) at 4 Ml/d combined, new raw water mains to transfer to existing raw water reservoirs, treatment at existing Buckton Castle WTW
WR110	GWE	SRZ	Increased abstraction from existing Rushton Spencer boreholes (Congleton), utilise existing raw water mains and Hug Bridge WTW to treat additional 2 Ml/d
WR111	GWE	SRZ	Increased abstraction from existing Woodford borehole (Cheshire), utilise existing treated water main as raw water main, new WTW at treated water storage to treat 12 Ml/d
WR112	GWN	SRZ	Increased abstraction of 3 Ml/d from Tytherington boreholes (Macclesfield), new treated water main between Tytherington WTW and treated water storage
WR113	GWE	SRZ	Increased abstraction from the M&EC Permo-Triassic sandstone aquifers, treatment to potable standards and transfer to treated water storage in SRZ

Option ID	Category	WRZ	Scope
WR114	GWE	SRZ	Reinstate Python Mill borehole (Littleborough), new raw water main to discharge into Rochdale Canal, thereby offsetting compensation from Chelburn reservoir
WR117	GWE	SRZ	Increased abstraction from the Ribble Carboniferous aquifers, treatment to potable standards and transfer to treated water storage in SRZ
WR119a	GWE	SRZ	Maintain abstraction from South Egremont boreholes (11 Ml/d), new WTW at treated water storage, new treated water main to treated water storage
WR119b	GWE	SRZ	Maintain abstraction from South Egremont boreholes (11 Ml/d), plus three new boreholes and one existing at Catgill (10 Ml/d total), new WTW at treated water storage, new treated water main to treated water storage
WR120	GWE	SRZ	New boreholes at treated water storage (Wirral), new 15 Ml/d WTW, revocation of existing abstraction licences at Gorston, Springhill and Hooton
WR120i	GWE	SRZ	New boreholes at treated water storage (Wirral), new 15 Ml/d WTW including water softening, revocation of existing abstraction licences at Gorston, Springhill and Hooton
WR121a	GWE	SRZ	Reinstate Eaton boreholes (Tarporley), reinstate Eaton WTW at 6.7 Ml/d, new treated water main to treated water storage
WR121b	GWE	SRZ	Reinstate Eaton boreholes (Tarporley), reinstate Eaton WTW at 6.7 Ml/d, new treated water main link to Mid Cheshire Main (Congleton supplies)
WR122	GWE	SRZ	Reinstate Newton Hollows boreholes, new 9 Ml/d WTW, recommission existing treated water main to treated water storage
WR123	GWE	SRZ	Increased abstraction from the Wirral and West Cheshire Permo-Triassic Sandstone aquifers, treatment to potable standards and transfer to treated water storage in SRZ
WR124	GWE	SRZ	Increased abstraction from the Wirral and West Cheshire Permo-Triassic Sandstone aquifers, treatment to potable standards and transfer to treated water storage in SRZ
WR125	GWE	SRZ	Reinstate Bearstone boreholes (Woore), reinstate Bearstone WTW at 6.36 Ml/d, utilise existing treated water main to treated water storage
WR127	GWE	NERZ	Increased abstraction from Eden Valley and Carlisle Basin Permo-Triassic Sandstone aquifers, treatment to potable standards and transfer to treated water storage in NERZ
WR128	GWN	CRZ	Increased 4 Ml/d abstraction from Tarn Wood boreholes, modified Tarn Wood WTW, new pumping station, new treated water main to Cumwhinton WTW
WR129	GWE	SRZ	Maintain abstraction from Scales boreholes (Aspatria) at 6 Ml/d, maintain raw water main and treatment at Quarry Hill WTW, new boreholes at Waverton and Thursby, new raw water main to Quarry Hill WTW, modified WTW to treat combined 10 Ml/d, new treated water main to treated water storage
WR130	DSL	CRZ	New desalination plant in Solway-Tweed estuary, treatment to potable standards and transfer to treated water storage in Carlisle
WR131	DSL	SRZ	New desalination plant in Dee estuary (Dee TraC), treatment to potable standards and transfer to treated water storage in SRZ
WR132	DSL	SRZ	New desalination plant in Mersey estuary (North West TraC), treatment to potable standards and transfer to treated water storage in SRZ
WR133	DSL	SRZ	New desalination plant in Solway Outer South waterbody, treatment to potable standards and transfer to treated water storage in Cumbria
WR138	EFR	SRZ	New final effluent reuse scheme from River Gowy (Ellesmere Port WwTW to Little Stanney WTW), transfer of max 50% of dry-weather flow to existing WTW facility
WR139	EFR	CRZ	New final effluent reuse scheme from River Gelt (Castle Carrock WwTW to Castle Carrock WTW), transfer of max 50% of dry-weather flow to existing WTW facility
WR140	EFR	SRZ	New final effluent re-use (Horwich WwTW) abstraction at 5 Ml/d from River Douglas, new pumping station and raw water main to Rivington WTW, modified WTW process
WR141	EFR	SRZ	New final effluent re-use (Rossendale WwTW) abstraction at 10 Ml/d from River Irwell, new pumping station and raw water main to Townsend Fold WTW, modified WTW process
WR142	EFR	SRZ	New final effluent re-use (Hyndburn WwTW) abstraction at 10 Ml/d from River Calder, new pumping station and raw water main to Martholme WTW, modified WTW process
WR144	EFR	SRZ	New final effluent re-use (Mossley Top/Saddleworth WwTW) abstraction at 5 Ml/d from River Tame, new pumping station and raw water main to Buckton Castle WTW, modified WTW process
WR145	EFR	SRZ	New final effluent reuse scheme from Workington and Whitehaven WwTW, transfer of max 50% of dry-weather flow to existing WTW facility (Williamsgate)
WR146	EFR	SRZ	New final effluent re-use (Davyhulme WwTW) storage tank and pumping station at 159 Ml/d, new WTW and treated water storage, transfer to Manchester
WR148	GWN	CRZ	New 6.5 Ml/d boreholes at Cumwhinton, new raw water main to Cumwhinton WTW, new treated water link to treated water storage
WR149	ITC	SRZ	Lightshaw WTW - increased treatment capacity, new source development (linked to Croft, Landside, Lightshaw BHs)
WR150	RES	CRZ	Utilisation of Castle Carrock reservoir dead water storage to existing Castle Carrock WTW, option capacity 6 Ml/d

Option ID	Category	WRZ	Scope
WR151	RWL	SRZ	Reduction in raw water losses
WR153	ITC	SRZ	Reinstate Helsby boreholes at 2 Ml/d, new raw water main between redundant treated water storage and Foxhill WTW. Reinstate Foxhill BH1, increase outputs from existing Simmonds Hill borehole group, increased Simmonds Hill WTW capacity
WR154	ITC	SRZ	Increased output of 10 Ml/d from Delamere borehole group, increased output of Delamere and Sandiford WTW, including nitrate treatment, transfer to treated water storage
WR159	RWL SSO	SRZ	Group 1 - Improved reservoir compensation release control from 76 individual reservoirs in order to better match abstraction licence conditions, 13.2 Ml/d estimated saving in water storage
WR160	RWL SSO	SRZ	Group 2 - Improved reservoir compensation release control from Vyrnwy, Rivington, Thirlmere and Haweswater in order to better match with abstraction licence conditions, 8.8 Ml/d estimated saving in water storage
WR162	OUT	SRZ	Reduction in outages by refurbishment (enhanced maintenance) of raw water infrastructure
WR165	SSO	SRZ	Maximise pumping from Windermere and Ullswater between March-October (subject to all existing constraints and only when Haweswater is below 95% storage)
WR166	GWN	SRZ	New groundwater abstractions from Penrith area, new WTW, transfer to treated water storage
WR167	DPS	SRZ	Drought Permits 2.7 Ml/d - Delph reservoir
WR168	DPS	SRZ	Drought Permits 10.9 Ml/d - Dovestone reservoir
WR169	DPS	SRZ	Drought Permits 13.9 Ml/d - Jumbles reservoir
WR170	DPS	SRZ	Drought Permits 10.5 Ml/d - Longdendale reservoirs
WR171	DPS	SRZ	Drought Permits 165 Ml/d - River Lune LCUS abstraction
WR172	DPS	SRZ	Drought Permits 1.9 Ml/d - Rivington reservoirs - Brinscall Brook
WR173	DPS	SRZ	Drought Permits 2.2 Ml/d - Rivington reservoirs - White Coppice
WR174	DPS	SRZ	Drought Permits - Ullswater
WR175	DPS	SRZ	Drought Permits 20 Ml/d - Lake Vyrnwy
WR176	DPS	SRZ	Drought Permits 178 Ml/d - Lake Windermere: Scenario 1
WR177	DPS	SRZ	Drought Permits 568 Ml/d - Lake Windermere: Scenario 2
WR178	DPS	SRZ	Drought Permits 4 Ml/d- Swineshaw boreholes
WR179	DPS	NERZ	Drought Permits - Bowscar; Gamblesby; Tarn Wood boreholes
WR800	NIT	SRZ	New third party abstraction licence trade (River Bela), new 4.5 Ml/d pumping station and raw water main to discharge into Thirlmere aqueduct, treatment at Lostock WTW
WR801	NIT	SRZ	Abstraction trade from existing non-water industry abstraction licence holder, transfer from lagoon at farm near Tebay with unused abstraction licence of 1 million gallons/day to Watchgate WTW for treatment to potable standards and transfer to treated water storage in SRZ
WR802	NIT	SRZ	Abstraction trade from 3 existing boreholes at Bromborough frim existing non-water industry abstraction licence holder
WR806	ITC	SRZ	Third party monitoring of incoming water to secure quality. Potentially increased abstraction through better water quality monitoring
WR810	RWT/WIT	SRZ	New third party abstraction from Cow Green Reservoir (Northumbrian Water), new 40 Ml/d pumping station and raw water main, discharge into Heltondale aqueduct and into Haweswater IR
WR811	RWT/WIT	SRZ & CRZ	Transfer water (40 Ml/d) from Cow Green IR to discharge 40 Ml/d into Heltondale aqueduct and hence discharge into Haweswater for use in SRZ, and to discharge 10 Ml/d into R. Eden to be re-abstracted downstream, treated and transferred into CRZ
WR812	RWT/WIT	SRZ	New third party abstraction from Kielder Reservoir (Northumbrian Water), new 100 Ml/d pumping stations and raw water main, discharge into Heltondale aqueduct and into Haweswater IR
WR813	RWT/WIT	SRZ	New third party abstraction from Scammonden Reservoir (Yorkshire Water), new 5 Ml/d pumping station and raw water main, discharge into Huddersfield Canal, new abstraction at Mossley, new pumping station and raw water main to Buckton Castle WTW
WR814a	WIT	SRZ	Reduced third party non-potable abstraction by 24 Ml/d from River Dee (Chester), allowing increased volume of abstraction for UU from existing River Dee abstraction and treatment at Huntington WTW
WR814b	WIT	SRZ	Reduced third party non-potable abstraction by 24 Ml/d from River Dee (Chester), transfer, abstraction and treatment via Shropshire Union Canal at increased capacity Hurleston WTW (Nantwich), new treated water main transfer to Mid Cheshire Main
WR814c	WIT	SRZ	Reduced third party non-potable abstraction by 24 Ml/d from River Dee (Chester), new raw water main to Hurleston WTW, increased capacity Hurleston WTW (Nantwich), new treated water main transfer to Mid Cheshire Main
WR815	NIT	SRZ	New abstraction from the Lancaster Canal and transfer into Thirlmere Aqueduct for subsequent treatment.

Option ID	Category	WRZ	Scope
WR816	NIT	SRZ	New third party 5.2 Ml/d abstraction (revised down from 10 Ml/d) from raw water Reservoir (Bury), part of Manchester/Bolton/Bury canal, new WTW, new treated water main to treated water storage (Bury)
WR817	NIT	SRZ	New third party 16 Ml/d abstraction (revised down from 23 Ml/d) from Carr Mill Dam (St Helens), part of St Helens canal, new WTW, new treated water main to treated water storage
WR818	RWT/NIT	SRZ	Existing disused abstraction licence (historic industrial use to chemical works no longer in use), made available for UU abstraction use from Ashton Canal, treatment to potable standards and transfer to treated water storage in SRZ
WR820	NIT	SRZ	New third party 15.5 Ml/d abstraction from Shropshire Union Canal at Hurleston (Nantwich), increased WTW capacity at Hurleston WTW, new treated water main to connect into Mid Cheshire Main
WR821	NIT	SRZ	New third party 30 Ml/d abstraction from Shropshire Union Canal at Hurleston (Nantwich), increased WTW capacity at Hurleston WTW, new treated water main to connect into Mid Cheshire Main
WR823	NIT	SRZ	Third party mine water abstraction from Aspull Sough Mine (Built), new WTW to treat to potable standard, transfer to Aspull Service Reservoir
WR824	NIT	CRZ	New third party mine water abstraction from Blenkinsopp Mine, new 2.2 Ml/d pumping station and raw water main to Castle Carrock WTW
WR825	NIT	SRZ	Third party mine water abstraction from Bridgewater Canal (Built), 3 Ml/d, treatment to potable standard, connection to trunk main system at Worsley basin area
WR826	NIT	SRZ	New third party mine water abstraction from Clough Foot mine (includes previous WR827 and WR832), 1.8 Ml/d, treatment through existing Clough Bottom WTW
WR831	NIT	SRZ	Third party mine water abstraction from Hockery Brook mine(Built), 1.8 Ml/d, new WTW with treatment to potable standards, transfer to Aspull Service Reservoir, new pumping station required
WR833	NIT	SRZ	Third party mine water abstraction from Silverdale mine (Built), 2.7 Ml/d, new PS transfer to Alsager Service Reservoir, new WTW and transfer into potable storage.
WR844	RWT/WIT	SRZ	Third party bulk transfer of treated water from Dee Valley Water to the Helsby area 3 Ml/d
WR845	NIT	CRZ	Third Party transfer and treatment of water from Dalston borehole to Brownelson reservoir 1 Ml/d
WR846	RWT/WIT	SRZ	Third Party transfer and treatment of water from Dalston borehole to Brownelson reservoir 60 Ml/d
WR903a	LEA	SRZ	Third Party 24.7 Ml/d Leakage Reduction Service for SRZ
WR903b	LEA	CRZ	Third Party 0.23 Ml/d Leakage Reduction Service for CRZ
WR903c	LEA	NERZ	Third Party 0.07 Ml/d Leakage Reduction Service for NERZ
WR905	APP	SRZ	Third party 1.341 Ml/d reduction via new application
WR907a	LEA	SRZ	Third Party 108 Ml/d Leakage Reduction Service for SRZ
WR907b	LEA	SRZ	Third Party 43.2 Ml/d Leakage Reduction Service for SRZ
WR907c	LEA	SRZ	Third Party 108 Ml/d Leakage Reduction Service for SRZ
WR907d	LEA	SRZ	Third Party 54 Ml/d Leakage Reduction Service for SRZ
WR907e	LEA	SRZ	Third Party 2.106 Ml/d Leakage Reduction Service for SRZ
WR907f	LEA	SRZ	Third Party 10.53 Ml/d Leakage Reduction Service for SRZ
WR907g	LEA	SRZ	Third Party 10.53 Ml/d Leakage Reduction Service for SRZ
WR908	LEA	SRZ	Third Party Leakage Reduction Service for SRZ
WR911a	LEA	SRZ	Third Party 5 Ml/d Leakage Reduction Service for SRZ
WR911b	LEA	SRZ	Third Party 5 Ml/d Leakage Reduction Service for SRZ
WR912	LDF	SRZ	Third Party 5 Ml/d Leakage Reduction via advice and information service for SRZ
WR913	LEA	SRZ	Third party application 4.52 Ml/d reduced leakage
WR914	LEA	SRZ	Third party 4 Ml/d reduction
WR915	LEA	SRZ	Third party network optimisation through smart networks
WR916	LEA	SRZ	Third party 60 Ml/d leakage reduction through identification, find and fix of trunk mains leakage
WR500a	LEA	SRZ	10 Ml/d Leakage reduction through additional find/fix and pressure optimisation - detection surveys and repairs, construction of chambers, installation of PMVs, some rehab to enable schemes.
WR500b	LEA	SRZ	10 Ml/d Leakage reduction through additional find/fix and pressure optimisation - detection surveys and repairs, construction of chambers, installation of PMVs, some rehab to enable schemes.
WR500c	LEA	SRZ	8 Ml/d Leakage reduction through additional find/fix and pressure optimisation - detection surveys and repairs, construction of chambers, installation of PMVs, some rehab to enable schemes.

