Affinity Water

Drought Management Plan 2023

www.affinitywater.co.uk

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Foreword from our Chief Executive Officer

Water is a precious resource and essential for life. We are all custodians of the natural environment, and at Affinity Water we take our responsibilities very seriously – our Drought Plan supports our commitment to provide our customers with a high-quality service and to minimise impacts on the environment."

Our new Drought Plan has been developed at a time of global climatic change, which will have implications for generations to come.

Droughts are a naturally occurring phenomena that we anticipate and diligently prepare for, aligning with our responsibility as providers of an essential public service.

I would like to thank all of our customers and stakeholders who took part in helping to shape our latest Drought Plan.

We have listened to what matters to you, and to meet these expectations, we have taken a completely fresh approach to our Drought Plan to ensure the plan reflects the changing priorities and needs of your community, whilst minimising impact on the environment.

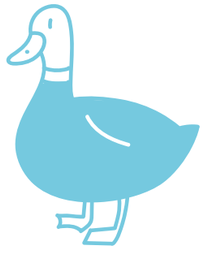
You asked us to engage with you sooner during times of water shortage and to take more actions earlier, before water supplies become stretched and at points when we may start to see environmental stress. Our plan explains how we will do that.

Written in a style that is simpler to read and easier to navigate, our hope is that more of our customers and stakeholders can access our plan and in so doing understand the actions we need to take in drought periods.

Our Drought Plan serves as an operational guide for our people. However, it is also a commitment to our customers on how we will ensure we balance the needs of water demand and the environment during times of drought.

I hope you will find this Drought Plan informative and easy to read.

Keith Haslett
Chief Executive Officer
Affinity Water



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Glossary

ADO – Average Deployable Output
The average output of a source

ALF – Alleviation of Low Flow Scheme

AMP – Asset Management Period
5 year investment period used for planning purposes

AMR – Automatic Meter Reading

BMA – Bulk Metered Area

DD11 – The Drought Direction 2011

DI – Distribution Input
The amount of water entering the distribution system at the point of production

DO – Deployable Output
The output of a commissioned source or group of sources assessed under drought conditions

Drought Order
An authorisation granted by the Secretary of State under drought conditions which imposes restrictions upon the use of water and/or allows for abstraction/impoundment outside the schedule of existing licences on a temporary basis

Drought Permit
An authorisation granted by the Environment Agency under drought conditions which allows for abstraction/impoundment outside the schedule of existing licences on a temporary basis

DMA – District Metered Area

DMP – Drought Management Plan
Operational plan which sets out how the company will deal with a drought situation

EAR – Environmental Assessment Report
Report to support drought permit applications, which investigates and predicts environmental impacts of permits, as well as setting out the associated monitoring and mitigation actions

EP – Effective Precipitation
The amount of precipitation which is actually added and stored in the soil. Used as an indicator of recharge

GWL – Groundwater level
Level of groundwater above ordnance datum

HDZ – Hydraulic Demand Zone
Zone characterised by having discrete supply and storage arrangements with strategic inter zone transfers

HRA – Habitats Regulations Assessment
An assessment of effects of actions on any Special Areas of Conservation, Special Protection areas or Ramsar sites, as per the requirements of the Habitats Regulations

LSE – Likely significant effects
Referring to environmental impacts of certain actions

LTA – Long Term Average
Average monthly rainfall or groundwater level calculated over a 30 year period

mAOD – Metres Above Ordnance Datum
The height of a point in metres above average sea level

Ml/d – Megalitres a day
Measurement we use for the volume of water we abstract or put into supply. 1 megalitre equates to 1 million litres of water.

MORECS – Meteorological Office Rainfall and Evapotranspiration Calculation System
Operational system which provides estimates of evaporation, soil moisture deficit and effective precipitation under British climatic conditions

MOU – Memorandum of Understanding

NEUB – Non-essential use ban
Demand management action which restricts some non-essential use for both household and non-household customers. The permission to impose this restriction is granted as a drought order by Secretary of State

NEP – National Environment Programme
A programme of investigations and actions for environmental improvement schemes to ensure that water companies meet their statutory environmental obligations

OBH – Observation Borehole
A borehole drilled to monitor groundwater levels

Ofwat
The economic regulator of the water sector in England and Wales

PCC – Per Capita consumption
The amount of water typically used by one person in a day

PDO – Peak Deployable Output
The maximum output of a commissioned source, as constrained by (if applicable):
- Environment, aquifers
- Licence, if applicable
- Pumping plant and/or aquifer properties
- Raw water mains, transfer and/or output main
- Treatment capabilities and water quality

SAC – Special Area of Conservation
Defined in the European Union's Habitats Directive, to protect habitats and species considered to be of European interest

SEA – Strategic Environmental Assessment
An assessment of the effects of certain plans and programmes on the environment, including nationally designated sites and priority habitats and species

SMD – Soil Moisture Deficit
The amount of rain needed to fully saturate the soil

SPA – Special Protection Area
A designation under the European Union Directive on the Conservation of Wild Birds

SSSI – Site of Special Scientific Interest
A conservation designation denoting a protected area in the United Kingdom

TUB – Temporary Use Ban
Demand management action which temporarily restricts non-essential use of water by customers during a drought (formerly a 'hosepipe ban')

WAFU – Water Available for Use

WFD – Water Framework Directive
A European Union directive which commits EU member states to achieve good qualitative and quantitative status of all water bodies by 2027

WRMP – Water Resource Management Plan
25 year plan which water companies use to plan ahead and manage their water resources

WINEP - Water Industry National Environment Programme
The programme of work water companies are required to do to meet their obligations from environmental legislation and UK government policy

WRZ – Water Resource Zone
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

WSP – Water Saving Programme

Affinity Water

1 Introduction

This section introduces us as a company, including our purpose, what we stand for and why we need a drought plan. It gives an overview of our supply areas and shows where we are responsible for supplying water. Finally it provides information on the consultation process for our Drought Plan.

1.1 Who we are and why we need a drought plan

We are a water company situated in the South East of England, supplying parts of Bedfordshire, Berkshire, Buckinghamshire, Essex, Hertfordshire, Surrey, and North West London. We also supply water to the Tendring peninsula in Essex and the Folkestone and Dover areas of Kent. We are the largest water only supplier in the UK. We provide on average 900 million litres of drinking water to approximately 3.8 million people, or 1.4 million households, every day. Our supply area also includes 74,000 commercial customers.

We have recently updated and clarified our company purpose, which is to provide high quality drinking water and to take care of our environment for our communities now and in the future. This marks a step change in that we are placing the environment at the heart of what we are here to do.

The South East of England has been designated as an area of 'serious water stress'[1]. It is vital that we plan for and are able to effectively manage droughts when they arise and in doing so balance the needs of the environment with meeting customer demand for water. But this is not only a plan for times of drought, the challenge of being water efficient is ever present and our **Water Saving Programme** works tirelessly to promote the need for reduced demand.

We face a number of future challenges in our supply region, including climate change and an increasing population. Changing weather patterns could mean droughts occur more frequently and are harder to predict. We need to manage these challenges and continue to maintain reliable supplies to our customers, and we must do this in a sustainable way. As a water company we have a statutory duty to prepare and maintain a drought plan[2]. This plan will cover the period from 2023 to 2028.

The purpose of a drought plan is to describe the actions that we will take before, during and after a drought event and when we will take them. It shows how we monitor water resources, and how we forecast our water resources in a developing drought.

Our drought actions are designed to safeguard supplies for our customers, protect the environment and work with our customers and stakeholders to understand the environmental and operational impacts of drought, as well as explaining how our customers can help.

Our supply area is located in one of the driest parts of the UK. The Thames Valley and London normally receive less than 650 mm of rain per year[3], which is less than Rome, Sydney, or New York, and among the lowest in the UK for total annual average rainfall per person. Climate change is predicted to bring warmer wetter winters and hotter drier summers. These factors will have the effect of reducing the available supply of water and increasing the demand. Our plan is designed to be flexible and adaptive to ensure we can manage these risks.

Our Drought Plan explains why it is important to use less water at all times. It sets out how we will reduce demand for water, change the way we operate during a drought and what we will do to minimise the chance that we will need to apply for drought permits and drought orders. We have integrated our communications plan into the drought trigger sections, to ensure the Drought Plan is set out in a user-friendly way, as this is intended to be an operational manual.

[1] Environment Agency, 2013. Water stressed areas – final classification.
[2] Sections 39B and 39C of the Water Industry Act, 1991, as amended by the Water Act 2003 and in accordance with the Drought Plan (England) Direction 2020.
[3] Source: https://www.metoffice.gov.uk/climate/uk/regional-climates/so#rainfall

1.2 Our environmental responsibilities

We play an essential role as custodians of the environment and we take our responsibilities seriously. We are committed to supporting the goals of the government's 25 Year Environment Plan[4] and we share its aim to improve the environment within a generation and leave it in a better state than we found it.

We have a well-established and substantial **Environmental Enhancement Programme**[5], which aims to deliver projects on the ground that protect the environment through various initiatives; river restoration projects working on private and public land; biodiversity programmes protecting threatened plant, tree and wildlife species; catchment management working with farmers on pesticide removal and through reductions in abstraction where our investigations have told us that our operations may be having an impact on the local environment.

Our supply area has 8 to 9% of the world's chalk streams within it, which are internationally recognised as rare ecological habitats. Many of these chalk streams have been heavily modified through human activities, which increases their sensitivity to stress events such as droughts. The impacts of climate change and increasing populations are likely to further compound the environmental impacts of droughts.

We recognise the environmental pressures that these precious chalk catchments face, and we are committed to continuing to work with partnership organisations to protect water ecosystems, improve river habitats for wildlife and enhance biodiversity at our sites and throughout our regions.

Working in partnership with the Environment Agency, our **Revitalising Chalk Rivers Programme**[6] (which includes the Rivers Ver, Lea, Mimram, Misbourne, Gade and Beane), has been expanded in the current five year planning period (AMP7) to include the Upper Chess, Bulbourne, Colne, Ivel, Cam, Brett and Dour. The programme has thus far reduced groundwater abstraction and implemented river restoration works to improve over 120km of chalk streams.

We have also provided additional support to the Rivers Hiz and Oughton as well as the Cam through our flow enhancement initiatives by pumping water from our boreholes into the rivers when the local environment requires it.

Through the **Water Industry National Environment Programme**[7] we will continue to invest extensively in delivering habitat enhancements in 14 rivers across our three supply areas, with projects planned on each of these rivers. We will also reduce our abstractions in chalk catchments by 27 megalitres a day (Ml/d) by 2025. Our aim is to improve the long-term resilience of these important habitats, which will help to improve their ability to recover from naturally occurring events such as drought.

Since 1990 we have undertaken a number of in-depth investigations on most of the chalk river catchments within our supply areas. These have helped to improve our understanding of how these catchments function, and how they respond to factors such as droughts and abstraction. We have used that knowledge to make decisions about reducing abstraction where our operations may be having an impact and going forward, we will continue this commitment.

Our Drought Plan supports our environmental ambitions by minimising the impacts of drought on the environment in our region wherever possible. In line with the Environment Agency Water Company Drought Plan Guideline (2020) (referred to as the Guidance), our plan prioritises taking actions that have the least environmentally damaging impact. This includes demand management and operational actions like promoting water efficiency. In this round of planning we have included enhanced environmental monitoring to ensure we are closely following conditions on the ground and work to mitigate the impacts of any actions we may need to take during a drought.

Later in this plan we have set out in detail how we have sequenced the measures we will take during a drought in order to support our aim to limit impacts on customers whilst protecting the environment.

We monitor our sources carefully and consistently to ensure we understand their status week to week. Through our business as usual activities we communicate with customers and let them know how things are looking for water supplies and the local environment. We escalate actions through a series of triggers to deliver activity that mitigates the impact of escalating conditions.

We have designed our plan and the sequence of measures we will take in a way that ensures the best possible outcome for both our customers and the environment under drought conditions.

We will continue to use any opportunity to innovate our techniques and activities to improve our ways of working and minimise impacts on the environment.

[4] Defra, 2018, A Green Future, Our 25 Year Plan to Improve the Environment; https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/693158/25-year-environment-plan.pdf
[5] https://www.affinitywater.co.uk/corporate/environment
[6] http://www.revitalisingchalkrivers.org.uk/
[7] https://data.gov.uk/dataset/a1b25bcb-9d42-4227-9b3a-34782763f0c0/water-industry-national-environment-programme

1.3 Our supply area

We operate in three geographically separate regions in the South East of England. These are referred to as our Central, Southeast, and East regions. Our Central region is split into six communities: Wey, Pinn, Colne, Misbourne, Lee and Stort. Our East region is named the Brett community and our Southeast region is the Dour community. Each community is also a Water Resource Zone (WRZ) for water resources and drought planning purposes and is allocated a number, WRZ1 to WRZ8, as illustrated in Figure 1.

We take approximately 65% of our water from groundwater sources (see groundwater systems inset box in Section 2.1) and the remainder is from surface water sources, principally from the River Thames (removal of water from these sources is referred to as abstraction).

We also receive water from and provide water to neighbouring water companies (known as bulk supplies or transfers).

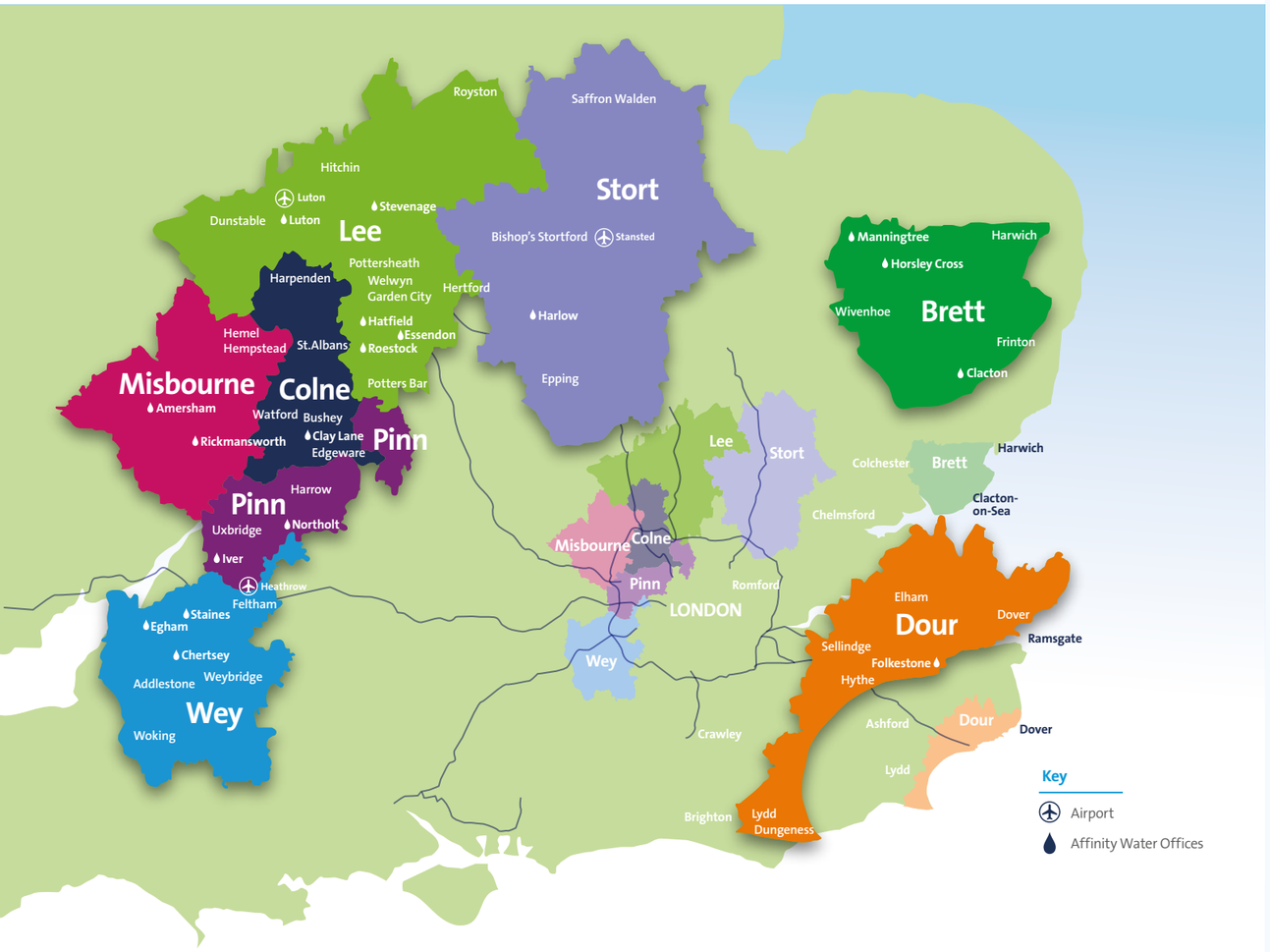


Figure 1: The Affinity Water Supply Area

1.3.1 Our Central region

The WRZs in our Central region are shown in more detail in the schematic map in Figure 2 below. The map shows the major demand centres, which are typically towns, labelled with a two letter code. It also shows how water can be moved between and within the WRZs via major pipelines, known as trunk mains, and how the Central region receives water from outside of our supply area from neighbouring water companies.

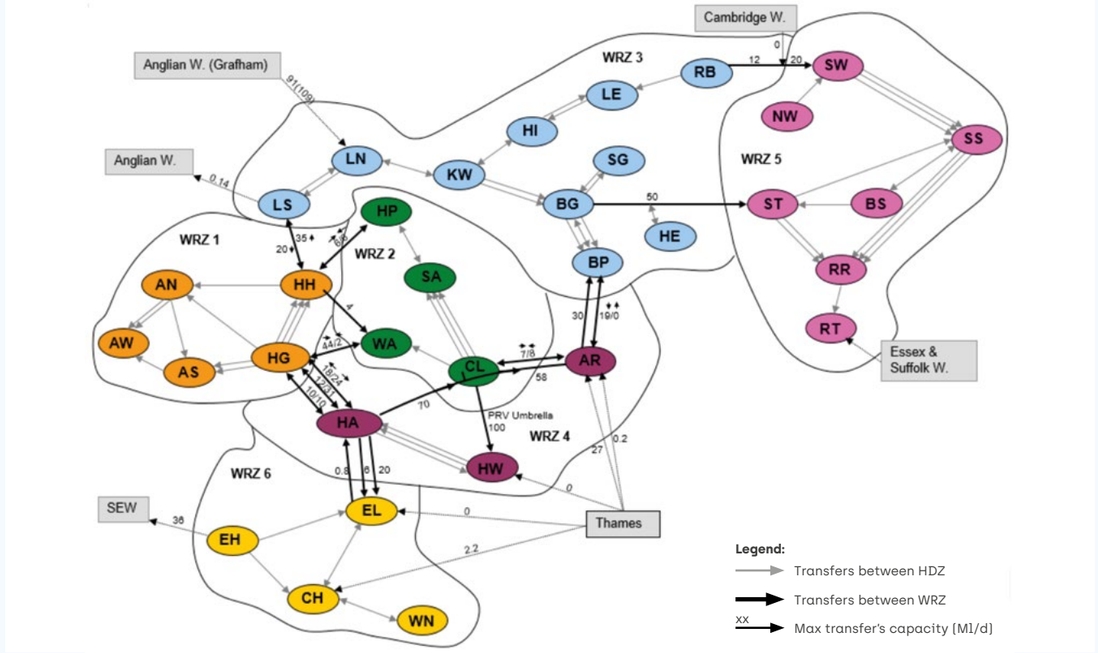


Figure 2: Map of Water Resource Zones, connectivity, and transfers in our Central region

In our Central region, approximately 60% of our water supply comes from groundwater sources. The remaining 40% is abstracted from surface water sources on the River Thames, or is imported from neighbouring water companies.

We treat the water we abstract from the River Thames at four locations along the river, some of which are also fed by small groundwater sources from the gravel aquifers. When combined, these are capable of providing reliable quantities of raw water following prolonged dry spells.

Thames Water carried out an investigation of the flows in the River Thames[8] that included our abstractions, and on the basis of this investigation, we conclude that our abstractions are environmentally sustainable, as they do not significantly impact river flows.

We currently have the capability to import up to 10% of our water supply from Anglian Water on a short-term basis (around one week), and 3% to 4% on a longer-term basis. We also export water to neighbouring water companies.

[8] AMP4 Thames Water investigation into the impact of abstraction on the Lower Thames and AMP5 Options Appraisal.

1.3.2 Our Southeast region

In our Southeast region we abstract 90% of the water supply from chalk boreholes, with the remaining 10% supplied from the shallow gravel aquifer of the Dungeness peninsula. We hold licences for small abstractions from springs in the chalk and a disused borehole in the greensand, although these have not been used for water supply for some years. Our internal transfers and transfers from Southern Water and South East Water can be seen in Figure 3.

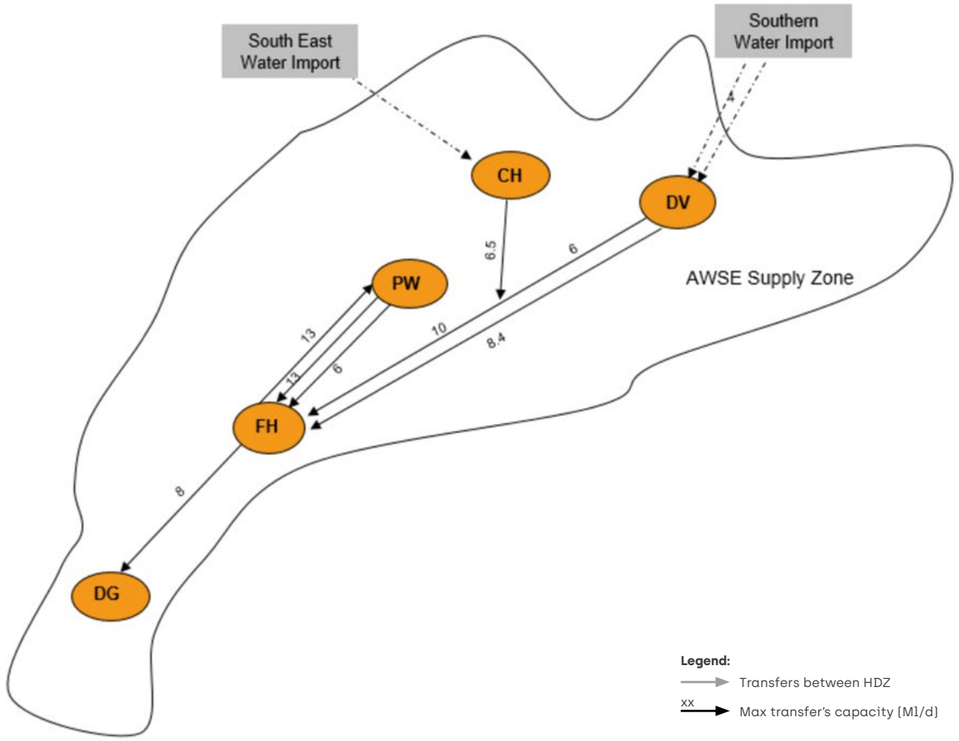


Figure 3: Map of Water Resource Zone, connectivity, and transfers in our Southeast region

There are no surface water abstractions or surface water storage available owing to the local geological and hydrological characteristics of the catchments.

Locally, our groundwater sources in the Dour catchment are subject to licence conditions which limit abstraction from a number of our groundwater sources at times of low groundwater level conditions. There is also a licence condition that requires us to support river flows on the River Dour from one of our groundwater sources under low flow conditions.

1.3.3 Our East region

In our East region, 80% of supply comes from groundwater, drawn from confined chalk aquifer boreholes in the River Stour and River Brett valleys in Essex and Suffolk. The boreholes proved robust and reliable during the groundwater drought conditions of 1990-1992, 1996-1998, 2006-2007 and more recently in 2011-2012. The remaining 20% is sourced from the River Colne and stored in a reservoir which is jointly owned with Anglian Water (TARD). Our internal connections can be seen in Figure 4.

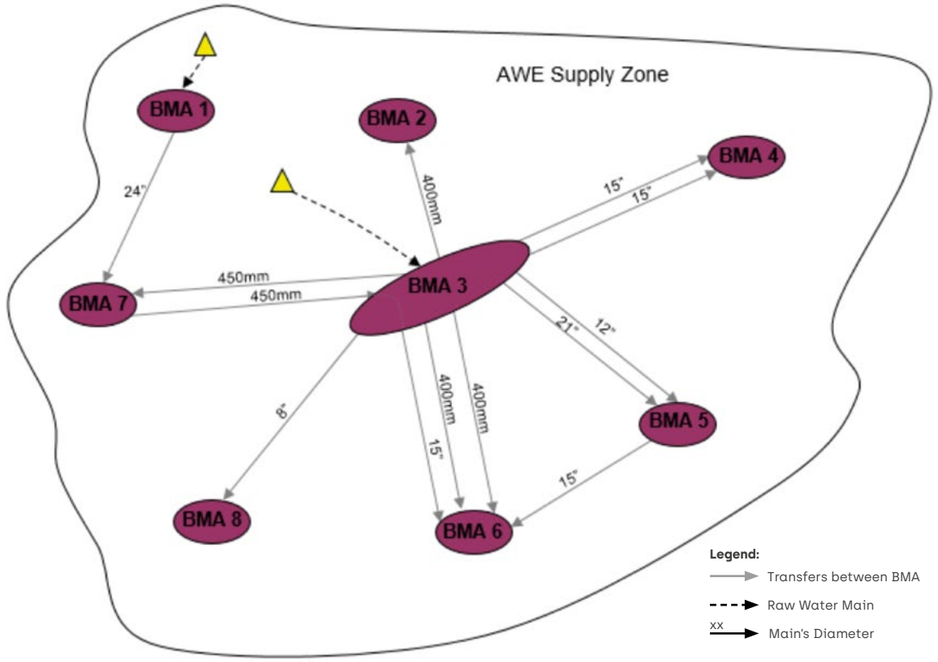


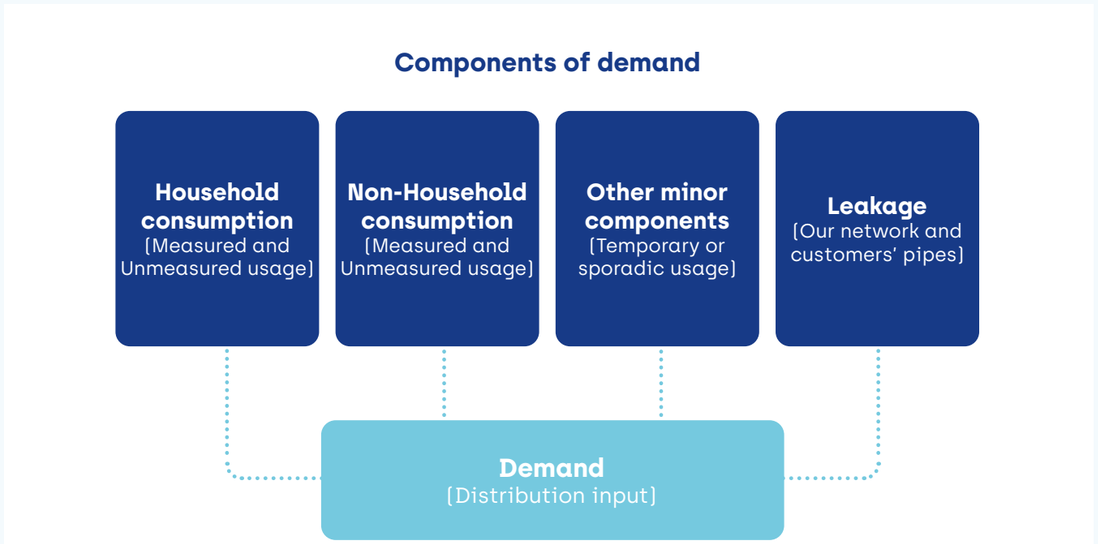
Figure 4: Map of Water Resource Zone, connectivity, and transfers in our East region

The surface water from TARD reservoir is used to meet customer demand for water in this region once groundwater sources have been fully utilised. TARD currently has an average deployable output of 26 Ml/d pending an operational review and WRMP 2024 analysis. The predicted peak output is 36 Ml/d but this will be confirmed following an operational trial. The reservoir is typically able to be re-filled each winter, even in a dry winter.

For normal operation and during a drought, either company can take extra water from TARD not required by the other company. In an extreme event, we could take all of the output available from TARD, provided the water is not required by Anglian Water, although at present we are able to supply all of our customers in our East region over sustained periods with limited use of TARD.

Customer demand

It is important that we are able to quantify the volumes of water distributed through our network, which is known as demand. The demand for water is made up of a number of components as seen here:



We measure the quantity of water supplied from all our water treatment works into our pipe network using flow meters; and the total volume is known as our distribution input (DI). Within our pipe network we also measure flows going into specific areas known as district metered areas (DMAs), which are effectively local zones covering urban areas, towns and villages.

Each DMA generally covers a few thousand homes. DMA flows are monitored continuously and enable us to assess daily changes in demand and consumption at a detailed level.

This in turn allows us to vary our source outputs if needed and helps us to identify and tackle leaks on our network.

Until recently we had one of the highest per capita consumption ("PCC") levels in the UK. PCC measures the amount of water each person uses each day. Through the work of our programmes, this has reduced but we still have an average PCC of approximately 157 litres per head per day (l/h/d).

More information on how we are working to reduce this is provided in Section 6a.

1.4 Drought plan consultation process

1.4.1 Pre-consultation

As part of the development of our Drought Plan, we carried out a pre-consultation and invited comment on the proposed changes. We have taken these on board. We have also used feedback received during informal engagement and earlier consultations with stakeholders, customers, and regulators to adapt our plan.

Our formal pre-consultation process ran from 25th June until 24th July 2020. We consulted with statutory consultees as well as key stakeholders, including our Customer Challenge Group (CCG), neighbouring water companies, water retailers and local environmental groups. We explained the key changes we were planning to make in developing our new plan and asked for feedback on these. We received a total of nine responses which were taken into consideration in the development of our Drought Plan. Feedback included:

- A more customer and user-friendly plan with the different elements and actions clearly explained
- Support for the greater focus on the environmental impacts of drought
- We should clearly articulate the reasons for how we have chosen and sequenced our drought actions
- The plan should explain how and when we would communicate with our customers about drought and water resources
- It should explain the potential environmental impacts of our drought management actions

1.4.2 Public consultation

We published our draft Drought Plan for public consultation in accordance with the Guidance. We invited views from both individuals and organisations on the key elements of our draft plan. The period of consultation was eight weeks, from 4th June to 30th July 2021.

The draft Drought Plan was published on our website (www.affinitywater.co.uk), and printed copies were also available on request. All regulators, stakeholders and statutory consultees were notified of the consultation.

During the consultation, representations were submitted to the Secretary of State at Defra.

We would like to thank the following for their formal representations on our draft drought plan:

- Environment Agency
- Natural England
- Consumer Council for Water
- Essex County Council
- Kent County Council
- Uttlesford District Council
- Broxted Parish Council
- Chalfont St Peter Parish Council
- Colney Heath Parish Council
- Great Missenden Parish Council
- Hatfield Town Council
- Little Hadham Parish Council
- Canal & River Trust
- Horticultural Trades Association
- Cam Valley Forum
- Ver Valley Society
- Ellenbrook Residents Association
- Individual respondent 1
- Individual respondent 2
- Individual respondent 3

We have taken into account all representations made on our draft Drought Plan and made responses to each comment individually in our Statement of Response, which was published on our website on 17th September 2021. Our Statement of Response sets out the changes we have made as a result of the representations received.

[9] Defra email address – water.resources@defra.gov.uk

Affinity Water

2 What is a drought?

This section describes drought and the different types which can occur. It explains how droughts can affect water supply systems differently, depending on where a water company sources its water from, and explains how this affects the actions that water companies may need to take.

2.1 The nature of droughts

Droughts are naturally occurring events, and each drought is different. Although they are all characterised by some degree of rainfall shortage, there is no single definition. Droughts can differ in their duration, severity, timing, and spatial extent. One way of categorising droughts is by the sectors which they affect[10]. Using this method of categorisation there are three main types of drought (which may occur separately or at the same time):

Environmental drought (environmental stress)

This is when a shortage of rainfall impacts the environment, which typically includes lower flows in rivers, lack of moisture in soils and low groundwater levels. These effects can result in signs of stress for habitats and wildlife, such as fish and other aquatic species.