Option ID	Category	WRZ	Scope
WR500d	LEA	SRZ	10 Ml/d Leakage reduction through additional find/fix and pressure optimisation - detection surveys and repairs, construction of chambers, installation of PMVs, some rehab to enable schemes.
WR500e	LEA	SRZ	10 Ml/d Leakage reduction through additional find/fix and pressure optimisation - detection surveys and repairs, construction of chambers, installation of PMVs, some rehab to enable schemes.
WR501a	LEA	CRZ	0.10 Ml/d Leakage reduction through additional find/fix and pressure optimisation - detection surveys and repairs, construction of chambers, installation of PMVs, some rehab to enable schemes.
WR501b	LEA	CRZ	0.10 Ml/d Leakage reduction through additional find/fix and pressure optimisation - detection surveys and repairs, construction of chambers, installation of PMVs, some rehab to enable schemes.
WR501c	LEA	CRZ	0.10 Ml/d Leakage reduction through additional find/fix and pressure optimisation - detection surveys and repairs, construction of chambers, installation of PMVs, some rehab to enable schemes.
WR501d	LEA	CRZ	0.10 Ml/d Leakage reduction through additional find/fix and pressure optimisation - detection surveys and repairs, construction of chambers, installation of PMVs, some rehab to enable schemes.
WR501e	LEA	CRZ	0.10 Ml/d Leakage reduction through additional find/fix and pressure optimisation - detection surveys and repairs, construction of chambers, installation of PMVs, some rehab to enable schemes.
WR502a	LEA	NERZ	0.05 Ml/d Leakage reduction through additional find/fix and pressure optimisation - detection surveys and repairs, construction of chambers, installation of PMVs, some rehab to enable schemes.
WR502b	LEA	NERZ	0.05 Ml/d Leakage reduction through additional find/fix and pressure optimisation - detection surveys and repairs, construction of chambers, installation of PMVs, some rehab to enable schemes.
WR502c	LEA	NERZ	0.05 Ml/d Leakage reduction through additional find/fix and pressure optimisation - detection surveys and repairs, construction of chambers, installation of PMVs, some rehab to enable schemes.
WR502d	LEA	NERZ	0.05 Ml/d Leakage reduction through additional find/fix and pressure optimisation - detection surveys and repairs, construction of chambers, installation of PMVs, some rehab to enable schemes.
WR502e	LEA	NERZ	0.05 Ml/d Leakage reduction through additional find/fix and pressure optimisation - detection surveys and repairs, construction of chambers, installation of PMVs, some rehab to enable schemes.
WR503	LEA	SRZ	3.81 Ml/d Proactive monitoring of all household meters to identify and fix supply pipe leaks. This means that someone will be proactively looking at meter reads and identifying properties with too high consumption for a household.
WR504	LEA	SRZ	Replace rather that repair - household supply pipes. At the moment our policy is to repair supply pipes, we have carried out a study to assess the impact on leakage if we will replace supply pipes instead of repairing them.
WR505	LEA	SRZ	Proactive monitoring of non-household meters to identify supply pipe leaks. Similar to option DEM02, but for non-households.
WR506	LEA	SRZ	0.5 Ml/d Free repair to all private supply pipe leaks - non-household
WR507	LEA	SRZ	Subsidy to customers once they have fixed their privately owned supply pipes (cash back once proof of repair is provided)
WR508a	LEA	SRZ	0.10 Ml/d Distribution mains rehabilitation
WR508b	LEA	SRZ	0.30 Ml/d Distribution mains rehabilitation
WR508c	LEA	SRZ	0.16 Ml/d Distribution mains rehabilitation
WR508d	LEA	SRZ	0.11 Ml/d Distribution mains rehabilitation
WR508e	LEA	SRZ	0.19 Ml/d Distribution mains rehabilitation
WR509	LEA	SRZ	Offer incentives for customers to report leaks, i.e. vouchers or cash when they ring in to report a leak
WR510	LEA	SRZ	Advice and information on leakage detection and fixing techniques (Industrial and Commercial Customers)
WR511	LEA	SRZ	8.22 Ml/d Enhanced logger verification - logger verification is a simple on site check to ensure that the flow being registered by a meter matches the flow being recorded by the data logging device attached to the meter.
WR512	LEA	CRZ	0.05 Ml/d Enhanced meter verification - meter verification is an on-site check to determine the accuracy of flow being registered through a meter.
WR513	LEA	NERZ	0.02 Ml/d Meter under /over registration analysis - meter verification is an on-site check to determine the accuracy of flow being registered through a meter.
WR514	LEA	SRZ	1.07 Ml/d Temporary logging of large customers - install temporary loggers to all customers identified as having a) high consumption (above 500 l/hr); b) in DMAs with poor operability; c) in DMAs with good operability; to assess which customers have the biggest impact on the operability within DMAs.
WR515	LEA	SRZ	8.82 Ml/d Splitting DMAs - to improve DMA operability a study of each non-operable DMA would be required to determine the reason for the DMA being non-operable and to carry out the appropriate action to fix any issues.
WR516	LEA	CRZ	0.05 Ml/d Splitting DMAs - Before splitting DMAs it is recommended that a desktop operability study is carried out. Scope includes office design, hydraulic modelling and site investigation, plus construction of chambers and installation of meters.

Option ID	Category	WRZ	Scope
WR517	LEA	SRZ	3.57 Ml/d Splitting large upstream tiles - Replace faulty meters - initial desk study and site visit to determine validity of fault before replacing existing meter.
WR518	LEA	CRZ	0.017 Ml/d Splitting large upstream tiles - Replace faulty probes - initial desk study and site visit to determine validity of fault before replacing existing probe.
WR519	LEA	NERZ	0.01 Ml/d Splitting large upstream tiles - Split large tile areas - install new meters - mixture of full bore meters and probes.
WR520	LEA	SRZ	0.48 Ml/d Set up hydraulic water supply zones for analysis and reporting - desk top exercise to establish new hydraulic areas in Netbase.
WR521	LEA	CRZ	2.6 m3/d Set up hydraulic water supply zones for analysis and reporting - desk top exercise to establish new hydraulic areas in Netbase.
WR522	LEA	NERZ	0.8 m3/d Set up hydraulic water supply zones for analysis and reporting - desk top exercise to establish new hydraulic areas in Netbase.
WR600a	WSD	SRZ	0.43 Ml/d Enhanced - above baseline activity - Water Efficiency Enabling Activities - offering free water butts to customers
WR601a	WSD	CRZ	0.01 Ml/d Enhanced - above baseline activity - Water Efficiency Enabling Activities - offering free water butts to customers
WR602a	WSD	NERZ	0.84 m3/d Enhanced - above baseline activity - Water Efficiency Enabling Activities - offering free water butts to customers
WR600b	WSD	SRZ	0.87 Ml/d Enhanced - above baseline activity - Water Efficiency Enabling Activities - offering free water butts to customers
WR601b	WSD	CRZ	0.01 Ml/d Enhanced - above baseline activity - Water Efficiency Enabling Activities - offering free water butts to customers
WR602b	WSD	NERZ	1.69 m3/d Enhanced - above baseline activity - Water Efficiency Enabling Activities - offering free water butts to customers
WR603a	WSD	SRZ	0.43 Ml/d Enhanced - above baseline activity - Water Efficiency Enabling Activities - offering subsidised water butts to customers
WR604a	WSD	CRZ	0.01 Ml/d Enhanced - above baseline activity - Water Efficiency Enabling Activities - offering subsidised water butts to customers
WR605a	WSD	NERZ	0.84 m3/d Enhanced - above baseline activity - Water Efficiency Enabling Activities - offering subsidised water butts to customers
WR603b	WSD	SRZ	0.87 Ml/d Enhanced - above baseline activity - Water Efficiency Enabling Activities - offering subsidised water butts to customers
WR604b	WSD	CRZ	0.02 Ml/d Enhanced - above baseline activity - Water Efficiency Enabling Activities - offering subsidised water butts to customers
WR605b	WSD	NERZ	1.69 m3/d Enhanced - above baseline activity - Water Efficiency Enabling Activities - offering subsidised water butts to customers
WR606a	ISD	SRZ	2.04 Ml/d Enhanced - above baseline activity - Existing domestic water saving retrofit products - installation through smart home visits
WR607a	ISD	CRZ	0.03 Ml/d Enhanced - above baseline activity - Existing domestic water saving retrofit products - installation through smart home visits
WR606b	ISD	SRZ	4.08 Ml/d Enhanced - above baseline activity - Existing domestic water saving retrofit products - installation through smart home visits
WR607b	ISD	CRZ	0.07 Ml/d Enhanced - above baseline activity - Existing domestic water saving retrofit products - installation through smart home visits
WR608b	ISD	NERZ	0.01 Ml/d Enhanced - above baseline activity - Existing domestic water saving retrofit products - installation through smart home visits
WR610a	EDU	SRZ	1.41 Ml/d Enhanced education programme
WR610b	EDU	SRZ	2.83 Ml/d Enhanced education programme
WR611a	PPO	SRZ	4.05 Ml/d Enhanced - above baseline activity - Partnership projects with public and third sector organisations, e.g. Housing Associations
WR613a	PPO	NERZ	0.01 Ml/d Enhanced - above baseline activity - Partnership projects with public and third sector organisations, e.g. Housing Associations
WR611b	PPO	SRZ	8.09 Ml/d Enhanced - above baseline activity - Partnership projects with public and third sector organisations, e.g. Housing Associations
WR612b	PPO	CRZ	0.14 Ml/d Enhanced - above baseline activity - Partnership projects with public and third sector organisations, e.g. Housing Associations
WR613b	PPO	NERZ	0.02 Ml/d Enhanced - above baseline activity - Partnership projects with public and third sector organisations, e.g. Housing Associations
WR615a	WUA	SRZ	2.60 Ml/d Fixing leaking toilets
WR615b	WUA	SRZ	5.20 Ml/d Fixing leaking toilets
WR616b	WUA	CRZ	0.08 Ml/d Fixing leaking toilets

Option ID	Category	WRZ	Scope
WR617b	WUA	NERZ	0.01 Ml/d Fixing leaking toilets
WR620a	WSD	SRZ	8.34 Ml/d Enhanced - above baseline activity - Provision of free water efficiency goods and advice to all newly metered customers
WR621a	WSD	CRZ	0.07 Ml/d Enhanced - above baseline activity - Provision of free water efficiency goods and advice to all newly metered customers
WR622a	WSD	NERZ	0.01 Ml/d Enhanced - above baseline activity - Provision of free water efficiency goods and advice to all newly metered customers
WR620b	WSD	SRZ	15.99 Ml/d Enhanced - above baseline activity - Provision of free water efficiency goods and advice to all newly metered customers
WR621b	WSD	CRZ	0.14 Ml/d Enhanced - above baseline activity - Provision of free water efficiency goods and advice to all newly metered customers
WR622b	WSD	NERZ	0.01 Ml/d Enhanced - above baseline activity - Provision of free water efficiency goods and advice to all newly metered customers
WR623a	WUA	SRZ	7.41 Ml/d Enhanced - above baseline activity - Offering water efficiency home checks when installing a meter at a customer's property
WR624a	WUA	CRZ	0.06 Ml/d Enhanced - above baseline activity - Offering water efficiency home checks when installing a meter at a customer's property
WR625a	WUA	NERZ	0.01 Ml/d Enhanced - above baseline activity - Offering water efficiency home checks when installing a meter at a customer's property
WR624b	WUA	CRZ	0.12 Ml/d Enhanced - above baseline activity - Offering water efficiency home checks when installing a meter at a customer's property
WR625b	WUA	NERZ	0.01 Ml/d Enhanced - above baseline activity - Offering water efficiency home checks when installing a meter at a customer's property
WR700a	MIP	SRZ	6.42 Ml/d Metering on change of occupancy (AMR)
WR701a	MIP	CRZ	0.12 Ml/d Metering on change of occupancy (AMR)
WR702a	MIP	NERZ	0.01 Ml/d Metering on change of occupancy (AMR)
WR700b	MIP	SRZ	10.52 Ml/d Metering on change of occupancy (AMR)
WR701b	MIP	CRZ	0.21 Ml/d Metering on change of occupancy (AMR)
WR702b	MIP	NERZ	0.02 Ml/d Metering on change of occupancy (AMR)
WR703a	RAF	SRZ	0.23 Ml/d Refer a friend meter installation scheme
WR704a	RAF	CRZ	0.002 Ml/d Refer a friend meter installation scheme
WR705a	RAF	NERZ	0.16 m3/d Refer a friend meter installation scheme
WR703b	RAF	SRZ	0.45 Ml/d Refer a friend meter installation scheme
WR704b	RAF	CRZ	0.004 Ml/d Refer a friend meter installation scheme
WR705b	RAF	NERZ	0.3 m3/d Refer a friend meter installation scheme
WR706	EMT	0	Switch existing non household meters from 'dumb' to AMR with advise
WR707a	CME	SRZ	0.28 Ml/d Enhanced FMO promotion (AMR) - blanket promotion
WR708a	CME	CRZ	0.004 Ml/d Enhanced FMO promotion (AMR) - blanket promotion
WR709a	CME	NERZ	0.0005 Ml/d Enhanced FMO promotion (AMR) - blanket promotion
WR707b	CME	SRZ	0.53 Ml/d Enhanced FMO promotion (AMR) - blanket promotion
WR708b	CME	CRZ	0.001 Ml/d Enhanced FMO promotion (AMR) - blanket promotion
WR709b	CME	NERZ	0.1 m3/d Enhanced FMO promotion (AMR) - blanket promotion
WR710	CME	SRZ	0.4 Ml/d Enhanced FMO promotion (AMR) - target customers with definite financial savings
WR711	CME	CRZ	0.006 Ml/d Enhanced FMO promotion (AMR) - target customers with definite financial savings
WR712	CME	NERZ	0 Ml/d Enhanced FMO promotion (AMR) - target customers with definite financial savings
WR713a	CME	SRZ	0.01 Ml/d Enhanced FMO promotion (AMR) - offering meters during water efficiency site visits
WR714a	CME	CRZ	0.22 m3/d Enhanced FMO promotion (AMR) - offering meters during water efficiency site visits
WR715a	CME	NERZ	0.02 m3/d Enhanced FMO promotion (AMR) - offering meters during water efficiency site visits
WR713b	CME	SRZ	0.02 Ml/d Enhanced FMO promotion (AMR) - offering meters during water efficiency site visits
WR714b	CME	CRZ	0.43 m3/d Enhanced FMO promotion (AMR) - offering meters during water efficiency site visits
WR715b	CME	NERZ	0.05 m3/d Enhanced FMO promotion (AMR) - offering meters during water efficiency site visits

Option ID	Category	WRZ	Scope
WR716a	CME	SRZ	Enhanced FMO promotion (AMR) - promote to customers who had service renewal (therefore had a meter box already fitted)
WR717a	CME	CRZ	0.83 m3/d Enhanced FMO promotion (AMR) - promote to customers who had service renewal (therefore had a meter box already fitted)
WR718a	CME	NERZ	0.09 m3/d Enhanced FMO promotion (AMR) - promote to customers who had service renewal (therefore had a meter box already fitted)
WR716b	CME	SRZ	0.13 Ml/d Enhanced FMO promotion (AMR) - promote to customers who had service renewal (therefore had a meter box already fitted)
WR717b	CME	CRZ	2.2 m3/d Enhanced FMO promotion (AMR) - promote to customers who had service renewal (therefore had a meter box already fitted)
WR718b	CME	NERZ	0.25 m3/d Enhanced FMO promotion (AMR) - promote to customers who had service renewal (therefore had a meter box already fitted)
WR719	EMT	0	Advanced Metering Infrastructure - Fixed Network (SMART meters)
WR400	WIT	SRZ	Vyrnwy reservoir raw water releases to River Severn to support Thames Water
WR401	WIT	SRZ	Vyrnwy reservoir raw water releases to River Severn to support Bristol Water
WR402	WIT	SRZ	Raw water transfer from Whiteholme Reservoir to Withens Moor reservoir to support Yorkshire Water
WR403	WIT	SRZ	Treated water transfer from Walsden village from UU network into YWS network
WR404	WIT	SRZ	Treated water transfer from UU network into YWS network at High Bentham
WR405	RWT	SRZ	Potential option to trade UU abstractions from R. Ribble/R. Darwen to C&RT to help address their deficit in Leeds & Liverpool Canal - relevant options tbc - WR025/WR026/WR074??
WR406	RWT	SRZ	Potential option to trade UU abstractions from Python Mill to C&RT to help address their deficit in Rochdale Canal - See WR114
WR407	RWT	SRZ	Raw water transfer from Vyrnwy to South Staffs Water via River Trent / Seven
WR408	WIT	SRZ	Abstraction licence trade
WR409	WIT	CRZ	Bulk transfer of groundwater from Eden Lyvennet to Scottish Water at Eamont
WR410	WIT	SRZ	Treated water transfer from UU network into STW network at treated water storage (Buxton)
WR411	WIT	SRZ	Vyrnwy reservoir raw water releases to River Severn to support Severn Trent Water
WR412	WIT	SRZ	Treatment and treated water transfer from Mow Cop Borehole to Severn Trent Water treated water storage
WR413a & WR413b	WIT	SRZ	Raw water transfer from Congleton to Tittesworth Reservoir including UU network reinforcement to facilitate. Or a treated water transfer to Severn Trent Water treated water storage

Appendix G – List of all options and screening outcomes

Option ID at Feasible options stage	Option Group	Option Type	Option Name & outline scope	Primary screening outcome	Secondary screening outcome
WR001	UU Resource Mgt	SWN	New 13.5 Ml/d abstraction from River Alt, new raw water main to Prescot WTW, modifications to existing WTW if required, transfer to existing treated water storage	IN	IN
WR002	UU Resource Mgt	SWN	New abstraction from River Crossens catchment (near Ormskirk), new WTW, new water mains to existing treated water storage	OUT	OUT
WR003	UU Resource Mgt	RES	Reinstate Fisher Tarn Reservoir, new raw water main to discharge 5 Ml/d into Thirlmere Aqueduct, existing raw water transfer to Lostock WTW, transfer to existing treated water storage	IN	IN
WR004	UU Resource Mgt	RES	New impounding reservoir at Longsleddale, new 25 Ml/d pumping station and raw water main to Watchgate WTW, transfer to existing treated water system	IN	OUT
WR005	UU Resource Mgt	SWN	New 5 Ml/d abstraction from Ditton Brook (Widnes), new WTW, new treated water main to existing treated water storage (Liverpool)	IN	OUT
WR006	UU Resource Mgt	SWN	New 15 Ml/d abstraction from Glaze Brook, new pumping station and raw water main to Lightshaw WTW, new WTW process, transfer to existing treated water storage	IN	IN
WR007	UU Resource Mgt	SWN	New 10 Ml/d abstraction from Sankey Brook, new raw water main to new WTW at Hill Cliffe, new treated water main to existing treated water storage	IN	IN
WR008	UU Resource Mgt	SWN	New 1.7 Ml/d abstraction from Arrowe Brook/Birket (Wirral), new raw water main to Grange WTW (West Kirkby), new WTW, new treated water main to existing treated water storage	IN	OUT
WR009	UU Resource Mgt	SWN	New 15 Ml/d abstraction from River Rawthey, new pumping stations and raw water main to Watchgate WTW, modified WTW process, transfer to existing treated water system	IN	IN
WR010_WR013	UU Resource Mgt	SWN	New 10 Ml/d abstractions from the Rivers Greta (Burton in Lonsdale) and River Wenning (Low Bentham), new raw water mains to existing Lancaster WTW, modified WTW no increase in capacity, transfer to existing treated water storage	IN	OUT
WR011	UU Resource Mgt	SWN	New abstraction from River Keer catchment (Carnforth), abstraction volume not specified, new WTW, new treated water mains to existing treated water storage	OUT	OUT
WR012	UU Resource Mgt	RES	New impounding reservoir at Borrow Beck, new 60 Ml/d pumping station and raw water main to Watchgate WTW, transfer to existing treated water system	IN	OUT
WR013	UU Resource Mgt	SWN	See WR010 - New 10 Ml/d abstractions from the Rivers Greta (Burton in Lonsdale) and River Wenning (Low Bentham), new raw water mains to existing Lancaster WTW, modified WTW no increase in capacity, transfer to existing treated water storage	IN	OUT
WR014	UU Resource Mgt	SWN	New abstraction from the Bollin, Dean, Upper Mersey Canals catchment, new WTW and transfer to existing treated water storage	OUT	OUT
WR015	UU Resource Mgt	SWN	New abstraction from the Croal Irwell Canals catchment, new WTW and transfer to existing treated water storage	OUT	OUT
WR016	UU Resource Mgt	SWN	New abstraction from the Cumbria and Lancashire Canals and SWTs catchment, new WTW and transfer to existing treated water storage	OUT	OUT
WR017	UU Resource Mgt	SWN	New abstraction from the Dane Canals and surface water transfers catchment, new WTW and transfer to existing treated water storage	OUT	OUT
WR018	UU Resource Mgt	SWN	New abstraction from the Glaze canals catchment, new WTW and transfer to existing treated water storage	OUT	OUT
WR019	UU Resource Mgt	SWN	New abstraction from the Goyt Etherow Tame Canals catchment, new WTW and transfer to existing treated water storage	OUT	OUT
WR020	UU Resource Mgt	SWN	New abstraction from the Manchester Ship and Bridgewater Canals catchment, new WTW and transfer to existing treated water storage	OUT	OUT
WR021	UU Resource Mgt	SWN	New abstraction from the Roch Irk Medlock Canals and SWTs catchment, new WTW and transfer to existing treated water storage	OUT	OUT
WR022	UU Resource Mgt	SWN	New abstraction from the Sankey Canals catchment, new WTW and transfer to existing treated water storage	OUT	OUT
WR023	UU Resource Mgt	SWN	New abstraction from the Weaver Lower Canals catchment, new WTW and transfer to existing treated water storage	OUT	OUT
WR024	UU Resource Mgt	SWN	New abstraction from the Weaver Upper Canals catchment, new WTW and transfer to existing treated water storage	OUT	OUT
WR025	UU Resource Mgt	SWN	New abstraction from Limestone Ribble catchment (Settle), new WTW, new treated water mains to existing treated water storage	OUT	OUT
WR026a	UU Resource Mgt	SWN	New 10 Ml/d abstraction from River Ribble near Clitheroe, new pumping main and raw water main to Stocks IR, treatment at Hodder WTW, transfer to existing treated water storage	IN	IN
WR026b	UU Resource Mgt	SWN	New 6.5 Ml/d abstraction from the River Ribble (Clitheroe), new WTW, new pumping station and treated water mains to treated water storage	IN	OUT
WR027	UU Resource Mgt	SWN	New abstraction from the Savick Brook and Fylde South Drains catchment (west Preston), new WTW, new treated water mains to existing treated water storage	OUT	OUT
WR028	UU Resource Mgt	SWN	New abstraction from the River Irt catchment (near Seascale, West Cumbria), new WTW, new treated water mains to existing treated water storage	OUT	OUT
WR029	UU Resource Mgt	SWN	New 6 Ml/d abstraction from the River Mite catchment (near Ravenglass, West Cumbria), new WTW, new treated water mains to existing treated water storage	IN	OUT
WR030	UU Resource Mgt	SWN	New 10 Ml/d abstraction from the River Esk catchment (near Eskdale, West Cumbria), new WTW, new treated water mains to existing treated water storage	IN	OUT

Option ID at Feasible options stage	Option Group	Option Type	Option Name & outline scope	Primary screening outcome	Secondary screening outcome
WR031	UU Resource Mgt	SWN	New 3 Ml/d abstraction from the River Annas catchment (near Bootle, West Cumbria), new WTW, new treated water mains to existing treated water storage	IN	OUT
WR032_WR080	UU Resource Mgt	SWN	New 10 Ml/d abstractions from the Rivers Dane, Wheelock (5 Ml/d) and Weaver (5 Ml/d); new pumping stations and raw water mains to new WTW at Nanneys Bridge; new connection to Mid Cheshire Main and transfer to existing treated water system	IN	OUT
WR033	UU Resource Mgt	SWN	New abstraction from the River Gowy catchment (near Chester), new WTW, new treated water mains to existing treated water storage	OUT	OUT
WR034	UU Resource Mgt	SWN	New abstraction from the River Brock catchment (Garstang), new WTW, new treated water mains to existing treated water storage	OUT	OUT
WR035	UU Resource Mgt	SWN	New abstraction from the Fleetwood Peninsula tributaries (Fylde), new WTW, new treated water mains to existing treated water storage	OUT	OUT
WR036	UU Resource Mgt	SWN	New 5 Ml/d abstraction from the River Caldew (South Carlisle); new pumping station and raw water main to High Brownelson; new WTW; new treated water connection to treated water storage	IN	OUT
WR037a	UU Resource Mgt	RES	Raise impoundment structure by 0.5 metres on Haweswater IR dam, existing raw water transfer to Watchgate WTW, option capacity 8 Ml/d	IN	OUT
WR037b	UU Resource Mgt	RES	Raised impoundment structure by 1.0 metres on Haweswater IR dam, existing raw water transfer to Watchgate WTW, option capacity 23 Ml/d	IN	OUT
WR038_WR040	UU Resource Mgt	SWN	New 5 Ml/d abstraction from the River Eamont (East Penrith); new WTW at Barbary Plains; new pumping station and treated water main to treated water storage	IN	OUT
WR039a	UU Resource Mgt	SWN	New 50 Ml/d abstraction from River Eden at Temple Sowerby, new pumping station and raw water main to Watchgate WTW, treatment and transfer to existing treated water storage	IN	OUT
WR039b	UU Resource Mgt	SWN	New 16 Ml/d abstraction from River Eden at Temple Sowerby, new WTW and pumping station, new treated water main to treated water storage	IN	OUT
WR040	UU Resource Mgt	SWN	See WR038 - New abstraction from River Eden (Temple Sowerby), new WTW and transfer to North Eden WRZ treated water storage	IN	OUT
WR041	UU Resource Mgt	SWN	New 6.5 Ml/d abstraction from River Irthing, new raw water main to Cumwhinton WTW, new treated water main to treated water storage	IN	IN
WR042	UU Resource Mgt	SWN	New 6.5 Ml/d abstraction from the River Esk, new raw water main to Cumwhinton WTW, modifications to existing Cumwhinton WTW, new treated water main to treated water storage	IN	OUT
WR043	UU Resource Mgt	SWN	New 6.5 Ml/d abstraction from the River Petteril (Carleton, Penrith), new raw water main to Cumwhinton WTW, modifications to existing Cumwhinton WTW process, existing treated water main to treated water storage	IN	OUT
WR044	UU Resource Mgt	SWN	New 5 Ml/d abstraction from the River Waver (Wigton), new pumping station and raw water main to treated water storage, new WTW	IN	OUT
WR045	UU Resource Mgt	SWN	New 5 Ml/d abstraction from the River Wampool (Powhill), new pumping station and raw water main to treated water storage, new WTW	IN	OUT
WR046	UU Resource Mgt	SWE	New abstraction from the Dee catchments (Chester), new WTW, new treated water main to treated water storage	OUT	OUT
WR047a	UU Resource Mgt	SWN	New 70 Ml/d abstraction from Milwr mine tunnel at Bagillt, North Wales, new pumping station and raw water main to discharge into River Alyn, reabstract from River Dee at existing Huntington WTW, treatment and transfer into existing treated water system	IN	OUT
WR047b	UU Resource Mgt	SWN	New abstraction from the outfall of the Milwr tunnel at Bagillt, new c.18km raw water transfer main, new raw water pumping main to inlet of Sutton Hall WTW, modifications to existing WTW process as required	IN	OUT
WR048	UU Resource Mgt	SWN	New abstraction from the Lune - Rawthey to Greta catchment, new WTW and transfer to existing treated water storage	IN	OUT
WR049a	UU Resource Mgt	SWN	New 30 Ml/d abstraction from the Big Ribble catchment, new WTW and transfer to existing treated water storage	IN	OUT
WR049b	UU Resource Mgt	SWN	New 40 Ml/d abstraction from River Ribble at Salmesbury, new pumping station and raw water main to Anglezarke IR, treatment at existing Rivington WTW, transfer into existing treated water storage	IN	OUT
WR050	UU Resource Mgt	SWE	New abstraction from the Duddon catchment, new WTW and transfer to existing treated water storage	OUT	OUT
WR051	UU Resource Mgt	SWE	New abstraction from the Duddon catchment, new WTW and transfer to existing treated water storage	IN	OUT
WR052	UU Resource Mgt	SWE	New abstraction from the Ehen-Calder catchment, new WTW and transfer to existing treated water storage	OUT	OUT
WR053	UU Resource Mgt	SWE	New abstraction from the Ehen-Calder catchment, new WTW and transfer to existing treated water storage	OUT	OUT
WR054	UU Resource Mgt	SWE	New abstraction from the Wyre and Calder catchments, new WTW and transfer to existing treated water storage	OUT	OUT
WR055	UU Resource Mgt	SWE	Increased abstraction of 32 Ml/d from River Eden at Cumwhinton or new location, modification to existing WTW and transfer to existing treated water storage in Carlisle	IN	OUT
WR056a	UU Resource Mgt	SWE	Increased abstraction of 50 Ml/d from River Eden at Cumwhinton or new location, modification to existing WTW and transfer to existing treated water storage	IN	OUT
WR056b	UU Resource Mgt	SWE	Increased abstraction of 50 Ml/d from River Eden at Cumwhinton or new location, modification to existing WTW and transfer to existing treated water storage	IN	OUT
WR057	UU Resource Mgt	RES	New abstraction from the Upper Calder catchment, new WTW and transfer to existing treated water storage	OUT	OUT
WR058	UU Resource Mgt	SWE	New abstraction from the Cocker catchment, new WTW and transfer to existing treated water storage	OUT	OUT