Droughts can have a more damaging effect in environmental systems which have been heavily modified or affected by human activities. Examples of this include river channels that have been straightened over time to meet industrial or landowners needs for the water. Natural healthy ecosystems are more resilient to natural stress events such as droughts.

In a year where temperatures are very high, more environmental stress will tend to occur. Environmental droughts can occur even when groundwater levels are relatively normal and are typically characterised by low levels in surface water bodies like rivers, lakes, and wetlands.

Agricultural drought

This occurs when lack of rainfall reduces water supply and moisture in soils, which can impact crop production and other farming practices.

Depending on what is happening in the surrounding environment, farmers may be affected by constraints placed on their ability to abstract water which may in turn impact the irrigation of their crops.

Agricultural and environmental drought conditions often happen at the same time, and these impacts are typically felt before a public water supply drought.

Public water supply drought

A drought in water resource terms happens after a prolonged period of below average rainfall (over several months) which causes challenges in the ability to maintain a secure supply of water to customers.

A public water supply drought tends to take longer to develop than environmental or agricultural droughts. Droughts can affect water companies differently depending on whether their supplies come from groundwater or surface water sources. Water supply droughts for groundwater dependent water companies typically take longer to manifest because of the time it takes for groundwater systems to respond to a shortage of rain.

We plan for dry weather to ensure our customers are not affected by enduring dry conditions in all but the most exceptional circumstances. We have developed robust storage systems to manage the effects of dry weather so that our customers are not affected in most years.

For all droughts, the return to normal conditions is unpredictable and dependent on the magnitude, duration and timing of rainfall, as well as other factors such as temperature, rainfall intensity and soil moisture deficit (SMD)[11], making the duration and severity of droughts hard to forecast (see Section 5.4 for information on how we forecast droughts).

[10] Environment Agency, 2017. Drought response – our framework for England.
[11] SMD is the amount of rain needed to fully saturate the soil, which needs to be fulfilled before rain water will filter down through the soil to replenish the aquifer below.

2.2 How droughts affect our water supply

Droughts vary from region to region. Neighbouring water companies will take the actions that are necessary in their region to protect supplies and this can mean that our actions may differ according to the particular circumstances.

The reasons why companies may have to react differently in terms of restrictions and their timing are explained below:

- **Differing levels of drought severity across the region:**
  Whilst droughts across the South East will generally be caused by a regional trend of several months of below average rainfall, sub-regional differences in rainfall amount may cause different levels of water shortages across the region. In other words, the need to impose restrictions for one company may not equally apply to another.

- **Differing vulnerabilities for different water supply systems:**
  Due to the way the water supply system has developed over time, many water company supply areas are sub-divided into Water Resources Zones (WRZs). These are defined as the largest possible zone in which all resources, including external transfers, can be shared and hence the zone in which customers experience the same risk of supply failure from a resource shortfall. WRZs can be divided into those dependent upon:
  – Groundwater abstraction,
  – Surface water – river abstraction,
  – Surface water – reservoirs filled by abstracting local river water or by impounding river water,
  – Combinations of the above.

Each of these sources generates a different risk at different times during a drought. This mix of WRZ types means that even if there were not a significant difference in drought severity across the region, WRZs will tend to react differently to the same drought, with certain zones experiencing higher levels of risk to potable supplies than others. That means in similar drought conditions, rivers, groundwater sources and reservoirs across the region can respond differently in terms of risk to supply.

For example, a WRZ dependent on combined river abstraction and reservoir storage for supply may have a different level of risk to one based on groundwater abstraction. This difference in WRZ vulnerability has an impact both at the company level and regional level.

A water company may need to introduce water use restrictions in its more vulnerable WRZs but not need to extend the ban to the remaining zones in its area of supply.

2.2.1 Groundwater supply systems

This diagram provides an overview of the key elements of a chalk groundwater system. These are complex systems and it is important for us to understand the nature of interactions between groundwater and surface water and how our abstractions could affect these. Groundwater systems rely on winter rainfall to replenish water resources during what is known as the recharge period (typically October to April).

Aquifer
An aquifer is a layer of permeable rock which stores and transmits water through its mass. There are different types of aquifers, and these have different properties which affect how water flows underground. For instance, for the chalk aquifer, this water movement is mainly through the fractures and fissures (cracks of the rock). Aquifers can occur at different depths, and can range in thickness from a few metres to tens of metres. Water can be abstracted from an aquifer using a well or a borehole.

Blue shaded sections of the ground
The layers of the rock (aquifer) that are saturated with water and allow water movement through their mass.

Alluvial aquifer
An alluvial aquifer is formed of unconsolidated coarse material, and typically occurs close to the surface, next to rivers and paleo channels (old river channels). This aquifer can also provide baseflow to chalk streams and depending on its thickness and spatial extent, may be significant in maintaining healthy river flows.

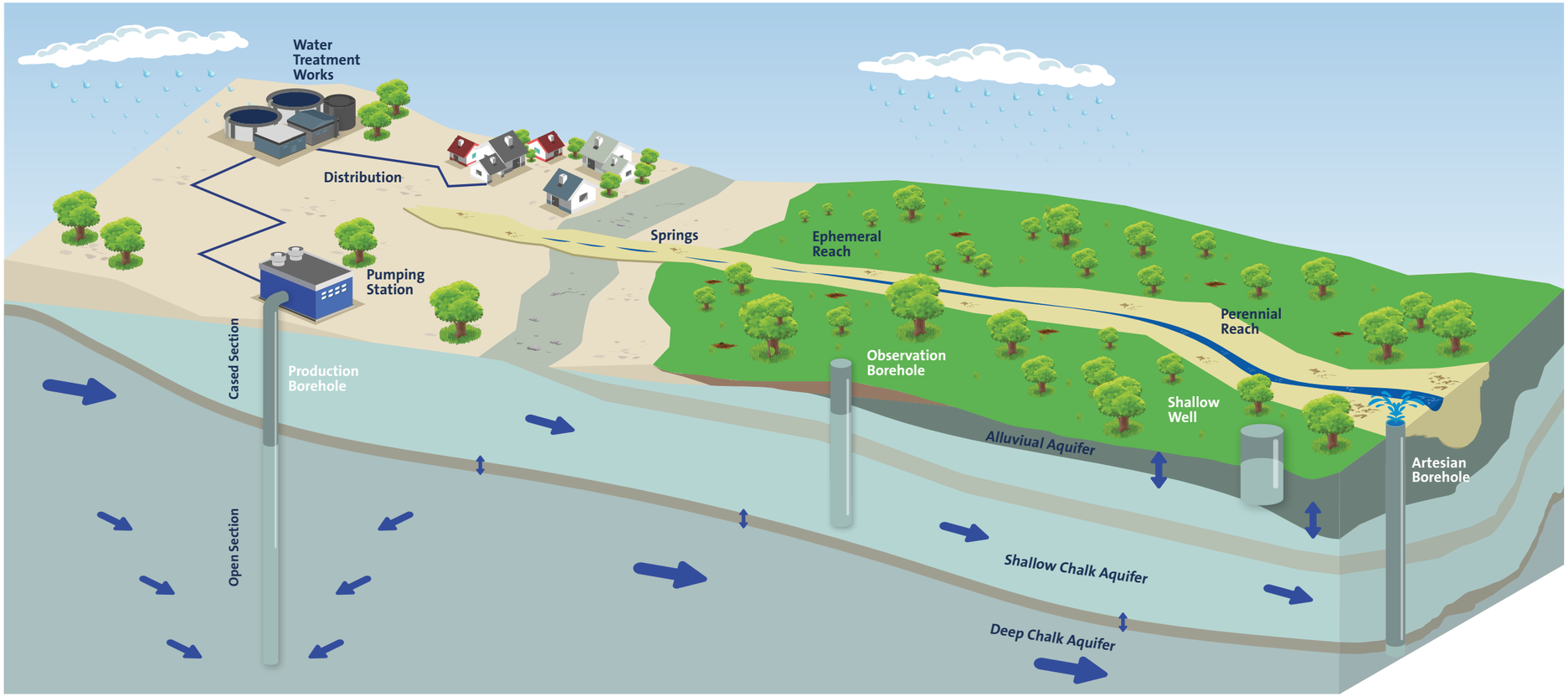
Shallow chalk aquifer
A chalk aquifer encountered at shallow depth (typically 0 – 30 metres deep). This aquifer primarily provides river baseflow to chalk streams.

Deep chalk aquifer
A chalk aquifer typically occurring at depths greater than 30 metres below ground level, underneath the shallow chalk aquifer. This aquifer contributes primarily to abstractions for water supply.

Perennial reach
The reaches of a river which flow all year round.

Ephemeral reach
The reaches of a river (usually the upper reaches) which tend to dry up during certain seasons, when groundwater levels are low or after prolonged periods of low rainfall.

Model of Chalk aquifer - Chalk aquifers and groundwater abstraction in the Chilterns



Borehole - A hole drilled into the ground for different purposes.

Production borehole
A borehole which is used to draw water from the deep chalk aquifer, to be treated and supplied to customers.

Cased section
The section of the borehole which is lined with a pipe. This prevents it from drawing water from the upper sections of the borehole, and protects the borehole from collapsing inwards.

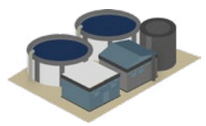
Open section
The section of the borehole which is not enclosed by casing, which allows the pumps to draw water from fissures and pores in the surrounding rock.

Observation borehole
This is a borehole which is used to measure the groundwater levels and/or to monitor water quality in an aquifer, to monitor how these change over time.

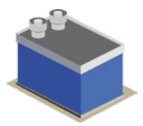
Flowing artesian borehole
A borehole drilled though a layered aquifer into deeper sections that are pressurised. This pressurisation causes the water to flow upward in the borehole without pumping and overflow to the surface, often feeding rivers. Some artesian boreholes may stop overflowing during low groundwater level periods and restart overflowing during higher groundwater level periods.

Shallow well
A well is a wide diameter borehole (>1 metre) which has been dug into an aquifer very close to the surface, such as an alluvial aquifer. These were historically used for the purposes of private water supply.

Distribution
The network of pipes we use to distribute potable water to homes and businesses.



Water treatment works
A plant where water is treated and purified to make sure it is clean and safe for consumption before it is distributed to customers.



Pumping station
This houses the machinery and monitoring instruments needed above a borehole, including the pumps which draw the water from deep underground, and pipes which transport the water to its next destination, such as a water treatment works.

Blue Arrows
Indicate the direction of groundwater flow. Arrow size is proportionate to amount of flow.

Springs
Points at which groundwater naturally emerges up to the surface, and water overflows. These can form the head of a river. They don't always flow all year round (depending on groundwater levels).

2.2.1 Groundwater supply systems continued

Of critical importance to how effective the recharge period will be is where groundwater levels are at for the beginning of that period (usually October) and the amount that levels rise during the recharge season.

Recharge depends upon how much rainfall infiltrates down through the soil to add to the water in an aquifer – we call this 'effective precipitation'.

The proportion of rainfall which becomes effective precipitation is influenced by a number of factors, including:

Soil moisture deficit (SMD) – this is the amount of rain needed to fully saturate the soil. Soil must be saturated first before rainwater can filter down through to replenish the aquifer. When soil moisture deficit is higher (commonly during the summer months) less of the rain which falls reaches the aquifer.

Temperature – higher temperatures result in greater evapotranspiration (water that evaporates off the soil and from plants up into the atmosphere) and this in turn increases soil moisture deficit.

Rainfall intensity – rain which falls in high intensity, short-duration events such as thunderstorms tends to result in a greater proportion of runoff (a flow of water that does not sink into the soil) than less intense, longer-duration rainfall events.

Other factors – such as land use, topography, geology and and soil type also play a role in influencing the proportion of rainfall which infiltrates the soil and contributes to recharge.

The recovery of groundwater levels during the winter is also dependent on how healthy they are at the start of the recharge period. If groundwater levels are already very low when the recharge period starts, an average rainfall pattern over the winter may not be enough for them to recover to the long-term average before water levels naturally start to decline again in summer months (the recession period). The effect of several successive dry winters in a row compounds the problem and can cause significant water resource issues over time.

Chalk groundwater dominated supply systems such as ours tend to be more resilient to short, intense droughts than surface water systems. This is because chalk groundwater levels decline relatively slowly and in a predictable manner. They are however more susceptible to impacts from less intense, longer duration droughts, particularly when there are two or more consecutive dry winters. They also tend to take longer to recover from drought than surface water supply systems.

2.2.2 Surface water supply systems

Surface water supply systems are those which source water from rivers and reservoirs. Similarly to groundwater, the majority of reservoir recharge occurs typically during the winter months when rivers are flowing at their highest and when runoff is more commonly available. There are exceptions to this, as these systems can also be topped up by rainfall events all year round.

Surface water systems typically react much faster to changes in weather patterns than groundwater systems, and reservoir levels can reduce rapidly during a few very dry months.

Surface water supply systems can therefore be more vulnerable to short, intense droughts depending on the level of reservoir storage; however they tend to recover more quickly when a dry period ends as they respond more quickly to rainfall events all year round.

2.2.3 Water supplies and drought planning

The difference in water supply vulnerability between the two types of system (groundwater and surface water) has an impact both at the company level and at a regional level. It compels different actions from water companies, such as the possibility of introducing water use restrictions (such as Temporary Use Bans) in one or more of its Water Resource Zones or across the entire company supply area.

At the regional level, one water company may need to impose water use restrictions earlier in a drought than its neighbours, as their system may be more vulnerable to the particular set of observed drought conditions at the time. As a result, flexibility needs to be built into the drought plan to allow for the most efficient and effective way of responding to a range of drought situations.

This is also why we work closely with other water companies and partner organisations, to understand the water resource situation and prospects at a regional and national level, and to work together collaboratively to communicate and manage risks.

2.2.4 Water supply droughts vs heatwaves

Drought events and high demand incidents have different characteristics and are managed differently. Water supply droughts are medium to long term events over many months which affect availability of water supply through a shortage of rainfall or effective rainfall, usually over consecutive winters. The impacts of drought events are managed through the actions set out in our Drought Plan.

High demand incidents are usually associated with short term heatwaves. Heatwaves are hot dry periods, usually in the summer, during which demand for water typically increases. These seasonal peaks are common and typically result in high demand for water.

A significant proportion of the increase in domestic use during heatwaves can be attributed to outdoor use such as garden watering.

During 2020 we also experienced the unique conditions of a pandemic which has resulted in a change to the typical summer demand profile with more customers staying at home and not travelling to work or holiday destinations. The pandemic, combined with the summer high temperatures resulted in a high demand incident which was managed operationally without the need for drought actions.

Heatwaves can occur at the same time that a drought is happening, but not always. As water resource levels (and particularly groundwater levels) are largely driven by the amount of rainfall received over the previous winter periods, a heatwave can be experienced regardless of whether our water resources are at normal levels or not.

We have a history of effectively managing peaks in demand associated with heatwaves by developing 'peak' resources through business-as-usual operational activities, and in the long-term through operational investment plans. The balance between supply and demand for water during summer peak periods has been considered for the next 60 years as part of our WRMP.

We are confident that we can continue to manage these periods as part of our day-to-day operations and therefore we have not considered heatwaves outside of drought events as a scenario to be managed under our Drought Plan.

Affinity Water

3 Drought planning in the wider context

This section sets out the wider context within which our drought management and planning sits. We explain how it links to regional planning, as well as other key plans.

This section also sets out our planned levels of service which are a key element of water resource management planning.

3.1 Regional drought planning and management

There are a number of groups responsible for managing the impacts of droughts in England, and we work together with these groups to minimise the impacts of drought on customers and the environment. The main organisations responsible for managing water resources during droughts are[12]:

- **The Environment Agency;** provides strategic oversight and is responsible for monitoring, reporting, advising, and acting to reduce the impact of a drought on the environment and water users
- **Water companies;** responsible for managing water supplies for their customers and taking a range of measures to maintain supplies whilst minimising environmental impact
- **Government;** responsible for policies relating to water resources

A number of other organisations also play an important role in managing droughts, including Natural England, Canal and River Trust, local councils and representative bodies such as the National Farmers' Union (NFU) and environmental charities.

Our Drought Plan is aligned with the Environment Agency Drought Response: Framework for England, which sets out how the Environment Agency works with government, water companies and others to manage the impacts of drought on people, business and the environment.

We actively participate in the National Drought Group (NDG) which is led by the Environment Agency. The group aims to provide high level strategic direction for drought management in England and commissions working groups to undertake and deliver specific pieces of work to address risks and issues. The NDG is responsible for producing a cross-sector view of drought issues at a national level and they co-ordinate the delivery of drought management activities, communications, and risk mitigation.

We are a founding member of Water Resources in the South East[13] (WRSE) and utilise its function as a regional planning organisation. The group is constituted of an alliance of six water companies (see map in Figure 5). The group is responsible for water resource planning through the development of a regional resilience plan, including assessment of supply options and associated modelling.

The regional plan will inform our new Water Resource Management Plan (WRMP) and will be used to plan water supply investment by each company in the region, to ensure long term resilience of water supplies in the South East.

[12] Environment Agency, 2017. Drought response – our framework for England
[13] https://www.wrse.org.uk/

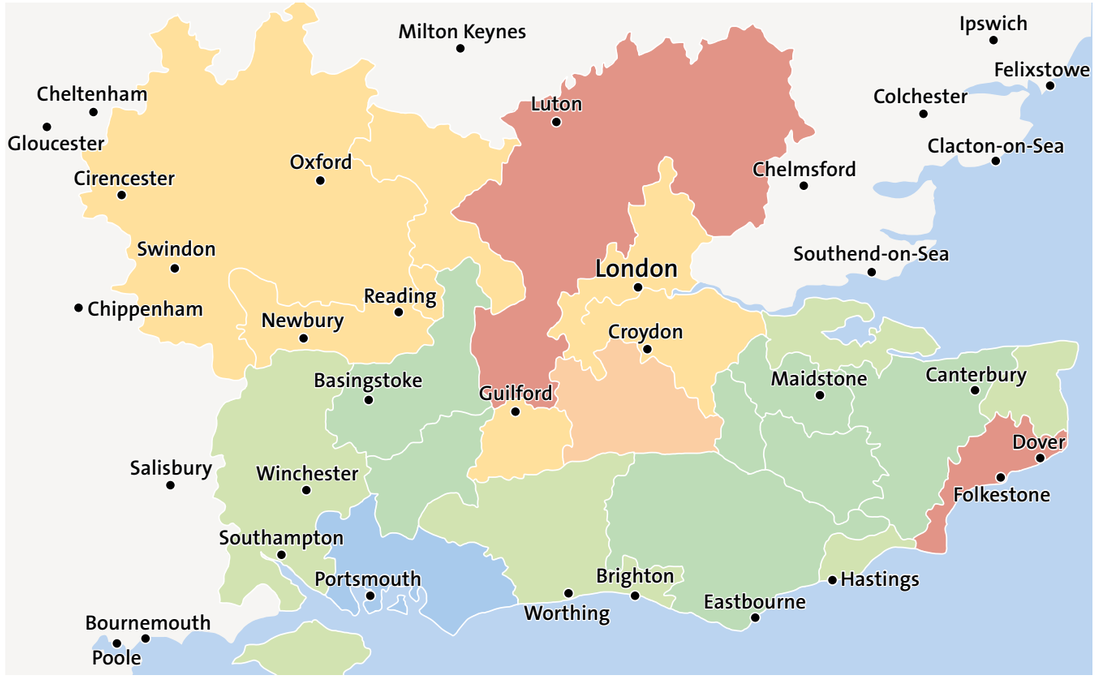


Figure 5: Map showing area covered by the six companies in WRSE group

Thames Water **Affinity Water** **Sutton & East Surrey Water**

South East Water **Southern Water** **Portsmouth Water**

The introduction of the new powers in the form of the Temporary Use Ban in 2011 provided an opportunity for the water companies in the South East to review our Drought Plans with a view to finding a clearer, more consistent and more unified approach to introducing water use restrictions across the region than in the past.

The water companies in the South East have had formal meetings to discuss the development of our plans and to ensure that we are implementing the powers as consistently as possible.

We are committed to working collaboratively across the region during periods of water shortages. In this context we have worked together to align the drought levels in our plans and to align as closely as possible the restrictions and exemptions that would be imposed when temporary restrictions are implemented.

However, due to local differences in water resources highlighted in Section 2.2, the timing of drought plans and actions are likely to vary across the region.

We also coordinate live drought management measures through the group, such as jointly actioned communications (please see Section 12.1) and regional demand modelling.

The WRSE dry weather monitoring group holds regular calls during drought events to ensure engagement and support between water companies in the region, as well as ensuring consistency in communications and sharing of engagement material.

We are also a member of Water Resources East (WRE) and fully support its multi-sector regional planning process. The group is constituted of five water companies as well as several partners coming from the agriculture, power, business and environmental sectors.

The group is pioneering a collaborative approach to water resource planning through which its members co-create and deliver an ambitious multi-sector best value regional plan that provides additional value to the WRE region and can respond to the challenges posed by socio-economic growth, environmental ambition and climate change.

As a core member of WRE, we are fully committed to supporting its regional planning process and ensuring alignment between regional plans, WRMP and drought plan. We have carried out a significant amount of engagement with WRE and WRE companies and will continue to do so in preparation of our WRMP24 submission. We have aligned data, methods and processes to those of WRE where relevant (i.e. in our Brett region), including developing a consistent methodology for assessing regional options and potential transfers during a drought. Through our engagement and recognising our pivotal role in WRSE and WRE, we have sought to achieve a high degree of consistency across the two regions.

We are confident that the modelling carried out for WRE aligns with our drought and water resource planning processes, as we supply our own DO and return period data to WRE for the regional simulator. We are also liaising with WRE with regards to the environmental destination work, and this also feeds into our sustainability reduction strategy.

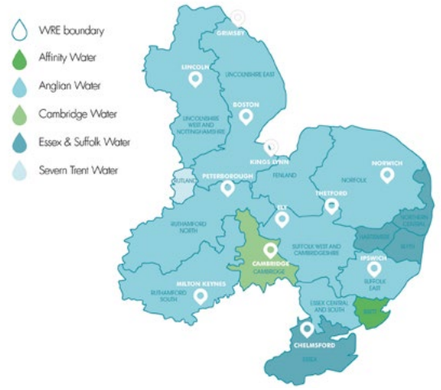


Figure 6: The water companies operating in WRE region

3.2 Links with other plans

3.2.1 Links with our Water Resource Management Plan

The Guidance sets out the need for our Drought Plan to be consistent with our WRMP[14]. Our WRMP19 sets out how we will provide a reliable, resilient, efficient, and affordable water supply to customers from 2020 to 2080, whilst protecting the environment. It identifies what interventions are needed to balance the availability of water supply with the demand for water from customers. Through its flexible approach, our WRMP allows us to adapt to future uncertainties and ensures the timely delivery of the appropriate solutions. Figure 7 provides a graphical representation of the relationships between our key plans.

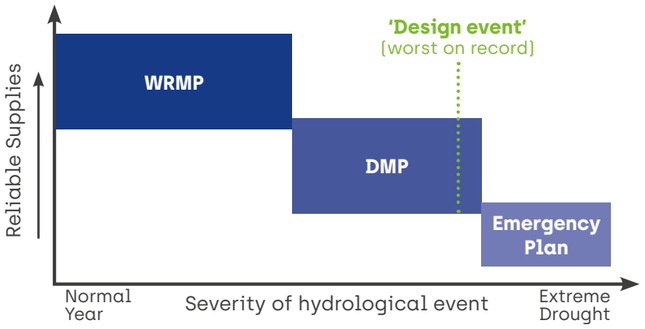


Figure 7: Approximation of relationships between our plans

The WRMP provides the strategic framework within which the drought plan sits as an operational plan. This framework highlights the scale and complexity of the planning problem that our WRMP seeks to solve. The outputs of this analysis were fed into our drought risk assessment and identified the need to consider a more challenging range of droughts and to plan for a design drought that reflects the hydrological risks imposed on our supply system.

[14] https://www.affinitywater.co.uk/corporate/plans/water-resources-plan

The work that we have carried out to model drought impacts and assess the vulnerability of our supply system includes:

Drought modelling and vulnerability assessment
We assessed the drought vulnerability of our groundwater sources for WRMP19 by modelling the impact of 'worst historic', severe (1 in 200 year event) and extreme droughts (1 in 500 year event). The use of stochastic climate data from the WRSE regional group allowed us to consider these drought events that sit outside our historic records, thereby testing the likely behaviour of our sources in situations we have never experienced in the past.

Once the impact of drought of various severities on regional groundwater levels was identified, this was subsequently translated to an available source output. We calculated the total amount of water that can reliably be supplied to customers over the course of these droughts of different magnitudes. In addition, the modelled groundwater level sequences were also compared with the drought plan trigger levels to identify whether the source output assessment would have led to drought plan measures being implemented, i.e. Temporary Use Bans (TUBs), Non-essential Use Bans (NEUBs or 'ordinary drought orders') and supply side drought permits. This analysis informed the settings that were used within our decision-making modelling tool. Please refer to the WRMP19 Technical Report 1.1.1 Deployable Output and DMP-WRMP Links Addendum Report.

Climate change
Climate change could lead to an increase in severity and frequency of droughts in the future. For this reason, the Guidance requires water companies to assess the risk that climate change poses to their supply system and the likely implications for current and future source outputs.

We assessed the impact of climate change on our water resource base as part of our WRMP19. The outputs of the climate change assessment were factored into our supply-demand balance calculations, and the risks will be managed through our investment schemes.

Other sectors
As part of our WRMP programme of work we have considered the needs for water of other sectors in our area. We have reviewed the potential future demand for water for non-public water supply within our water resource zones (WRZs) using WRSE consistent data sets as part of our WRMP24 programme of work and used this to inform our DMP. The data clearly demonstrated that for the most part, non-public water consumption in our water resource zones within the WRSE region is highly distributed and relatively small in scale. Local other sector demand is generally therefore not a significant component of either the regional or local demand within our supply area, nor is it at local scale.

The potential to develop such opportunities is therefore limited in scope for strategic scale transfer options. We are working on non-public water supply side concepts at local scale separately under our WRMP options programme. This work is focused on locally distributed non-public water supply demands and the availability of water within our supply area and will be reported in due course alongside our draft WRMP.

We would consider requests from other water users such as private water suppliers or other sectors such as agriculture, for example where there are needs for livestock during a drought and we will make best endeavours to provide supplies in these circumstances. However, we are only able to do this where it does not adversely affect the security of supply for our own customers, and we will give priority to supply to our own customers.

3.2.2 Links with our Emergency Plan

A drought is not an emergency unless it poses a serious threat to the ability of water companies to maintain supply without restrictions using rota cuts or standpipes. Water company drought plans are required to cover the actions required to manage a drought up to the classification of an emergency.

Beyond that point, we would activate our Emergency Plan to deal with a potential loss of supply, and this would involve communication in advance with local councils, emergency services and local resilience forums about how best this is co-ordinated in a major drought emergency.

The emergency response actions are not included within our Drought Plan; however a summary of the key elements is provided in Section 10.

Our Emergency Plan provides a framework for effective and adaptive response to events, incidents, and emergencies. The Crisis Management Plan provides the framework for a response to a Crisis.

Events and incidents can occur at any time, although as a drought increases in severity, they may become more likely as resources come under greater pressure. If a drought becomes serious enough for levels to reach drought trigger 4, this is likely to trigger an emergency response.

The procedure for managing this is set out in our Emergency and Crisis Management Plans and summarised in Section 10 of this plan.

3.3 Levels of service

In developing a drought plan water companies must consider levels of service. Water supply levels of service are a measure of the likelihood that we would need to apply temporary restrictions on customers during drought conditions; they set out how often on average we expect that we will need to take a specified step in response to a drought (Table 1).

Table 1: Our planned levels of service

Drought Management Action	Frequency pre 2024	Frequency post 2024
Temporary Use Ban restrictions	1 in 10 years	1 in 10 years
Demand-side ordinary drought orders restricting non-essential use (also known as non-essential use bans)	1 in 40 years	1 in 40 years
Category 1 supply-side drought permits/drought orders	1 in 40 years – 1 in 100 years	1 in >200 years
Category 2 supply-side drought permits/drought orders	> 1 in 100 years	1 in >200 years
Emergency drought orders	Deemed unacceptable but could be used for short periods of time in localised areas as a result of a civil emergency	Deemed unacceptable but could be used for short periods of time in localised areas as a result of a civil emergency

We have defined a 1 in 10 year level of service for Temporary Use Bans (TUBs) (previously known as hosepipe bans) which means that in any year we would expect a 10% probability of needing to put in place these restrictions. The last time we needed to implement a TUB was in 2012.

A 1 in 40 year level of service for demand-side drought orders means that there is a 2.5% probability in any given year that we would need to implement these restrictions.

An improvement to our levels of service would need investment in order to increase the resilience of our supply system. This includes actions such as increasing connectivity in our network and reducing demand, through activities such as working with customers and other stakeholders to change the way water consumers behave. The investment required for any changes is sought through the WRMP and Business Plan (BP) process.

Planning and management of water resources systems under drought conditions often requires the calculation of return periods of drought events – this is an estimation of the average time between events occurring.

The evaluation of return periods for such events needs to consider both duration and severity in order to take into account the longer duration of several droughts.

The work for our WRMP19 included calculating a new drought return period for our supply area with a return period of 1 in 60 to 1 in 80, based on the droughts experienced in the 1930s and 1940s. Upon this basis, a 1 in 200 year drought event was calculated and adopted as the baseline for our supply, or deployable output calculations.

The investment included in our WRMP19 means that we aim to be resilient to a drought equivalent to a 1 in 200 year event without the use of drought permits or supply-side drought orders by 2024.

This changes our level of service for drought permits after December 2024. This move to a new level of service will be reflected in the drought plan published after 2024. The overall package of scenarios upon which we have consulted for the WRMP19 is consistent with our Drought Plan.

We have tested and confirmed the soundness of our current levels of service against different magnitudes of droughts through drought scenario modelling. This has included droughts up to the most severe experienced in our historic record, as well as droughts which are more severe than this, including a 1 in 200 year event. The methodology and outcomes of this assessment are set out in our WRMP. For further information on modelling please also refer to **Appendix 4.**

Affinity Water

4 Actions in normal/ non-drought conditions

This section explains what we do as part of our day-to-day business activities to help mitigate the risks of drought, before a drought event occurs. This includes our business as usual communications, operational activities and environmental monitoring and mitigation actions.

4.1 Operational Resilience Monitoring Group

The Drought Management Group is an incident management body mobilised during a developing drought situation. Its purpose is to follow the drought guidance and deliver the actions set out in our Drought Plan for the management of specific drought events.

With the impacts of climate change and population growth affecting demand patterns, there is a need for a business as usual function that manages conditions outside drought parameters. We have set up an Operational Resilience Monitoring Group for this purpose (ORMG). Chaired by our Director of Customer Delivery, the ORMG closely monitors current operational supply, demand and water resource conditions and anticipates near future emerging risks from drought, flood, pandemic, military and civil emergencies.

The 2020 pandemic coupled with a heatwave generated an extreme high demand event during the spring and summer months. This provides an example of how the ORMG functions to support timely decision making under non-drought but still constrained conditions.

The ORMG is made up of the members and associated roles set out in the table below. The group is responsible for monitoring water resource conditions and mobilising the Drought Management Group once drought trigger conditions have been met.

Membership	Role
Director of Customer Delivery	• Chair • Status reports to EMT and Board
Head of External Communications	• Monitors customer and stakeholder channels • Reports on comms activities under BAU and environmental stress • Identifies emerging comms issues/needs
Head of Water Resources and Environment	• Identifies emerging groundwater risks • Environment Agency drought contact • AIM status • Produces monthly water situation report
Head of Supply Insight	• Identifies production supply risks • Produces monthly ORMG dashboard

4.2 Actions to reduce demand

4.2.1 Communications and reducing demand

We supply water to more than 3.8 million people across three supply regions designated as areas of "serious water stress".

Regular communication during normal/ non-drought times focus on water efficiency messages and promoting the value of water and the water environment, particularly the chalk streams in our region.

The South East is a severely water stressed region, so we work with local government to ensure that all new developments are designed to meet the best water usage standards.