Option ID at Feasible options stage	Option Group	Option Type	Option Name & outline scope	Primary screening outcome	Secondary screening outcome
WR059	UU Resource Mgt	RES	New abstraction from the Derwent catchment, new WTW and transfer to existing treated water storage	OUT	OUT
WR060	UU Resource Mgt	SWE	New abstraction from the Derwent catchment, new WTW and transfer to existing treated water storage	OUT	OUT
WR061	UU Resource Mgt	SWN	New abstraction from the Ellen catchment, new WTW and transfer to existing treated water storage	IN	OUT
WR062a	UU Resource Mgt	RES	Reinstate Worthington IR, reinstate Worthington WTW at 12 Ml/d, new pumping station and existing treated water main to treated water storage	IN	IN
WR062b	UU Resource Mgt	RES	Reinstate Worthington IR, new 12 Ml/d pumping station and raw water main to Rivington WTW, treatment and transfer to existing treated water storage	IN	IN
WR063	UU Resource Mgt	SWN	New abstraction of 10 Ml/d from the Yarrow and Lostock catchment, new WTW and transfer to existing treated water storage	IN	OUT
WR064	UU Resource Mgt	RES	Raise impoundment structure on Entwistle IR, existing WTW and transfer to existing treated water storage, option capacity 0.6 Ml/d	IN	OUT
WR065a	UU Resource Mgt	RES	Raise impoundment structure on Watergrove IR, existing WTW and transfer to existing treated water storage, option capacity 0.7 Ml/d	IN	OUT
WR065b	UU Resource Mgt	RES	Raise impoundment structure on Whiteholme IR, existing WTW and transfer to existing treated water storage, option capacity 0.7 Ml/d	IN	OUT
WR066	UU Resource Mgt	SWN	New 6 Ml/d abstraction from the Roch Irk Medlock catchment, new WTW and transfer to existing treated water storage	IN	OUT
WR067	UU Resource Mgt	ITC	New abstraction from the Crake catchment, new WTW and transfer to existing treated water storage	OUT	OUT
WR068	UU Resource Mgt	RES_ITC	New abstraction from the Crake catchment, new WTW and transfer to existing treated water storage	OUT	OUT
WR069	UU Resource Mgt	RES	New abstraction from the Leven catchment, new WTW and transfer to existing treated water storage	OUT	OUT
WR070	UU Resource Mgt	SWN	New abstraction from the Pilling, Ridgy, Cocker and Conder catchment, new WTW and transfer to existing treated water storage	OUT	OUT
WR071	UU Resource Mgt	SWN	New abstraction from the Pilling, Ridgy, Cocker and Conder catchment, new WTW and transfer to existing treated water storage	OUT	OUT
WR072	UU Resource Mgt	SWN	New abstraction from the Calder catchment, new WTW and transfer to existing treated water storage	IN	OUT
WR073	UU Resource Mgt	SWN	New abstraction from the Colne Water catchment, new WTW and transfer to existing treated water storage	IN	OUT
WR074	UU Resource Mgt	SWN	New 10 Ml/d abstraction from River Darwen, new pumping station and raw water main to Fishmoor IR, treatment at Fishmoor WTW	IN	IN
WR075	UU Resource Mgt	RES	Raise impoundment structure on Stocks IR, existing WTW and transfer to existing treated water storage, option capacity 0.6 Ml/d	IN	OUT
WR076	UU Resource Mgt	SWN	New 25 Ml/d abstraction from River Bollin near Lymm, new WTW, new pumping station and treated water main to treated water storage	IN	IN
WR077a	UU Resource Mgt	RES	Raise impoundment structure on Dovestone IR, existing WTW and transfer to existing treated water storage, option capacity 0.6 Ml/d	IN	OUT
WR077b	UU Resource Mgt	RES	Raise impoundment structure on Errwood IR (Goyt), existing WTW and transfer to existing treated water storage, option capacity 0.5 Ml/d	IN	OUT
WR077c	UU Resource Mgt	RES	Raise impoundment structure on Fernilee IR (Goyt), existing WTW and transfer to existing treated water storage, option capacity 0.6 Ml/d	IN	OUT
WR078	UU Resource Mgt	SWE	New abstraction from the Goyt, Etherow, Tame catchment, new WTW and transfer to existing treated water storage	OUT	OUT
WR079a	UU Resource Mgt	RES	Reinstatement of Appleton Reservoir, Warrington, new pumping station and raw water main, new WTW (3 Ml/d) at treated water storage	IN	OUT
WR079b	UU Resource Mgt	RES	Reinstatement of Appleton Reservoir, Warrington, new pumping station and raw water main, new WTW (6 Ml/d) at treated water storage	IN	IN
WR079c	UU Resource Mgt	RES	Reinstatement of Appleton Reservoir, Warrington, new pumping station and raw water main, new WTW (9 Ml/d) at treated water storage	IN	IN
WR079d	UU Resource Mgt	RES	Reinstatement of Appleton Reservoir, Warrington, new pumping station and raw water main, new WTW (12.5 Ml/d) at treated water storage	IN	IN
WR080	UU Resource Mgt	SWN	See WR032 - New abstraction from the Weaver catchment, WTW and transfer to treated water storage in SRZ	IN	OUT
WR081	UU Resource Mgt	RES	Increased abstraction from the Vyrnwy catchment, new WTW and transfer to existing treated water storage	OUT	OUT
WR082	UU Resource Mgt	ICT	New abstraction from the Crake catchment (Paddy End) utilises a surplus of water identified from the Paddy End water resource integrity review to be pumped into Barrow Link Main (BLM)	OUT	OUT
WR083	UU Resource Mgt	ICT	Increase pumping flow in Barrow Link Main to Haweswater Aqueduct to enable surplus water from the Barrow supply area to be utilised in the Strategic Resource Zone, via Watchgate WTW.	OUT	OUT
WR084	UU Resource Mgt	ICT	Transfer of 3 Ml/d of treated water from Carlisle WRZ to North Eden WRZ, new treated water connection	IN	OUT

Option ID at Feasible options stage	Option Group	Option Type	Option Name & outline scope	Primary screening outcome	Secondary screening outcome
WR085	UU Resource Mgt	GWN	New abstraction from the Derwent and West Cumbria Lower Palaeozoic and Carboniferous aquifers, new WTW and transfer to existing treated water storage	OUT	OUT
WR086	UU Resource Mgt	GWN	New abstraction from the Lune and Wyre Carboniferous aquifers, new WTW and transfer to existing treated water storage	OUT	OUT
WR087	UU Resource Mgt	GWN	New abstraction from the Sankey-Glaze Carboniferous aquifers, new WTW and transfer to existing treated water storage	OUT	OUT
WR088	UU Resource Mgt	GWN	New abstraction from the South Cheshire and North Staffordshire Permo-Triassic aquifers at Alsager of 3 Ml/d, new WTW and transfer to existing treated water storage	IN	OUT
WR089	UU Resource Mgt	GWN	New abstraction from the South Cumbria Lower Palaeozoic and Carboniferous aquifers, new WTW and transfer to existing treated water storage	OUT	OUT
WR090	UU Resource Mgt	GWN	New abstraction from the Weaver and Dane Quaternary Sand and Gravel aquifers, new WTW and transfer to existing treated water storage	OUT	OUT
WR091	UU Resource Mgt	GWN	Increased abstraction from the West Lancashire Quaternary Sand and Gravel aquifers, new WTW and transfer to existing treated water storage	OUT	OUT
WR092_WR126	UU Resource Mgt	GWN	New abstraction from Carlisle Basin Triassic and Jurassic aquifer system of 1 Ml/d at High Brownelson, new WTW and transfer to treated water storage	IN	OUT
WR093	UU Resource Mgt	GWN	New abstraction from Carlisle Basin Triassic and Jurassic aquifer system, new WTW and transfer to existing treated water storage	OUT	OUT
WR094	UU Resource Mgt	GWN	New abstraction from Carlisle Basin Triassic and Jurassic aquifer system, new WTW and transfer to existing treated water storage	OUT	OUT
WR095	UU Resource Mgt	GWE	Reinstate Roughton Gill mine abstraction, reinstate raw water main to new 1.5 Ml/d WTW at treated water storage, new treated water main to treated water storage	IN	IN
WR096	UU Resource Mgt	GWN	New abstraction from Eden Valley and Carlisle Basin Permo-Triassic Sandstone aquifers at Durdar of 2 Ml/d, new WTW and transfer to existing treated water storage	IN	OUT
WR097	UU Resource Mgt	GWN	New abstraction from Eden Valley and Carlisle Basin Permo-Triassic Sandstone aquifers of 5 Ml/d at Kirklinton, new WTW and transfer to existing treated water storage	IN	OUT
WR098	UU Resource Mgt	GWE	New abstraction from the Dee GW catchment of 2 Ml/d at Threapwood, new WTW and transfer to existing treated water storage	IN	OUT
WR099a	UU Resource Mgt	GWE	Reinstate abstraction from Worsthorne borehole (Burnley), new 4 Ml/d capacity raw water main to discharge into River Brun as compensation	IN	IN
WR099b	UU Resource Mgt	GWE	Reinstate abstraction from Worsthorne borehole (Burnley), new 4 Ml/d capacity raw water main to discharge into Hurstwood IR	IN	IN
WR099c	UU Resource Mgt	GWE	Reinstate abstraction from Worsthorne borehole (Burnley), reinstate raw water main to Worsthorne WTW, modified WTW process for additional 4 Ml/d	IN	IN
WR100	UU Resource Mgt	GWE	New 4.5 Ml/d borehole at Thorncliffe Road, Barrow in Furness, new WTW process, new inlet to treated water storage, reduced abstraction from Schneider Road boreholes	IN	IN
WR101	UU Resource Mgt	GWE	Reinstate 18 Ml/d abstraction from Franklaw Z site boreholes (Garstang), reinstate raw water transfer main to Franklaw WTW, increased abstraction of 12 Ml/d from other Franklaw boreholes, modified WTW process for additional 30 Ml/d	IN	IN
WR102a	UU Resource Mgt	GWE	Reinstate abstraction from 11 Widnes boreholes, reinstate Cronton Booster, new raw water main to Prescot WTW, modified WTW process for additional 52.3 Ml/d	IN	IN
WR102ai	UU Resource Mgt	GWE	Reinstate abstraction from 11 Widnes boreholes, reinstate Cronton Booster, new raw water main to Prescot WTW, modified WTW process (including water softening) for additional 52.3 Ml/d	IN	IN
WR102b	UU Resource Mgt	GWE	Reinstate abstraction from 11 Widnes boreholes, reinstate Netherley WTW for partial flow, new treated water main between Netherley and treated water storage, reinstate Pex Hill WTW for partial flow, new slip lined raw water main between Stockswell and Pex Hill, abandonment of Cronton Booster, total capacity 55.3 Ml/d (annual average 46.6 Ml/d)	IN	IN
WR102c	UU Resource Mgt	GWE	Reinstate abstraction from 11 Widnes boreholes, new raw water main, new Hale Bank WTW, new pumping station (30-48 Ml/d) treated water main to treated water storage. Reinstate Pex Hill borehole, new WTW for local demands (6-9 Ml/d) Total capacity 55 Ml/d (annual average 46.6 Ml/d)	IN	IN
WR102d	UU Resource Mgt	GWE	Reinstate Eccleston Hill boreholes (St Helens) at 5 Ml/d, new raw water main to Prescot raw water reservoir, utilise existing WTW	IN	IN
WR102e	UU Resource Mgt	GWE	Reinstate Bold Heath boreholes (Warrington) at 9 Ml/d maximum capacity, new raw water main to Prescot raw water reservoir, utilise existing WTW	IN	IN
WR103	UU Resource Mgt	GWE	Reinstate 5 Ml/d abstraction from the Lower Mersey Basin and North Manchester Permo-Triassic sandstone aquifers at Croft, new WTW and transfer to existing treated water storage	IN	OUT
WR104	UU Resource Mgt	GWE	Increased abstraction from the Lower Mersey Basin and North Manchester Permo-Triassic sandstone aquifers in Southport area, modified WTW and transfer to existing treated water storage	OUT	OUT
WR105a	UU Resource Mgt	GWE	Decommission existing Lymm WTW, utilise both existing boreholes at Lymm at 9.1 Ml/d, convert treated water main to raw water main to new WTW located at Sow Brook (near Lymm), utilise existing treated water main to Manchester DMZ	IN	IN
WR105ai	UU Resource Mgt	GWE	Decommission existing Lymm WTW, utilise both existing boreholes at Lymm at 9.1 Ml/d, convert treated water main to raw water main to new WTW located at Sow Brook (near Lymm), including water softening, utilise existing treated water main to Manchester DMZ	IN	IN
WR105b	UU Resource Mgt	GWE	Decommission existing Lymm WTW, utilise both existing boreholes at Lymm at 9.1 Ml/d, new raw water main between Lymm and new WTW located at existing treated water storage (Warrington)	IN	IN
WR105bi	UU Resource Mgt	GWE	Decommission existing Lymm WTW, utilise both existing boreholes at Lymm at 9.1 Ml/d, new raw water main between Lymm and new WTW located at existing treated water storage (Warrington), including water softening	IN	IN