We want to help the people in our communities use water more sustainably and we run customer awareness campaigns and fit water meters to help achieve our aim of reducing per capita consumption (PCC) by 12.5% by the end of AMP7.

Through effective communications and engagement with our customers we promote the importance and need for water efficiency and plan long-term reductions in PCC.

This is important as it ensures a good relationship with our customers, so that they are receptive when we need to escalate communications during a drought.

Our water efficiency communications therefore provide a good baseline on which to build during drought conditions.

This section outlines our PCC reduction programme, engagement with retailers and non-household customers, how we communicate water resources and use and our wider influencing work on water efficiency.

4.2.2 Communications and programmes to reduce per capita consumption

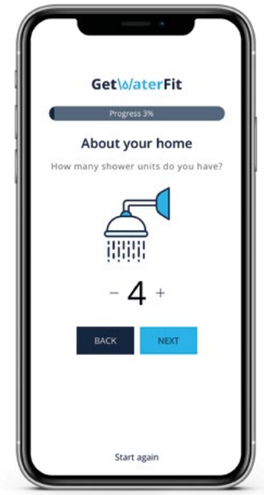
We have a dedicated programme to focus efforts on reducing PCC among our customers, resulting in the development of a defined PCC strategy. Data insight work was undertaken to understand the water savings from meter installations and our Home Water Efficiency Checks across different customer demographics, shaping the delivery plan for 2020/21 and beyond as we plan to install over 200,000 water meters over AMP7. Meters provide customers with the information and transparency to understand their water use. Research has shown that unmetered customers use more, on average, than metered customers.

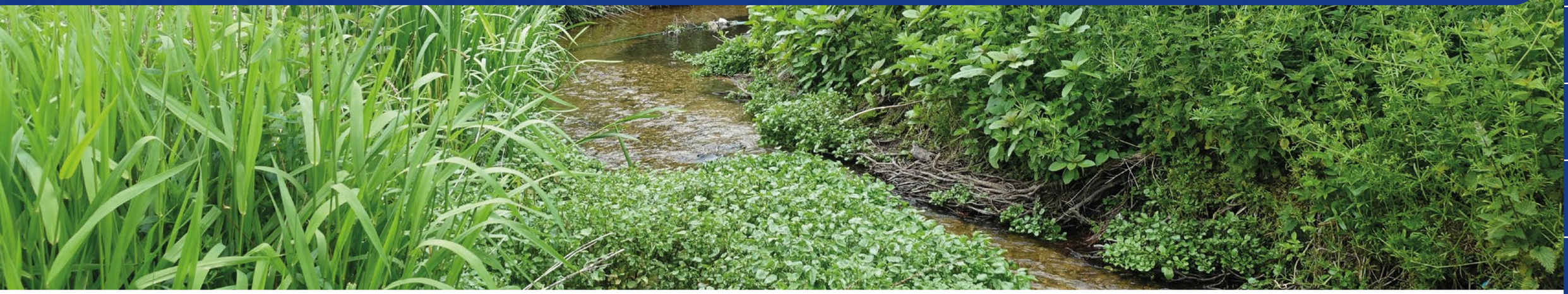
We have improved communications with our customers through our My Account online portal, which now shows customers their personal water use in litres per day as well as average usage in their area to drive behavioural change. With input from the Behavioural Insights Team we have also completely redesigned our bills to help customers understand (more easily) the water they use and how they can use less. We will continue to use innovation to help give customers a greater understanding of their water usage, and help them to be more water efficient.

We have worked on a number of initiatives to promote the importance of water efficiency, and to help our customers achieve this. One example of this has been our 'Save 10 a day' campaign which we launched in 2020. Now when customers access **affinitywater.co.uk/save-water**, they are directed to **getwaterfit.co.uk** to request a tailored free water-saving kit that is personalised to their household's exact water use.

- After a 5 minute questionnaire, a dashboard displays where the customer's water, energy and money is going – for many it is the first time they see a clear picture of their water footprint.
- Customers are also provided with extra water saving tips to help them reduce their water and energy bills.

Our latest and most ambitious water saving campaign to date is SOS: Save Our Streams. Please see Section 12.1.5 in this plan or visit saveourstreams.co.uk for more information on this award-winning initiative.





4.2.3 Engagement with retailers and non-household customers

In the medium term, as well as the household initiatives described above, we will be seeking to reduce demand in the non-household properties that are served by water retailers in our wholesale supply area.

Currently, our plans are to meter the remaining non-household properties within our region where it is practical to do so, and working with retailers, we will extend our water audit offering to those customers that have high usage that is not associated with industrial processes. These plans are supported by potential schemes to install rainwater and greywater schemes at larger premises, again working with retailers in our supply area.

During AMP7 we will also explore the potential for greater engagement with the non-household water retailers in our region to seek water savings with their customers.

We are considering a number of options for working with retailers to reduce demand for non-household customers, as well as being actively involved in shaping the Retailer Wholesaler Group (RWG) Water Efficiency Joint Action Plan.

Part of our work in promoting water efficiencies through non-household water retailers will include:

- Carrying out detailed data analysis and targeting high use customers
- Identifying customers who may be impacted by TUBs or NEUBs - how can we get them to save water earlier in drought?

4.2.4 Communicating water resources and water use

We provide a summary of water resources on our website with detailed groundwater levels, long term averages, previous year benchmark and drought triggers (Figure 8).

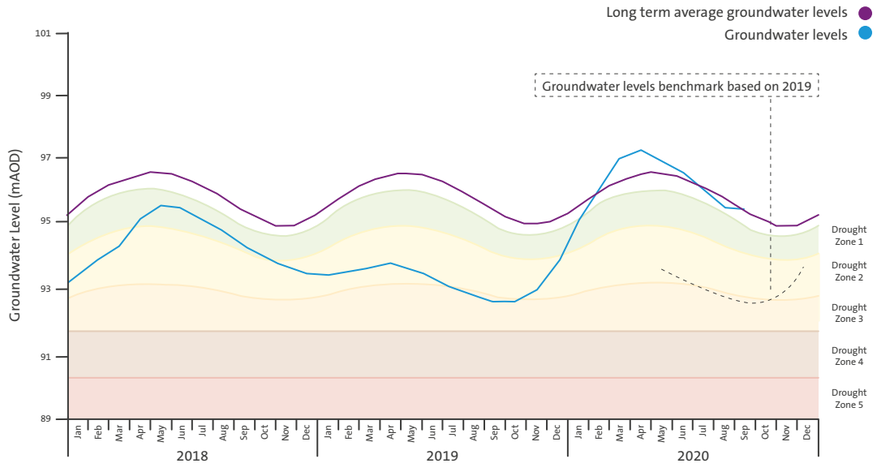


Figure 8: Example groundwater level graph with drought trigger zones to show water resource position

We plan to actively engage customers, communicating the current state of water resources, their water use and impacts on PCC targets in normal/non-drought periods. Although our sources are predominantly from groundwater, there is also a need to communicate about flows in our local rivers. The Centre for Ecology and Hydrology (CEH) Water Resources portal[15] provides a detailed picture of river flows and we are exploring how we can use this data to provide a more regional level and make it more accessible to a wider audience.

[15] https://eip.ceh.ac.uk/hydrology/water-resources/

4.3 Actions to protect the environment

4.2.5 Leakage reduction

Leakage reduction is a core part of our business plan and operational priorities. We have and will continue to invest in new technology and innovation once it is proven and becomes available. We have successfully integrated these into the delivery of our leakage reduction operations to improve our efficiency and effectiveness. In the Asset Management Period (AMP) 6 years from 2015-2020 we, reduced leakage by 15%.

We recognise that there is still more to be done in terms of reducing leakage, so we have committed to an ambitious 20% reduction by 2025 as part of our AMP 7 business plan.

We have improved the management of leakage reduction delivery, investing to improve performance and productivity of proactive leakage control and we will deliver a programme of leakage activities that contributes to delivering our AMP 7 leakage performance commitment. This strategy includes:

Prevention of Leakage through:

- Expansion of our pressure management programme
- Optimisation of our existing pressure managed areas
- Renewal of our poorest performing mains

Better awareness of leakage through:

- Improving our understanding of customer consumption
- Improved monitoring
- Improved understanding of weather-related impacts

Improved detection of leaks through:

- Increased resource in the operational leakage teams
- Investing in new state of the art leakage detection equipment
- Increased district meter coverage
- Improved customer engagement

Faster repair of leaks through:

- Expansion of assistance for customer side leakage
- Reduction of repair process timescale

4.3.1 Sustainability Reductions

England is home to 85% of the world's chalk streams, which make up a globally rare habitat. Chalk stream systems are however under threat, due to a number of reasons including climate change, abstraction, historical changes to the shape, location, and structure of rivers, change to land-use or changes within the wider catchment. Our supply area is home to around 8-9% of these chalk streams.

We have committed to ending unsustainable abstraction and have a long history of investigating rivers where we may be seeing an impact from groundwater abstraction. Where abstraction is having an impact, we are implementing solutions to protect our chalk streams, and we will continue to do so, working alongside regulators and local river groups to monitor how we are doing.

Sustainability reductions are decreases in water company deployable output, due to a change in the licensed volumes we are permitted to abstract. These licence changes aim to improve long term sustainability, by leaving more water in the environment to improve river flows. The ultimate aim of this is to contribute to improving ecological health, as per the legislative requirements under the Water Framework Directive (WFD) and set out in the River Basin Management Plans (RBMP) programme of measures.

We have been working with the Environment Agency and its predecessor since 1990 to improve flows in local chalk streams, implementing solutions in the Rhee, Ver, Misbourne, Hiz, Oughton, Beane, Mimram, Hughenden, Gade and Dour catchments from 1990 onwards. Since 1993, we have made sustainability reductions totalling 63Ml/d, some 7% of our resource base at that time. Our AMP7 plans, include further reductions in Central and East regions totalling 36.31Ml/d (average) and 23.66Ml/d (peak).

This will mean that by 2025 we will have implemented licence reductions totalling around 120Ml/d, which is equivalent to almost one fifth (18%) of our groundwater licence base.

4.3.2 Environmental Monitoring

We have a large network of environmental monitoring across our supply region. This includes groundwater levels, river flows, lake levels, ecological surveys, weather stations, river photos and rain gauges. We use this data to inform our day-to-day operations in terms of assessing our water resources situation, for licence management and compliance and as part of our obligations under the Water Industry National Environment Programme (WINEP).

This means that we collect data under a range of hydrological conditions, through normal periods, as well as prolonged dry weather, droughts and periods of high flow/groundwater levels and flooding.

The photos shown here are examples of our river monitoring photos taken of the River Misbourne under different groundwater conditions. Further information on our enhanced environmental monitoring during drought events is provided in Section 7.4.1.

This environmental monitoring also underpins our sustainability reduction programme. We are working with the Environment Agency to assess the response to abstraction reductions to help inform future decision making.

We are committed to a long-term approach to water resource management, to protect and enhance the environment, working collaboratively with catchment partners and key stakeholders.

4.3.3 Licence provisions to protect the environment

We have a number of abstraction licences across our three supply regions which include conditions intended to protect the environment. These licences have either a river flow or groundwater level trigger, whereby we reduce abstraction or provide mitigation in the form of river support/augmentation, when levels fall below normal (as defined by the trigger).

4.3.4 Temporary abstraction reductions

We have a small number of licences which include a condition that obliges us to reduce the quantity of water we take from a particular site, when conditions are below normal. These are either based on reaching a certain river flow or groundwater level. This means we adapt our operations to reflect the background conditions and we manage this as part of our business as usual activities. These triggers will typically be initiated before we reach our Environmental Stress trigger.

Figure 9: Top to bottom respectively – River Misbourne in high, average and low groundwater level conditions as shown in our river monitoring photographs.

4.3.5 River restoration projects

In the last five year planning period (known as AMP6), we delivered 11 river restoration projects across six rivers in our Central region (Misbourne, Gade, Beane, Mimram, Upper Lea and Ver). The aim of our work is to improve the health of the chalk streams in our supply area. A key benefit of this work will be to improve habitats, so the ecology is better able to cope with naturally occurring droughts. The river improvement projects have been a regulatory expectation under the Water Industry National Environment Programme (WINEP) since the start of AMP6 and were also included in the 2015 River Basin Management Plans. The key drivers of this work are to diversify river flows, improve flow velocities and to support chalk rivers reaching good ecological status/potential under the Water Framework Directive by 2027.

The regulatory requirement has continued into the current planning period (AMP7) and the new River Restoration Programme for 2020-2025 is Affinity Water's largest and most ambitious to date. The total number of rivers has increased to 14 across our three supply areas, with projects planned on each of these rivers. We are delivering these projects under our Revitalising Chalk Rivers programme[16], in partnership with the Environment Agency. One of the programme's objectives is to improve customer awareness of the importance of chalk streams and to make the connection between water usage and the impact upon the natural environment.

A range of measures within the river restoration programme were applied to the projects delivered in the last five year planning period:

- Bypassing of weirs - to address barriers to longitudinal connectivity on the River Beane.
- Channel narrowing and re-alignment - to address lateral connection between the river and its floodplain, for example on the River Gade and River Beane.
- Naturalising the channel, floodplain reconnection and wetland recreation – to address the rivers' vertical connection with groundwater on the River Lea, Beane and Misbourne.
- In-channel enhancements, tree works and fencing – to allow more light to the river channel, improving habitat diversity and preventing livestock from damaging the river banks and bed, for example on the River Mimram and Ver.

Appendix 10 provides some example case studies of the projects that we have completed.

Manor Road Park, Luton prior to the river restoration works. The channel was constrained by concrete steps and a concrete riverbed (January 2018)

After river restoration work at Manor Road Park, Luton. The concrete steps have been removed and the channel has been naturalised and re-connected to the floodplain (September 2018)

Figure 10: Before and after photos of Manor Road Park, Luton river restoration project on the River Lea

[16] http://www.revitalisingchalkrivers.org.uk/

4.4 Actions to maintain supply

4.4.1 Identifying when sources are underperforming

We review daily abstraction for each of our groundwater and surface water sources against their Deployable Output[17] (DO) values, to identify whether they are producing less than expected. The reliable supply over the course of a year is known as average DO and the reliable supply during the summer or highest demand period is known as peak DO.

There are a number of constraints on supply which are incorporated into the calculation of DO, such as the licence, hydrogeological or physical constraints, treatment constraints and known water quality issues. Further information on source performance assessment is provided in Appendix 5.

Deployable Output (DO)

The deployable output (DO) value represents the minimum amount of water that can be reliably abstracted from a source during certain low groundwater level conditions.

As a result, during a normal year, actual abstraction will often exceed DO volumes. This would produce a utilisation score of above 100%. However, in a drought year, utilisation will often fall under 100%.

We use the percentage utilisation of a source to track site performance. Percentage utilisation is calculated under both average and peak demand conditions. This is in addition to peak day utilisation which allows us to identify a specific day when abstraction was the highest across our three supply regions. Once average and peak utilisation has been calculated for all of the sources, we flag any sources with particularly low utilisation, usually under 85%.

This gives us the chance to identify opportunities to improve the source output or reliability through activities such as capital investment schemes.

4.4.2 Groundwater resting assessment

We have completed a proactive groundwater resting assessment since April 2017 during specific months of the year, to assess groundwater level vulnerability at all of our sources across our Central and Southeast regions. It is conducted under all conditions: business as usual and during drought years.

The purpose of the assessment is to flag sources that are at risk from low pumping water levels where these are getting close to a constraint e.g. an adit[18], the pump intake, the base of plain casing within the borehole, that could impact yield or quality.

For any sources identified in the assessment at an increased risk, a recommendation would be made to reduce output or change pumping regime to protect the source.

A resting profile is typically implemented in the spring before peak summer demand. If additional water is required, another source will need to be identified, that is considered to be less vulnerable to low groundwater conditions and is able to pump additional volumes to maintain supply.

The benefit of resting a source (i.e. reducing its output) is to preserve the capability for a higher pumping level for the summer months when we experience peak demand. Further information on groundwater resting assessment is provided in Appendix 5.

[17] Deployable output (DO) is the amount of water that can be reliably abstracted under a particular set of hydrological conditions and delivered into supply.
[18] An adit is a hand dug horizontal tunnel extending radially out from a vertical shaft, to increase yield of the borehole or well, generally by increasing its surface area and the number of fissures it taps into.

4.4.3 Transfers

We work with our neighbouring water companies to transfer water from them to us and vice versa when there is a need. We have a number of operational transfers or bulk supply agreements in place, some of which form an integral part of our WRMP, whilst others act as emergency options and are in place to assist with shorter term, transient situations.

We have arrangements with a number of neighbouring water companies for the bulk supply import of treated water to our WRZs and for bulk supply exports in different locations.

For each existing bulk supply we have an agreement in place with the respective company, and these include details of how the transfer is expected to operate during a drought.

In most cases we would expect transfers to be maintained during a drought up to and including our drought trigger 3 level. Details of the bulk imports and exports are presented in Figure 11 and Table 2 opposite.

Note that the volumes represent the available capacity as agreed, not actual utilisation, which varies from year to year.

Drought transfers fall into the following three categories:

- **Category 1:** Transfers that are only likely to be used for operational emergencies (to replace locally significant treatment capacity).
- **Category 2:** Transfers that can either be used for emergency purposes, as above, or could be used as needed once we crossed into drought trigger 1. We would start discussions with the other water companies once the 'environmental stress' threshold had been reached for an extended period (longer than 3 months).
- **Category 3:** Transfers that are described within our WRMP where we rely on the transfer as part of our supply/demand balance. We would ensure that these are operating to their full capability once we reach drought trigger 1, and would use them as appropriate to support demand requirements, as well as the Abstraction Incentive Mechanism (AIM) schemes (see Section 6.3.1).

The locations and size of all of the transfers into and out of our three regions are shown below, these transfers are categorised into the three types described above.

Note that any changes to provision of bulk supplies in very serious drought scenarios would only be made in full agreement with the other water companies involved. In a severe drought it is important to retain the flexibility of allowing further discussions with other water companies to take into account the specific conditions of that drought and to use any operational flexibility that may be available at the time to help maintain customer supplies.

The general principles of the provision of inter-company bulk supplies rely on mutual support and equitable 'pain share' with regards to the provision of supplies during a drought. During the onset of a drought, we would begin increased communications with the relevant neighbouring companies. It will normally be expected that should a company need to seek restraint from its customers or to restrict the water use of its customers, to maintain the bulk supply, then we should also seek restraint from our customers or restrict their water use.

We will continue to liaise with neighbouring companies to ensure there is mutual transparency and understanding around respective plans to seek restraint from, and place restrictions on, customers. See additional information provided in Appendix 5 which explains how we would expect these transfers to operate during a drought event.

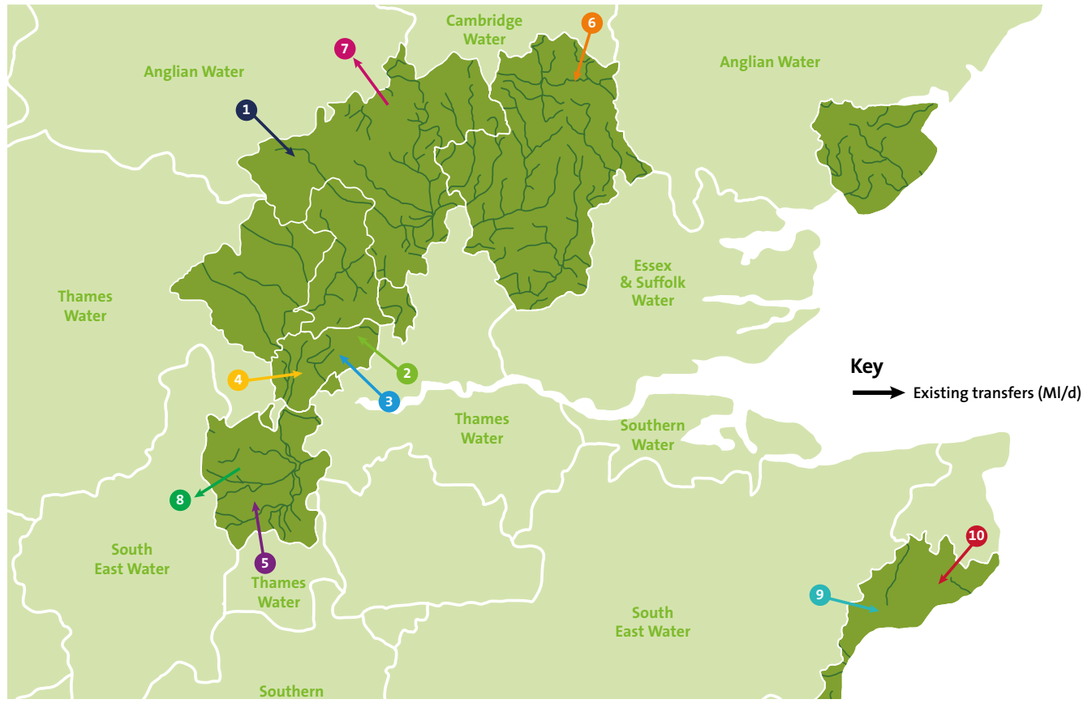


Figure 11: Intercompany transfers into and out of our supply area

Table 2: List of intercompany transfer agreements and categories

ID	Donor Company	Recieving Company	Transfer Category (Cat)	Maximum volume at average (Ml/d)	Maximum volume at peak (Ml/d)
1	Anglian Water	Affinity Water (WRZ3)	3	91	109
2	Thames Water	Affinity Water (WRZ4)	3	12	16
3	Thames Water	Affinity Water (WRZ4)	1,2	0.2	0.2
4	Thames Water	Affinity Water (WRZ4)	3	2	2
5	Thames Water	Affinity Water (WRZ6)	3	2.27	2.27
6	Cambridge Water	Affinity Water (WRZ5)	3	0.3	0.3
7	Affinity Water	Anglian Water	3	0.14	0.14
8	Affinity Water	South East Water	3	36	36
9	South East Water	Affinity Water (WRZ7)	3	2	2
10	Southern Water	Affinity Water (WRZ7)	3	0.0714	4

Note that the above import into WRZ3 from Anglian is a shared supply, which is governed by the Great Ouse Water Act 1961. We have capped the average capacity of this source to 50 Ml/d until 2023/24 when we plan to have installed conditioning treatment, which will facilitate greater volumes for use during average demand periods. This transfer is confirmed to be available up to a 1 in 200 year return period drought. The second transfer listed (from Thames Water) is subject to some restrictions related to capacity in our network, and is expected that it could provide up to 12 Ml/d on average and up to 16Ml/d under peak conditions during a drought, although the agreement states a maximum peak transfer volume of 27 Ml/d.

There are two additional bulk supply agreements in place with Thames Water for connections at AFW_tra-pericon and AFW_tra-cockfoscon, for up to 10 Ml/d and 5 Ml/d respectively. We do not currently include the volumetric benefit of these connections in our supply demand balance modelling as they are related to the construction of HS2. The Perivale connection is designed to provide water during peak conditions only and is supported by an agreement for the loss of peak supply capability in the event of HS2 construction phase activities impacting on our existing supply base.

The Cockfosters connection is designed for both average and peak demand conditions and covers exclusively the HS2 water demand for the construction of the Chilterns tunnel as an indirect supply. As such, for the duration of HS2 construction these two connections cannot be used for supply demand balance calculations.

The agreements are on a best endeavours basis and if needed would be maintained if a TUB was imposed, but may be suspended in a severe drought (approximately 1 in 200 year severity) or if a NEUB was imposed.

In agreement with Thames Water we are exploring the potential to include these connections in our longer term supply demand balance planning (post HS2 construction phase) as part of the WRSE modelling under the various drought modelling scenarios (beyond AMP8). We expect to be able to provide an update on the feasibility of operating these connections on a longer term basis under drought conditions later this year, once the WRSE modelling has progressed to a point where we can clarify further how they might be operated in the future. During the 2017-2019 drought event, we carried out a full review of the existing transfers and identified points in our network where additional transfers could be introduced, to help manage needs. Such transfers of water are not guaranteed by the source companies (Thames Water or Anglian Water). They can however potentially be used in situations such as the 2017-2019 drought event. During this time certain parts of our water supply system were under drought stress, due to the lack of winter recharge over consecutive years causing low groundwater levels, whereas other seasonal rainfall periods meant that Thames Water's surface water sources were not under significant drought stress. These transfers, if available, can therefore be used to alleviate drought stress so long as they are where the emerging need is located. The use of these transfers would depend on regional and local drought conditions and would be agreed between companies prior to use.

There are a number of large-scale transfer schemes that are being investigated as part of the WRMP process, involving other water undertakers and third party options. These are described within our WRMP19 Main Plan. All of these require extensive investigation, licensing, and construction, so do not form part of this Drought Plan (where we focus on schemes that may be deliverable with much shorter lead in times). If and when new transfer options are implemented, these will be included in updates of the Drought Plan.

Affinity Water

5 Identifying and monitoring droughts

This section provides information about how we monitor our water resources as part of our day to day activities, and how we use our triggers to monitor and forecast our water resource position and prospects during a drought. It also explains how our triggers relate to drought management actions, at different stages during a drought event.

5.1 Introduction

To determine whether we are experiencing drought conditions and therefore to indicate when we need to activate the different stages of this plan, we track the groundwater levels at key monitoring locations within our supply area.

These indicate the status of the chalk groundwater resources in our area at a given time. This data is compared with historic lows and highs, and average data to determine the current position relative to the historic record.

Around 65% of the water that we supply to our customers across our three supply regions comes from chalk groundwater. The remaining 35% is either abstracted from the River Thames or imported from neighbouring water companies.

Our surface water sources, i.e. the volumes we abstract from the River Thames or from TARD Reservoir, are not drought sensitive (i.e. they would not be expected to decrease when we are experiencing a drought, as we are constrained on how much we abstract by our abstraction licences and these are therefore referred to as licence constrained).

For this reason, the focus of this plan is on how we will operate during chalk groundwater drought events across our three supply regions.

This includes how we define the start and end of a drought event, how we classify each level of drought severity and what we will do at different stages of a drought, to reduce demand, meet the water supply demands of our customers and to protect the environment.

5.2 Monitoring our water resources

We have an extensive groundwater and surface water monitoring network across our supply regions. We use this network, as well as third party data (such as from the Environment Agency and Met Office) to support ongoing water resources management, and to provide an accurate picture of the status of water resources, which helps to inform business decisions.

We have chosen seven boreholes as 'key wells' across our three supply regions. We use these to monitor and report on the water resource situation. The selection process for these was rigorous and included a review of previous drought events (including the low groundwater levels of 2017-19 and, the very high demand of summer 2018, to ensure that these key wells depict the full range of conditions that we can experience across our three regions during different drought events.

This includes challenges to both the environment and security of public water supply. To ensure that these criteria were met, 'key questions' were considered for each potential key well (please see Appendix 1) to enable a robust screening process and selection of the most appropriate sites for the purposes of this plan.

Five of these are located in Central region, one is located in East region (Figure 13) and one is located in Southeast region (Figure 14).

The locations of the five key wells in our Central region are shown in Figure 12. Three of these have been used in our previous DMP (2019) to assess the drought risk to the chalk aquifer in our Central region. These were Lilley Bottom (located in the Upper Mimram catchment in our Lee Community), Chalfont Centre (located in the Misbourne catchment and Community of the same name) and Elsenham Nurseries (located in the Stort/ Cam catchment interfluves/ Stort Community).

A review of the 2017-2019 drought event, including close liaison with the Environment Agency resulted in two additional key wells for our Central region for our DMP 2023. Little Bordeaux Farm has been added to ensure dry weather impacts in the River Cam catchment can easily be reported on and forecast.

A comprehensive monitoring network sits behind this and feeds into decision making, incorporating both groundwater and surface water monitoring.

Ashley Green has also been added as a key well in our new Drought Plan. This improves alignment with the Herts and North London (HNL) Environment Agency monthly water resources situation report, which increases the cross-organisational consistency of messaging for stakeholders. Ashley Green also has good correlation with flows in the Chess catchment. Further information on the selection process and reasons behind the choice of each key well is provided in Appendix 1.2.

There is a general pattern across our Central region of chalk boreholes to the West responding more quickly to rainfall/recharge events than those to the East, and this is apparent when comparing the hydrographs of Chalfont Centre/Ashley Green and Elsenham Nurseries.

The timing of groundwater level fluctuations at these key wells ranges from about 1-2 months earlier, to 1-2 months later than Lilley Bottom. This makes Lilley Bottom a good indicator of the average drought risks posed to our Central region as a whole and means that it is generally well related to the regional groundwater supply availability.

For this reason, in Central region, drought risk is principally defined by the Lilley Bottom groundwater level, with input from the other four key wells, and with recognition that there can be some variation in drought status across the Central region.

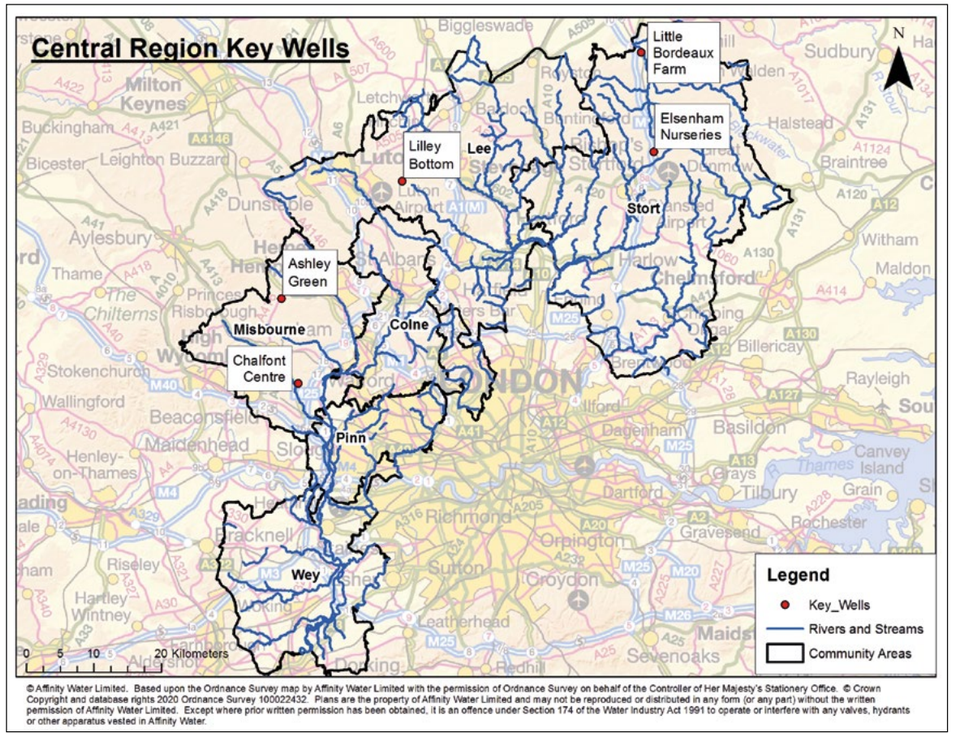


Figure 12: Central region key wells

Following review of the drought event of 2017-2019, it was confirmed that the groundwater level hydrographs of Lady Lane (East region) and Wolverton (Southeast region) continue to well represent the water supply and environmental drought status of their respective communities.

These key wells benefit from having a lengthy monitoring record that spans several drought events and in the case of Wolverton, has been used in the deployable output (DO) calculations for some of our chalk sources in the Southeast region. The groundwater level at this key well is also intrinsically linked to the resource availability of our Dour Community, as it is used as the trigger for limiting groundwater abstraction in the Upper Dour catchment during drought events, under the licence conditions.

The correlation between river flows in the Brett and groundwater levels at Lady Lane is also important for drought management purposes, as our river support scheme may be in operation during low flow events.

Groundwater levels in our East region are not intrinsically linked to available supply in the same way that they are in Southeast region, as in our East region, our available supply is instead licence constrained.

In view of the above, the key wells used for our East and Southeast regions remain unchanged from the 2019 Drought plan, and the locations of these are provided in Figure 13 and Figure 14.

A strong focus of this plan is its environmental ambition and so we carried out an exercise to explore what our chalk streams might look like during different groundwater level periods.

This is important, since the introduction of the Environmental Stress' drought trigger (discussed in later sections) is designed to focus attention on the environmental impacts of low groundwater levels, which would typically occur before we start to experience potential supply deficits.