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WR106	UU Resource Mgt	GWE	Reinstate Walton and Darebsury boreholes (Warrington) at 8.45 Ml/d, new raw water main to new WTW located at treated water storage	IN	IN
WR107a	UU Resource Mgt	GWE	Reinstate Aughton Park and Moss End boreholes (Bickerstaffe) at 10 Ml/d, new raw water main to existing Royal Oak WTW, modified WTW to allow for additional volume	IN	IN
WR107ai	UU Resource Mgt	GWE	Reinstate Aughton Park and Moss End boreholes (Bickerstaffe) at 10 Ml/d, new raw water main to existing Royal Oak WTW, modified WTW to allow for additional volume, including water softening	IN	IN
WR107b	UU Resource Mgt	GWE	Reinstate Randles Bridge, Knowsley boreholes (Croxteth) and Primrose Hill borehole (Ormskirk) at 12 Ml/d combined, new raw water mains to existing Royal Oak WTW, modified WTW process	IN	IN
WR108	UU Resource Mgt	GWE	Reinstate 1.82 Ml/d abstraction from the M&EC Carboniferous aquifers at Mow Cop, new WTW and transfer to existing treated water storage	IN	OUT
WR109	UU Resource Mgt	GWE	Reinstate three Swineshaw boreholes (Buckton Castle) at 4 Ml/d combined, new raw water mains to transfer to existing raw water reservoirs, treatment at existing Buckton Castle WTW	IN	IN
WR110	UU Resource Mgt	GWE	Increased abstraction from existing Rushton Spencer boreholes (Congleton), utilise existing raw water mains and Hug Bridge WTW to treat additional 2 Ml/d	IN	OUT
WR111	UU Resource Mgt	GWE	Increased abstraction from existing Woodford borehole (Cheshire), Manchester and East Cheshire Permo-Triassic Sandstone Aquifers, utilise existing treated water main as raw water main, new WTW at treated water storage to treat 12 Ml/d	IN	IN
WR112	UU Resource Mgt	GWN	New 5 Ml/d abstraction from Manchester and East Cheshire Permo-Triassic Sandstone aquifer at Bramhall, new WTW and transfer to treated water storage	IN	IN
WR113	UU Resource Mgt	GWE	Increased abstraction of 3 Ml/d from the Manchester & East Cheshire Permo-Triassic sandstone aquifers at Tytherington, modified WTW and transfer to treated water storage	IN	IN
WR114	UU Resource Mgt	GWE	Reinstate Python Mill borehole (Littleborough), Northern Manchester Carboniferous Aquifers, 3 Ml/d, new raw water main to discharge into Rochdale Canal, thereby offsetting compensation from Chelburn reservoir	IN	IN
WR115	UU Resource Mgt	GWE	Increased abstraction from the Northern Manchester Carboniferous aquifers, new WTW and transfer to existing treated water storage	OUT	OUT
WR116	UU Resource Mgt	GWE	Increased abstraction from the Ribble Carboniferous aquifers, new WTW and transfer to existing treated water storage	OUT	OUT
WR117	UU Resource Mgt	GWE	Reinstate Lowcocks and Waddington Springs, Ribble Carboniferous aquifers, new WTW and transfer to existing treated water storage	IN	OUT
WR118	UU Resource Mgt	GWE	Maintain abstraction from Dark Lane and Greetby Hill boreholes (Ormskirk), existing WTW and transfer to existing treated water storage	OUT	OUT
WR119a	UU Resource Mgt	GWE	Maintain abstraction from South Egremont boreholes (11 Ml/d), new WTW at treated water storage, new treated water main to treated water storage	IN	IN
WR119b	UU Resource Mgt	GWE	Maintain abstraction from South Egremont boreholes (11 Ml/d), plus three new boreholes and one existing at Catgill (10 Ml/d total), new WTW, new treated water main to treated water storage	IN	OUT
WR120	UU Resource Mgt	GWE	New boreholes at Wirral, new 15 Ml/d WTW, transfer to existing treated water storage, revocation of existing abstraction licences at Gorston, Springhill and Hooton	IN	IN
WR120i	UU Resource Mgt	GWE	New boreholes at Wirral, new 15 Ml/d WTW including water softening, transfer to existing treated water storage, revocation of existing abstraction licences at Gorston, Springhill and Hooton	IN	IN
WR121a	UU Resource Mgt	GWE	Reinstate Eaton boreholes (Tarporley), reinstate Eaton WTW at 6.7 Ml/d, new treated water main to treated water storage	IN	IN
WR121b	UU Resource Mgt	GWE	Reinstate Eaton boreholes (Tarporley), reinstate Eaton WTW at 6.7 Ml/d, new treated water main link to Mid Cheshire Main (Congleton supplies), transfer to existing treated water system	IN	IN
WR122	UU Resource Mgt	GWE	Reinstate Newton Hollows boreholes, new 9 Ml/d WTW, recommission existing treated water main to treated water storage	IN	IN
WR123	UU Resource Mgt	GWE	Increased 2.7 Ml/d abstraction from the Wirral and West Cheshire Permo-Triassic Sandstone aquifers at Helsby, new WTW and transfer to existing treated water storage	IN	OUT
WR124	UU Resource Mgt	GWE	Increased 4.5 Ml/d abstraction from the Wirral and West Cheshire Permo-Triassic Sandstone aquifers at Ashton, new WTW and transfer to existing treated water storage	IN	OUT
WR125	UU Resource Mgt	GWE	Reinstate Bearstone boreholes (Woore), reinstate Bearstone WTW at 6.36 Ml/d, utilise existing treated water main to treated water storage	IN	IN
WR126	UU Resource Mgt	GWE	New abstraction from Carlisle Basin Triassic and Jurassic aquifer system, new WTW and transfer to existing treated water storage	IN	OUT
WR127	UU Resource Mgt	GWE	Increased abstraction of 2 Ml/d from Eden Valley and Carlisle Basin Permo-Triassic Sandstone aquifers at Fairhill, modified WTW and transfer to existing treated water storage	IN	OUT
WR128	UU Resource Mgt	GWN	Increased 4 Ml/d abstraction from Tarn Wood boreholes, modified Tarn Wood WTW, new pumping station, new treated water main to Cumwhinton WTW	IN	OUT
WR129	UU Resource Mgt	GWE	Maintain abstraction from Scales boreholes (Aspatria) at 6 Ml/d, maintain raw water main and treatment at Quarry Hill WTW, new boreholes at Waverton and Thursby, new raw water main to Quarry Hill WTW, modified WTW to treat combined 10 Ml/d, new treated water main to treated water storage	IN	IN
WR130	UU Resource Mgt	DSL	New 5 Ml/d desalination plant in Solway-Tweed estuary, new WTW and transfer to existing treated water storage	IN	OUT
WR131	UU Resource Mgt	DSL	New 20 Ml/d desalination plant in Dee estuary (Dee TraC), new WTW and transfer to existing treated water storage	IN	OUT
WR132	UU Resource Mgt	DSL	New 50 Ml/d desalination plant in Mersey estuary (North West TraC), new WTW and transfer to existing treated water storage	IN	OUT

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WR133	UU Resource Mgt	DSL	New 20 Ml/d desalination plant in Solway Outer South waterbody, new WTW and transfer to existing treated water storage	**IN**	**OUT**
WR134	UU Resource Mgt	SWU	Surface water sewer interception from storm events (Skelmersdale area, WN8)	**OUT**	**OUT**
WR135	UU Resource Mgt	SWU	Surface water sewer interception from storm events (Appleton area) WA4	**OUT**	**OUT**
WR136	UU Resource Mgt	SWU	Surface water sewer interception from storm events (Birchwood area) WA3	**OUT**	**OUT**
WR137	UU Resource Mgt	SWU	Surface water sewer interception from storm events (Little Hulton area) M38	**OUT**	**OUT**
WR138	UU Resource Mgt	EFR	New 10 Ml/d final effluent reuse scheme from River Gowy (Ellesmere Port WwTW to Little Stanney WTW), transfer of max 50% of dry-weather flow to existing WTW facility, transfer to non-potable demand	**IN**	**OUT**
WR139	UU Resource Mgt	EFR	New 0.03 Ml/d final effluent reuse scheme from River Gelt (Castle Carrock WwTW to Castle Carrock WTW), transfer of max 50% of dry-weather flow to existing WTW facility, transfer to existing treated water storage	**IN**	**OUT**
WR140	UU Resource Mgt	EFR	New final effluent re-use (Horwich WwTW) abstraction at 5 Ml/d from River Douglas, new pumping station and raw water main to Rivington WTW, modified WTW process	**IN**	**IN**
WR141	UU Resource Mgt	EFR	New final effluent re-use (Rossendale WwTW) abstraction at 10 Ml/d from River Irwell, new pumping station and raw water main to Townsend Fold WTW, modified WTW process	**IN**	**IN**
WR142	UU Resource Mgt	EFR	New final effluent re-use (Hyndburn WwTW) abstraction at 10 Ml/d from River Calder, new pumping station and raw water main to Martholme WTW, modified WTW process	**IN**	**IN**
WR143	UU Resource Mgt	EFR	New final effluent reuse scheme from River Darwen (Darwen WwTW to Fishmoor WTW), transfer of max 50% of dry-weather flow to existing WTW facility	**OUT**	**OUT**
WR144	UU Resource Mgt	EFR	New final effluent re-use (Mossley Top/Saddleworth WwTW) abstraction at 5 Ml/d from River Tame, new pumping station and raw water main to Buckton Castle WTW, modified WTW process, transfer to existing treated water storage	**IN**	**IN**
WR145	UU Resource Mgt	EFR	New 16 Ml/d final effluent reuse scheme from Workington and Whitehaven WwTW, transfer of max 50% of dry-weather flow to existing WTW facility (Williamsgate)	**IN**	**OUT**
WR146	UU Resource Mgt	EFR	New final effluent re-use (Davyhulme WwTW) storage tank and pumping station at 159 Ml/d, new WTW and treated water storage, transfer to existing treated water system	**IN**	**IN**
WR147	UU Resource Mgt	EFR	Supply of final effluent to non-household customers	**OUT**	**OUT**
WR148	UU Resource Mgt	GWN	New 6.5 Ml/d boreholes at Cumwhinton, new raw water main to Cumwhinton WTW, new treated water link to treated water storage	**IN**	**IN**
WR149	UU Production Mgt	ITC	Lightshaw WTW - increased treatment capacity of 9 Ml/d, new source development (linked to Croft, Landside, Lightshaw boreholes)	**IN**	**OUT**
WR150	UU Resource Mgt	RES	Utilisation of Castle Carrock reservoir dead water storage to existing Castle Carrock WTW, option capacity 6 Ml/d	**IN**	**IN**
WR151	UU Production Mgt	RWL	Reduction in raw water losses of 2 Ml/d	**IN**	**OUT**
WR152	UU Resource Mgt	ASR	New ASR_MAR schemes in order to increase deployable output from aquifers in Cheshire area	**OUT**	**OUT**
WR153	UU Production Mgt	ITC	Reinstate Helsby boreholes at 2 Ml/d, new raw water main between redundant treated water storage and Foxhill WTW. Reinstate Foxhill BH1, increase outputs from existing Simmonds Hill borehole group, increased Simmonds Hill WTW capacity	**IN**	**OUT**
WR154	UU Production Mgt	ITC	Increased output of 10 Ml/d from Delamere borehole group, increased output of Delamere and Sandiford WTW, including nitrate treatment, transfer to treated water storage	**IN**	**IN**
WR155	UU Resource Mgt	CAM	Catchment based solutions in order to increase source deployable output or yield	**OUT**	**OUT**
WR156	UU Resource Mgt	IGA	New infiltration gallery installations in order to maximise shallow groundwater supplies from certain groundwater catchments	**OUT**	**OUT**
WR157	UU Resource Mgt	RCS	Rain cloud seeding to induce artificial precipitation at certain times	**OUT**	**OUT**
WR158	UU Resource Mgt	TBA	Tidal barrage for the impoundment of water	**OUT**	**OUT**
WR159	UU Production Mgt	RWL SSO	Group 1 - Improved reservoir compensation release control from 76 individual reservoirs in order to better match abstraction licence conditions, 13.2 Ml/d estimated saving in water storage	**IN**	**IN**
WR160	UU Production Mgt	RWL SSO	Group 2 - Improved reservoir compensation release control from Vyrnwy, Rivington, Thirlmere and Haweswater in order to better match with abstraction licence conditions, 8.8 Ml/d estimated saving in water storage	**IN**	**IN**
WR161	UU Production Mgt	SSO	Drought management options (drought permits/orders) as permanent supply/demand options, including reduced compensation, reduced prescribed flows, reduced HoF conditions; abstraction licence changes and new abstraction licence) - as detailed in Drought Plan	**NOT SCREENED - IN**	**OUT**
WR162	UU Resource Mgt	OUT	Reduction in outages by refurbishment (enhanced maintenance) of raw water infrastructure	**IN**	**OUT**
WR163	UU Resource Mgt	OUT	Reduction in outages of raw water transfer systems through pro-active asset condition assessment and smart operation of non-infrastructure assets (Windermere & Ullswater)	**IN**	**OUT**
WR164	UU Resource Mgt	CON	Conjunctive use of sources - Broughton collector main capacity increase	**IN**	**OUT**