Further information on how we did this is provided in Appendix 1.

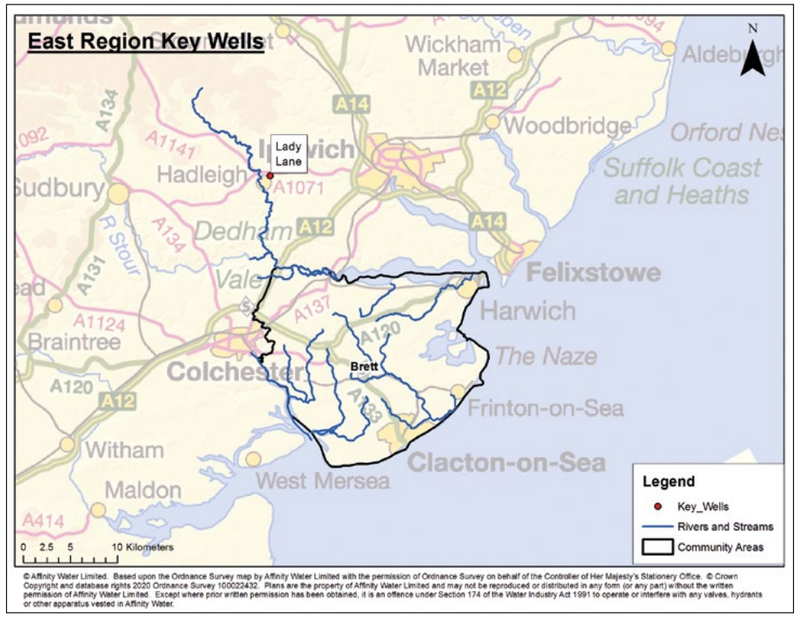


Figure 13: East region key wells (our Brett community is labelled)

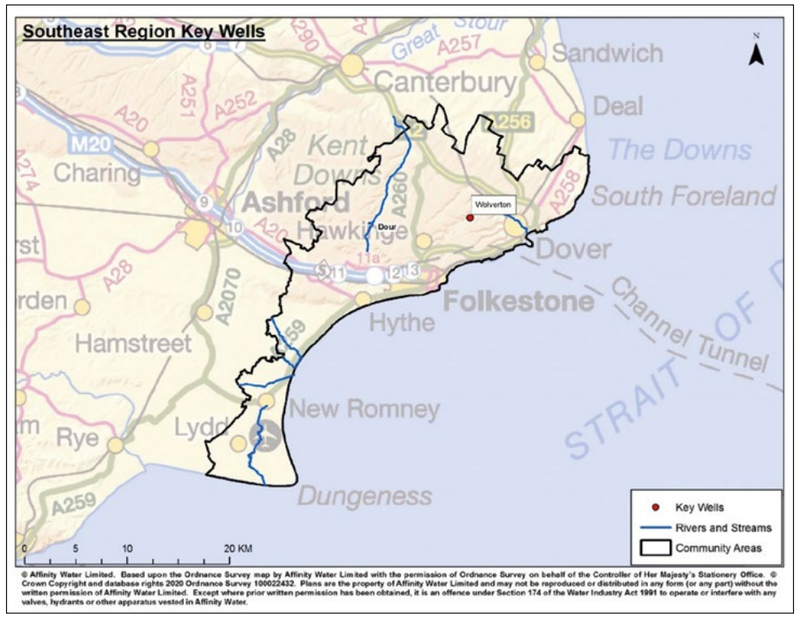


Figure 14: Southeast region key wells

5.3 Drought triggers

5.3.1 What are drought triggers?

We need to know when action should be taken as a result of changing environmental and groundwater supply conditions. Drought triggers define a set of conditions which when present, tell us to take action, when to stop and how we will know that we have been successful.

We have set out a series of 'drought triggers' which are based on the long term average data for each borehole that we monitor.

We have learned lessons from the most recent drought and listened to feedback from our stakeholders to develop an updated profile of these drought triggers. Information on how our drought triggers have changed is provided in Appendix 1.

Groundwater levels tend to increase during winter/spring months (known as the recharge period) when the air temperature is lower and all other factors (evaporation, plant transpiration, soil moisture) are less significant. Groundwater levels typically decline during summer months (known as the recession period) when temperatures are higher, evaporation is greater, and more water is absorbed by the soil and by plants.

The proportion of rainfall that infiltrates through the soil to recharge the chalk aquifer is known as effective rainfall.

For the reasons above, the effective rainfall over the winter months is especially important for recharging the chalk aquifer. Actual groundwater levels in a given year vary depending on the level of recharge, especially during the winter months.

5.3.2 Our drought triggers

- **Environmental Stress Trigger** - This is a new classification to take account of the period of time before a water supply drought develops. It considers what we can do to protect the environment during a vulnerable period when water supplies are healthy but where we might start to see the effects of declining groundwater levels on the environment. This effect may not always be visible to the eye. Experience tells us that when groundwater levels are within this range, this is likely to have an effect on river flows in chalk streams, and we receive some contact from key stakeholders, but the level of drought related customer contact is generally low. We have set a trigger for action based on the lowest groundwater level and river flow period of an average year, which typically occurs between late autumn and early winter. As we progress from late Spring to Autumn, the flowing length of chalk streams naturally reduces, as background groundwater levels decline. Under such conditions depending on the background groundwater levels, the AIM (Abstraction Incentive Mechanism), river support and "Hands off Flow" constraints will be active (see Section 6.2.5), in some of the chalk stream catchments most sensitive to prolonged dry spells.

In Central region;

- At Lilley Bottom the environmental stress trigger has been set at 94.47 mAOD. This is based on the relationship between groundwater levels and river flows and to capture the lowest groundwater levels in an average year. Under such conditions, it is highly likely that flows in the lower Beane, lower Rib, middle Mimram and lower Ash will be well above Q95 levels. Flows in the Ver at Redbourn usually cease around Q70 levels, and this is likely to happen at a similar time to us reaching our Environmental Stress trigger.
- At Elsenham Nurseries, the environmental stress trigger has been set at 66.2 mAOD. Under such conditions, it is highly likely that flows in the Stort will be well above Q95 levels.
- At Chalfont Centre, the environmental stress trigger has been set at 61.2 mAOD. Under such conditions, it is highly likely that flows in the upper Misbourne will be well above Q95 levels.
- At Ashley Green, the environmental stress trigger has been set at 116.5 mAOD. Under such conditions, it is highly likely that flows in the lower Chess and upper Gade will be well above Q95 levels.
- At Little Bordeaux Farm, the environmental stress trigger has been set at 37 mAOD. Under such conditions, it is highly likely that flows in the upper Cam will be well above Q95 levels.

In Southeast region, this has been set at 34.80 mAOD at Wolverton, to be consistent with the level set in the Upper Dour licences that limits abstraction in the upper catchment.

In the East region, this has been set to 16.20 mAOD at Lady Lane, to capture the lowest groundwater level in an average year and also to capture the Brett at Higham Q95 flow, which based on the relationship with groundwater levels, is around 16 mAOD.

- Drought Trigger 1 corresponds to groundwater levels seen approximately in a 1 in 5 year drought event of 'mild' status. During a groundwater drought of this severity, river flows and the lengths of flowing chalk streams would visibly reduce due to declining regional groundwater levels. This is likely to generate an uplift in customer contact, which during the drought events of 2017 and 2019 was focused on a few rivers suffering from particularly low flows. Additionally, the AIM would be active in most catchments and it is likely that we would be supporting flows in the Hiz, Oughton, Cam, Rhee, Dour and Brett.
- Drought Trigger 2 corresponds to a 1 in 10 year drought event of 'medium' severity. As groundwater levels approach and cross into this drought trigger, experience tells us that a second uplift in the level of drought related customer contact is likely, as significant lengths of chalk streams naturally dry, often through towns and villages, which makes them visible to more people. During the 2017 and 2019 drought events, this was generally the case, with specific focus around the Rivers Ver, Mimram, Chess, Cam and in the Mid Colne Valley. Over these drought events, the AIM was active in all catchments apart from the Denge peninsula, whilst all existing river support schemes, except for the River Oughton, were triggered.
- Drought Trigger 3 has been set as the lowest groundwater level in recent operational history at all key wells, corresponding to approximately a 1 in 40 year drought event. At this groundwater level, we operated our sources without failures to public water supply and without the need for drought orders or permits (for most boreholes this low level occurred in 1997). This provides a known environmental (i.e. how will the environment be stressed and how might it recover) and operational (i.e. how much groundwater resource is available for supply) baseline, to which we can compare the potential future events. Proposed drought severity is 'worst recent'. During the 1997 drought event, the Mimram did not have consistent flow from its source to the viaduct at Digswell, whilst the continuously flowing length of the Ver started at Shafford Mill. At this time, most chalk streams reached at least Q95 flows at the Environment Agency gauging stations at the bottom of the catchments. Drought events with return periods of 1 in 100 and 1 in 200 also fall within this trigger zone.
- Drought Trigger 4 has been updated from the 2019 Drought Plan for Wolverton, Lilley Bottom, Elsenham Nurseries and Chalfont Centre key wells, to reflect the forecast water level for a 1 in 500 year extreme drought event (see our WRMP19). In other key wells, this level reflects either the drying of the asset or has been forecast as the lowest water levels predicted using expert opinion. A drought of this 'unprecedented' nature would result in transition to our Emergency Plan.

We will assess the suitability of all drought triggers along with the Drought Plan on an annual basis and update the long-term average trend alongside. Figure 18 provides some examples of what the environment might look like (in this case the River Ver) during periods of different groundwater levels.

Examples of some hydrographs linked to flows in other chalk stream catchments across our Central supply region are provided in Appendix 1.

[19] Q95 is the level of river flow that is exceeded 95 % of the time. Another way of looking at this is to say that flows lower than this point are within the lowest 5 % of flows in the data record.

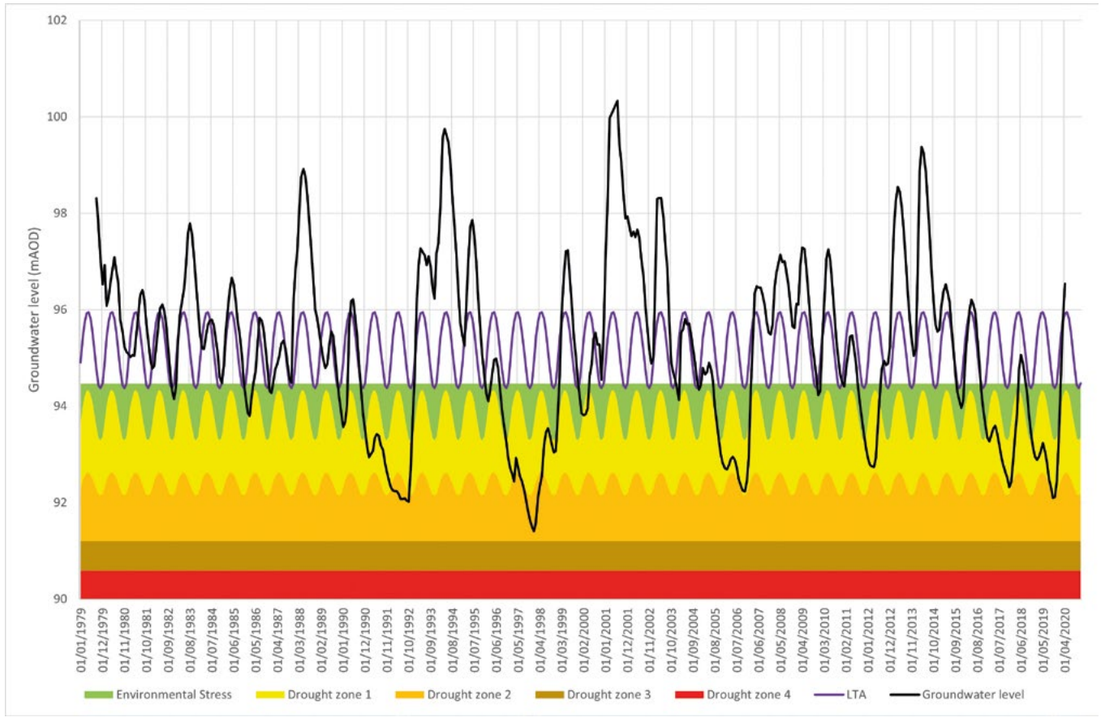


Figure 15: Central region (Lilley Bottom) drought triggers

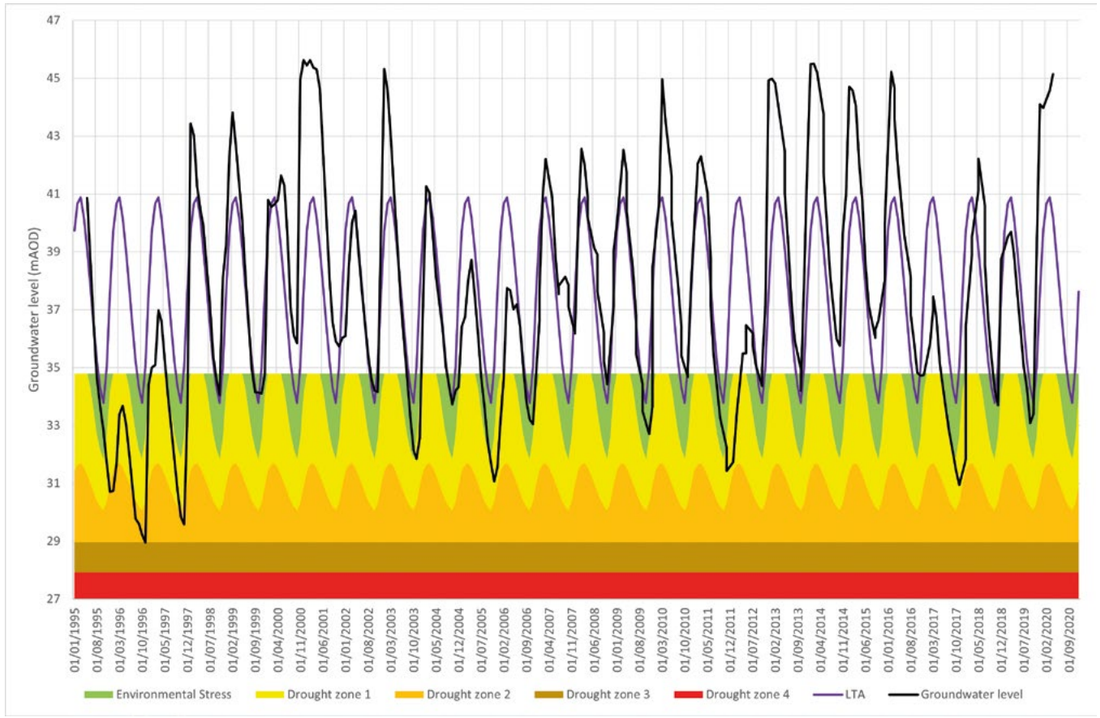


Figure 16: Southeast region (Wolverton) drought triggers

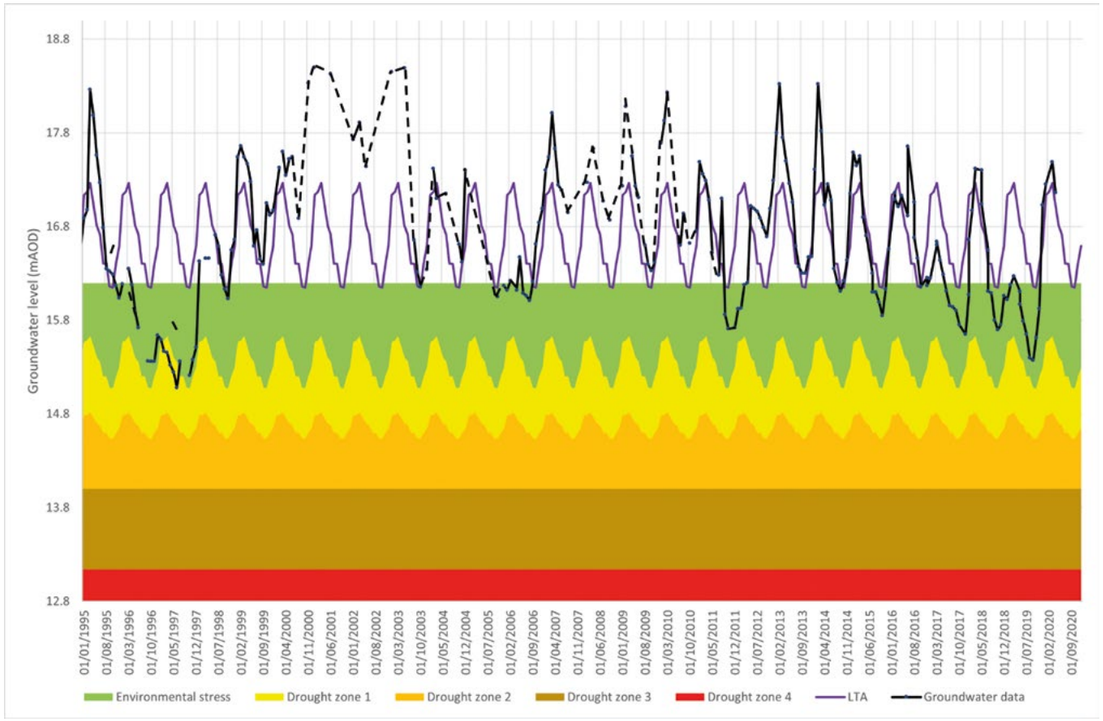


Figure 17: East region (Lady Lane) drought triggers

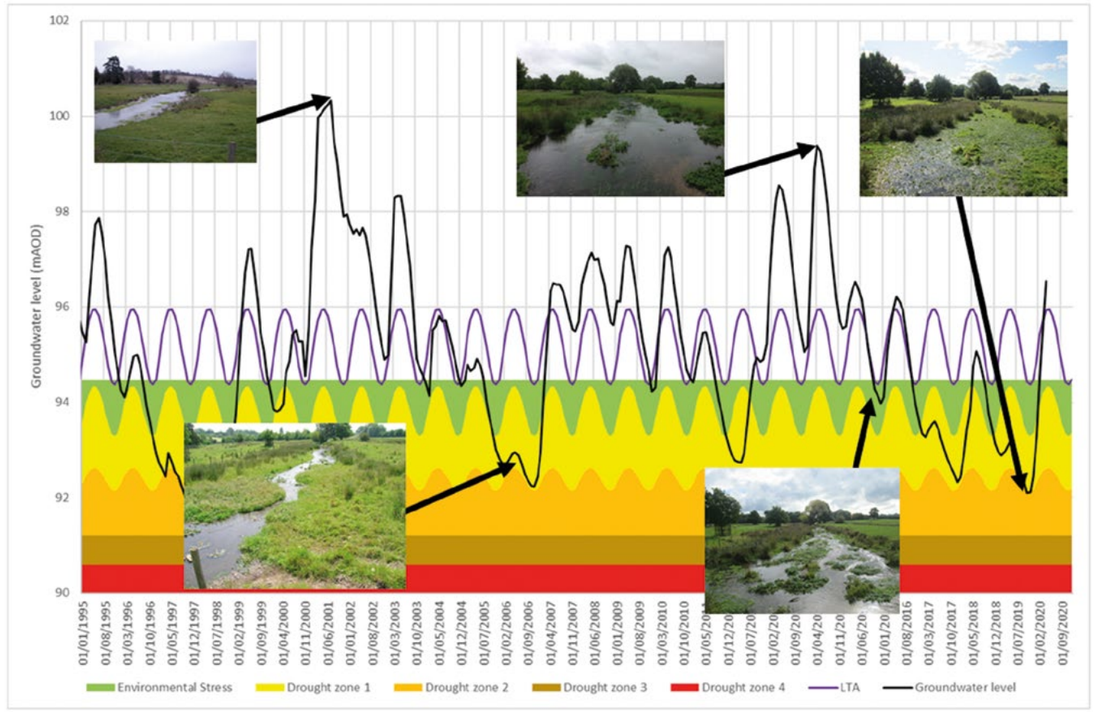


Figure 18: Photographs of the Ver at Redbournbury Mill under different hydrological conditions (based on Lilley Bottom key well)

5.3.3 How do we know these are the right drought triggers?

One of the primary aims of this Drought Plan is to act as an operational manual that sets out how we will manage the risks posed by drought conditions. A key part of this is being able to demonstrate that the choice of key wells and the positioning of triggers allow actions to be taken in a timely manner, so as to effectively mitigate risks to supply caused by drought.

For this reason, an exercise was undertaken to establish the fastest possible time that it could take to move from one drought trigger to the next, based on the observed groundwater level recessions that have been experienced to date. This could then be compared with the known lead-in times for drought interventions such as temporary use bans and drought permits, to ensure that the plan allows for them to be planned and implemented at the right time.

The results of this assessment are clear and are illustrated in Appendix 3. The key outcomes of our observations are:

- The fastest possible time it would take from the start of the Environmental Stress period to the start of Drought Trigger 1 over the winter/spring (starting from January, typically the highest annual groundwater level period) has ranged between one and two months and over the summer and autumn (starting from July, typically the lowest annual groundwater level period) has ranged from two to three months. This is enough time for us to take action to protect the environment and engage our customers and stakeholders.
- The fastest possible time from the start of Drought Trigger 1 to the start of Drought Trigger 2 has been five months between January and April and seven months during the summer and autumn (average of six). This gives us enough time to prepare for the potential introduction of a temporary use ban in Drought Trigger 2.
- The fastest possible time from the start of Drought Trigger 2 to the start of Drought Trigger 3 was in excess of nine months, regardless of the starting position. This provides enough time to prepare for the introduction of drought permits and/or drought orders and non-essential use bans in Drought Trigger 3.

These plots show the fastest groundwater level recession each month in the observed data under similar groundwater levels.

They have been compared with actual groundwater level recessions from historic droughts which are comparable.

In essence, chalk groundwater level trends respond in a uniform and predictable way to varying recharge patterns given different starting positions, which makes representative observation boreholes a suitable tool for predicting resource availability and environmental stress.

An important aspect of our Drought Plan is ensuring that our response aligns with regional water resource availability. Key wells in our Central and Southeast regions have been used to help calculate regional groundwater resource availability during droughts.

During the recent drought event of 2017 to 2019, the relationship between the available water and Lilley Bottom groundwater level was still very strong. This allowed drought management decisions to be taken based on the forecast groundwater level trends under different rainfall scenarios and therefore the level of resource available.

As part of the development of this plan, we have tested our triggers through stochastic modelling, and we produced worked examples which show the high level actions we would take at different stages during a drought.

These highlight the fact that our drought triggers are appropriate as they provide enough time to carry out the necessary actions during a drought. Information on our worked examples is provided in Appendix 4.

It is also our intention to carry out a drought exercise to test our planned triggers and actions under different drought scenarios. We will engage closely with the Environment Agency as part of this exercise and will incorporate any learnings into an annual update of our Drought Plan.

5.4 Water resource forecasting

In addition to knowing our current water resource position, it is important for us to be able to forecast how these are likely to improve or worsen, so we can plan and implement our next steps. As described in Section 5.2, we have a number of observation boreholes or key wells which we use to keep track of water resource levels and forecast prospects. We use the groundwater trigger zones at our key wells to report on the drought status of each of our supply regions at a given point in time. Typically, this is done on a monthly basis through our 'Water Resources Situation Report', although during periods of prolonged dry weather or drought, more frequent updates may be required. Our company actions are intrinsically linked to groundwater levels through our Drought Plan. Consequently, to enable good planning, it is vital that we are able to estimate where groundwater levels may be up to one year in the future and therefore what the likelihood of us needing to take certain actions is.

We forecast groundwater levels based on a range of rainfall scenarios. These rainfall scenarios are categorised as a percentage of the long term average (LTA) for each month. These percentages are:

- 60 % of the LTA (very low)
- 80 % of the LTA (low)
- 100 % of the LTA (average)
- 120 % of the LTA (above average)

The use of 60% of LTA rainfall is typically used as the realistic worst case scenario in an ongoing dry weather period. It should be noted that the forecasting assumes a uniform (linear) distribution of rainfall and effective precipitation through each month, and that each month will receive the same proportion of rainfall relative to the LTA.

In reality, rainfall patterns can vary over a month and the proportion of effective precipitation can change due to other factors. The uncertainty associated with the forecast increases with the time over which we are trying to predict groundwater level change, with the greatest certainty being associated with the first three months of each scenario.

The groundwater level forecasts are carried out using expert judgement and take into account a number of factors. These can be separated into short term (one to three months) and short to medium term (one month to one year) groundwater outlook.

Further information on how we carry out short term and short to medium term water resource forecasting is provided in Appendix 2. Figure 19 provides an example of groundwater level forecasts under different rainfall scenarios.

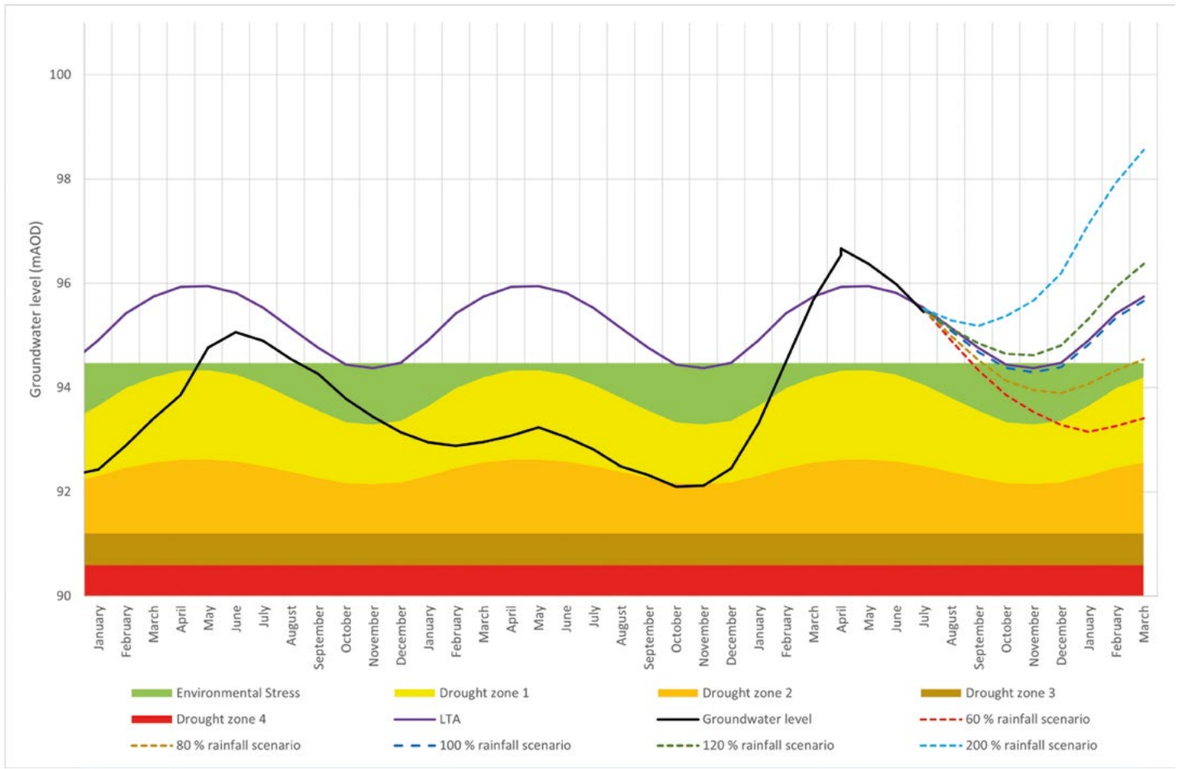


Figure 19: Forecast groundwater level changes under different rainfall scenarios

5.5 Linking our drought triggers to actions

Each of our drought triggers is associated with operational actions which are designed to address and minimise the risks associated with a developing drought.

The key high level actions associated with each trigger have been presented as a worked example, provided in Appendix 4. Further information on all of our drought actions is presented in each of the following drought trigger sections (including actions in non-drought conditions, before a drought occurs). Details for supply and demand side actions are also provided in Appendix 5.

The sequencing of our drought actions has been set out in our plan in the order with which they would be expected to be implemented. The prioritisation has been planned with the aim of minimising impacts on our customers, as well as mitigating impacts on the environment.

Our communications are designed to give customers early warning about the potential need to introduce temporary restrictions, and we have environmental mitigation actions specifically designed to mitigate the impacts of drought on the environment.

In addition, our supply side actions have been prioritised to ensure that those actions with the least environmental impact are carried out before any potentially environmentally damaging actions.

Affinity Water

6 Environmental Stress

This section explains what we would do when we reach our Environmental Stress trigger, which would occur after a period of dry weather. Actions in this trigger zone include communicating and engaging with customers to reduce their water usage, and to reduce impacts of drought on the environment.

6.1 Introduction

Groundwater levels would reach the Environmental Stress trigger before water supplies become affected by lack of rainfall.

This trigger would be characterised by river catchments being affected by lack of rainfall and low groundwater conditions. In some catchments these effects may have already started to appear before this trigger is reached.

We would expect to see the headwaters of some rivers start to move downstream as upper reaches begin to dry up. In some rivers this happens more regularly, such as those with winterbourne reaches, which generally only flow at times of year when groundwater levels are relatively high.

Low flows in some reaches could affect ecological communities such as fish and macroinvertebrates, and aquatic plants could also be impacted.

The actions in this trigger zone are focused on education and communication with our customers, building on our business-as-usual water efficiency messaging to explain the environmental impacts of drought and what our customers can do to help. Although some catchments will already be experiencing low flows by the time this trigger is reached, this will help us to implement actions which can help to make a difference in alleviating these issues at this point.

Throughout this period, we would continue with our business as usual activities including river restoration projects, sustainability reductions and environmental monitoring.

Table 3 provides a summary of the actions which would be carried out when we reach the Environmental Stress trigger.

Further information on how these actions are carried out is provided in this section.

Table 3: Drought management actions carried out in Environmental Stress trigger

Category	Action description	Benefit of action/why it is appropriate	Implementation timescales	Permissions or constraints	Risks	Environmental Impacts
Actions to reduce demand	Enhanced communications	Appeal to customers to voluntarily reduce demand	2-3 weeks to develop material and agree messaging	Marketing and Customer Experience approval	Potential confusion for customers if messages are not clear and consistent	Reductions in demand will help to leave more water in the environment
Actions to reduce demand	Citizen science projects	Engaging directly with customers to appeal for voluntary reductions in demand	3-4 weeks to develop material and agree messaging	Marketing and Customer Experience approval	Potential confusion for customers if messages are not clear and consistent	Reductions in demand will help to leave more water in the environment
Actions to reduce demand	Stakeholder engagement & partnership communications	Make stakeholders aware of dry weather situation, and gain support for sharing water efficiency messaging	1-2 weeks to agree messaging	Corporate Affairs approval	None	NA
Actions to reduce demand	Leakage reduction	Reduced leakage volumes as per targets set out in Business Plan	NA - ongoing BAU activities	Head of Leakage	Changing leakage strategy or bringing in additional teams may have implications for resource allocation across the business	NA
Environmental actions	Abstraction Incentive Mechanism (AIM)	Reducing groundwater abstraction at potentially sensitive sources during low flow periods	Less than a week	Actions linked to environmental triggers	Reduction in abstraction will be dependent on operational need	Positive impacts on environment through abstracting less from sensitive catchments
Environmental actions	River support	Augmentation of river flows using groundwater from certain sites during low flow conditions	Less than a week	Actions linked to triggers associated with abstraction licences	None	Positive impacts on the environment through increasing river flows
Environmental actions	Continuation of environmental actions in non-drought conditions	See environmental actions in Section 4.3	See environmental actions in Section 4.3	See environmental actions in Section 4.3	See environmental actions in Section 4.3	See environmental actions in Section 4.3

Note that the actions identified within this table are not necessarily sequential and may need to be flexible depending on the precise circumstances at the time. This may mean that some actions happen concurrently or some happen sooner than the order listed here, depending on what is most appropriate.

6.2 Actions to reduce demand

Our communications approach aims to reduce consumption and to achieve similar demand savings to those seen with TUBs but at a much earlier point in a drought timeline. Given the pressures on the environment and our commitments to protecting the chalk streams in our region our plan escalates communications activities at the 'Environmental Stress' trigger. This will help inform customers of the developing drought status and by taking actions earlier in a drought it may reduce the need for greater levels of water use restrictions or drought permits to abstract more water at certain sources.

6.2.1 Communicating early

We will increase messaging at this stage that it is not a 'normal' dry year and provide reassuring messaging on what customers can do at home and the importance of reducing the impact on the environment. It is important to communicate early, particularly when experiencing a dry winter. Examples of how we may communicate at this stage include:

- Media briefings to provide hydrological and meteorological position information, utilising partners such as the Science Media Centre to do this effectively and broadly. Brief key regional and national media to explain the situation we are facing, stress their important role in helping communicate the facts.
- Close liaison between key agencies including the Met Office, Environment Agency and DEFRA, to ensure alignment with media content developed independently of Affinity Water.
- Media updates providing regular, factual background information and context to encourage factual reporting. Directing to the dedicated water resource page on our website for updates and further information.
- Utilising third party spokespeople and channels for example NFU, CEH, Rivers Trust, Environment Agency.
- Utilise social media channels to share and target messaging and multimedia content. Social media channels such as Facebook, Twitter and Instagram are useful as it is possible to share third party content to bolster our own messaging.
- Targeted communications to customers for example through social media, SMS, email, mailshots, bill inserts, setting out the context of the dry weather situation, sharing what we are doing and explaining what customers can do to help.
- Web development to signpost clearly to the drought information and water saving advice. We may take a regional approach working with WRSE and WRE to communicate at this stage. These pages, as well as other communications channels would carry content such as:
  - Why are we thinking about drought?
  - What is a drought?
  - Targeted information campaign – drop 20 to leave more water in the environment
  - How we look after resources and our work on leakage
  - Links between water efficiency and the environment.

6.2.2 Catchment based communications campaign

The focus of communications at this stage of the plan will be around environmental stress, particularly chalk streams, and working with customers to raise awareness and reduce demand for water. We will focus this on key catchments facing environmental stress, working with partners in those areas.

We will work with the Environment Agency to support a joint approach to communications. An example from 2019 is the blog post "Environmental Drought in Hertfordshire and North London", which refers to the work of Affinity Water in reducing groundwater abstractions as well as wider monitoring and work[20]. We will also work with local rivers trusts to communicate to their members and the wider communities they are part of.

A brief outline for the OASIS plan that can be deployed for this campaign is below:

OASIS Plan	Proposed approach
Objectives	• Raise awareness of environmental stress amongst our customers and stakeholders • Expand our reach through partnership with the Environment Agency and rivers trusts • Reduce water use in target catchments
Audience Insight	• Use segmentation and customer insight research • Survey customers on their awareness of environmental stress and drought/chalk streams
Strategy/Idea	• Work with trusted sources of information – EA and rivers trusts • Outline audience journey – engaged via Public Relations Team, social media, drought specific website with blog posts • Pilots – target comms in key catchments • Link to citizen science project
Implementation	• Develop a PR approach building on partnerships • Organic social media campaign
Scoring/ Evaluation	• Collect baseline data on awareness and water use in target catchments • Change in water consumption • Uptake of water efficiency devices/ programmes from target post codes

[20] https://environmentagency.blog.gov.uk/2019/10/01/environmental-drought-in-hertfordshire-and-north-london/

6.2.3 Citizen science project – increased engagement and monitoring

Our chalk streams citizen science project will be scaled up during this period of environmental stress and maintained through a drought event.

We will consider an incentive programme where we collaborate with others to invest in upgrading some of the recreational and access amenities of rivers in a community that has demonstrated a reduction in water use (similar to the Southern Itchen project). The project recognises the limitations of monitoring infrastructure that is predominantly designed for flowing rivers.

The citizen scientists measure the waterways in sections to compare drying patterns over time linked to temperature, precipitation, stream flows and drought[21]. A citizen science project was undertaken in the UK during dry weather in April 2019 and involved sharing photos of drought impacts[22]. The Dry Project also engaged with schools on trees and droughts[23].

Citizen science projects are already running in the chalk streams region and could be expanded.

This includes MoRPh, which is a citizen science tool to record local information on physical habitat conditions to complement biological monitoring[24].

The key elements of this initiative will include:

- Increasing engagement and promotion through partners including the Environment Agency and rivers trusts.
- Increasing the number of monitoring report and photos submitted as part of the project.
- Developing a feedback loop so that participants can see the impact of their water saving measures.

6.2.4 Partnership communications

We will make use of the partnership arrangements we have in place and placement roles in catchment partners to help us communicate the current conditions, including how dry weather is impacting local rivers, and the prospects for how those conditions could improve or deteriorate under different rainfall scenarios.

This will include regulators such as the Environment Agency and environmental groups such as the Herts & Middlesex Wildlife Trust, Chilterns Chalk Streams Project and Up on the Downs.

6.2.5 Leakage reduction

When we are in a period of Environmental Stress when water supplies are not at risk, but the environment may be seeing some stress from prolonged dry weather, we would refocus our leakage programme to target areas of our region that are most affected.

We will deliver the following:

- Increased active leakage control in these areas by reallocating leakage teams from across the business to seek to help reduce leakage in these areas.
- Increased engagement with customers in these areas that have a customer side leak.
- Focus repair resources to reduce leak run time in affected areas.
- Review if pressure management could be employed.

We would continuously review the current leakage position from this point forward to fully consider the benefits of implementing additional leakage detection and repair activity as events unfold.

[21] https://www.nsf.gov/discoveries/disc_summ.jsp?cntn_id=297579&org=NSF&from=news
[22] http://dryproject.co.uk/citizen-science/map-your-drought/
[23] http://dryproject.co.uk/about-the-project/citizen-science/urban-and-rural-trees/
[24] https://www.therrc.co.uk/sites/default/files/files/Conference/2017/Posters/gurnell_morph.pdf; https://modularriversurvey.org/wp-content/uploads/Beach-et-al-2018-Appriasing-Chalk-Streams-Using-Citizen-Science.pdf

6.3 Actions to protect the environment

6.3.1 Abstraction Incentive Mechanism (AIM)

The Abstraction Incentive Mechanism (AIM) process has the objective of encouraging water companies to reduce the environmental impact of abstracting water at environmentally sensitive sites during low flow periods (i.e. droughts). It is activated on a catchment basis via the triggering of bespoke low flow or groundwater level triggers.

We put forward 23 AIM sites at the scheme's inception, recognising the importance of protecting the environment we put forward significantly more sites than other water companies. Following the implementation of a number of sustainability reductions which have led to a cessation of abstraction from some sources, the current number of AIM sites is 19.

There is also the potential to add further AIM sites if our investigations identify that this would be beneficial to the environment.

6.3.2 River support

We have a number of abstraction licences which include requirements to provide river support under low flow situations (Table 4). When these conditions are active, we pump groundwater from our boreholes or wells into the adjacent river (or use them to artificially recharge a well in close proximity to a spring) thereby helping to maintain river flows.

These additional flows help to support the river flow and ecology at times of stress. This means that there is less water available from that particular source for public supply and as this happens as a business as usual activity, we use water from other sources to meet demand.

We proactively monitor these licence conditions alongside the Environment Agency, who are usually required to notify us when a condition has been reached. These licence provisions can be triggered under business as usual conditions and are likely to be in force through periods of environmental stress, as well as through our operational drought triggers.

Table 4: River support schemes to support low flows

River support source	Source type	Supported river
UTTL	Groundwater	Cam
SPRF	Groundwater	Cam
OUGH	Groundwater	Oughton
OFFS	Groundwater	Oughton
WELL	Groundwater	Hiz
SLIP	Groundwater	Rhee
SHEL	Groundwater	Brett
SBUC	Groundwater	Dour

Affinity Water

7 Drought Trigger 1

This section explains what we would do when we reach our drought trigger 1, including our actions to reduce demand, operational and environmental activities.

7.1 Introduction

Reaching drought trigger 1 would likely occur after a dry winter or prolonged period of dry weather resulting in limited recharge of aquifers. Flows in some chalk streams in our area would be lower than normal, and in some upper reaches would be dry.

Actions in this trigger zone are intended to reduce impacts of drought on the environment where possible, as well as engaging with our customers around the developing drought situation.

The actions set out under the Environmental Stress trigger will be kept under review and will continue as appropriate through the development of a drought, to ensure we can mitigate impacts on the environment where possible.

Operationally we would be proactively managing the situation, and start to plan for implementing further actions should the water resource position continue to become more serious.

Table 5 provides a summary of the actions which would be carried out when we reach drought trigger 1.

Further information on how these actions are carried out is provided in this section.

Table 5: Drought management actions carried out in drought trigger 1

Category	Action description	Benefit of action/ why it is appropriate	Implementation timescales	Permissions or constraints	Risks	Environmental Impacts
NA	Formation of Drought Management Group	Provides a central group to make decisions and drive forward workstreams and actions to manage drought risks	One week to assemble group members	Director of Asset Strategy & Capital Delivery is responsible for forming Drought Management Group (DMG)	Resource/time constraints – members of DMG will need to ensure they can dedicate time to their role	NA
Actions to reduce demand	Agile communications	Appeal to customers to voluntarily reduce demand	2-3 weeks to develop material and agree messaging	DMG & Marketing and Customer Experience approval	Potential confusion for customers if messages are not clear and consistent	Reductions in demand will help to leave more water in the environment
Actions to reduce demand	Stakeholder engagement	Make stakeholders aware of drought situation, and gain support for water efficiency messaging	1-2 weeks to agree messaging	DMG & Corporate Affairs approval	None	NA
Actions to reduce demand	Enhanced leakage reduction	Volume saved to be confirmed, as this will depend on the amount of leakage at the time of reaching trigger	To be confirmed	DMG & Head of Leakage approval	Changing leakage strategy or bringing in additional teams may have implications for resource allocation across the business	NA
Environmental actions	Continuation of actions from Environmental Stress trigger	Mitigating impacts of drought on the environment	Continuation from previous trigger	NA	See Table 3	Positive impacts on environment
Environmental actions	Enhanced environmental monitoring	Provides baseline monitoring data for drought permits and enhances understanding of drought impacts on the environment	1-2 weeks	DMG approval	None	None
Actions to maintain supply	Optimising source performance	Actions to ensure sources are performing optimally	Dependent on specific actions	DMG & Director of Customer Delivery		NA – operating within licences
Actions to maintain supply	Groundwater resting	Resting key groundwater sources to preserve peak capability	Less than a week	DMG & Director of Customer Delivery	None	NA – operating within licences

Table 5: Drought management actions carried out in drought trigger 1

Category	Action description	Benefit of action/why it is appropriate	Implementation timescales	Permissions or constraints	Risks	Environmental Impacts
Actions to maintain supply	Intra-company transfers	Transfers from areas with surplus water available to those under drought stress	Less than a week	DMG & Director of Customer Delivery	Potential water quality risks associated with different sources of water transferred to different areas of the network	NA – operating within licences
Actions to maintain supply	Inter-company transfers	Investigate opportunities for new transfers of water from neighbouring companies	Dependent on whether new connections are needed	DMG & Director of Customer Delivery	Potential water quality risks associated with new sources of water	NA – operating within licences
Actions to maintain supply	Capital investment schemes	Assess opportunities for fast-tracking investment schemes	Reduction in volumes lost due to outage related to impacts of drought	DMG approval	Fast tracking schemes can disrupt investment plans set out for the AMP	NA – operating within licences

Note that the actions identified within this table are not necessarily sequential and may need to be flexible depending on the precise circumstances at the time. This may mean that some actions happen concurrently or some happen sooner than the order listed here, depending on what is most appropriate.

7.2 Our Drought Management Group

During a developing drought situation, our Drought Management Group is mobilised. The group will convene upon entering drought trigger zone 1, and if predictions indicate a potential worsening of the situation.

As well as internal drought management actions, the DMG is also responsible for wider collaboration between companies and organisations, through groups such as the National Drought Group (NDG) and Water Resources South East (WRSE). This ensures consistency and alignment of messaging, which is particularly important when droughts affect more than one company or region at the same time. It also ensures collaboration and support between companies and other organisations, to help ensure the most effective drought response.

The DMG is comprised of a core group responsible for high level decision-making, and associated sub-groups who are responsible for driving forward their respective workstreams. In addition, the DMG is responsible for reviewing performance during a drought, to ensure that actions are being managed effectively.

The management structure for this is set out in Figure 20. The frequency of DMG meetings is dictated by the water resource conditions and as a drought situation becomes more serious, the group will meet more frequently. It is expected that in drought trigger 1, the group will meet monthly, escalating in frequency until trigger 3, when the group would meet on a weekly basis.

The DMG is comprised of the following members:

Title	Role in group	Responsibilities
Director of Asset Strategy & Capital Delivery	Chair	Accountable to the CEO for the actions of the Group and for the development, maintenance, and communication of the Drought Plan. Provides updates to the Board on drought status, risks and planned actions
Senior Asset Scientist/Asset Specialist (Asset Strategy)	Group Secretary/Project Manager	Responsible for the organisation of meetings, authority of documents and co-ordination of actions of the Group
Head of Legal	Chairs Legal & Governance sub-group	Accountable to DMG Chair and responsible for the meetings and actions of their group
Head of Water Resources and Environment	Chairs Monitoring & Mitigation sub-group	Accountable to DMG Chair and responsible for the meetings and actions of their group
Director of Customer Experience and Technology	Chairs Communications sub-group	Accountable to DMG Chair and responsible for the meetings and actions of their group
Director of Customer Delivery	Chairs Operations sub-group	Accountable to DMG Chair and responsible for the meetings and actions of their group

Additional specialists may sometimes be included to carry out tasks and provide expert knowledge to inform the group when required. These will include:

- A Public Affairs Specialist, responsible for high level stakeholder engagement.
- A Customer Relations representative, responsible for considering our customers' needs when implementing our drought management actions and managing responses to customer queries regarding drought and potential temporary restrictions.
- A representative of the Wholesale Operations Service Desk, responsible for engaging with non-household retailers, to keep them informed of drought development.

Figure 20: Structure supporting the Drought Management Group

7.3 Actions to reduce demand

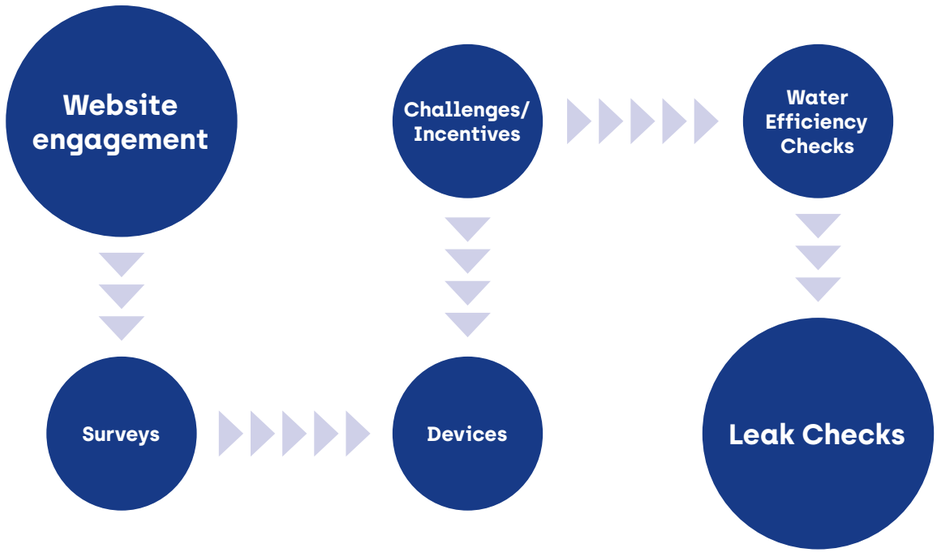
At this drought trigger we will deliver a communications and stakeholder engagement programme aimed at reducing demand and ensuring we are prepared should further drought triggers be reached.

7.3.1 Agile communications campaign – from *save 10 a day to save 20/30 a day*

The aim of our agile communications campaign is to achieve TUB level savings in advance of having to implement restrictions. We will build on the existing content developed for the environmental stress communications and expand these in a company-wide approach.

Our save 10 a day programme is outlined in Section 4.2. We propose to scale this up in the event of a drought as our primary approach to reducing demand before we need to implement TUBs. We will also bring in additional measures to the programme beyond the initial community engagement, provision of devices and online water efficiency checks.

This may include incentives to reduce demand (e.g. an investment in the local community or provision of 'green redeem' or similar points to customers). We will build on our existing reporting and review dashboard for the programme, which provides the route for agile changes in relation to statistics from each of the elements below.



We would also bring in segmentation research and target specific areas of water use, potentially with personalised targets. The household consumption demand modelling tool will help us to measure and communicate to customers how much water they have saved at the community level.

7.3.2 Stakeholder engagement

At this drought trigger we will increase our levels of stakeholder engagement to include:

- Increased contact with Defra, Environment Agency, Water UK, neighbouring water companies and new appointments and variations (NAVs[25]) to share positions and messages. Explore ways of working with other water companies and regulators to share resources to get message out, if appropriate such as through joint radio campaigns.
- Meet with appropriate stakeholders to highlight the situation and agree a Memorandum of Understanding (MOU) to share messages in the event a TUB is introduced (E.g. Local Resilience Forums, Environmental Groups, National Farmers Union, Local Authority Communications departments, housing associations, disability/vulnerability groups).
- Meet with retailers to ensure they are prepared for potential future restrictions and confirm what will be required if the water resources position continues to decline (support and provide water efficiency messaging to be shared with non-household customers if/when required).
- Meet with NAVs to ensure they understand obligations and what will be required should the water resources position continue to decline.
- A Drought Awareness Consultation will be carried out (if predictions indicate that drought trigger 2 is likely to be reached). This will prepare customers and stakeholders about the potential future need to implement a TUB, and will give them the opportunity to provide their early feedback on the restrictions.
- Question and Answer document to be updated and reissued to frontline teams to help answer customer queries.

7.3.3 Approach to wider communications and engagement

We will update our drought website to move from the environmental stress focus to wider engagement to reduce demand for water and prepare for potential introduction of TUBs. This will include:

- Regular blogs targeted at customers and stakeholders on our water resources position and feedback on demand management activities.
- Greater investment in social media linked to our demand reduction programme.
- A customer wide email and text updating them on the drought situation.
- Regular customer surveys and holding a drought focus group to take an adaptive approach to messaging and communications.

It is likely that the impacts of drought will be felt by other water companies in the South East and East of England at the same time as we are experiencing them. We will work closely with regional planning groups (WRSE and working groups) and the National Drought Group to develop a joint communications campaign and to share material and learning from experiences. This would enable collaborative messaging, a single brand for the drought and wider reach for the same advertising spend than if it were individual companies. A joint website on the drought my also provide a platform for consistent messaging on future TUBs (including exemptions) and was recommended following the 2012 drought.

7.3.4 Leakage reduction

Managing the demand for water and its impact on the environment is vital during a drought. Leakage activity plays a part in this, and can help in protecting our communities against more stringent measures and conserving water for the environment at times when it is scarce.

In the event of reaching drought trigger 1, we will do all we can to reduce leakage in areas vulnerable to the effects of drought. This would involve the items listed above in the Environmental Stress Trigger but would also include consideration of additional pressure management if necessary.

[25] New appointments and variations (NAVs) are limited companies which provide a water and/or sewerage service to customers in an area which was previously provided by the incumbent monopoly provider

7.4 Actions to protect the environment

As a drought continues to develop and we reach drought trigger 1, we would continue with our environment focused actions set out in Sections 4 and 6. This includes driving forward our sustainability reductions and river restoration programmes, as well as operational actions such as the Abstraction Incentive Mechanism (AIM) and river support schemes to support low flows.

These actions will help mitigate impacts of the drought and our actions on the environment.

7.4.1 Enhanced environmental monitoring

In addition to our extensive programme of environmental monitoring as BAU, upon reaching Drought Trigger 1 we would instigate additional monitoring to assess the impacts of the developing drought on the environment. The additional data gathered would also help us in preparation for applying for a drought permit or drought order should the drought conditions continue to worsen. Experience of drought events in our supply areas has shown that our operations are robust for a number of months of drought conditions.

We anticipate at least one season of actual drought conditions to prepare and update our Environmental Assessment Reports (EAR's). This additional monitoring would continue throughout the period of the implementation of the drought permit applications and until flows/levels have returned to normal conditions. Data collected during the recovery phase will be valuable in reviewing the Drought Plan and the Environmental Monitoring Plan ready for future drought events.

7.4.1.1 Walkover surveys

Walkover surveys are necessary to characterise the drought conditions and effects on the river. The walkover surveys will commence in drought trigger 1, preferably undertaken by both Environment Agency and Affinity Water staff, subject to agreement.

The objective of the survey will be the identification of reaches under stress, so that a more detailed environmental impact assessment can be completed at the time and immediate mitigation measurements can be implemented if needed.

7.4.1.2 Spot gauging and water quality

The monitoring schedule will comprise of business-as-usual spot gauging during drought trigger 1 (typically monthly), or more frequent spot gauging as drought conditions worsen, as set out in the Environmental Assessment Reports.

If a drought permit is in place, the post drought spot gauging frequency will depend on the speed of recovery from the drought, following agreement with the Environment Agency.

If the drought permit is not used, the post-drought spot gauging frequency will be monthly. If monthly spot gauging is already in place due to other projects, then the frequency will be increased accordingly.

The spot gauging rounds include in-situ water quality monitoring (pH, temperature, dissolved oxygen, and conductivity).

7.4.1.3 Macroinvertebrate surveys

Spring and autumn macroinvertebrate monitoring will continue throughout a drought event to ensure continuity of data sets.

7.4.1.4 Supporting monitoring data

Appendix 9 contains supporting data and enhanced monitoring schedules.

More detailed monitoring schedules that are associated with the drought permits can be found in the individual EARs, which are available to view at our offices upon request.

7.5 Actions to maintain supply

7.5.1 Optimising source performance

As we cross our drought trigger 1, we will carry out actions necessary to optimise how our sources perform, and to reduce any impacts from drought which may start to develop. The source performance assessment explained in Section 4.3.1 continues to be undertaken when we cross our drought triggers. Tracking the performance of sources against their respective DO's improves resilience during droughts by helping to identify opportunities for improving performance.
This can be achieved through operational activities or capital investment schemes. These can either be accelerated (scheduled work undertaken earlier than planned) or new (work not currently planned to be undertaken) schemes. Typically, they allow us to abstract and move water to meet demand or increase the output or reliability of our groundwater sources.

The list below provides a high-level summary of some of the opportunities for capital investment schemes that can potentially be realised from source performance tracking and identification of recommendations.

In addition to capital investment works, licence changes could be recommended. In these circumstances, we would need to prove we can achieve the increased output through a pumping test prior to preparing an application to the Environment Agency.

- Pump deepening, pump replacement or new pump installations to increase output or increase resilience.
- Recommissioning licensed borehole sources not currently in use.
- Other capital works including but not limited to borehole rehabilitation, pipework replacement, valve replacement or upgrading boosters.
- Changes in network configuration - for further maximisation during peak demand.
- Install new or additional treatment to overcome a water quality constraint.
- Software updates:
  - To set the site up in the best configuration to optimise output.
  - Upgrades - for the preferential use of a borehole(s) over another that may be less at risk at the same source.
  - Install new software – to balance pressure in the network and improve local control.

Assessment for the potential to implement or fast track schemes to mitigate drought risk will be led through the DMG. This will continue to be undertaken as a drought develops in severity, to ensure appropriate actions are taken.

When groundwater levels are low and we are following our Drought Plan, we typically increase utilisation of surface water sources and imports. This action further supports planned resting of groundwater sources to help maintain peak availability. The source performance assessment is one of the tools used to demonstrate these managed changes in source operation.

Table 6 below provides a summary of the key points associated.

Table 6: A comparison of the key points for source performance review assessment in BAU and in a drought

Business as Usual	Drought
In a normal, non-drought year, utilisation will often exceed 100% for some sources unless demand is constrained or there are planned or unplanned outages. Therefore, no comments or recommendations will be required for those sources	In a drought year, utilisation is more likely to fall under 100%. Comments will be provided to capture the reasons behind the source's underperformance and there will be a focus on recommending key actions. The actions will be assigned to appropriate team(s) to deliver
The source performance assessment is completed on a quarterly basis in both BAU and in a drought year. An annual report is also written up. The differences are in the number and types of actions recommended, and the priority assigned to them	

7.5.2 Groundwater resting

The groundwater resting assessment continues to be undertaken when we cross into our drought triggers. This will help to ensure we can continue to rely on our groundwater sources during peak periods, even when groundwater levels have reduced.

The groundwater resting assessment will be conducted on a monthly basis from early spring for as long as groundwater levels remain low, which is likely to continue through the summer and autumn months, unlike during a BAU year. The assessment is completed over several months to protect critical assets in the borehole such as an adit. An alternative to this, which has already been rolled out across a number of our groundwater sources is trimming software. The software allows the output or abstraction at a source to be controlled based on a known critical groundwater level.

Furthermore, there is also the possibility to rest sources for environmental and drought purposes, which can be done manually or through the use of trimming software.
This may include source(s) that are in catchments which are susceptible to low river flows and/or source(s) that have been affected by a lack of rainfall.

We will also consider the feasibility of increasing abstraction at a source(s) in a neighbouring catchment, that is not susceptible to low flows at the time of assessment, to maintain supply.

If the predictions at the key observation boreholes forecast the potential of entering drought trigger 2, actions will be recommended depending on the outcome of downhole camera inspection surveys (CCTV) of our boreholes under pumping conditions. We have listed the type of potential capital investment schemes that may be identified through these surveys under the source performance assessment section as example actions. Other issues related to water quality constraints may require additional treatment, so appropriate actions can be then initiated.

Table 7 below provides a comparison between the key points associated with conducting the assessment in a business as usual year and during a drought year.

Table 7: A comparison of the key points for groundwater resting assessment in BAU and during a drought

Business as Usual	Drought
• Groundwater resting assessment completed on a monthly basis from May to July inclusive	• Groundwater resting assessment completed on a monthly basis or more frequently if required
• Assessment will be completed and sources will be rested in early spring in preparation for peak demand in order to safeguard it for public water supply • Only specific sources will be considered for resting and it will be done to reserve peak capability at the time	• Assessment will be completed and sources will be rested in early spring in preparation for peak demand. The assessment will continue throughout the year whilst groundwater levels remain low. Trimming software would be considered as an alternative to control output at a source • During a drought year, we may be able to rest vulnerable sources for environmental and drought purposes. Resting may have to wait until after the peak demand period has gone
	• Further actions will be recommended when the drought is fully developed with predictions at the key observation boreholes which suggest reaching drought trigger 3

7.5.3 Intra and inter-company transfers

Transfers of water between and within companies provide opportunities to move water from areas with surplus water to those which may otherwise experience a supply deficit, which is particularly useful during drought events when water resources are impacted.

We have agreements in place with companies with whom we have existing transfer arrangements, which set out the expectations for how the transfers would operate during a drought. In the event of crossing drought trigger 1 we would be working closely with these companies to ensure that the arrangements remain effective, and to identify any risks which could arise as a result of the drought. We are also in the process of discussing potential new transfer options with our neighbouring water companies, and three examples of these are provided in Table 8 below.

We are planning to enhance our inter-Water Resource Zone transfer capabilities through the implementation of the first stage of the 'Supply 2040' initiative.

Whilst part of this represents a straightforward enhancement of the transfer from WRZ6 to WRZ4, it also requires improvements to the interaction between our ARKL hydraulic zone and the NORM treatment works within WRZ4. We will therefore carry out tests on the operation of this element of the schemes during the initial stages of the drought (once drought trigger 1 has been passed) to ensure we can fully utilise the transfer capability.

During the 2017-2019 drought event, we carried out a comprehensive review of additional capital investment options which would be deliverable in a timeframe which would enable improvements to drought resilience during that event, should it have continued to worsen. We shortlisted and categorised all of the viable options that we identified as a result of that event, and we consider that there are no further options that would be open to us at this point in time without considerable investment with longer lead in times, similar to long term supply demand balance schemes included in our WRMP.

Table 8: Potential new transfer schemes to be implemented in a drought

Transfer company	Transfer scheme	Deployable output	Location	Risks or constraints	Comments
Anglian Water	Transfer supported by an Anglian group licence previously used for augmentation of the River Pant	To be confirmed	WRZ5	New connection required	Discussions with Anglian Water are ongoing to agree next steps in the development of this option
Thames Water	MILH Reservoir Connection	To be confirmed	WRZ4	Only available if Thames Water is not experiencing a drought	Resilience transfer option – further discussion with Thames Water required
Thames Water	WALT Treatment Works connection	To be confirmed	WRZ4	Only available if Thames Water is not experiencing a drought	Resilience transfer option – further discussion with Thames Water required

7.5.4 Capital investment supply schemes

Through our WRMP and Business Planning process we set out programmes of investment to improve resilience and ensure we are able to meet our supply demand balance in the long term. In some instances, it is possible to identify schemes which could be brought forward or 'fast-tracked', in order to improve resilience during a drought event.

As with our transfers, we carried out a thorough review of all of the potential opportunities for increasing our supply capability as a result of capital investment schemes during the 2017-2019 drought. All of the options achievable in the short term were implemented at that time, and were primarily aimed at ensuring our stated 'water available for use' (WAFU), as described in the WRMP, could be deployed. These options were successful in ensuring that we were able to manage the impacts of the 2017-2019 drought event without any failures in supply.

There are a number of remaining capital schemes that were identified during that review that could be implemented if we pass through drought trigger 1 in future events. Most of these represent operational improvements that help with flexibility but ultimately do not improve the supply/demand situation.

Two schemes, at BOWR and BALD, would allow us to abstract more groundwater within licence, but under prolonged drought conditions both sources become hydrogeologically constrained, so this only increases capability during lesser drought events.

The 'accelerated capital investment' programme therefore includes the following items with associated timing:

- When drought trigger 1 is reached we would examine any current causes of outage due to drought impacts, to determine if there are any planned or new 'asset health' schemes that can be brought forward to reduce the level of outage. See potential options under the Optimising Source Performance section.
- When drought trigger 2 is breached we would examine the potential for implementing the transfers identified in the previous section. We would begin planning and mobilisation of the WHIH scheme, running parallel to preparation of the drought permit application for this source.
- When drought trigger 3 is breached we would expect to be well underway with the WHIH scheme and carry out the activities required to complete and commission the works.

There can be risks associated with accelerating or fast-tracking investment schemes. These are usually associated with the fact that investment options are carefully planned and could impact on other programmes within the planning framework.

Affinity Water

8 Drought Trigger 2

This section explains the actions we would take when we reach drought trigger 2, as well as continuing those actions implemented in Environmental Stress and drought trigger 1. We prioritise actions that enable a reduction in demand. We do this first to ensure that we mitigate any need to call upon stronger measures to manage the prevailing conditions.

8.1 Introduction

Reaching drought trigger 2 will reflect a worsening drought situation and increasing risk. The impacts would be felt in the environment with flows in chalk streams noticeably declining, and upper reaches remaining dry. The middle reaches of some of the chalk streams in our region would also appear dry at this stage in a drought, due to the low groundwater levels.

This would have environmental implications, particularly for aquatic species such as fish and macroinvertebrates. Actions in this trigger zone are intended to reduce impacts of drought on the environment where possible, as well as engaging with our customers around the developing drought situation. We are likely to need to implement temporary use ban (TUB) restrictions, although this will depend on the time of year. The actions set out under the Environmental Stress trigger will be kept under review and will continue as appropriate through the development of a drought, to ensure we can mitigate impacts on the environment where possible.

Table 9 provides a summary of the actions which would be carried out when we reach drought trigger 2.

Further information on how these actions are carried out is provided in this section.