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WR165	UU Production Mgt	SSO	Maximise pumping from Windermere and Ullswater between March-October (subject to all existing constraints)	IN	OUT
WR166	UU Resource Mgt	GWN	New groundwater abstractions from Penrith area, new WTW, transfer to treated water storage	IN	OUT
WR167	UU DPS	DPS	Drought Permits 2.7 Ml/d - Delph reservoir	IN	IN
WR168	UU DPS	DPS	Drought Permits 10.9 Ml/d - Dovestone reservoir	IN	IN
WR169	UU DPS	DPS	Drought Permits 13.9 Ml/d - Jumbles reservoir	IN	IN
WR170	UU DPS	DPS	Drought Permits 10.5 Ml/d - Longdendale reservoirs	IN	IN
WR171	UU DPS	DPS	Drought Permits 165 Ml/d - River Lune LCUS abstraction	IN	IN
WR172	UU DPS	DPS	Drought Permits 1.9 Ml/d - Rivington reservoirs - Brinscall Brook	IN	IN
WR173	UU DPS	DPS	Drought Permits 2.2 Ml/d - Rivington reservoirs - White Coppice	IN	IN
WR174	UU DPS	DPS	Drought Permits - Ullswater	IN	IN
WR175	UU DPS	DPS	Drought Permits 20 Ml/d - Lake Vyrnwy	IN	IN
WR176	UU DPS	DPS	Drought Permits 178 Ml/d - Lake Windermere: Scenario 1	IN	IN
WR177	UU DPS	DPS	Drought Permits 568 Ml/d - Lake Windermere: Scenario 2	IN	IN
WR178	UU DPS	DPS	Drought Permits 4 Ml/d- Swineshaw boreholes (Glossop)	IN	IN
WR179	UU DPS	DPS	Drought Permits - Bowscar; Gamblesby; Tarn Wood boreholes (7.33 Ml/d)	IN	IN
WR180	UU Resource Mgt	OUT	Reduction in WTW outage due to failure of critical WTW asset, through criticality risk assessment, contingency planning, and asset maintenance	NOT SCREENED - IN	OUT
WR800	3rd-party Resource Mgt	NIT	New third party abstraction licence trade (River Bela), new 4.5 Ml/d pumping station and raw water main to discharge into Thirlmere aqueduct, treatment at Lostock WTW	IN	IN
WR801	3rd-party Resource Mgt	NIT	Abstraction trade from existing non-water industry abstraction licence holder, transfer from lagoon Farm with unused abstraction licence of 1M gallons/day to Watchgate WTW and transfer to treated water storage	IN	OUT
WR802	3rd-party Resource Mgt	NIT	Abstraction trade from 3 existing boreholes at Bromborough from existing non-water industry abstraction licence holder	IN	OUT
WR803	3rd-party Resource Mgt	NIT	Abstraction Licence Trading. Possibility in trading abstraction licences. Saline water from the River Wyre	OUT	OUT
WR804	3rd-party Resource Mgt	INT	Transportation of water on a ship. Procurement and the movement of bulk water from multiple sources (e.g. Scotland, Ireland, Iceland, Norway) to the North West, by ship	OUT	OUT
WR805	3rd-party Resource Mgt	WIT	Source and supply bulk water at a standardised price	OUT	OUT
WR806	3rd-party Resource Mgt	ITC	Third party monitoring of incoming water to secure quality. Potentially increased abstraction through better water quality monitoring	NOT SCREENED - IN	OUT
WR807	3rd-party Resource Mgt	ITC	We recognise that a number of organisations within the WRMP area have significant water supplies (sometimes in more remote locations) and one of the key considerations in accessing these supplies will be current and future network infrastructure/resilience.	OUT	OUT
WR808	3rd-party Production Mgt	PRO	Optimisation Services at Water and Wastewater WTW. Identification and reduction of process losses using benchmarking tools	OUT	OUT
WR809	3rd-party Resource Mgt	GWE	Remediation to existing borehole sources. In the majority of cases bringing existing sources back to their original and full capacity	OUT	OUT
WR810	3rd-party Resource Mgt	RWT/WIT	New third party abstraction from Cow Green Reservoir (Northumbrian Water), new 40 Ml/d pumping station and raw water main, discharge into Heltondale aqueduct and into Haweswater IR, existing WTW	IN	OUT
WR811	3rd-party Resource Mgt	RWT/WIT	Transfer water (40 Ml/d) from Cow Green IR to discharge 40 Ml/d into Heltondale aqueduct and hence discharge into Haweswater for use in SRZ, and to discharge 10 Ml/d into R. Eden to be re-abstracted downstream, treated and transferred into Carlisle WRZ	IN	OUT
WR812	3rd-party Resource Mgt	RWT/WIT	New third party abstraction from Kielder Reservoir (Northumbrian Water), new 100 Ml/d pumping stations and raw water main, discharge into Heltondale aqueduct and into Haweswater IR, existing WTW	IN	OUT
WR813	3rd-party Resource Mgt	RWT/WIT	New third party abstraction from Scammonden Reservoir (Yorkshire Water), new 5 Ml/d pumping station and raw water main, discharge into Huddersfield Canal, new abstraction at Mossley, new pumping station and raw water main to Buckton Castle WTW	IN	IN
WR814a	3rd-party Resource Mgt	WIT	Reduced third party non-potable abstraction by 24 Ml/d from River Dee (Chester), allowing increased volume of abstraction for UU from existing River Dee abstraction and treatment at Huntington WTW	IN	IN
WR814b	3rd-party Resource Mgt	WIT	Reduced third party non-potable abstraction by 24 Ml/d from River Dee (Chester), transfer, abstraction and treatment via Shropshire Union Canal at increased capacity Hurleston WTW (Nantwich), new treated water main transfer to Mid Cheshire Main and existing treated water system	IN	IN

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WR814c	3rd-party Resource Mgt	WIT	Reduced third party non-potable abstraction by 24 Ml/d from River Dee (Chester), new raw water main to Hurleston WTW, increased capacity Hurleston WTW (Nantwich), new treated water main transfer to Mid Cheshire Main	IN	IN
WR815	3rd-party Resource Mgt	NIT	New abstraction from the Lancaster Canal and transfer into Thirlmere Aqueduct for subsequent treatment	IN	OUT
WR816	3rd-party Resource Mgt	NIT	New third party 5.2 Ml/d abstraction (revised down from 10 Ml/d) from Elton Reservoir (Bury), part of Manchester/Bolton/Bury canal, new WTW, new treated water main to treated water storage (Bury)	IN	IN
WR817	3rd-party Resource Mgt	NIT	New third party 16 Ml/d abstraction (revised down from 23 Ml/d) from Carr Mill Dam (St Helens), part of St Helens canal, new WTW, new treated water main to treated water storage	IN	IN
WR818	3rd-party Resource Mgt	RWT/NIT	Existing disused abstraction licence (historic industrial use to chemical works no longer in use), made available for UU abstraction use from Ashton Canal, new WTW and transfer to existing treated water storage	IN	OUT
WR819	3rd-party Resource Mgt	RWT/NIT	Possible small disused abstraction licences that could be made available for UU use for abstraction from Peak and Pennine Canal, new WTW and transfer to treated water storage in SRZ	OUT	OUT
WR820	3rd-party Resource Mgt	NIT	New third party 15.5 Ml/d abstraction from Shropshire Union Canal at Hurleston (Nantwich), increased WTW capacity at Hurleston WTW, new treated water main to connect into Mid Cheshire Main	IN	IN
WR821	3rd-party Resource Mgt	NIT	New third party 30 Ml/d abstraction from Shropshire Union Canal at Hurleston (Nantwich), increased WTW capacity at Hurleston WTW, new treated water main to connect into Mid Cheshire Main	IN	IN
WR822	3rd-party Resource Mgt	RWT/NIT	New abstraction from the Manchester Ship Canal, new WTW and transfer to existing treated water storage	OUT	OUT
WR822	3rd-party Resource Mgt	RWT/NIT	New abstraction from the Bridgewater Canal, new WTW and transfer to existing treated water storage	OUT	OUT
WR823	3rd-party Resource Mgt	NIT	Third party mine water abstraction from Aspull Sough Mine (Built), new WTW to treat to potable standard, transfer to treated water storage	IN	OUT
WR824	3rd-party Resource Mgt	NIT	New third party mine water abstraction from Blenkinsopp Mine, new 2.2 Ml/d pumping station and new raw water main to Castle Carrock WTW	IN	IN
WR825	3rd-party Resource Mgt	NIT	Third party mine water abstraction from Bridgewater Canal (Built), 3 Ml/d, treatment to potable standard, new connection to Manchester ring main system at Worsley basin	IN	OUT
WR826	3rd-party Resource Mgt	NIT	New third party mine water abstraction from Clough Foot mine (includes previous WR827 and WR832), 1.8 Ml/d, modified treatment through existing Clough Bottom WTW	IN	OUT
WR848	3rd-party Resource Mgt	NIT	Third party mine water abstraction from Deerplay mine (Built) 2 Ml/d, new WTW and transfer to existing treated water system	IN	OUT
WR828	3rd-party Resource Mgt	NIT	Third party mine water abstraction Down Brook (Built)	OUT	OUT
WR829	3rd-party Resource Mgt	NIT	Third party mine water abstraction Ewanrigg (Built)	OUT	OUT
WR830	3rd-party Resource Mgt	NIT	Third party mine water abstraction Great Clifton (Built)	OUT	OUT
WR831	3rd-party Resource Mgt	NIT	Third party mine water abstraction from Hockery Brook mine(Built), 1.8 Ml/d, new WTW with WTW, transfer to treated water storage, new pumping station required	IN	OUT
WR849	3rd-party Resource Mgt	NIT	Third party mine water abstraction from Old Meadows (Built) 3.4 Ml/d	IN	OUT
WR833	3rd-party Resource Mgt	NIT	Third party mine water abstraction from Silverdale mine (Built), 2.7 Ml/d, new PS transfer to treated water storage, new WTW	IN	OUT
WR834	3rd-party Resource Mgt	NIT	Third party mine water abstraction Mine Water: Smithy Brook / Pemberton (Built)	OUT	OUT
WR835	3rd-party Resource Mgt	NIT	Third party mine water abstraction Mine Water: Summersales (Built)	OUT	OUT
WR836	3rd-party Resource Mgt	NIT	Third party mine water abstraction Mine Water: Agecroft (Proposed)	OUT	OUT
WR837	3rd-party Resource Mgt	NIT	Third party mine water abstraction Mine Water: Aspen Valley (Proposed)	OUT	OUT
WR838	3rd-party Resource Mgt	NIT	Third party mine water abstraction Mine Water: Bradley Brook (Proposed)	OUT	OUT
WR839	3rd-party Resource Mgt	NIT	Third party mine water abstraction Mine Water: Brindley Ford (Proposed)	OUT	OUT
WR840	3rd-party Resource Mgt	NIT	Third party mine water abstraction Mine Water: Carr Wood (Proposed)	OUT	OUT
WR841	3rd-party Resource Mgt	NIT	Third party mine water abstraction Mine Water: Hawarden (Proposed)	OUT	OUT
WR842	3rd-party Resource Mgt	NIT	Third party mine water abstraction Mine Water: Haydock Sough (Proposed)	OUT	OUT
WR843	3rd-party Resource Mgt	NIT	Third party mine water abstraction Mine Water: Towneley Park (Proposed)	OUT	OUT
WR844	3rd-party Resource Mgt	RWT/WIT	Third party bulk transfer of treated water from Dee Valley Water to the Helsby area 3 Ml/d	IN	OUT
WR845	3rd-party Resource Mgt	NIT	Third Party transfer and treatment of water from Dalston borehole to treated water storage at 1 Ml/d	IN	OUT

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Option ID at Feasible options stage	Option Group	Option Type	Option Name & outline scope	Primary screening outcome	Secondary screening outcome
WR846	3rd-party Resource Mgt	RWT/WIT	Third Party transfer and treatment of water from Dalston borehole to Brownelson reservoir 60 Ml/d	IN	OUT
WR847	3rd-party Resource Mgt	NIT	Third party disused reservoir near Goosnargh, Lancashire	OUT	OUT
WR900	3rd-party Customer Mgt	SWE	Third Party - Real-time water availability and abstraction cost model	OUT	OUT
WR901	3rd-party Distribution Mgt	LEA	Third Party - Data Cleansing	OUT	OUT
WR902	3rd-party Customer Mgt	WEI	Third Party - Customer behaviour change pilots	OUT	OUT
WR903a	3rd-party Distribution Mgt	LEA	Third Party 24.7 Ml/d Leakage Reduction Service for SRZ	IN	IN
WR903b	3rd-party Distribution Mgt	LEA	Third Party 0.23 Ml/d Leakage Reduction Service for CRZ	IN	IN
WR903c	3rd-party Distribution Mgt	LEA	Third Party 0.07 Ml/d Leakage Reduction Service for NERZ	IN	IN
WR904	3rd-party Customer Mgt	WEP	Cheshire West and Chester - Local Plan Policy	OUT	OUT
WR905	3rd-party Customer Mgt	APP	Third party 1.341 Ml/d reduction via new application	IN	IN
WR906	3rd-party Distribution Mgt	LEA	Third Party Smart Water Network	OUT	OUT
WR907a	3rd-party Distribution Mgt	LEA	Third Party 108 Ml/d Leakage Reduction Service for SRZ	IN	IN
WR907b	3rd-party Distribution Mgt	LEA	Third Party 43.2 Ml/d Leakage Reduction Service for SRZ	IN	IN
WR907c	3rd-party Distribution Mgt	LEA	Third Party 108 Ml/d Leakage Reduction Service for SRZ	IN	IN
WR907d	3rd-party Distribution Mgt	LEA	Third Party 54 Ml/d Leakage Reduction Service for SRZ	IN	IN
WR907e	3rd-party Distribution Mgt	LEA	Third Party 2.106 Ml/d Leakage Reduction Service for SRZ	IN	IN
WR907f	3rd-party Distribution Mgt	LEA	Third Party 10.53 Ml/d Leakage Reduction Service for SRZ	IN	IN
WR907g	3rd-party Distribution Mgt	LEA	Third Party 10.53 Ml/d Leakage Reduction Service for SRZ	IN	IN
WR908	3rd-party Distribution Mgt	LEA	Third Party Leakage Reduction Service for SRZ	IN	OUT
WR909	3rd-party Production Mgt	APP	Third party - Water demand and supply planning (WDASP)	OUT	OUT
WR910	3rd-party Distribution Mgt	LEA	Third Party provide a family of PIPEMINDER products	OUT	OUT
WR911a	3rd-party Distribution Mgt	LEA	Third Party 5 Ml/d Leakage Reduction Service for SRZ	IN	IN
WR911b	3rd-party Distribution Mgt	LEA	Third Party 5 Ml/d Leakage Reduction Service for SRZ	IN	IN
WR912	3rd-party Distribution Mgt	LDF	Third Party 5 Ml/d Leakage Reduction via advice and information service for SRZ	IN	IN
WR913	3rd-party Distribution Mgt	LEA	Third party application 4.52 Ml/d reduced leakage	IN	OUT
WR914	3rd-party Distribution Mgt	LEA	Third party 4 Ml/d leakage reduction	IN	IN
WR915	3rd-party Distribution Mgt	LEA	Third party network optimisation through smart networks	NOT SCREENED - IN	OUT
WR916	3rd-party Distribution Mgt	LEA	Third party 60 Ml/d leakage reduction through identification, find and fix of trunk mains leakage	IN	OUT
WR500a	UU Distribution Mgt	LEA	10 Ml/d Leakage reduction through additional find/fix and pressure optimisation - detection surveys and repairs, construction of chambers, installation of PMVs, some rehab to enable schemes.	IN	IN
WR500b	UU Distribution Mgt	LEA	10 Ml/d Leakage reduction through additional find/fix and pressure optimisation - detection surveys and repairs, construction of chambers, installation of PMVs, some rehab to enable schemes.	IN	IN
WR500c	UU Distribution Mgt	LEA	8 Ml/d Leakage reduction through additional find/fix and pressure optimisation - detection surveys and repairs, construction of chambers, installation of PMVs, some rehab to enable schemes.	IN	IN
WR500d	UU Distribution Mgt	LEA	10 Ml/d Leakage reduction through additional find/fix and pressure optimisation - detection surveys and repairs, construction of chambers, installation of PMVs, some rehab to enable schemes.	IN	IN
WR500e	UU Distribution Mgt	LEA	10 Ml/d Leakage reduction through additional find/fix and pressure optimisation - detection surveys and repairs, construction of chambers, installation of PMVs, some rehab to enable schemes.	IN	IN