Table 9: Drought management actions carried out in drought trigger 2

Category	Action description	Benefit of action/why it is appropriate	Implementation timescales	Permissions or constraints	Risks	Environmental Impacts
Actions to reduce demand	Enhanced communications	Appeal to customers to voluntarily reduce demand	2-3 weeks to develop material and agree messaging	DMG & Marketing and Customer Experience approval	Potential confusion for customers if messages are not clear and consistent	Reductions in demand will help to leave more water in the environment
Actions to reduce demand	Stakeholder engagement	Make stakeholders aware of drought situation, and gain support for water efficiency messaging	1-2 weeks to agree messaging	DMG & Corporate Affairs approval	None	NA
Actions to reduce demand	Enhanced leakage reduction	Volume saved to be confirmed, as this will depend on the amount of leakage at the time of reaching trigger	To be confirmed	DMG & Head of Leakage approval	Changing leakage strategy or bringing in additional teams may have implications for resource allocation across the business	NA
Actions to reduce demand	Temporary use bans (TUBs)	Restricting certain uses of hosepipes for domestic use – expected demand saving of 3%*	Approximately 3 weeks	DMG approval	Potential confusion for customers if neighbouring companies do not implement TUBs. Potential impacts on businesses which rely on hosepipe use for non-essential activities	Reductions in demand will help to leave more water in the environment
Environmental actions	Continuation of actions from Environmental Stress and drought trigger 1	Mitigating impacts of drought on the environment	Continuation from previous trigger	NA	See Table 3	Positive impacts on environment
Environmental actions	Enhanced environmental monitoring	Provides baseline monitoring data for drought permits and enhances understanding of drought impacts on the environment	1-2 weeks	DMG approval	None	None
Actions to maintain supply	Continuation of supply side actions from drought trigger 1	See Table 5	Dependent on specific actions	See Table 5	See Table 5	NA – operating within licences
Actions to maintain supply	Managing outage	Minimising planned outage where possible, to ensure as much water in the system as possible	Approximately 2 weeks	DMG & Director of Customer Delivery approval	Potential risks associated with delaying routine maintenance of assets	NA – operating within licences
Actions to maintain supply	Preparation of drought permit applications	No immediate benefit – preparation stage	1-6 months depending on chosen drought permits	DMG approval to begin drought permit preparation	TBC	Assessed as part of environmental assessment reports

Note that the actions identified within this table are not necessarily sequential and may need to be flexible depending on the precise circumstances at the time. This may mean that some actions happen concurrently or some happen sooner than the order listed here, depending on what is most appropriate.

*The expected demand savings as a result of implementation of TUBs is being assessed as part of an ongoing WRSE project, and this information will be updated when the study is complete.

8.2 Actions to reduce demand

8.2.1 Engaging and communicating with customers

The existing agile communications approach will continue but be supported with new communications to explain the potential introduction of TUBs.

- Customer wide email and text message campaign to inform customers that a Temporary Usage Ban is likely to be put in place – signposting to dedicated webpage.
- Adaptive messaging on appropriate Business as Usual customer letters to raise awareness that a TUB is planned or is in place. This includes bills or notification of planned works.
- Paid for social media announcement to raise awareness of upcoming restrictions.
- Organic social media content to raise awareness of TUB and water saving.
- Business as Usual water efficiency campaigns to include TUB message, to help prepare customers for TUBs to be implemented.
- Arrange further meetings with retailers around future restrictions so they are fully versed in implications for their customers and how these will need to be managed.
- Vulnerable customers would be given a period of grace–specific communications will be developed for these customers.
- Communications for vulnerable customers will also be coordinated with vulnerable/ disability groups.

8.2.2 Stakeholder engagement

- If the drought affects neighbouring companies as well as us, Water UK will appoint a Drought Liaison Coordinator to act as industry spokesperson – their role is presented in Figure 21.
- Produce guidance and Q&A's for retailers and NAVs to ensure their frontline staff are fully briefed on the situation.
- Email communications to stakeholders to highlight introduction of TUBs and call to action to help share messages.
- Communications about potential implementation of temporary restrictions will include clear information about which activities are restricted and those which are exempt, to ensure stakeholders and businesses have a full understanding of what the restrictions mean for them.
- Retailers and NAVs will be advised in advance of impending restrictions to allow time to prepare teams, update websites and communicate with their customers (especially those who will be affected by the restrictions).
- Communications will be sent out to prepare customers for the possibility of a TUB before this is implemented.
- Before a TUB is launched, news releases will be sent to local media and local politicians will be briefed.
- Public Notice of TUB in national and local media will be posted as per regulatory requirement.
- If widespread, the drought will likely be a national media story, the External Communications Team will provide reactive and proactive media management to maximise awareness, education and maintain customer confidence.
- Working with retailers to produce focused messaging towards non-household water users will take place. This will include notice of further potential restrictions should water resources position worsen as these will have greater significance on non-household customers. We will offer to provide dual-branded communications for retailers to share with their customers, to avoid confusion and ensure clarity of messaging.

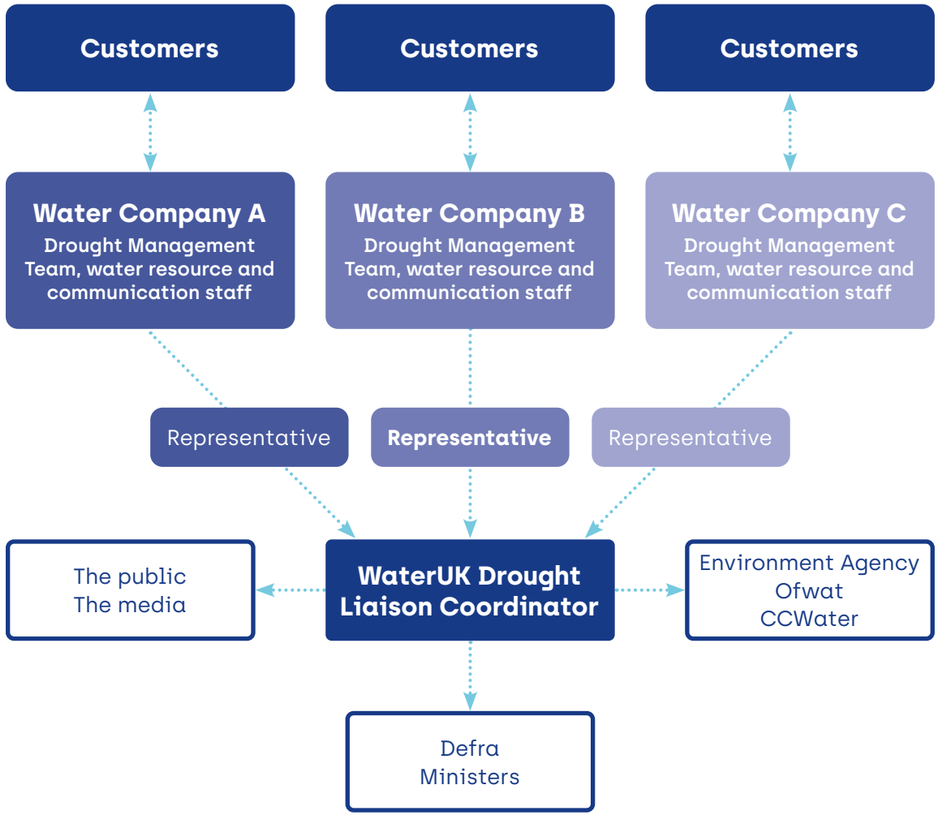


Figure 21: The role of a Drought Liaison Coordinator in droughts which span more than one water company area, as presented in the UKWIR Code of Practice[26]

[26] UKWIR, 2014, Managing through drought: Code of practice and guidance for water companies on water use restrictions – 2013 (incorporating lessons from the 2011-12 drought). 14/WR/33/6.

8.2.3 Temporary Use Bans

Temporary bans on water use are an important demand management measure that water companies can use to reduce demand during a drought. They not only enable us to maintain essential supplies but also help to conserve water resources for later in a drought and reduce the environmental impacts of abstraction during this critical period. We support the principles and actions set out in the Code of Practice and Guidance for Water Companies on Water Use Restrictions – 2013 published by UKWIR. Should circumstances require that we depart from the Code of Practice, we will explain the reasons for this. This document is currently being updated following the introduction of TUB's by several water companies in 2022.

The introduction of these restrictions is considered proportionate to the risks associated with a worsening drought, and these align with our levels of service (see Section 3.3). The Water Use (Temporary Bans) Order 2010 provides detailed definitions of uses, exemptions and conditions in relation to these powers, and these are set out in Appendix 6.

The use of TUBs as a method of demand reduction is considered to be most effective during Spring and Summer months, and it is unlikely that we would implement a TUB outside of those periods.

It is important that when introducing restrictions, we balance the need for water savings against potential adverse impacts on our customers and businesses. This has been considered in our Drought Plan both through the sequencing of drought actions, and also in how they are introduced, in this case through the consideration of what exceptions should be associated with TUB restrictions (see Section 8.2.3.5).

A media campaign would be regularly reinforced during a TUB, outlining clear messages and educating customers that restrictions are remaining in place, despite rainfall events, if necessary.

The activities that would be restricted by the implementation of TUBs are shown in Table 10.

Table 10: Summary of activities which can be restricted through temporary use bans

Drought trigger 2 – All 11 Temporary Use Ban measures to be introduced in single phase
• Watering a garden* using a hosepipe
• Cleaning a private motor-vehicle using a hosepipe
• Watering plants on domestic or other non-commercial premises using a hosepipe
• Cleaning a private leisure boat using a hosepipe
• Filling or maintaining a domestic swimming or paddling pool
• Drawing water, using a hosepipe, for domestic recreational use
• Filling or maintaining a domestic pond using a hosepipe; and
• Filling or maintaining an ornamental fountain
• Cleaning walls, or windows, of domestic premises using a hosepipe
• Cleaning paths or patios using a hosepipe
• Cleaning other artificial outdoor surfaces using a hosepipe

* The definition of a 'garden' has been widened to include: a park; gardens open to the public; a lawn; a grass verge; an area of grass used for sport or recreation; an allotment garden; any area of an allotment used for non-commercial purposes; any other green space. It does not include: agricultural land; other land used in the course of a business for the purposes of growing, for sale or commercial use, any crops, fruit, vegetables or other plants; land used for the purposes of a National Plant Collection; a temporary garden or flower display; plants (including plant organs, seeds, crops and trees) which are in an outdoor pot or in the ground, under cover.

Crossing into drought trigger 2 will not automatically result in us implementing a temporary use ban; rather it depends on the water supply position and the overall conditions being experienced during the drought. We may choose to delay the imposition of restrictions until a more appropriate time. For instance, if drought trigger 2 was not reached until late summer or autumn and then tracked the trigger level, either slightly above or below, we would not aim to impose restrictions until the spring of the following year.

It is accepted within the water industry that implementing a temporary use ban in autumn or winter would result in minimal demand savings, and waiting until the following spring is more effective for bringing about reductions in demand.

In that situation we would review the position in January and then again in April, when the recharge season has ended.

We appreciate the confusion that can be caused among customers when one company introduces restrictions, but its neighbouring company does not. Where appropriate we would work with our neighbouring companies to implement restrictions in a consistent manner. With this in mind, a Drought Liaison Coordinator will be appointed by Water UK, and their role will be to act as an industry spokesperson. Their role will be to act as a coordinator in liaising with interest groups during a period of drought management, to ensure consistency of public messages.

Before any restrictions are implemented under these new provisions, we will provide the opportunity for representations to be made. The process that we would follow to implement the restrictions are detailed in the following sections.

8.2.3.1 Publicity requirements

Before applying any restrictions, we will:

- Publish a notice on our company website at the same time as we publish a notice in two newspapers circulating in the affected areas
- Provide details in the notice of how to make representations about proposed restriction and exceptions
- Give notice each time the scope of any restriction is altered
- Give notice in relation to the lifting of any restriction on the website and in two newspapers circulating in the affected areas

8.2.3.2 Making representations

Before any restrictions are implemented, we will provide the opportunity for representations to be made. This will be done in line with the requirements set out in Section 76B of the Water Industry Act (WIA) 1991.

We will allow at least two weeks for representations to be made in the first instance and one week for any subsequent notices or changes in the restrictions or the exceptions. Those seeking to make a representation will be able to do so by completing and returning a representation form.

8.2.3.3 Handling representations

Representations received into the business will be collected and reviewed on a weekly basis. A panel of members from the Drought Management Group (DMG) (described in Section 7.2) will convene to discuss the outcome of representations with responses proposed for approval by the DMG. A final decision will be made by these representatives on any action to be taken as a result of the representations. Representations will be considered on an individual basis and as a whole. Exceptions from restrictions will not be granted on a case by case basis unless provision is made in the public notice. There will be no appeal process if the application for a concession or exception is denied.

[27] UKWIR, 2013, Managing through drought: Code of practice and guidance for water companies on water use restrictions – 2013 (incorporating lessons from the 2011-12 drought). 14/WR/33/6.

8.2.3.4 Implementation of restrictions

Water companies have the flexibility to prioritise and sequence different categories of restriction, which could lead to the implementation of restriction on different activities at different times. We believe this could cause confusion among customers and would be difficult to consult upon. Instead, a single phase in which all eleven activities are simultaneously banned at the start of the Temporary Use Ban is felt to be the clearest implementation policy. The activities that could be restricted under this measure are identified above in Table 10. We are aware that the complexity of the restrictions has the potential to be confusing. We will endeavour to minimise confusion by informing our customers on what the restrictions are and what they mean. Following the consultation period outlined above we would publish our statement of response on our website, outlining how we have responded to representations.

We feel that by imposing the full use of powers immediately, we maximise the benefit of the restrictions and ensure resources remain within our ability to supply customers. This also sends out a strong and clear message to customers that the situation is becoming more serious. Restrictions would be imposed for the minimum period required and would be lifted with immediate effect once the situation has recovered. Whilst there will be a lead in time for the implementation of restrictions to allow for representations, there is no such lead in time necessary for the revocation of restrictions; the lifting of a ban will take effect as soon as notice is given.

8.2.3.5 Exceptions

Table 11 provides details of activities which are likely to be exempt from the TUB restrictions. These have been informed by the Statutory Exceptions set out in the legislation and Discretionary Universal Exceptions as agreed as part of the UKWIR Code of Practice[27]. These have been agreed by the Water Resources South East Group, to help ensure there is no confusion for customers if multiple companies impose TUB restrictions at the same time.
The exceptions have been set out to minimise impacts on businesses where possible. Where other exceptions are proposed, we will state this in our public notice. No compensation will be awarded in the event of a TUB being implemented.

Table 11: Temporary Use Ban exceptions

TUB Category	Exception	Notes
1. Watering a garden using a hosepipe	1. Using a hosepipe to water a garden for health and safety reasons 2. To Blue Badge holders on the grounds of disability and customers on the company's priority service register who have mobility issues but who are not in possession of a blue badge 3. Use of an approved drip or trickle irrigation system fitted with a pressure reducing valve and timer 4. To water newly laid turf for the first 28 days	An area of grass used for sport or recreation is included in the definition of a garden. This exception would only apply to the active strip/ playing area, and not the entire ground. The remaining ground can still be watered using other methods
2. Cleaning a private-motor-vehicle using a hosepipe	1. To Blue Badge holders on the grounds of disability and customers on the company's priority service register who have mobility issues but who are not in possession of a blue badge 2. Use of a hosepipe in the course of a business to clean private motor vehicles where this is done as a service to customers	A private motor-vehicle' does not include (1) a public service vehicle, as defined in section 1 of the Public Passenger Vehicles Act 1981 (c), and (2) a goods vehicle, as defined in section 192 of the Road Traffic Act 1988(d)
3. Watering plants on domestic or other non-commercial premises using a hosepipe	1. To Blue Badge holders on the grounds of disability and customers on the company's priority service register who have mobility issues but who are not in possession of a blue badge 2. Use of an approved drip or trickle irrigation system fitted with a pressure reducing valve and timer 3. To water newly laid turf for the first 28 days	This does not include watering plants that are (1) grown or kept for sale or commercial use, or (2) that are part of a National Plant Collection or temporary garden or flower display
4. Cleaning a private leisure boat using a hosepipe	1. Cleaning any area of a private leisure boat which, except for doors and windows, is enclosed by a roof and walls. 2. Using a hosepipe to clean a private leisure boat for health or safety reasons 3. Commercial cleaning 4. Vessels of primary residence 5. Cases where fouling is causing increased fuel consumption 6. Engines designed to be cleaned with a hosepipe 7. To prevent or control the spread of non-native and/or invasive species	
5. Filling or maintaining a domestic swimming or paddling pool	1. Where necessary in the course of its construction 2. Using a hand-held container which is filled with water drawn directly from a tap 3. That is designed, constructed, or adapted for use in the course of a programme of medical treatment 4. Used for the purpose of decontaminating animals from infections or disease 5. Used in the course of a programme of veterinary treatment 6. In which fish or other aquatic animals are being reared or kept in captivity	
6. Drawing water, using a hosepipe, for domestic recreational use	None	
7. Filling or maintaining a domestic pond using a hosepipe; and	1. Filling or maintaining a domestic pond in which fish or other aquatic animals are being reared or kept in captivity 2. Blue badge holders on the grounds of disability and customers on the company's priority service register who have mobility issues but who are not in possession of a blue badge	
8. Filling or maintaining an ornamental fountain	1. Filling or maintaining an ornamental fountain which is in or near a fishpond and whose purpose is to supply sufficient oxygen to the water in the pond in order to keep the fish healthy 2. To operate water features with religious significance	
9. Cleaning walls, or windows, of domestic premises using a hosepipe	1. Using a hosepipe to clean the walls or windows of a domestic premises for health or safety reasons 2. To Blue Badge holders on the grounds of disability and customers on the company's priority service register who have mobility issues but who are not in possession of a blue badge 3. Commercial cleaning	1. The use of water-fed poles for window cleaning at height is permitted under H&S statutory exception 2. The restrictions do not apply where cleaning apparatus is not connected to mains supply
10. Cleaning paths or patios using a hosepipe	1. Using a hosepipe to clean paths or patios for health or safety reasons 2. To Blue Badge holders on the grounds of disability 3. Commercial cleaning	
11. Cleaning other artificial outdoor surfaces using a hosepipe	1. Using a hosepipe to clean an artificial outdoor surface for health or safety reasons 2. To Blue Badge holders on the grounds of disability and customers on the company's priority service register who have mobility issues but who are not in possession of a blue badge 3. Commercial cleaning	1. The use of water-fed poles for window cleaning at height is permitted under H&S statutory exception 2. The restrictions do not apply where cleaning apparatus is not connected to mains supply

8.2.3 Temporary Use Bans

8.2.3.6 Enforcement
We will publish our policy on enforcement by the date that restrictions come into effect.

8.2.3.7 Adjustment to charges
We do not make an additional charge for water used for any of the restricted uses so no reduction in charges would apply in the event of a temporary use ban.

8.2.3.8 Monitoring and review of temporary restrictions
We will monitor the effectiveness of a TUB through demand monitoring methods as described in Section 12.2. A post implementation review of the impacts and demand savings of these restrictions will be completed after a drought period.

Construction of bypass channel on the River Beane

8.3 Actions to protect the environment

As a drought continues to develop and we reach drought trigger 2, we would continue with the environment focused actions as set out in Sections 4.3 and 6. This includes driving forward our sustainability reductions and river restoration programmes, as well as operational mitigation actions such as the Abstraction Incentive Mechanism (AIM) and river support schemes.

8.4 Actions to maintain supply

We will continue to carry out the operational actions implemented during drought trigger 1, with our DMG driving forward accelerated capital investment schemes to maintain supply, as well as working to identify additional further opportunities as the drought progresses. Ongoing drought management supply actions would include groundwater resting and regular source performance assessments, and the frequency of these would increase as necessary as a drought situation becomes more serious.

8.4.1 Managing outage
For the supply side of our operations, a key drought intervention is to make sure that we have as much of our operational abstraction and treatment capacity available as possible during the critical drought period. A number of our routine maintenance and asset improvement operations require planned outages, which means that specific production sites are shut down temporarily so the scheme can be implemented. The programme for these is planned out in advance, and can be changed if necessary.

These shutdowns are carefully managed as part of our BAU operations and do not cause issues in supply when water resources are at normal levels. As we enter a drought situation and water becomes more scarce, we aim to reduce any temporary reductions in supply caused by outage. This means we will use the lead in time through trigger zones 1 and 2 to change our planned shutdown regime so that we defer any planned outages unless absolutely necessary, to minimise volumes lost at production sites.

It is also possible to experience unplanned outage, which can occur due to a number of reasons, such as water quality issues, power failures or mains bursts. We have carried out a full review of options which would mitigate unplanned losses of supply, and we implemented all of the available schemes at the time during the 2017-2019 drought event, so any further opportunities are limited. However, we have a philosophy of continuous improvement to enhance and optimise utilisation and will review opportunities for this on an enhanced basis during drought conditions.

Water quality can become a significant constraint on source capability during low groundwater level periods at some of our sources. Temporary treatment could be considered under serious drought circumstances to minimise water quality outages. These could also support drought permit and order sites if required.

8.4.2 Drought permit preparation
When groundwater levels approach drought trigger 3, consideration will be given to applying for drought permits in order to maintain supply.

The drought planning guidance is clear that applying for a drought permit should be viewed as a last resort and that as a prerequisite, all possible demand side and lower impact supply side actions must have been implemented.

This includes potential capital investment schemes, which may offer an 'unlocking' of previously unavailable water to different areas of our network. The regular source performance assessment forms part of the evidence requirements to demonstrate maximum achievable yield, within the constraints of source DO's and outage.

Preparations for potential application for drought permits would be implemented if water resource forecasts indicate the potential to cross drought trigger 3. This would involve regular liaison with the Environment Agency and collecting of operational and environmental data required to support a drought permit application.

The list of our potential drought permits options is provided in Section 9.4.

Affinity Water

9 Drought Trigger 3

This section explains the additional actions we would take when we reach drought trigger 3. As with earlier triggers, we prioritise actions that help us to suppress demand so that we can reduce the likelihood for the need for stronger action such as supply side measures.

9.1 Introduction

Reaching drought trigger 3 will mean we are in a significant drought situation. River flows are likely to be very low, with many reaches completely dry.

This would have serious implications for ecological populations and recovery from this will take some time. Actions in this trigger zone are intended to reduce risks to supply caused by the drought.

We will actively and extensively engage with our customers and stakeholders to ensure they are aware of the seriousness of the situation and will keep them updated regularly. The actions set out under the Environmental Stress trigger will be kept under review and will continue as appropriate through the development of a drought, to ensure we can mitigate impacts on the environment where possible.

We are likely to need to implement non-essential use bans in addition to the temporary use ban restrictions on our customers, although this will also depend on the time of year and any associated potential savings.

Table 12 provides a summary of the actions which would be carried out when we reach drought trigger 3.

Further information on how these actions are carried out is provided in this section.

Table 12: Drought management actions carried out in drought trigger 3

Category	Action description	Benefit of action/why it is appropriate	Implementation timescales	Permissions or constraints	Risks	Environmental Impacts
Actions to reduce demand	Enhanced communications	Appeal to customers to voluntarily reduce demand	2-3 weeks to develop material and agree messaging	Drought Management Group (DMG) & Marketing and Customer Experience approval	Potential confusion for customers if messages are not clear and consistent	Reductions in demand will help to leave more water in the environment
Actions to reduce demand	Stakeholder engagement	Make stakeholders aware of drought situation, and gain support for water efficiency messaging	1-2 weeks to agree messaging	DMG & Corporate Affairs approval	None	NA
Actions to reduce demand	Enhanced leakage reduction	Volume saved to be confirmed, as this will depend on the amount of leakage at the time of reaching trigger	To be confirmed	DMG & Head of Leakage approval	Changing leakage strategy or bringing in additional teams may have implications for resource allocation across the business	NA
Actions to reduce demand	Continuation of temporary use bans (TUBs)	Restricting certain uses of hosepipes for domestic use – expected demand saving of 3%	Approximately 3 weeks	DMG approval	Potential confusion for customers if neighbouring companies do not implement TUBs	Reductions in demand will help to leave more water in the environment
Actions to reduce demand	Drought orders restricting non-essential use (non-essentia use bans)	Restricting certain uses of hosepipes for domestic and non-household use – expected demand saving of approximately 5%*	Approximately 3 weeks	DMG approval. Approval from Secretary of State	Potential confusion for customers if neighbouring companies do not implement NEUBs. Potential impacts on businesses which rely on hosepipe use for non-essential activities	Reductions in demand will help to leave more water in the environment
Environmental actions	Continuation of actions from non-drought, Environmental Stress and drought trigger 1 and 2	Mitigating impacts of drought on the environment	Continuation from previous trigger	NA	See Section 4.3 and Table 3	Positive impacts on environment
Actions to maintain supply	Continuation of supply side actions from drought trigger 1	See Table 5	Dependent on specific actions	See Table 5	See Table 5	NA – operating within licences
Actions to maintain supply	Managing outage	Minimising planned outage where possible, to ensure as much water in the system as possible	Approximately 2 weeks	Director of Customer Delivery	Potential risks associated with delaying routine maintenance of assets	NA – operating within licences
Actions to maintain supply	Implement drought permits and/or drought orders	Up to 48.52 Ml/d	1-6 months depending on drought permit site	DMG approval. Approval from Environment Agency required	TBC	Assessed as part of environmental assessment reports

Note that the actions identified within this table are not necessarily sequential and may need to be flexible depending on the precise circumstances at the time. This may mean that some actions happen concurrently or some happen sooner than the order listed here, depending on what is most appropriate.

*The expected demand savings as a result of implementation of NEUBs is being assessed as part of an ongoing WRSE project, and this information will be updated when the study is completed

9.2 Actions to reduce demand

As with during previous drought triggers, our communications during drought trigger 3 will be focused on reducing demand. Key demand side actions associated with Drought Trigger 3 are:

- Communicating with our customers about what we are doing to manage the ongoing drought situation, including:
  - Continuing to review and implement investment opportunities to manage the serious water resource position being experienced.
  - Applying for and implementing drought permits and orders to increase abstraction or decrease augmentation.
  - Implementing ordinary drought orders to temporarily restrict non-essential use of hosepipes.

- Communicating with our customers about the deteriorating water resource situation, and prediction forecasts under different rainfall scenarios.

Following reaching drought trigger 3, all drought trigger 1 and 2 activities will continue and will be supplemented with:

- Notices to be sent to the appropriate bodies to advise that we are applying for drought permits, if this is the case.

- Stakeholder contact, particularly with interest groups, will be increased and planned to assist with a worsening drought situation. Communications will explain the need for more stringent actions and drought permits to reduce the likelihood of objections to applications.

- As part of the drought permit application process, notices will be published in local and national media as per regulatory requirements. In the event that our applications are not successful we will continue to work with stakeholders as we proceed with drought order applications.

If any representations are received before or as part of our application for a drought permit, these will be considered and responded to by our DMG. If an objection is made and an agreement cannot be reached between us and the objector, a public hearing will be held to resolve the issue.

9.2.1 Non-essential use bans

Non-essential use bans are a form of temporary restriction on water use by our customers, for which we must apply to the Secretary of State for a drought order (this is known as a demand-side drought order).

Ordinary drought orders under the Water Resources Act (WRA) 1991 can be sought by a water company to restrict the use of water for those categories set out in the Drought Direction 2011.

These categories are identified in Table 13. In addition to domestic customers, these restrictions would also affect commercial customers and businesses.

Table 13: Summary of activities restricted by drought orders

All 10 drought order (DD11) measures to be introduced in single phase
• Watering outdoor plants on commercial premises
• Filling or maintaining a non-domestic swimming or paddling pool
• Filling or maintaining a pond
• Cleaning non-domestic premises
• Cleaning a window of a non-domestic building
• Operating a mechanical vehicle-washer
• Cleaning any vehicle, boat, aircraft, or railway rolling stock
• Cleaning industrial plant
• Suppressing dust
• Operating cisterns in any building that is unoccupied or closed

We would not introduce the measures given in the Drought Direction 2011 if the water situation were not becoming demonstrably very serious. We consider that a straightforward total ban without phasing of implementation not only sends a clear message underlining the severity, but also maximises water savings and is easier to communicate and administer. Statutory health and safety exceptions apply to some categories as set out in the Direction, as well as some discretionary exceptions. Note this includes an exception for plants which are grown or kept for sale or commercial use (such as agricultural crops). We have worked with other companies to ensure our discretionary exceptions are aligned. The detailed definitions of restrictions and full lists of exceptions are set out in Appendix 6. The process of representations would also be consistent with that outlined in Section 8.2.3.3. In the unlikely event of the need to apply for an emergency drought order, such an approach would stand us in good stead for an application.

Before submitting an ordinary drought order application, we would discuss the need for such a measure with Defra as well as the Environment Agency.

Within the application process, the principal document submitted to Defra is the 'Statement of Reasons', which presents our case for seeking authorisation to implement these restrictions. This report would explain, in detail, why and how the exceptional shortage of rainfall is likely to lead to a serious deficiency in water supply.

Following our application, if any objections are received, the Secretary of State would hold a local inquiry or hearing unless they consider that the drought order must be made urgently. This could be a lengthy process and experience from the 2006 drought, when four water companies applied for drought orders, showed that the process from first advertising the intention to apply for a drought order to receiving notice of the order took around three months.

This period of time would be taken into account when planning when to apply for any required drought orders, as well as consideration of the time of year, which will influence implementation timings.

9.3 Actions to protect the environment

As a drought continues to develop and we reach drought trigger 3, we would continue with the environment focused actions as set out in earlier sections.

This includes driving forward our sustainability reductions and river restoration programmes, as well as operational mitigation actions such as the Abstraction Incentive Mechanism (AIM) and river support schemes. If we need to use drought permits, there are also actions associated with mitigating the environmental impacts of these. These mitigation actions are set out in the associated drought permit environmental assessment reports (EARs), which are summarised in Appendix 8.

9.4 Actions to maintain supply

During this stage of a drought we would continue to implement the supply side actions described above. In addition, we would seek to apply for drought permits, which would help to ensure we are able to maintain supply despite the worsening drought situation. We would only consider the option of applying for drought permits once a drought has become serious, and after we have reduced demand through voluntary demand reductions, TUBs, and leakage reduction.

9.4.1 Drought permits

Drought permits are an option available to water companies during serious (drought trigger 3 or greater) drought events. They provide us with an additional source of water once available demand-side options have been exhausted (i.e. through actions such as enhanced communications, TUBs, and leakage reduction). We would plan to implement NEUBs around the same time as drought permits. We will monitor the benefits of these actions using innovative approaches as described in Section 12.2, to demonstrate that we have reduced demand before applying for a drought permit. In the lead up to submission of an application for a drought permit, we will carry out significant engagement with the Environment Agency and Natural England. This will be carried out both through the pre-application process and throughout the escalation of other drought actions as appropriate.

Due to the potential for environmental impacts, the decision to use drought permits is not taken lightly, and we have not needed to use them in any of our three regions before. As described in Appendix 4 (Worked Examples), by accelerating capital delivery schemes in earlier stages of drought, we will increase transfers with neighbouring water companies where possible, achieve the highest possible outputs from our groundwater and surface water sources and optimise the mobility of water within our network. These actions will help to ensure that the use of drought permits really is the last resort. They remain, however, a key part of our mitigation planning for serious drought events, something which is acknowledged in the planning guidance. It is important to note that all of our drought permits are groundwater sources, which means we do not abstract directly from any surface water sources at our drought permit sites.

The level of resilience and volumes required through our selection of drought permits is driven by modelling for our WRMP19. This indicates that we need to be able to draw upon 26.29 Ml/d from drought permit sources to be resilient to a drought event with up to a 1:200 year return period in the year 2022-2023.

The impacts of these, more serious drought events, are uncertain and this uncertainty is compounded by the increase in demand which we have seen in relation to recent warm years and, in particular, the impacts of Covid-19. Whilst this is still emerging and the assessment of potential long term impacts is still being carried out, it is likely that the background demand patterns will continue to be higher than those which were modelled for our WRMP19 for some time.

As a result of these uncertainties we have identified and included a further 20Ml/d of drought permits within this Drought Plan. As indicated below, we have separated our permits for our Central region into two categories, and increased the potential frequency of application to between 1 in 40 and 1 in 100 years for the Category 1 drought permits. In real terms, this means that we would be resilient to droughts well into drought trigger 3 as defined by groundwater levels at the Lilley Bottom key well, or to put it another way, a drought event more severe than that experienced in 1997, before we would need to apply for any of the drought permits that we have identified.

Due to the implementation of demand management, capital investment and leakage reduction measures through AMP7, the modeled volume of drought permits required to provide resilience under our design drought event (the severity of drought event modelled as part of our WRMP19 work) decreases year on year, as shown in Table 14. This cumulates with planned completion of the Sundon conditioning plant in the last year of AMP7, beyond which, modeling suggests that drought permits will not be required for a 1 in 200 year drought event. For more extreme drought events, drought permits will still be required.

Table 14: Progression of drought permit volumes needed through AMP7 (as per WRMP 19)

	2020-21	2021-22	2022-23	2023-24	2024-25
Total DP Volume - Central (Ml/d)	**70.38**	**56.02**	**26.29**	**9.04**	**0.00**

New drought plan active

9.4.2 Overview of drought permit screening process

An in-depth screening process was undertaken to select our drought permit sites, taking into account both environmental and operational considerations.

An important factor was that the chosen sites would be operationally ready to produce the permitted volume within six months of being required by the start of this plan (2023), whilst preference was given to less environmentally sensitive permit sites.

Recent experiences and learning from investigations were factored into the decision-making process.

For more information, please see Appendix 7.

A further drought permit assessment process has also been carried out in the form of a Strategic Environmental Assessment (SEA). This took a two-phased approach, the first of which was to carry out a preliminary assessment of the unconstrained list of options which had been considered for potential drought permits. This assessment confirmed that the nine options which were initially included in the draft Drought Plan were appropriate to take through to the constrained list of options, based on their potential environmental impact.

9.4.3 Our drought permit sites

We have selected nine drought permit sites by following the screening process outlined in the previous section. All of our drought permits are for groundwater sources. These are split across our Central (Table 15 and Figure 22) and Southeast (Table 16 and Figure 23) supply regions.

This represents a reduction in both the number of drought permit sites and the available water that they could provide. All of the sites listed below would be applied for as drought permit sites.

As part of the application for a drought permit, we would demonstrate that:

- There has been an exceptional shortage of rain
- Justification of need exists, including the timing of risk to public water supply
- Appropriate drought actions have already been implemented

We will ensure that drought permit applications are as ready as possible before a drought event occurs, by carrying out appropriate preparation work. This will include engagement with the Environment Agency around drought permits and also preparation of drought permit Environmental Assessment Reports (EARs).

It would always be our aim to apply for a Drought Permit before a Drought Order. However, if during our liaison with the Environment Agency (whether as pre-engagement to a Drought Permit application or from any of the actions taken prior to any application as environmental stress and supply drought triggers escalate) it is indicated (by the Environment Agency) that a Drought Permit would likely be refused or (the Environment Agency consider) a Drought Order more appropriate, then we will consider those requirements. Appropriate steps will be taken which may mean that a Drought Order is prepared in parallel to or in the alternative to a Drought Permit.

If our supply side drought order actions were to affect or cause losses to third parties, they may claim for compensation from us under the circumstances set out in Schedule 9 of the Water Resources Act 1991. Prior to application for any drought order or permit we would engage with stakeholders and any third parties likely to be affected. We are working with the Environment Agency as part of the development of our EARs to ensure that all such parties have been identified.

As part of our drought permit applications to the Environment Agency we would not be required to seek any additional authorisations or planning consents, other than the drought permit application itself.

As part of our environmental assessment for our drought permit sites, we have carried out an SEA. The outcomes of this work have been used to prioritise the sites according to environmental impact, and the sites with the least environmental impact would be applied for first.

9.4.3.1 Central region

Our Central region drought permit sites have been split into two categories based on priority of use. These are Category 1 and Category 2 (Table 15).

The combined volume of additional water made available by applying for the Category 1 drought permits exceeds 26.29 Ml/d, which is equivalent to the identified need within our WRMP19. These would be progressively applied for as the drought severity progressed beyond the worst historic levels, up to the 1 in 100 year return period risk level. The sites selected to be in the Category 1 reflect the lowest potential abstraction increase in catchments where we have implemented sustainability reductions, whilst still making up the required volume.

Drought permits in Category 1 are more likely to be required than those in Category 2, but the likelihood of use is still very low.

Drought permits listed in Category 2 would only be implemented in more serious circumstances, where the drought exceeds the 1 in 100 year return period level of severity. All Category 2 sites have been subject to sustainability reductions in AMP6.

This has provided the opportunity for considerable data collection and a detailed understanding of the impact of the respective abstractions on the environment. In the unlikely event that a Category 2 drought permit is required, this information would be utilised to put in place suitable mitigation measures to minimise the impact of the increases in abstraction on the environment.

More information on each of our Central region drought permit sources is presented below. Note that the names of these sources have been coded for security purposes.

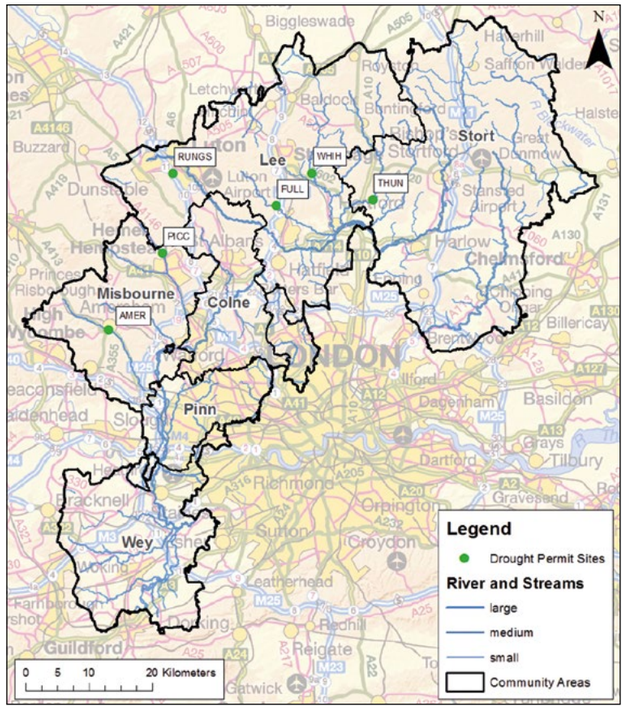


Figure 22: Our Central region drought permit sites

Table 15: Our Central region drought permit sites

Number	Source	WRZ	Water body/ catchment	Category 1= High priority 2 = Medium priority	Volume (Ml/d)	Comments
1	THUN	5	River Rib	1	4.91	Abstraction increase, including relaxing licence flow constraint
2	WHIH	3	River Beane	1	14.82	Sustainability reduction site
3	RUNGS	3	River Lea*	1	5.3	New drought permit site not included in DMP19
	Category 1 Total volume			**1**	**25.03**	**Total additional water available for supply**
4	PICC	1	River Gade	2	6.4	Sustainability reduction site
5	AMER	1	River Misbourne	2	8	Sustainability reduction site
6	FULL	3	River Mimram	2	9.09	Sustainability reduction site
	Category 2 Total volume			**2**	**23.49**	**Total additional water available for supply**
	Total Volume				**48.52**	

* Although RUNGS is situated within the Lea topographic catchment, this source abstracts water from the Greensand aquifer and would not impact flows in the Lea

9.4.3 Our drought permit sites

9.4.3.1 Central region

THUN
Our THUN source is located in the River Rib catchment. Under the proposed drought permit, the hands off flow (HoF) constraint which ordinarily constrains abstraction when the flow in the Rib is low, would be suspended.

This would make an additional 2.73 Ml/d available for public water supply. Additionally, the THUN drought permit would allow us to increase abstraction at the source by 2.18 Ml/d. The result would be 4.91 Ml/d in total of additional water for public water supply.

WHIH
Our WHIH source is located in the River Beane catchment. Under the terms of the drought permit, we would seek to uplift abstraction for public water supply by 14.82 Ml/d from the current annual average licensed rate of 2 Ml/d.

RUNGS
Our greensand source at RUNGS is located within the catchment of the River Lea. The Lower Greensands aquifer is located deep below the Chalk and the two geological units are not hydraulically connected, with the greensand aquifer being recharged from the area in the Anglian region. As a result, abstraction from this source does not have the potential to impact the River Lea but may exhibit a small, delayed impact in the area where the Lower Greensand aquifer is exposed.

PICC
Our PICC abstraction is located in the River Gade catchment. Under the terms of the drought permit, we would seek to uplift the permitted abstraction from this source and the Upper Gade catchment by 6.4 Ml/d. This permit option has not changed from our previous drought plan.

AMER
AMER pumping station is located in the River Misbourne catchment. Under the terms of the drought permit, we would seek to increase abstraction at the site by 8 Ml/d. The proposed uplift is the same both before and after the planned 2024 sustainability reduction at the site. This permit option has not changed from our previous Drought Plan.

FULL
FULL is located in the River Mimram catchment, we would seek an increase in abstraction from the source to 6 Ml/d and disaggregation with our DIGS source.

This would result in a 9 Ml/d increase in abstraction from the Mimram catchment for public water supply.

9.4.3.2 Southeast region

Our previous Drought Plan included four drought permit options for our Southeast region. The modelling carried out for our WRMP19 did not indicate a deficit which would require the use of drought permits, however we have decided not to remove them completely, but to retain three as a contingency volume (Table 16 and Figure 23).

More information is provided about each permit option below.

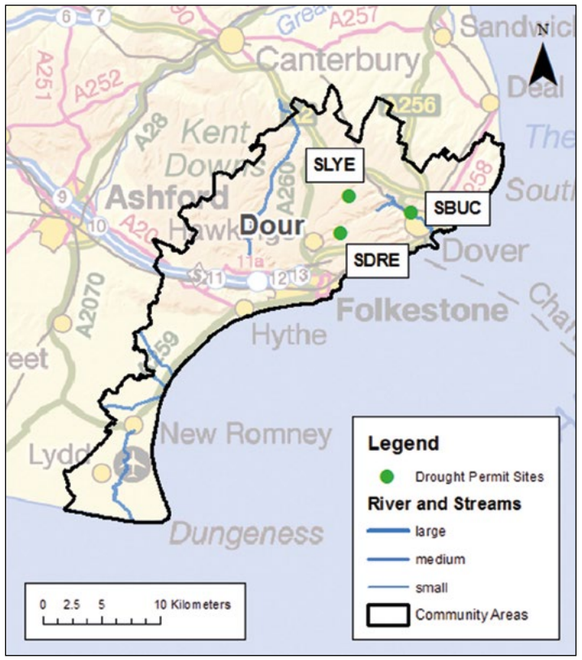


Figure 23: Our Southeast region drought permit sites

Table 16: Our Southeast region drought permit sites

Number	Source	WRZ	Water body/ catchment	Volume	Comments
1	SBUC	7	River Dour	2	Removal of low flow constraint and cessation of augmentation
2	SDRE	7	River Dour	2	Removal of hands off level constraint
3	SLYE	7	River Dour	3.5	Removal of hands off level constraint
	Total Volume			**7.5**	

9.4.3 Our drought permit sites

9.4.3.2 Southeast region

SLYE

Our SLYE source is located in the River Dour catchment and is subject to a Hands off Level (HoL) constraint, which limits output when local groundwater levels are low. Under the terms of the permit, this condition would be temporarily suspended. This would provide an additional 3.5 Ml/d of water for supply purposes during a drought event.

SDRE

Our SDRE source is also located in the catchment of the River Dour. Like SLYE, the source is subject to a HoL constraint which limits output when local groundwater levels are low. Under the terms of the permit, this condition would be temporarily suspended. This would provide an additional 2 Ml/d of water for supply purposes during a drought event.

SBUC

SBUC pumping station is located adjacent to the River Dour and is subject to a both a hands off flow constraint and river support clause on the abstraction licence. This constrains abstraction when the flow in the river is low, and also requires discharge to the Dour of half the volume of water which is abstracted for public water supply. Under the terms of the permit, this condition would be temporarily suspended. This would make an additional 2 Ml/d of water available for supply purposes during a drought event.

9.4.3.3 East region

Presently, there are no drought permit options in our East supply region. This is due to the groundwater sources in this region already being robust to drought events.

It should be noted that there is an on-going investigation into the impacts of our groundwater abstractions on the River Brett. The outcomes of this, in combination with the requirement for us to provide river support during low flows, may necessitate a drought permit being introduced in the future.

It is our intention to continue to work with our neighbouring water companies and the EA to understand the impacts of abstraction on the river whilst seeking to minimise impacts on regional drought vulnerability, depending on the solution agreed as a result of the investigation and subsequent options appraisal.

If it is decided following future assessment that a drought permit option is required for our East region, it is our intention to incorporate this into one of the drought plan annual updates as appropriate, in consultation with the Environment Agency.

Affinity Water

10 Drought Trigger 4

10.1 Introduction

The groundwater level associated with drought trigger 4 has not been reached in our operational history. It therefore represents an extreme and unprecedented drought event for us, which would necessitate enactment of our Emergency Plan procedures.

The decision to transition from our Drought Plan to our Emergency Plan will be made by the Drought Management Group. In addition to enacting our Emergency Plan, some actions which could be implemented in the event of a drought of this severity are set out in Appendix 5.

Together, the Emergency and Crisis Management Plans describe the structure, and define the roles and responsibilities, that form the basis for our emergency response.

An emergency response will invariably result in the formation of the Emergency Response Team (ERT). The ERT is a trained and experienced response team which assembles in a dedicated Incident room to take coordinated decisions. The ERT meets frequently until the objective is achieved or the escalated response is no longer required.

The group defines an agreed way of working to resolve an issue, mitigate the impacts of an incident, and manage a situation back to business as usual. Our plans have been written to align with emergency response best practice (JESIP) principles.

The plans are designed to be generic so that they can be applied to any incident, including an extreme drought. This flexibility in our approach allows us to adapt and apply the same response structure whatever the situation. The generic plans are supported by a suite of emergency plans that provide guidance on how to respond to a specific incident, for example a pandemic event or widespread power outage.

Our plans allow us to form an ERT quickly when responding to a sudden onset incident, but also provide a response mechanism for a 'slow escalation' incident, such as in a drought scenario. The response can be managed initially as an event and progress through to an emergency response and ultimately a crisis, as the situation dictates.

This means that as a drought worsens, timely decisions can be taken to further utilise the framework and support roles offered by the ERT are designed to be made available as required.

These decisions will be taken with the input of a Gold Commander (Executive Director) at the time.

The triggers for establishing an ERT can vary, but are typically when:

- The teams working on a repair solution require significant or extraordinary operational support
- Because the impact of the issue requires managing above-and-beyond what the business-as-usual teams can deliver
- Control cannot, or may not, be regained within usual timescales

10.2 Actions to maintain supply

We would continue to actively manage risks arising from a worsening drought through our Drought Management Group. If we reach drought trigger 4, we would continue with operational mitigation actions such as optimising source performance and minimising planned outage.

One option in severe drought situations can be to reduce the amount of water that we need to move around our network, through changes in network pressure. Pressure management to below our committed level of service is possible for temporary (peak) demand management, and we have experience of this from the 2018 and 2020 peak demand events.

This is a potential option to reduce demand during a severe drought, and we have the understanding and capability to increase savings derived from pressure control schemes, however we are aware that these can increase the risk of compromising service standards.

As this requires a deliberate failure of our Performance Commitment to customers, we would only use this as a last resort in response to particular localised issues that emerged during severe events. Risk assessments would be undertaken prior to this and hydraulic modelling would be able to simulate changes in pressure that will determine whether the scheme is viable or not.

This risk will be addressed by the ERT, with input from the DMG. We also recognise that pressure reductions may affect some fixed fire-hydrants in our area, so we will make every effort to mitigate any associated problems. We have a Memorandum of Understanding in place with local fire brigades in our area, which sets out the expectations for engagement between us. As a drought escalates, we would engage closely with fire brigades in our area to ensure any risks arising can be proactively managed. If we do need to utilise pressure reduction as a tool to manage a drought after reaching drought trigger 4, we are able to use manual pressure management to isolate certain areas of the network, so pressure can be maintained to specific fire hydrants if required.

A potential option which we may consider to maintain supply during an extreme drought is the tankering of fresh water from overseas to a designated terminal on the Thames. This would require new or temporary infrastructure to transfer the water from the receiving terminal to a suitable connection point in our network.

We recognise that certain external measures would need to be put in place before the option can be considered to be available. This option is being further developed through the WRSE group in order to assess operational considerations and logistical issues associated with its implementation, and also potential benefits for the wider South East. If necessary, this option would be implemented through close working with WRSE and also potentially Essex and Suffolk Water.

10.3 Emergency Drought Orders

Under the scope of emergency drought orders we may apply to the Secretary of State to limit or prohibit the use of water for any purpose we consider appropriate, however we consider the use of stand pipes or rota cuts to be unacceptable and would only implement these in a civil emergency.

Emergency drought orders have not been implemented in the UK by any water company since 1976, and there has since been significant investment across the water industry. If those drought conditions were experienced today there would be no need for an emergency drought order.

In an event that the drought was to reach this level of severity then we would enact our Emergency Plan as described above, and restrictions would likely only need to be implemented in particular areas of significant water stress, the scope of which is not considered as part of the remit of this Drought Plan.

Affinity Water

11 After a drought ends

11.1 Identifying when a drought has ended

The end of a drought can be defined as the point at which the risk we are facing from drought is no greater than during a normal year, and where normal conditions have continued for a period of time.

The hydrological and environmental conditions during recovery from drought can be complex and identifying the end of a drought can be difficult to determine, especially as it does not always occur in a linear or uniform fashion.

We will confirm first and foremost with the Environment Agency that the water resource situation has returned to normal before taking any action.

The following stakeholders would also be notified before any actions are taken:

- Defra
- Ofwat
- Water UK
- Consumer Council for Water
- DWI and Environmental Groups

The end of a drought will be determined using the company's established triggers, with all restrictions to be removed when groundwater levels have moved above drought trigger 1, and our water resource forecasting indicates that this recovery will continue.

The lifting of restrictions will first require notice to be published on our website and in two newspapers circulating in the affected areas. Unlike the imposition of restrictions, there is no lead in time necessary; restrictions will be revoked instantly when the notice is given.

It can take many months of consecutive above LTA rainfall in order to recover from a long-term groundwater drought scenario.

It may require restrictions to be in place throughout this period until groundwater levels have fully recovered. When we lift restrictions, we would communicate to customers that even though the drought has ended, there is still a need for water efficiency.

The drought management group will be responsible for stepping down or stopping any ongoing drought actions such as restrictions.

11.2 Actions after a drought has ended

After a drought event has ended, it is important that we reflect on the experiences and lessons learned to improve future actions and processes. It will be the responsibility of the Asset Strategy and Capital Delivery Directorate at Affinity Water to produce a "lessons identified" report that will enable future processes to be improved.

We will hold internal workshops within 3 months of a drought ending, which will be attended by the members of the DMG, the DMG sub-groups and any other colleagues who have been involved in or affected by the drought. These will be aimed at capturing experiences of the drought from various perspectives across the business, as well as providing opportunities for discussion about how processes could be improved upon in future. The lessons identified report will be produced within 3-6 months of a drought ending and will be followed up within a year with evidence that recommendations have been acted upon.

The report will include:

- A review of the environmental impacts of our drought actions by analysing baseline, in-drought, and post-drought data.
- A review of the effectiveness of any mitigation measures implemented.
- A review of the success of any drought permit and drought order applications.
- An assessment of how well individual sources delivered additional water and determine where any re-assessments of yields may be needed or invested to maintain yields of sources.
- Review of communications and customer engagement during the drought.
- An assessment of the effectiveness of demand reduction from the implementation of demand side drought management actions.
- An investigation into whether or not the company would need to make any changes to its demand forecast or longer term demand forecast.
- Whether any investments made as a result of the drought will affect other plans or programmes.
- Review of agreements with other companies regarding bulk supplies if these have been affected by drought.

In addition to the lessons learned report, we will continue to carry out enhanced environmental monitoring, to improve our understanding of environmental recovery from drought.

This learning will inform updates to our drought permit EARs and will help to improve conceptual understanding of catchments in our area.

For further information on our environmental monitoring see Appendix 9.

The post-drought review process will involve close communications with the Environment Agency and any other key organisations. This will principally consist of meetings with follow-up actions agreed mutually. Additionally, a drought workshop would be held to assess the efficacy of the management process and review whether any improvements or changes to the Drought Plan were required. If necessary, these changes will be implemented by publishing an annual update of our Drought Plan with the improvements incorporated. See below table which provides a summary of the key activities following a drought and associated timescales.

Table 17: Summary of post drought activities and associated timescales

Activity/deliverable/milestone	Timescale post drought
Data gathering – stakeholder workshops, review of documentation and data associated with management of the drought	0-3 months
Development of lessons identified report	3-6 months
Updates to Drought Plan if required	< 1 year
Continuation of enhanced environmental monitoring	Up to 1 year (longer if required for specific reasons identified through the environmental assessment reports)

Affinity Water

12 Our approach to communications and engagement

Over many years, we have worked with our stakeholders and customers to increase awareness and general knowledge around water, water processes and the activities that we undertake to mitigate the impact of our operations during droughts.

This section explains how we plan to go further than ever before to engage in meaningful dialogue around drought and how we will monitor the benefits of this.

More detailed information about the specific communications actions relating to each drought trigger is provided in drought trigger sections.

Our experience from earlier droughts tells us that we must consider engagement of customers on the matter of water resources a de facto part of our business-as-usual activity. It is an ongoing requirement in order to promote water issues and water efficiency, so that there is a background of understanding in advance of the next drought. Research has shown that customers are generally not widely engaged around issues with drought and perceive it as something which rarely has any impact on their lives[28].

The outcomes of the work also showed that it is important that we explain to our customers what we are doing to manage the drought situation, which will help to establish a more transparent relationship and enhance customer trust.

The more we help our customers to understand the causes, processes and impacts of drought, the more engaged we hope they will be in the solution.

In 2020 we carried out some customer engagement research along with other companies in the South East. This work provided some useful insights into customers' perceptions of drought and water resources in our area, and this will help to inform how we communicate with our customers.

The results of the research indicated that customers preferred traditional channels (such as television or letters) from their water supplier.

Some of the ways in which we will go further than ever before to engage with our customers and stakeholders and achieve a good baseline of understanding are set out below.

12.1 Engaging more effectively with our customers and stakeholders

12.1.1 Agile communications

The lessons learned from earlier droughts and the feedback received through the Environment Agency's consultation on drought planning tells us that we need to be more innovative in the way that we manage drought and more effective in the way we communicate actions to our customers. We need to be more agile, do more and do it earlier. Engaging customers on their water use and the need to reduce demand is a critical aspect of this approach.

The latest survey of attitudes to water use undertaken for Water UK shows that the majority of people don't have a clear view of how much water they use each day[28]: In fact, the average person in the UK uses 142 litres of water a day as compared with 121 litres in Germany.

We know from previous droughts that there is a need to improve communications and engagement with our customers to get the right messages across about the need to reduce demand for water.

A more targeted approach to communicating is needed that goes beyond top tips and general resources to a more segmented approach working with our customers as individuals, understanding their perspectives and meeting their specific needs. This Drought Plan will ensure that we communicate important messages earlier and more clearly.

We intend to utilise innovative communications methods during droughts because we recognise the greater potential these have to support customers to reduce their water use before the need to implement temporary use bans (TUBs). This will help to prepare customers for the possibility that temporary use bans may need to be introduced, and will ensure they are fully aware of emerging drought risks.

Opportunities to reduce household water use for example from showering and washing may be lost in messages around temporary use bans which focus minds on outdoor and garden water use. This is important as on average a significant portion of household water usage is from indoor activities, as shown in Figure 24.

Our detailed communications actions are outlined for each drought trigger in this plan.

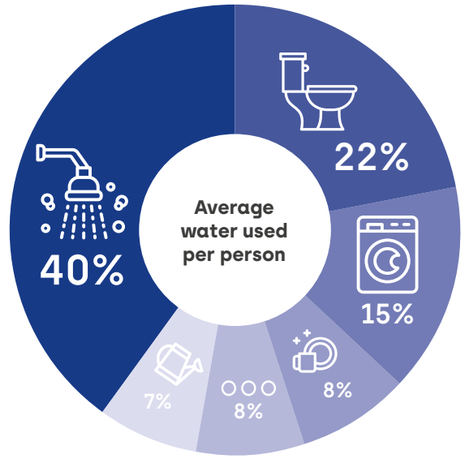


Figure 24: Average household water use pie chart

[28] Consumer Council for Water, Understanding drought and resilience, 2013

[29] https://www.water.org.uk/news-item/vast-majority-of-brits-have-no-idea-how-much-water-they-use-each-day/

12.1.2 Communicating earlier

A review of the 2018 drought found short-term campaigns to be challenging and ineffective over the mid-long term. Preparatory communications were shown to be important and customers wanted continual communications. We will therefore communicate with customers on water resources and water use outside of drought conditions so that they are aware of the current situation and actions they can take to reduce their water usage.

12.1.3 Communicating more frequently

A more constant flow of information to keep awareness of water resources front of mind and up to date would be more effective than communicating solely in times of drought. We are developing localised approaches to communicating with customers and stakeholders, using catchment scale updates through platforms such as our website to communicate timely information on the flow status of chalk streams and rivers in our supply area, as well as local groundwater conditions. We are looking at ways to make it easier for customers to understand the available data.

During the latest drought event (2017-2019) we started providing regular updates on our website about the water resource situation and prospects. We will continue to provide these updates, as they are a useful resource to promote awareness about water resources and how they can change. The homepage of our website features our water resource status, which links through to more detailed information. Customers can therefore see at a glance whether we are in a good water resource position or whether we are at risk from drought.

We also sent out monthly stakeholder newsletters during the last drought event. This included information about the water resource position and the prospects. The newsletter was sent out to over 1,000 stakeholders including councils, local resilience forums, environmental groups, retailers and NAVs. We received positive feedback to say that the newsletter updates were useful and informative, and we will use this format in future drought events to ensure our stakeholders are fully aware of the developing situation. We will ensure that the stakeholder list remains up to date by carrying out regular reviews.

If the drought becomes serious enough that we are likely to need to implement temporary restrictions, we will use the newsletter to make our stakeholders aware of this in advance.

12.1.4 Utilising tools to support communication

We are exploring new map based tools, offering a postcode searchable dataset where customers can view their current sources of water (for example reservoirs, rivers, groundwater) and how this has changed over time.

This approach will help communicate to our customers how sources are changing due to the need to protect the environment, climate change and population growth.

We know that some reaches of chalk streams dry up long before there is an impact on public water supplies. The system will allow us to communicate instances of environmental stress on local rivers and clearly explain the difference between environmental drought and a water supply drought, whilst highlighting the factors that impact on the flow of chalk streams.

It will allow us to engage more effectively with local environment and river groups, galvanising their support to share messages. It will also help us to align messaging with the Environment Agency, which has recently changed its spatial scale for declaring drought to a catchment basis, to reflect experiences from the 2017-2019 drought.

Once implemented, this system will form part of our business as usual communications strategy, and will be communicated all year round, whatever the water resource position may be. We will also engage with other water companies regionally to compare approaches and look for opportunities for wider communication on water resources.

12.1.5 Chalk stream education

Our supply area is home to a number of environmentally significant chalk streams, but many are in poor ecological health and face historical and growing pressures.

While the causes and solutions are complex, we recognise that groundwater abstraction can affect flows in chalk streams and have a long-standing programme of abstraction reductions. Chalk stream habitats are also affected by historic channel modifications, changes in climate, and changes in land use in their catchments.

Due to the complicated nature of groundwater and surface water interactions in relation to chalk streams, helping our customers to understand these complex interactions is key, both during normal water resource conditions and during droughts.

Our ambition is to protect globally rare chalk streams in our supply area, but we need to engage our local communities to help make this happen. To this end, in 2020 we launched our SOS: Save Our Streams Campaign, the UK's biggest water saving initiative. As a company we've committed to ending unsustainable abstraction; but we know there's a greater role we need to play to ensure our customers' water use is as sustainable as possible, both during droughts and during normal operations.

Save Our Streams is a multi-disciplinary movement that sees our water saving messages appear on billboards, in newspapers, on the radio, on social media, in local town centres and in many other places. Save Our Streams aims to make our customers understand the link between local rivers, streams, and their own water use. As part of this we have used humour to help our customers understand why reducing their water wastage is important and also give them practical advice on how to do so. The campaign is aimed at helping customers to waste less water, whilst also explaining how we are doing our bit as a company to minimise the environmental impacts of our actions.

This campaign is part of a significant investment to manage consumer demand and reduce per capita consumption (PCC) (see Section 4.2) in line with our WRMP and PR19 business plan targets. We expect this investment to deliver considerable benefits, increasing awareness of Affinity Water, helping to increase customers' levels of trust in our company, and improving their perceptions of the value of our work. But most importantly, it will help us to safeguard our precious rivers and streams for future generations. Another key benefit is that by increasing our customers trust and awareness of us during non-drought conditions, this will help our communications during drought conditions land more effectively.

12.1.6 Using insight to reduce demand – customer research

One element of the Save Our Streams campaign was to carry out research into how well the campaign landed with our customers. The original target of 120,000 customer sign-ups, was achieved 1 month early, and by mid November 2021 there had been 170,000 sign-ups to the campaign. When carrying out follow-up research with a representative sample of our customers, we found that:

- 39% of our respondents were aware of the risks faced by chalk streams
- 60% underestimated the national PCC of 142l/d
- 65% believe they could do more to save water
- 73% said that being aware of the Save Our Streams campaign has caused them to take some form of water saving action
- 76% are interested in saving water

The above statistics highlight the importance of education around the need for water efficiency, and the value in helping our customers understand the part they can play by wasting less water. Our communications campaigns focus on why individuals use water and aim to bridge the gap between attitudes and behaviours. Studies have shown that self-reported attitudes towards water saving often do not result in behaviours that reduce demand. It is important to design methods for maximum effect that take into account different customer motivations.

In 2017 we launched a partnership with Hubbub called #Tapchat. The initiative focused on hidden water use habits to get people thinking and talking about water efficiency. The approach was informed by national polling among 3,000 UK consumers and a study involving 40 households in Watford and Harlow. A high-level segmentation was undertaken through the #Tapchat survey into categories such as 'dreamer', 'busy bee' and others with specific advice for saving water.

Why is engaging people in water saving such a tricky task?

Through #TapChat we have identified six reasons why encouraging people to save water is a tricky task.

1. Water is used in private. Excessive water use can go unnoticed. For example, many people admit that they always left the tap on when brushing teeth until a new partner asked why. Focusing on daily routines is an effective way to make people consider their daily water use.

2. It's cheaper. Water is relatively cheap compared to other utilities, making financial savings less of an incentive. For unmetered households, messages about saving money has little or no bearing.

3. Bills are less regular. This makes it harder for households to compare monthly usage and stay on top of changes.

4. Perceived abundance. Few people remember a time before clean drinking water was available on tap, or have lived through a drought or hosepipe ban. Paired with England's unwarranted bad reputation for rainy weather, the notion that there is more than enough water to go around prevails.

5. Benefits are less visible. Compared to many of the other issues that Hubbub works on, benefits of reducing water consumption are not necessarily felt by the individual.

6. Lack of trust. Many people do not believe that individual actions can make much of a difference compared to the amount of water lost through leakages. There's also widespread scepticism towards water saving messages coming from water companies.

https://www.hubbub.org.uk/Blog/six-reasons-why-encouraging-people-to-save-water-is-difficult

We have also carried out a customer research project in 2021 along with some other companies in the Southeast region. The consultation aimed to assess how people in our region view water shortages as a result of drought, and investigated the most effective means of communicating about the need for water efficiency and reducing demand during drought events.

The outcomes of this consultation showed that people can be grouped into different segments in terms of how they behave and how they respond to different forms of messaging around their water use. The three key groups which were identified by this research were:

- Resisters:
  - Not very water conscious
  - Unwilling to compromise on baths, car cleaning, hot tubs
  - Justify their water usage behaviour – there's enough water in the UK, I pay for it
  - Blame water industry for shortages e.g. privatisation, perception of poor water management, lack of UK grid
  - Initially very reluctant to engage
- Persuadables:
  - Some awareness of household water usage
  - Try not to be wasteful but inconsistent behaviours
  - Initially surprised at possibility of drought in the UK/South East
  - Research journey changes opinions on short/long term water scarcity
  - Anxious about wider impact on communities
  - Willing to engage
- Believers:
  - Water aware
  - Zero tolerance to household wastage (including water)
  - Environmentally active recyclers
  - Distinct behaviours in place
  - Shower rules – three minutes, water butts rather than hosepipes
  - Willing to engage

It is important that we understand the different requirements of the above groups and take these into account when developing the content for our communications. The research showed that most customers prefer communications about drought to be through 'traditional' channels, such as letters and emails, as well as through adverts on television. The research indicated a number of key elements which should be included in communications about drought, these include:

- If we need to implement restrictions, how long these are likely to last
- Information about the water resource situation and prospects
- Clear explanations about why we need to implement restrictions
- Practical methods for how to use less water

We will take the above into account when communicating with our customers during droughts, and will use the insights to inform how we appeal to our customers to use less water.