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Option ID at Feasible options stage	Option Group	Option Type	Option Name & outline scope	Primary screening outcome	Secondary screening outcome
WR501a	UU Distribution Mgt	LEA	0.10 Ml/d Leakage reduction through additional find/fix and pressure optimisation - detection surveys and repairs, construction of chambers, installation of PMVs, some rehab to enable schemes.	**IN**	**IN**
WR501b	UU Distribution Mgt	LEA	0.10 Ml/d Leakage reduction through additional find/fix and pressure optimisation - detection surveys and repairs, construction of chambers, installation of PMVs, some rehab to enable schemes.	**IN**	**IN**
WR501c	UU Distribution Mgt	LEA	0.10 Ml/d Leakage reduction through additional find/fix and pressure optimisation - detection surveys and repairs, construction of chambers, installation of PMVs, some rehab to enable schemes.	**IN**	**IN**
WR501d	UU Distribution Mgt	LEA	0.10 Ml/d Leakage reduction through additional find/fix and pressure optimisation - detection surveys and repairs, construction of chambers, installation of PMVs, some rehab to enable schemes.	**IN**	**OUT**
WR501e	UU Distribution Mgt	LEA	0.10 Ml/d Leakage reduction through additional find/fix and pressure optimisation - detection surveys and repairs, construction of chambers, installation of PMVs, some rehab to enable schemes.	**IN**	**OUT**
WR502a	UU Distribution Mgt	LEA	0.05 Ml/d Leakage reduction through additional find/fix and pressure optimisation - detection surveys and repairs, construction of chambers, installation of PMVs, some rehab to enable schemes.	**IN**	**OUT**
WR502b	UU Distribution Mgt	LEA	0.05 Ml/d Leakage reduction through additional find/fix and pressure optimisation - detection surveys and repairs, construction of chambers, installation of PMVs, some rehab to enable schemes.	**IN**	**OUT**
WR502c	UU Distribution Mgt	LEA	0.05 Ml/d Leakage reduction through additional find/fix and pressure optimisation - detection surveys and repairs, construction of chambers, installation of PMVs, some rehab to enable schemes.	**IN**	**OUT**
WR502d	UU Distribution Mgt	LEA	0.05 Ml/d Leakage reduction through additional find/fix and pressure optimisation - detection surveys and repairs, construction of chambers, installation of PMVs, some rehab to enable schemes.	**IN**	**OUT**
WR502e	UU Distribution Mgt	LEA	0.05 Ml/d Leakage reduction through additional find/fix and pressure optimisation - detection surveys and repairs, construction of chambers, installation of PMVs, some rehab to enable schemes.	**IN**	**OUT**
WR503	UU Distribution Mgt	LEA	3.81 Ml/d Proactive monitoring of all household meters to identify and fix supply pipe leaks. This means that someone will be proactively looking at meter reads and identifying properties with too high consumption for a household.	**IN**	**IN**
WR504	UU Distribution Mgt	LEA	Replace rather that repair - household supply pipes. At the moment our policy is to repair supply pipes, we have carried out a study to assess the impact on leakage if we will replace supply pipes instead of repairing them.	**IN**	**OUT**
WR505	UU Distribution Mgt	LEA	Proactive monitoring of non-household meters to identify supply pipe leaks. Similar to option WR504, but for non-households.	**IN**	**OUT**
WR506	UU Distribution Mgt	LEA	0.5 Ml/d Free repair to all private supply pipe leaks - non-household	**IN**	**IN**
WR507	UU Distribution Mgt	LEA	Subsidy to customers once they have fixed their privately owned supply pipes (cash back once proof of repair is provided)	**IN**	**OUT**
WR523	UU Distribution Mgt	LEA	Give a subsidy to customers once they have fixed their private internal leaks (cash back once proof of repair is provided)	**OUT**	**OUT**
WR508a	UU Distribution Mgt	LEA	0.10 Ml/d Distribution mains rehabilitation	**IN**	**OUT**
WR508b	UU Distribution Mgt	LEA	0.30 Ml/d Distribution mains rehabilitation	**IN**	**OUT**
WR508c	UU Distribution Mgt	LEA	0.16 Ml/d Distribution mains rehabilitation	**IN**	**OUT**
WR508d	UU Distribution Mgt	LEA	0.11 Ml/d Distribution mains rehabilitation	**IN**	**OUT**
WR508e	UU Distribution Mgt	LEA	0.19 Ml/d Distribution mains rehabilitation	**IN**	**OUT**
WR509	UU Distribution Mgt	LEA	Offer incentives for customers to report leaks, i.e. vouchers or cash when they ring in to report a leak	**IN**	**OUT**
WR510	UU Distribution Mgt	LEA	Advice and information on leakage detection and fixing techniques (Industrial and Commercial Customers)	**IN**	**OUT**
WR511	UU Distribution Mgt	LEA	8.22 Ml/d Enhanced logger verification - logger verification is a simple on site check to ensure that the flow being registered by a meter matches the flow being recorded by the data logging device attached to the meter.	**IN**	**IN**
WR512	UU Distribution Mgt	LEA	0.05 Ml/d Enhanced meter verification - meter verification is an on-site check to determine the accuracy of flow being registered through a meter.	**IN**	**IN**
WR513	UU Distribution Mgt	LEA	0.02 Ml/d Meter under /over registration analysis - meter verification is an on-site check to determine the accuracy of flow being registered through a meter.	**IN**	**IN**
WR514	UU Distribution Mgt	LEA	1.07 Ml/d Temporary logging of large customers - install temporary loggers to all customers identified as having a) high consumption (above 500 l/hr); b) in DMAs with poor operability; c) in DMAs with good operability; to assess which customers have the biggest impact on the operability within DMAs.	**IN**	**IN**
WR524	UU Distribution Mgt	LEA	Permanent logging of large customers - it is assumed that 10% of the customers temporarily logged will become permanently CLUs (continuously logged users).	**IN**	**OUT**
WR515	UU Distribution Mgt	LEA	8.82 Ml/d Splitting DMAs - to improve DMA operability a study of each non-operable DMA would be required to determine the reason for the DMA being non-operable and to carry out the appropriate action to fix any issues.	**IN**	**IN**
WR516	UU Distribution Mgt	LEA	0.05 Ml/d Splitting DMAs - Before splitting DMAs it is recommended that a desktop operability study is carried out. Scope includes office design, hydraulic modelling and site investigation, plus construction of chambers and installation of meters.	**IN**	**OUT**
WR517	UU Distribution Mgt	LEA	3.57 Ml/d Splitting large upstream tiles - Replace faulty meters - initial desk study and site visit to determine validity of fault before replacing existing meter.	**IN**	**IN**

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WR518	UU Distribution Mgt	LEA	0.017 Ml/d Splitting large upstream tiles - Replace faulty probes - initial desk study and site visit to determine validity of fault before replacing existing probe.	IN	OUT
WR519	UU Distribution Mgt	LEA	0.01 Ml/d Splitting large upstream tiles - Split large tile areas - install new meters - mixture of full bore meters and probes.	IN	IN
WR525	UU Distribution Mgt	LEA	Splitting large upstream tiles - Split large aqueduct areas - install new probes - two on the Manchester ring main, one on the Hodder aqueduct and four on the Haweswater aqueduct.	IN	OUT
WR520	UU Distribution Mgt	LEA	0.48 Ml/d Set up hydraulic water supply zones for analysis and reporting - desk top exercise to establish new hydraulic areas in Netbase.	IN	IN
WR521	UU Distribution Mgt	LEA	2.6 m3/d Set up hydraulic water supply zones for analysis and reporting - desk top exercise to establish new hydraulic areas in Netbase.	IN	OUT
WR522	UU Distribution Mgt	LEA	0.8 m3/d Set up hydraulic water supply zones for analysis and reporting - desk top exercise to establish new hydraulic areas in Netbase.	IN	OUT
WR600a	UU Customer Mgt	WSD	0.43 Ml/d Enhanced - above baseline activity - Water Efficiency Enabling Activities - offering free water butts to customers	IN	OUT
WR601a	UU Customer Mgt	WSD	0.01 Ml/d Enhanced - above baseline activity - Water Efficiency Enabling Activities - offering free water butts to customers	IN	OUT
WR602a	UU Customer Mgt	WSD	0.84 m3/d Enhanced - above baseline activity - Water Efficiency Enabling Activities - offering free water butts to customers	IN	OUT
WR600b	UU Customer Mgt	WSD	0.87 Ml/d Enhanced - above baseline activity - Water Efficiency Enabling Activities - offering free water butts to customers	IN	OUT
WR601b	UU Customer Mgt	WSD	0.01 Ml/d Enhanced - above baseline activity - Water Efficiency Enabling Activities - offering free water butts to customers	IN	OUT
WR602b	UU Customer Mgt	WSD	1.69 m3/d Enhanced - above baseline activity - Water Efficiency Enabling Activities - offering free water butts to customers	IN	OUT
WR603a	UU Customer Mgt	WSD	0.43 Ml/d Enhanced - above baseline activity - Water Efficiency Enabling Activities - offering subsidised water butts to customers	IN	OUT
WR604a	UU Customer Mgt	WSD	0.01 Ml/d Enhanced - above baseline activity - Water Efficiency Enabling Activities - offering subsidised water butts to customers	IN	OUT
WR605a	UU Customer Mgt	WSD	0.84 m3/d Enhanced - above baseline activity - Water Efficiency Enabling Activities - offering subsidised water butts to customers	IN	OUT
WR603b	UU Customer Mgt	WSD	0.87 Ml/d Enhanced - above baseline activity - Water Efficiency Enabling Activities - offering subsidised water butts to customers	IN	OUT
WR604b	UU Customer Mgt	WSD	0.02 Ml/d Enhanced - above baseline activity - Water Efficiency Enabling Activities - offering subsidised water butts to customers	IN	OUT
WR605b	UU Customer Mgt	WSD	1.69 m3/d Enhanced - above baseline activity - Water Efficiency Enabling Activities - offering subsidised water butts to customers	IN	OUT
WR626	UU Customer Mgt	WSD	Enhanced - above baseline activity - Existing domestic water saving retrofit products - distribution	OUT	OUT
WR606a	UU Customer Mgt	ISD	2.04 Ml/d Enhanced - above baseline activity - Existing domestic water saving retrofit products - installation through smart home visits	IN	IN
WR607a	UU Customer Mgt	ISD	0.03 Ml/d Enhanced - above baseline activity - Existing domestic water saving retrofit products - installation through smart home visits	IN	OUT
WR608a	UU Customer Mgt	ISD	4.03 m3/d Enhanced - above baseline activity - Existing domestic water saving retrofit products - installation through smart home visits	IN	OUT
WR606b	UU Customer Mgt	ISD	4.08 Ml/d Enhanced - above baseline activity - Existing domestic water saving retrofit products - installation through smart home visits	IN	IN
WR607b	UU Customer Mgt	ISD	0.07 Ml/d Enhanced - above baseline activity - Existing domestic water saving retrofit products - installation through smart home visits	IN	IN
WR608b	UU Customer Mgt	ISD	0.01 Ml/d Enhanced - above baseline activity - Existing domestic water saving retrofit products - installation through smart home visits	IN	IN
WR627	UU Customer Mgt	WSD	Innovative technologies / products, e.g. Waterblade - distribution	OUT	OUT
WR628	UU Customer Mgt	WSD	Innovative technologies / products, e.g. Waterblade - installation	IN	OUT
WR610a	UU Customer Mgt	EDU	1.41 Ml/d Enhanced education programme	IN	IN
WR610b	UU Customer Mgt	EDU	2.83 Ml/d Enhanced education programme	IN	IN
WR629	UU Customer Mgt	WEE	Domestic rainwater harvesting system - existing households	OUT	OUT
WR630	UU Customer Mgt	WEE	Domestic rainwater harvesting system - new build households	OUT	OUT
WR631	UU Customer Mgt	WEE	Domestic rainwater harvesting system - non-households	OUT	OUT
WR611a	UU Customer Mgt	PPO	4.05 Ml/d Enhanced - above baseline activity - Partnership projects with public and third sector organisations, e.g. Housing Associations	IN	IN
WR612a	UU Customer Mgt	PPO	0.07 Ml/d Enhanced - above baseline activity - Partnership projects with public and third sector organisations, e.g. Housing Associations	IN	OUT

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WR613a	UU Customer Mgt	PPO	0.01 Ml/d Enhanced - above baseline activity - Partnership projects with public and third sector organisations, e.g. Housing Associations	IN	OUT
WR611b	UU Customer Mgt	PPO	8.09 Ml/d Enhanced - above baseline activity - Partnership projects with public and third sector organisations, e.g. Housing Associations	IN	IN
WR612b	UU Customer Mgt	PPO	0.14 Ml/d Enhanced - above baseline activity - Partnership projects with public and third sector organisations, e.g. Housing Associations	IN	IN
WR613b	UU Customer Mgt	PPO	0.02 Ml/d Enhanced - above baseline activity - Partnership projects with public and third sector organisations, e.g. Housing Associations	IN	IN
WR632	UU Customer Mgt	WUU	Do as I do - This project focuses on water use on all UU 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.	IN	OUT
WR615a	UU Customer Mgt	WUA	2.60 Ml/d Fixing leaking toilets	IN	IN
WR616a	UU Customer Mgt	WUA	0.043 Ml/d Fixing leaking toilets	IN	OUT
WR617a	UU Customer Mgt	WUA	0.01 Ml/d Fixing leaking toilets	IN	IN
WR615b	UU Customer Mgt	WUA	5.20 Ml/d Fixing leaking toilets	IN	IN
WR616b	UU Customer Mgt	WUA	0.08 Ml/d Fixing leaking toilets	IN	IN
WR617b	UU Customer Mgt	WUA	0.01 Ml/d Fixing leaking toilets	IN	IN
WR633	UU Customer Mgt	WEI	Targeted water conservation information (advice on appliance water usage)	IN	OUT
WR634	UU Customer Mgt	WEI	Intensive area / community based communications	IN	OUT
WR620a	UU Customer Mgt	WSD	8.34 Ml/d Enhanced - above baseline activity - Provision of free water efficiency goods and advice to all newly metered customers	IN	IN
WR621a	UU Customer Mgt	WSD	0.07 Ml/d Enhanced - above baseline activity - Provision of free water efficiency goods and advice to all newly metered customers	IN	OUT
WR622a	UU Customer Mgt	WSD	0.01 Ml/d Enhanced - above baseline activity - Provision of free water efficiency goods and advice to all newly metered customers	IN	OUT
WR620b	UU Customer Mgt	WSD	15.99 Ml/d Enhanced - above baseline activity - Provision of free water efficiency goods and advice to all newly metered customers	IN	IN
WR621b	UU Customer Mgt	WSD	0.14 Ml/d Enhanced - above baseline activity - Provision of free water efficiency goods and advice to all newly metered customers	IN	IN
WR622b	UU Customer Mgt	WSD	0.01 Ml/d Enhanced - above baseline activity - Provision of free water efficiency goods and advice to all newly metered customers	IN	IN
WR635	UU Customer Mgt	APP	Develop customer app to enable continued engagement with the customer, to help long term behaviour change.	OUT	OUT
WR623a	UU Customer Mgt	WUA	7.41 Ml/d Enhanced - above baseline activity - Offering water efficiency home checks when installing a meter at a customer's property	IN	IN
WR624a	UU Customer Mgt	WUA	0.06 Ml/d Enhanced - above baseline activity - Offering water efficiency home checks when installing a meter at a customer's property	IN	OUT
WR625a	UU Customer Mgt	WUA	0.01 Ml/d Enhanced - above baseline activity - Offering water efficiency home checks when installing a meter at a customer's property	IN	IN
WR623b	UU Customer Mgt	WUA	14.2 Ml/d Enhanced - above baseline activity - Offering water efficiency home checks when installing a meter at a customer's property	IN	IN
WR624b	UU Customer Mgt	WUA	0.12 Ml/d Enhanced - above baseline activity - Offering water efficiency home checks when installing a meter at a customer's property	IN	IN
WR625b	UU Customer Mgt	WUA	0.01 Ml/d Enhanced - above baseline activity - Offering water efficiency home checks when installing a meter at a customer's property	IN	IN
WR636	UU Customer Mgt	REB	Provide a financial incentive to customers who reduce their usage by 10% from the previous year	OUT	OUT
WR637	UU Customer Mgt	WEI	Enhanced - above baseline activity - Targeted water efficiency advice for industrial/commercial customers	OUT	OUT
WR638	UU Customer Mgt	WEI	Enhanced - above baseline activity - Targeted water efficiency advice for public sector customers and recreation facilities	IN	OUT
WR639	UU Customer Mgt	WEI	Targeted water efficiency advice for purchasers of water using appliances - at home/at point of purchase	OUT	OUT
WR640	UU Customer Mgt	WEI	Target shorter showers at adolescents	OUT	OUT
WR641	UU Customer Mgt	WEI	Target water consumption in university accommodation	OUT	OUT
WR642	UU Customer Mgt	WEI	Target water consumption in university private rental sector	IN	OUT