12.1.7 Customers in vulnerable circumstances

It is very important that we ensure tailored communications where needed for our customers in vulnerable circumstances, and provide additional support when needed.

Our priority services register is designed for customers with particular needs relating to their water use. This includes:

- Customers with specific communications needs, including the visually impaired and those with hearing difficulties
- Medical conditions, such as those which require large amounts of water
- Customers with disabilities
- Customers living with dementia

The register enables us to identify households with additional communication needs and get in touch with customers using the most appropriate method, to ensure they are aware of and fully understand the situation.

These communications will be utilised in the event of needing to implement temporary use restrictions, and will help to ensure those customers understand what the restrictions mean, and more importantly in which cases they will be exempt.

Most activities restricted under temporary use bans (TUBs) or non-essential use bans (NEUBs) have associated exemptions for health and safety reasons, which in many cases includes uses by customers on our priority services register. Please see Appendix 6 for more information on exemptions for temporary use restrictions.

As part of our communication strategy we will review the content for the right tone of voice and to ensure the message is easily understood, including how to find more information. We will also consider alternative ways to reach households in addition to our website such as through partners or community organisations.

As we go into a drought and in the event that we may need to implement temporary water use restrictions, we will develop sets of FAQs. These will be included on our website for customers to look up questions they might have about the restrictions, and will include a set of FAQs tailored for more vulnerable customers.

We will also ensure our customer contact teams have information sheets about the drought and the potential for restrictions, so that they can accurately answer any questions from customers who contact us directly.

12.1.8 Retailers and non-household customers

It is important that we work collaboratively with retailers and NAVs to ensure they are fully aware and informed of the water resources position in our area, which in turn ensures they are able to keep their customers fully informed of the situation. Retailers and NAVs have an important role to play in the lead up to, and during a drought period. As part of WRSE we will continue to work with retailers to ensure that drought communications are agreed between companies and retailers for future droughts.

As part of our engagement with retailers and NAVs we will;

- Provide a dedicated water resources page which is updated each month which details the resource levels in each of our areas (Central, East and Southeast).
- Provide monthly water resource updates via push notifications in the event of a worsening drought situation to all retailers and NAVs in our area, supplemented by more regular account meetings which would ensure water resources are at the forefront of any discussions. These notifications will ensure retailers and NAVs to begin to convey any water resources and efficiency messaging early and work with their customers to reduce demand.
- Provide a dedicated area on our wholesale webpages targeted to water efficiency for non-household customers which retailers can direct their customers to or use any material so they are clear on how they can help.
- Provide tailored water efficiency material (which can be branded or unbranded) for the use of retailers and NAVs to share with their customers.
- Identify high water users before any drought occurs to enable retailers to target these and begin demand and water efficiency discussions about their non-essential use early in a drought.
- Identify and target industries who may be impacted by TUBs or NEUBs so they can be engaged via their retailer earlier during drought, to enable them to prepare for potential restrictions.
- Request retailers and NAVs to help support any requests for voluntary reductions in demand.
- Provide further notice if we are considering restrictions to allow for feedback and preparation of additional material including FAQs, guides and communications for retailers and NAVs, for both their staff and their customers.
- Provide retailers and NAVs information to help them answer any queries they may receive from their own customers who may be required to comply with any restrictions imposed. We will ensure retailers and NAVs are clearly advised on the restrictions and the exemptions granted.

All of our communications will ensure that non household customers have clear and consistent information and are kept fully aware of the situation. Any communications we issue to retailers and NAVs will have a clear call to action when required.

12.1.9 Regional collaboration

We recognise that as an industry we need to work collaboratively to share knowledge and best practice, co-ordinate and align communication to customers and stakeholders, and promote the efficient use of water resources. Therefore, we work closely with other water companies in our region as part of the WRSE and WRE groups.

For example, we participate in the regular WRSE "dry weather" meetings which focus the risk of any potential future water shortages. In these meetings all water companies share information about their available water resources, weather forecasts, and any communication needed with customers about any emerging drought situation. These meetings are held all year round and are stepped up in frequency when a risk of water shortages across the South East starts to emerge.

The meetings facilitate collaboration between water companies and actions to ensure an effective regional response to a developing drought. By working together and following a joined-up approach to communication, we aim to reduce confusion so our customers clearly understand the pressure on water supplies and the environment during water shortages, what we are doing, how they can use water wisely, and what water restrictions may need to be, or are being, imposed.

Another important mechanism which supports collaboration between different water companies and other sectors is the National Drought Group (NDG). We actively participate in the NDG by attending meetings and supporting on workstreams where necessary. The group is led by the Environment Agency. It aims to provide high level strategic direction for drought management in England and commissions working groups to undertake and deliver specific pieces of work to address risks and issues. The NDG is responsible for producing a cross-sector view of drought issues at a national level and they co-ordinate the delivery of drought management activities, communications, and risk mitigation. The NDG facilitates active collaboration between groups and sectors which are affected by or responsible for managing drought events. The group developed a lessons report following the drought event between 2018 and 2020, and this will help to improve how the group functions during future drought events.

#WhyNotWater

12.1.10 #WhyNotWater campaign

In 2019, we developed a campaign to go beyond our usual water efficiency messaging, with the aim of influencing and changing legislation and to highlight water as a critical element in the climate change debate.

We have called for the following simple changes in legislation, which would help bring water on a par with energy, leading towards a more sustainable use of water in the long term and ultimately help build more resilience to water supply droughts.

- Mandatory water efficiency labelling
- Tenants' rights to water efficient goods
- Mandatory certification of domestic water efficiency for fittings and fixtures
- Local Authority local plans in severely water stressed areas to include the target of 110 litres per person per day

12.1.11 Internal communications

In the event of a drought we will ensure that our staff members across our business (over 1,000 employees) are aware of the current drought situation and can communicate this to customers, partners, and suppliers who they come into contact with. Regular drought briefings will be provided via intranet blog posts, emails to specific teams and via webinars/podcasts (similar to engagement we have started around Covid-19). We will also spread awareness through attendance at team meetings across the business, as well as informative posters throughout our company sites and offices.

12.1.12 Target audiences

We recognise that our different stakeholders have different needs from us, both in terms of the information we provide, the channels we use and the frequency of our updates. We have therefore reviewed the key messages we are trying to alert our different target audiences to and selected the most efficient communication channel to meet these needs. The results of this review are outlined in Table 18.

As part of our communications during droughts we will direct customers and stakeholders to our website for further information and updates on the situation. We will develop a set of frequently asked questions (FAQs) which will provide clarity on topics for a range of target audiences. The FAQs will be grouped according to whether they are applicable for household customers or businesses (non-household water users). This will be especially important in the event that we need to implement temporary restrictions, which have specific impacts on different activities depending on whether they are for domestic or commercial use. These FAQs will be added to the dedicated drought page on our website, as well as being shared with all our customer facing staff, to ensure they are able to answer any questions which may be asked of them.

Table 18: Objectives of our drought communications and the channels that would be employed to meet the needs of different target audiences.

Group	Objective	Channels
Household customers	• Help customers plan for potential drought restrictions • Minimise adverse temporary use ban (TUB) effects • Reduce demand for water • Increase understanding and acceptance of TUB • Enhance reputation through pro-active communication	• Billing booklet, bill communications • Dedicated direct mail • SMS Communications • Automated telephone messages • Contact Centre • Affinity Water website (and My Account) • Social media – Facebook, Twitter, Instagram • Employees in the community • Emails
Customers in vulnerable circumstances	• Help customers plan for potential drought restrictions, and promote awareness of exceptions which apply to them • Encourage customers to join our Priority Services Register if needed	• Billing booklet, bill communications • Dedicated direct mail • Automated telephone messages • Contact Centre • Affinity Water website • Social media – Facebook, Twitter, Instagram • Employees in the community • Emails
Non-household customers	• Help businesses plan for drought • Minimise adverse TUB and non-essential use ban (NEUB) effects • Reduce demand for water • Increase understanding and acceptance of TUBs	• Retailers via Wholesale Operations Service Desk • Workshops
Stakeholders - Including elected representatives - MPs, local councillors External Communications' stakeholder database	• Increase understanding and acceptance of TUB • Gain support from stakeholders to share messaging	• Email and direct mail • Face to face contact • Affinity Water e-newsletters • Affinity Water website • Facebook • Twitter • Business as usual engagement activities with local groups
Influencers - Media, advice groups and schools, colleges and universities. Trade associations including Horticultural Trades Association	• Increase understanding and acceptance of TUBs and NEUBs • Collaborate to share joint messaging where appropriate to communicate potential restrictions and explain the importance of reducing demand for water	Third party communications and support: • Education Team • Affinity Water website • Facebook • Twitter • Student campaigns
Affinity Water employees	• Increase understanding and acceptance of TUBs internally • Provide up to date information for customer facing team members • Minimise customer contact • Low cost reinforcement of messages among friends and family in the community	• Monthly team leader briefings • Internal website posts • Internal posters • Company-wide emails
Local interest groups	• Communicate monitoring programme and mitigation actions, share local environmental information	Third party communications and support: • Council meetings • Interest group meetings • Written communications • Affinity Water website • Social Media
Local Authorities (LAs) and local resilience forums (LRFs)	• Keep informed and engaged to enable LAs and LRFs to prepare for potential impacts in their communities, including impacts from restrictions and also potential impacts to customers who rely on private water supplies	• Direct messaging and meetings
Industry stakeholders including – • Environment agency • Water UK • WRSE • Other Water companies • CC Water • Ofwat • Retailers	• Work with industry stakeholders to develop consistent messages, media management and joint communications strategies	• Retailer promotion with other south east water companies. Continue dialogue with EA & other water companies • Joint appeals for restraint with EA and other water companies
Fire brigades	• Keep informed of any developing risks arising from drought to be proactively managed	• Direct communications – calls and meetings as appropriate
Customer Challenge Group	• Engage with group on customer and stakeholder communications	• Email and face to face contact

12.2 How we will monitor the benefits of our actions

12.2.1 Monitoring demand during a drought

During a drought we will continually monitor customer demand for water and how it changes over the course of the event. At times, in accordance with our Drought Plan, we may need to ask our customers to use less water, or introduce a temporary use ban or a demand-side ordinary drought order which limits a number of water use activities, as detailed in Sections 9 and 10.

We estimate that temporary use bans reduce average demand by approximately 3%. In the past this has been difficult to measure accurately due to the need to separate weather related changes from reductions driven by the restrictions, as well as other changes to demand such as reductions in leakage. Advancements in technology make this much more feasible now.

The inset box opposite demonstrates how we used 'deep machine learning' to monitor the impact that COVID-19 had on domestic water use.

During a drought we would be able to use a similar approach to understand how communications and restrictions impact both household and non-household water use (depending on the measures being implemented) and compare what demand would be with and without restrictions or agile communications.

Figure 25 demonstrates the type of outputs we would expect from such modelling, with the blue line representing how daily water use per person (per capita consumption or PCC) fluctuates due to weather and seasonal patterns and the orange line shows the resultant PCC following the implementation of a temporary use ban or communications activity. This allows for both daily impacts and the average to be calculated over the period the restrictions have been in place. This information will help us to understand customer behaviour and adapt our actions to take account of this.

Depending on the severity of the drought situation we will aim to set a target for water saving before we launch any communication campaigns to reduce demand. This target will be influenced by factors such as the demand at the time and the time of year. We would monitor the actual impacts of our campaigns on demand, as well as using other metrics to evaluate the impacts of our communication strategy.

Household Consumption Impact Modelling

COVID-19 had a profound impact on both the patterns of demand and customer response to dry/hot weather events. In order to evaluate the impact on household demand it was necessary to construct a 'Per Household Consumption Model' that fulfilled the following criteria:

1. It can account for seasonal and weather variability to estimate what demand would have been if customer behaviour remained the same as it was before the pandemic started.

2. It can generate results in a way that can be used to exclude the impact of changes in commercial demand.

A model that uses 'deep machine learning' was developed to address these requirements. Broadly speaking the model works using the following approach:

- The model uses flow and demographic characteristics of the households in any given District Metered Area (DMA) to calculate Per Household Consumption (PHC) for that DMA. A secondary model is able to then estimate DMA flow based on:
  - Weather (rainfall, temperature, humidity)
  - Seasonality (day of the week and week of the year)
  - The average flow over the last year

- This model structure is then used to estimate the impact of COVID by running two versions of the model
  - One model carries on learning until the current date, and includes COVID as an 'explanatory factor' in the modelling of DMA demand
  - One model stops 'learning' at the start of March and then simply predicts DMA demand based on weather and seasonality from that point onwards.

Calibration of the model is very good, with calibration (R^2) greater than 90% for most individual DMAs, and over 99% when the DMAs are considered on an aggregate basis.

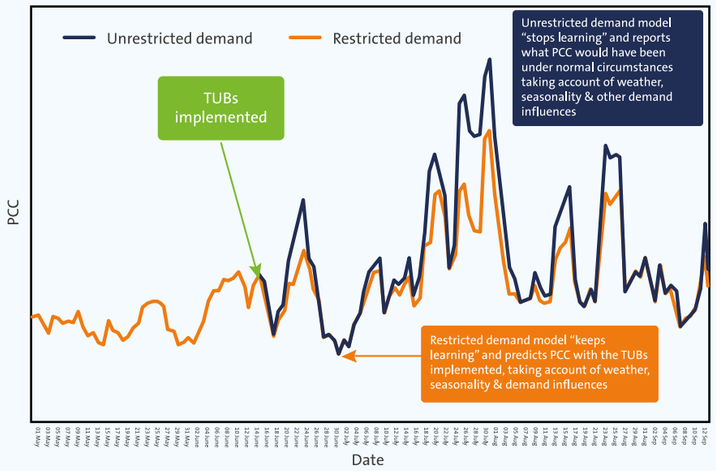


Figure 25: Example outputs for demand modelling

Through the above method we will be able to monitor and assess the effectiveness of our drought communications and demand side actions. An example of a successful communication campaign we have run is the Save Our Streams programme (see Section 12.1.5), and we can use this as a baseline for the success of future campaigns.

12.2.2 Monitoring the reach of our communications

We are able to monitor the success of our engagement activities by tracking the reach of our communications, which can be done in a number of ways. We use this information to help gauge how effective our communication campaigns and activities have been at achieving contact with our customers and communities.

Ways in which we can track and assess the reach of our communications include:

- Social media
- Surveys and focus groups
- Ad tracking
- News tracking
- Website visits and statistics
- Requests for water saving devices
- Email statistics

We will also track and assess any media coverage about the drought and in particular any coverage which is specific to us as a company. We can use this to help shape our engagement with the media, to ensure they are fully informed and to address any misconceptions which may arise. A successful example of how we have monitored the success of a communications campaign has been the Save Our Streams campaign. The campaign launched in April 2021 and by November 2021 the campaign message had been seen over 30.9 million times.

There had been 170,000 customers who signed up to the pledge to waste less water, and over 5 Ml/d of water had been saved.

We will use similar techniques to measure the impacts of our communications campaigns during drought events. We are able to assess these metrics in real-time, which means we can evaluate the success of our communications without delays, which supports our intention to have agile communications.

In the weeks following the launch of specific customer communications, we will carry out follow-up research to understand the customer experience of our campaign, this will be similar to the research we carried out for the Save our Streams campaign (see Section 12.1.5).

12.2.3 Joining it all up – understanding the impact of communications on demand to make agile changes to messaging

We will use the most up-to-date and effective methods for achieving customer engagement and demand reduction. With each activity, we will plan, do, review, learn, adapt. Things that work we will expand upon and use again. Less successful methods, channels and messages will be set aside. The information we gain from the monitoring work will be used to evaluate and enhance our communications strategy and, in that way, ensure it is constantly considering effectiveness to ensure it is as cost effective as possible.

It is also important to understand the effectiveness of our actions to have a clear indication of when we might need to escalate these actions to ensure our customers and stakeholders understand the seriousness of the situation.

Affinity Water

13 Environmental impacts

This section explains how our drought management actions could impact the environment, how we would plan to monitor these impacts, and actions to mitigate these.

13.1 Environmental Assessment

The drought plan guidance requires;

- An environmental assessment of the effects of planned actions
- An environmental monitoring plan
- Details of mitigation measures to lessen effects of actions on the environment
- A consideration of the need for a Habitats Regulations Assessment (HRA) and a Strategic Environmental Assessment (SEA).

Our drought permit documents include comprehensive environmental assessment reports which evaluate potential environmental impacts, and identify mitigation measures we will use to prevent any significant effects on the environment.

Drought permit environmental assessments can be viewed by appointment at our offices, and summaries of the outcomes of the assessment for each drought permit option are provided in this section.

Following the public consultation for our Drought Plan it was confirmed that both a HRA and SEA were required. These have been completed and the associated documents are published alongside our drought plan.

The SEA for our Drought Plan was carried out using a two-phased approach. The first of which involved carrying out a preliminary assessment of the original unconstrained list of options which had been considered for potential drought permits. This assessment confirmed that the nine options which have been included in the draft Drought Plan were appropriate to take through to the constrained list of options, based on their potential environmental impact. These nine options were then subject to a comprehensive SEA process. The SEA concluded on a precautionary basis that the options have the potential to cause environmental impacts on features including the water environment and National Environment and Rural Communities Act (NERC) species. Relevant monitoring and mitigation options have been identified where necessary for all of the drought permit options.

The outcomes of this SEA process have been considered for this drought plan and have been used to prioritise our drought permit options according to the level of environmental impact (see Section 9.4).

The HRA focused on our nine potential drought permits. A stage 1 screening assessment was completed to identify if any of the drought permits could lead to likely significant effects on European designated sites. The HRA stage 1 screening concluded that one of the drought permits (THUN) had potential to cause likely significant effects on a European site. This drought permit source was therefore taken through to stage 2 appropriate assessment.

The decision to take this site through to stage 2 assessment was due to uncertainty regarding the potential reduction in groundwater supply to the Lee Valley SPA and Ramsar site. In light of the European sites' Conservation Objectives, the stage 2 appropriate assessment concluded that the THUN drought permit would not cause adverse effects on the integrity of sites.

In-combination effects of the THUN drought permit alongside our Water Resource Management Plan (WRMP) 2019 projects, other water company WRMPs and drought permit options and other major infrastructure projects were assessed on a precautionary basis and following best practice. The HRA concluded that no in-combination effects are anticipated.

13.2 Drought permits

As part of the requirement for our drought permits to be 'application ready', we have carried out comprehensive environmental assessments to understand any potential impacts on the environment. The information from these assessments is provided in Environmental Assessment Reports (EARs), which are available to view at our offices on request. The range of potential impacts of various drought permits on the environment are presented in Table 19 below, although these are explored in more detail through the comprehensive site specific EARs. The implementation of drought permits will be prioritised based on level of environmental impacts. The approach to carrying out environmental assessments is based on the requirements as set out in Environment Agency guidance, which is represented in Figure 26. Summaries of the outcomes of environmental assessments for each of our drought permits are presented below. Note all of the EARs include comprehensive information about the actions for monitoring and potential mitigation associated with each of the drought permits.

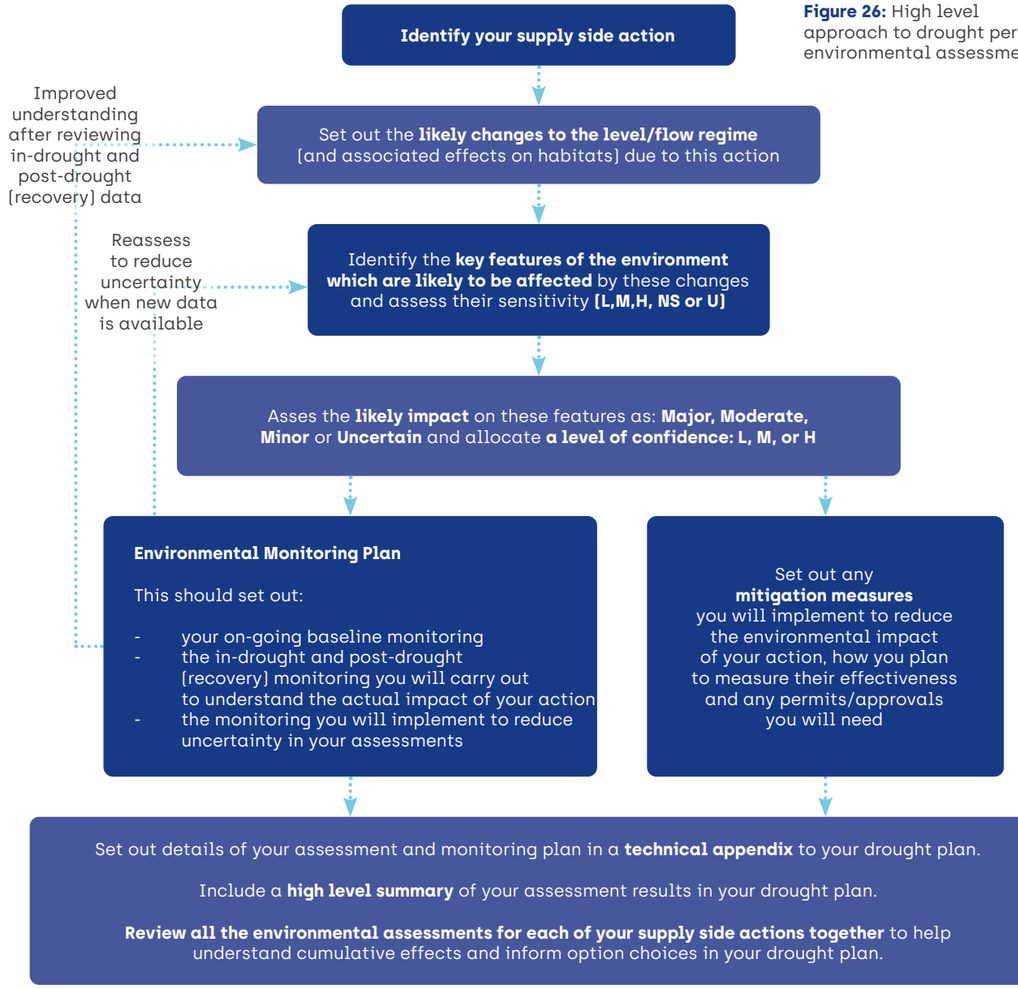


Figure 26: High level approach to drought permit environmental assessment

Table 19: Potential environmental impacts from supply-side drought actions

Action	Examples of Potential Impact
Increased Groundwater Abstraction	Associated reduction in river flow, resulting in potential for: • Decrease in dissolved oxygen content • Higher water temperatures • Variations in compositions of macroinvertebrates and plants • Increased concentration of pollutants • Increased turbidity/sedimentation • Algal blooms • Fish becoming stranded in affected reaches • Reduction in aesthetic appeal
	Prolonged period of no flow, resulting in potential for: • Loss of aquatic macrophytes and invasion of terrestrial plants • Drying of riverbed and loss of habitat for aquatic fauna e.g. macroinvertebrates • Fish kills
	Associated reduction in local groundwater levels, resulting in potential: • Negative impacts on wetland habitats which rely on groundwater connectivity • Associated loss of wetland species including both flora and fauna • Derogation of third party abstractions
Cessation of River Support	Associated reduction in river flow, resulting in potential for: • Decrease in dissolved oxygen content • Higher water temperatures • Variations in compositions of macroinvertebrates and plants • Increased concentration of pollutants, • Increased turbidity/sedimentation • Algal blooms • Fish to become stranded in affected reach • Reduction in aesthetic appeal
	Prolonged period of no flow, resulting in potential for: • Loss of aquatic macrophytes and invasion of terrestrial plants • Drying of riverbed and loss of habitat for aquatic fauna e.g. macroinvertebrates • Fish kills

13.2.1 Environmental assessment reports (EARs)

THUN drought permit

The THUN Environmental Assessment Report (EAR) has been produced to assess the potential impacts of our groundwater drought permit on river flows. It has been written as a draft report and will be fully updated with the latest data and information at the time that the drought permit is applied for.

Our AMP4 and AMP5 investigations have demonstrated that our abstraction does not significantly impact on river flows and that the lower part of the Rib is a naturally losing reach under all flow conditions. Under very low flows, the river may even be dry along this reach.

It is likely that if drought conditions were serious enough to require us to apply for a drought permit at THUN, flow in the River Rib would already be significantly reduced, and some reaches are likely to be dry. Assessment of available data and outcomes of groundwater modelling have indicated that there could potentially be impacts on the water regime for reaches in the Rivers Rib, Lea and Ash. These have the potential to be more serious if reaches are still flowing at the time of drought permit implementation. Any impacts that arise are assessed as being temporary.

There is a degree of uncertainty as to the impacts of abstraction under drought conditions on the River Rib, as when applying for the drought permit, we will be facing unprecedented lows in groundwater levels. Additional monitoring to identify environmental issues would therefore be carried out and in consultation with the Environment Agency, mitigation measures will be put in place where necessary.

PICC drought permit

An EAR has been produced to accompany a drought permit application for our PICC source, which forms part of a group licence. This report aimed to assess the potential environmental impacts of using this groundwater drought permit on the River Gade.

An analysis of data from past drought events and groundwater modelling outcomes identified that there are potential temporary impacts on flows in the River Gade associated with the PICC drought permit, although these would be temporary. These are also associated with potential temporary impacts on fish, macrophytes and macroinvertebrates. The assessment has been made on a precautionary basis and it is acknowledged that the level of impact will depend on the drought conditions at the time of and in the lead up to a drought permit application. This report will therefore be updated with the best information available at the time of application.

There is a degree of uncertainty as to the impacts of abstraction under drought conditions on the River Gade, as when applying for the drought permit, we will be facing unprecedented lows in groundwater levels. Additional monitoring to identify environmental issues would therefore be carried out and working with the Environment Agency, mitigation measures will be put in place where necessary.

AMER drought permit

The AMER EAR has been produced to assess the potential impacts of this groundwater drought permit on flows in the River Misbourne. The River Misbourne lies in Buckinghamshire and is a tributary of the River Colne. AMER is located in the middle of the catchment, adjacent to the River Misbourne. The vast majority of the River Misbourne reaches have been heavily modified by historic and recent human activities.

From the analysis of baseline data over past drought periods and groundwater modelling outcomes, it has been concluded that the increased abstraction at AMER could have an impact on river flows and associated ecology. There may also be impacts associated with a delay in the recovery of flows after a drought has ended. The drought permit is not expected to have any detrimental effect on the overall status of the EU WFD classification for the River Misbourne. There is a degree of uncertainty as to the recovery period due to the increased abstraction under drought conditions; additional monitoring to assess the environmental effects will therefore be carried out and working with the Environment Agency, mitigation measures will be put in place where necessary.

FULL drought permit

The FULL EAR has been produced to assess the potential impacts of this groundwater drought permit on the environment, predominantly in the River Mimram.

The primary controlling factor of both groundwater levels and hence river flows in the Mimram catchment is rainfall. The EAR has identified that there is potential for the drought permit at FULL to impact flows in the locality of the site and potentially also cause delays to the recovery period post drought.

It is likely that if drought conditions were serious enough to require us to apply for this drought permit at FULL, flow in the River Mimram would already be significantly reduced or dry with flows potentially starting from Digswell Lakes, as seen in September 2019 and autumn 1997. The drought permit is not expected to have any detrimental effect on the overall status of the EU WFD classification for the River Mimram. There is a degree of uncertainty as to the recovery period due to the increased abstraction under drought conditions on the River Mimram.

Additional monitoring to assess the environmental effects will therefore be carried out, as well as working with the Environment Agency to put mitigation measures in place where necessary.

WHIH drought permit

The WHIH EAR has been produced to assess the potential impacts of this drought permit on flows in the River Beane. The River Beane is a chalk stream and is believed to be mostly groundwater fed by the local chalk aquifer. WHIH is located within the upper sub-catchment, north of the confluence with the Stevenage Brook. The bedrock geology is essentially composed of Upper and Middle Chalk formations, overlaying significant thicknesses of glacial deposits of variable composition.

Analysis of the data available was undertaken, including historic groundwater levels and riverbed elevations, suggests that during serious drought conditions, the River Beane will suffer from very low flows. Even in the absence of pumping or under low pumping conditions, the riverbed of the Beane in the reach near WHIH is likely to be dry.

The historic data also indicates that the local groundwater levels are only partially controlled by the abstraction regime at WHIH, whilst the regional aquifer fluctuation largely determines the baseline trend. Analysis of available data and outcomes of groundwater modelling indicate that there are potential impacts on flow through use of the drought permit. The operation of the WHIH drought permit has the potential to delay the recovery time post drought. However, any impacts to the River Beane caused by operation of the WHIH drought permit will be temporary. Flow regimes and ecology recovered fully following previous droughts when we were abstracting a similar volume to that associated with this drought permit.

There is a degree of uncertainty as to the impacts of abstraction under drought conditions on the River Beane, as when applying for the drought permit, we will be facing unprecedented low groundwater levels. Additional monitoring to identify environmental issues would therefore be carried out and working with the Environment Agency, mitigation measures will be put in place where necessary.

RUNGS drought permit

The RUNGS EAR has been produced to assess the potential impacts of this groundwater drought permit on the environment. Although this source is located in the vicinity of the Upper River Lea catchment, the borehole abstracts from the Lower Greensands aquifer which lies underneath the Chalk. The Lower Greensands aquifer is located deep below the Chalk and the two units are not hydraulically connected, with the greensand aquifer being recharged from the area of outcrop in the Anglian region. As a result, abstraction from this source does not have the potential to impact the River Lea but may exhibit a small, delayed impact in the outcrop area.

The outcomes of groundwater modelling indicated that the drought permit could potentially have negligible impacts on river reaches within the identified study area; Broughton Brook, Flit Tributary, River Ivel from downstream of Langford to Roxton and Henlow Brook.

River Dour catchment

Three EARs have been developed – SLYE, SDRE and SBUC – to assess the potential impacts of using our groundwater drought permits on the River Dour. The river has been part of the NEP and the Alleviation of Low Flows (ALF) schemes led by the Environment Agency. Flows in the River Dour have been assessed along with likely impacts on designated sites and species. The main conclusion from hydrological and hydrogeological assessments is that at a time when these drought permits may be needed, this chalk stream will be dry in the upper reaches due to the naturally occurring drought conditions. It is our view that at the time the drought permits are being sought, it is unlikely that the use of these sources would cause further adverse effects to river flows and hence ecology. There could, however, be a delay in the rate of recovery post drought.

Additional monitoring in the form of walkovers and flow monitoring will be undertaken during and after a drought by both the Environment Agency and Affinity Water.

There are a number of Special Areas of Conservation within 3 km of SLYE, SDRE and SBUC. These have been assessed for likely significant effects (LSE) and were all found to be unlikely to be affected by use of the drought permit sites. There are numerous areas of Ancient Woodland in proximity to the four drought permit sites, but these are all located on relatively high ground and it is very unlikely that these will be impacted by putting the drought permits into operation. The summary for the environmental impact assessment of the SLYE, SDRE and SBUC drought permits is supplied in Appendix 8.

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14 Conclusions

This Drought Plan marks a step change in our approach from earlier plans and signals a greater focus on our environmental responsibilities as a key custodian of the local environment in which we serve.

This is primarily an operational plan in remit, but it also articulates the vital importance of early communication of the indicators of environmental stress that tell us a drought may be starting to develop.

The actions set out in our plan are designed to limit impacts on our customers whilst safeguarding supplies and protecting the environment.

Droughts are complex and their impacts and risks can be difficult to predict and mitigate – we are committed to working collaboratively with our communities to increase understanding and carry out actions to ensure we can effectively mitigate drought risks while minimising impacts on the environment.

Affinity Water

15 List of Appendices

1 Monitoring droughts and water resources
2 Water resource forecasting
3 Review of past drought experiences
4 Worked examples
5 Supply and demand drought actions
6 Demand restrictions
7 Drought permit screening process
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9 Environmental monitoring
10 River restoration

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