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WR643	UU Customer Mgt	WEI	Target water consumption at the community scale	**OUT**	**OUT**
WR644	UU Customer Mgt	REB	Subsidy to customers that purchase water efficient appliances (washing machines, dishwashers, showers & WC's)	**OUT**	**OUT**
WR645	UU Customer Mgt	WER	Treated greywater reuse - existing households blanket promotion	**OUT**	**OUT**
WR646	UU Customer Mgt	WER	Treated greywater reuse - new households blanket promotion	**OUT**	**OUT**
WR647	UU Customer Mgt	WER	Treated greywater reuse - existing non-households blanket promotion	**OUT**	**OUT**
WR648	UU Customer Mgt	WER	Treated greywater reuse - new non-households blanket promotion	**OUT**	**OUT**
WR649	UU Customer Mgt	WEE	Rainshare: community rainwater harvesting	**OUT**	**OUT**
WR650	UU Customer Mgt	WEE	Gamification - creating customer water efficiency league table	**IN**	**OUT**
WR749	UU Customer Mgt	CMT	Compulsory Metering (AMR)	**OUT**	**OUT**
WR700a	UU Customer Mgt	MIP	6.42 Ml/d Metering on change of occupancy (AMR)	**IN**	**OUT**
WR701a	UU Customer Mgt	MIP	0.12 Ml/d Metering on change of occupancy (AMR)	**IN**	**OUT**
WR702a	UU Customer Mgt	MIP	0.01 Ml/d Metering on change of occupancy (AMR)	**IN**	**OUT**
WR700b	UU Customer Mgt	MIP	10.52 Ml/d Metering on change of occupancy (AMR)	**IN**	**OUT**
WR701b	UU Customer Mgt	MIP	0.21 Ml/d Metering on change of occupancy (AMR)	**IN**	**OUT**
WR702b	UU Customer Mgt	MIP	0.02 Ml/d Metering on change of occupancy (AMR)	**IN**	**OUT**
WR720	UU Customer Mgt	MIP	Meter void properties (AMR)	**OUT**	**OUT**
WR721	UU Customer Mgt	MIP	Meter remaining unmetered non households (AMR)	**OUT**	**OUT**
WR722	UU Customer Mgt	MIP	Installation meters/meter boxes when premises change ownership (AMR)	**OUT**	**OUT**
WR723	UU Customer Mgt	MIP	Meter all households where a meter or meter box already exists (AMR)	**OUT**	**OUT**
WR724	UU Customer Mgt	MCS	Meter all properties without changing the customers unmeasured status (AMR)	**OUT**	**OUT**
WR725	UU Customer Mgt	MIP	Fit meters onto all properties that have a site visit for stop tap repairs and service renewals (AMR)	**OUT**	**OUT**
WR703a	UU Customer Mgt	RAF	0.23 Ml/d Refer a friend meter installation scheme	**IN**	**OUT**
WR704a	UU Customer Mgt	RAF	0.002 Ml/d Refer a friend meter installation scheme	**IN**	**OUT**
WR705a	UU Customer Mgt	RAF	0.16 m3/d Refer a friend meter installation scheme	**IN**	**OUT**
WR703b	UU Customer Mgt	RAF	0.45 Ml/d Refer a friend meter installation scheme	**IN**	**OUT**
WR704b	UU Customer Mgt	RAF	0.004 Ml/d Refer a friend meter installation scheme	**IN**	**OUT**
WR705b	UU Customer Mgt	RAF	0.3 m3/d Refer a friend meter installation scheme	**IN**	**OUT**
WR726	UU Customer Mgt	MIP	Meter all households with an outside tap (AMR)	**OUT**	**OUT**
WR727	UU Customer Mgt	MIP	Compulsory metering of homes with swimming pools (AMR)	**OUT**	**OUT**
WR728	UU Customer Mgt	MIP	Target and meter illegal connections e.g. problematic geographical areas (Southport, seasonal issue with market gardens) or farm troughs (AMR)	**OUT**	**OUT**
WR729	UU Customer Mgt	MIP	Improve meter maintenance strategy to reduce meter under registration (MUR)	**OUT**	**OUT**
WR706	UU Customer Mgt	EMT	Switch existing non household meters from 'dumb' to AMR with advise	**IN**	**OUT**
WR730	UU Customer Mgt	MSF	Metering of sewerage flow (to manage water consumption and water wastage) (AMR)	**OUT**	**OUT**
WR707a	UU Customer Mgt	CME	0.28 Ml/d Enhanced FMO promotion (AMR) - blanket promotion	**IN**	**OUT**

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WR708a	UU Customer Mgt	CME	0.004 Ml/d Enhanced FMO promotion (AMR) - blanket promotion	IN	OUT
WR709a	UU Customer Mgt	CME	0.0005 Ml/d Enhanced FMO promotion (AMR) - blanket promotion	IN	OUT
WR707b	UU Customer Mgt	CME	0.53 Ml/d Enhanced FMO promotion (AMR) - blanket promotion	IN	OUT
WR708b	UU Customer Mgt	CME	0.001 Ml/d Enhanced FMO promotion (AMR) - blanket promotion	IN	OUT
WR709b	UU Customer Mgt	CME	0.1 m3/d Enhanced FMO promotion (AMR) - blanket promotion	IN	OUT
WR710	UU Customer Mgt	CME	0.4 Ml/d Enhanced FMO promotion (AMR) - target customers with definite financial savings	IN	OUT
WR711	UU Customer Mgt	CME	0.006 Ml/d Enhanced FMO promotion (AMR) - target customers with definite financial savings	IN	OUT
WR712	UU Customer Mgt	CME	0 Ml/d Enhanced FMO promotion (AMR) - target customers with definite financial savings	IN	OUT
WR713a	UU Customer Mgt	CME	0.01 Ml/d Enhanced FMO promotion (AMR) - offering meters during water efficiency site visits	IN	OUT
WR714a	UU Customer Mgt	CME	0.22 m3/d Enhanced FMO promotion (AMR) - offering meters during water efficiency site visits	IN	OUT
WR715a	UU Customer Mgt	CME	0.02 m3/d Enhanced FMO promotion (AMR) - offering meters during water efficiency site visits	IN	OUT
WR713b	UU Customer Mgt	CME	0.02 Ml/d Enhanced FMO promotion (AMR) - offering meters during water efficiency site visits	IN	OUT
WR714b	UU Customer Mgt	CME	0.43 m3/d Enhanced FMO promotion (AMR) - offering meters during water efficiency site visits	IN	OUT
WR715b	UU Customer Mgt	CME	0.05 m3/d Enhanced FMO promotion (AMR) - offering meters during water efficiency site visits	IN	OUT
WR731	UU Customer Mgt	CME	Enhanced FMO promotion (AMR) - promote on customer contact	OUT	OUT
WR716a	UU Customer Mgt	CME	Enhanced FMO promotion (AMR) - promote to customers who had service renewal (therefore had a meter box already fitted)	IN	IN
WR717a	UU Customer Mgt	CME	0.83 m3/d Enhanced FMO promotion (AMR) - promote to customers who had service renewal (therefore had a meter box already fitted)	IN	OUT
WR718a	UU Customer Mgt	CME	0.09 m3/d Enhanced FMO promotion (AMR) - promote to customers who had service renewal (therefore had a meter box already fitted)	IN	OUT
WR716b	UU Customer Mgt	CME	0.13 Ml/d Enhanced FMO promotion (AMR) - promote to customers who had service renewal (therefore had a meter box already fitted)	IN	IN
WR717b	UU Customer Mgt	CME	2.2 m3/d Enhanced FMO promotion (AMR) - promote to customers who had service renewal (therefore had a meter box already fitted)	IN	OUT
WR718b	UU Customer Mgt	CME	0.25 m3/d Enhanced FMO promotion (AMR) - promote to customers who had service renewal (therefore had a meter box already fitted)	IN	OUT
WR732	UU Customer Mgt	CME	Enhanced FMO promotion (AMR) - 'try before you buy' (allow the customer a 2 year trial period where they will pay the lower of the measured/unmeasured bills)	OUT	OUT
WR733	UU Customer Mgt	CME	Enhanced FMO promotion (AMR) - other channels e.g. supermarkets	OUT	OUT
WR719	UU Customer Mgt	EMT	Advanced Metering Infrastructure - Fixed Network (SMART meters)	IN	OUT
WR734	UU Customer Mgt	EMT	Introduce a '2 year delayed tariff' window once a meter has been installed. This allows time for householders to understand their new bill, water consumption and opportunities to reduce their usage as much as possible prior to billing on a metered tariff.	OUT	OUT
WR735	UU Customer Mgt	WEI	Provide assistance to customers to manage their water usage through advice, information and free water saving devices, as well as providing support to those customers who are considered disadvantaged or vulnerable.	OUT	OUT
WR736	UU Customer Mgt	ISF	Introduction of special fees - charge special (additional) fees on households who use garden sprinklers, hosepipes, outside taps or swimming pools.	OUT	OUT
WR737	UU Customer Mgt	IST	Unmeasured tariff should be a 'premium' tariff, i.e. increase unmeasured charges according to RV	OUT	OUT
WR738	UU Customer Mgt	IST	Introduction of special tariffs for specific users: introducing "interruptible" industrial supplies, introducing lower charges for major users with significant storage, introducing higher cost "ban free" sprinkler or hosepipe licences, or introducing spot pricing for selected customers.	OUT	OUT
WR739	UU Customer Mgt	EMT	Seasonal Tariffs	OUT	OUT
WR740	UU Customer Mgt	EMT	Rising Block Tariffs	OUT	OUT
WR741	UU Customer Mgt	EMT	Time of Day Tariffs	OUT	OUT
WR742	UU Customer Mgt	REB	Reduce bill by an agreed amount if property has water efficient products fitted	OUT	OUT

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Option ID at Feasible options stage	Option Group	Option Type	Option Name & outline scope	Primary screening outcome	Secondary screening outcome
WR743	UU Customer Mgt	EMT	Remove fixed standing charge so customer only paying a true volumetric charge.	**OUT**	**OUT**
WR744	UU Customer Mgt	EMT	Develop payment scheme to migrate customers onto measured bills e.g. pay 1/3 measured, 2/3 unmeasured for 1st year. 2/3 measured, 1/3 unmeasured for 2nd year.	**OUT**	**OUT**
WR745	UU Customer Mgt	EMT	Pay the lesser of tariff - customer would pay the lowest charge (between RV and meter) for the first two years and then they can decide whether they want to opt in or out.	**NOT SCREENED - IN**	**OUT**
WR746	UU Resource Mgt	LOS	This option would involve a reduction in Levels of Service offered to customers from the current 1 in 20 years to a 1 in 10 years for the implementation of hosepipe bans.	**NOT SCREENED - IN**	**OUT**
WR747	UU Resource Mgt	LOS	This option would involve a reduction in Levels of Service offered to customers from the current 1 in 20 years for the implementation of drought permits.	**NOT SCREENED - IN**	**OUT**
WR748	UU Resource Mgt	LOS	This option would involve a reduction in Levels of Service offered to customers from the current 1 in 35 years to a 1 in 20 years for the implementation of non-essential use orders	**NOT SCREENED - IN**	**OUT**

Appendix H – Export options

Option ID	Option Long Name	Option Type	WRZ	Option Capacity (Ml/d)
WR400	Water export: United Utilities Vyrnwy IR raw water releases to River Severn to support Thames Water	WIT	SRZ	180
WR401	Water export: United Utilities Vyrnwy IR raw water releases to River Severn to support Bristol Water	WIT	SRZ	30
WR402	Water export: raw water transfer from United Utilities Whiteholme Reservoir to Withens Moor reservoir to support Yorkshire Water	WIT	SRZ	2.3
WR403	Water export: treated water transfer from Walsden village from United Utilities network into Yorkshire Water network	WIT	SRZ	1
WR404	Water export: treated water transfer from United Utilities network into Yorkshire Water network at High Bentham	WIT	SRZ	1
WR405	Water export: potential option to trade United Utilities abstractions from Ribble/Darwen to Canal & Rivers Trust to help address deficit in Leeds & Liverpool Canal	RWT	SRZ	10
WR406	Water export: potential option to trade United Utilities abstractions from Python Mill to Canal & Rivers Trust to help address their deficit in Rochdale Canal (See WR114)	RWT	SRZ	3
WR407	Water export: raw water transfer from Vyrnwy IR to South Staffordshire Water via River Trent/River Severn	RWT	SRZ	30
WR408	Water export: abstraction licence trade (Dŵr Cymru Welsh Water)	WIT	SRZ	8
WR409	Water export: bulk transfer of groundwater from Eden Lyvennet to Scottish Water at Eamont	WIT	CRZ	2
WR410	Water export: treated water transfer from United Utilities network into Severn Trent Water network at treated water storage (Buxton)	WIT	SRZ	60
WR411	Water export: Vyrnwy IR raw water releases to River Severn to support Severn Trent Water	WIT	SRZ	30
WR412	Water export: treatment and treated water transfer from United Utilities Mow Cop borehole to Severn Trent Water treated water storage	WIT	SRZ	2
WR413	Water export: raw water transfer from Congleton to Tittesworth Reservoir including United Utilities network reinforcement to facilitate, or a treated water transfer to Severn Trent Water treated water storage	WIT	SRZ	10
WR415	Water export: treated water transfer from Vyrnwy Aqueduct to Severn Trent Water (Llanforda)	WIT	SRZ	20
WR416	Water export: treated water transfer from Vyrnwy Aqueduct to Severn Trent Water (Peckforton)	WIT	SRZ	10
WR417	Water export: treated water transfer from Vyrnwy Aqueduct to Dee Valley Water (Dymock Arms and/or Bowens Farm)	WIT	SRZ	1
WR418	Water export: treated water transfer from Dee Aqueduct to Dee Valley Water (at various locations)	WIT	SRZ	1