

WONDERFUL ON TAP

SEVERN

TRENT

DROUGHT PLAN

2022-2027

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Summary

This is the final version of Severn Trent Water's statutory drought plan following the consultation of our initial draft drought plan. This drought plan will cover the period 2022-27. We produce drought plans to explain how we will manage both supplies and demand for water during a drought in our region. Our plan aims to balance the interests of customers, the environment and the wider economy. The plan helps us and our stakeholders to make the right decisions at the right time and shows how we will provide a continuous supply of water to our customers during a drought.

For the purposes of this plan we define a drought as a period when there is significantly less water available than normal¹ for a period of three months or more. Whether the effects of any particular drought are focused primarily on the environment, on public water supply or on other water users in the wider economy will depend on the individual characteristics of each drought. All droughts differ in severity, extent and duration. Droughts are naturally occurring events and we cannot plan to prevent them from happening. Instead, we plan to minimise the impacts of droughts when they do occur.

Our plan considers a wide range of drought scenarios. Our approach considers not only the worst droughts in the 1920 to 2014 record but also late 19th Century droughts, drought response surfaces and drought scenarios generated using statistical techniques.

The levels of service that our customers can expect as a response to drought are:

- We will restrict our customers' use of water, on average, no more than three times every 100 years. This applies to both temporary use bans and non-essential use bans. A temporary use ban applies to household customers and is similar to what we used to call a hosepipe ban. A non-essential use ban applies to non-household customers, for example commercial car washing or window cleaning businesses
- We consider that rota cuts / standpipes for our customers are unacceptable. As we would only need to consider using emergency measures in an extremely severe drought we do not have a planned frequency for them

There are a number of indicators that a drought period is developing, for example reservoir storage and rainfall data. We monitor these indicators to identify whether the region is experiencing or likely to experience drought conditions. 85% of our region is managed by predominately using reservoir drought trigger levels.

During times of drought we may utilise demand side actions and/or supply side actions. Actions that could reduce customer demand or leakage are our 'demand side actions'. We consider that demand side actions can be applied anywhere in our supply region. However, we will select the appropriate combination of options and target them depending on the extent to which different parts of our region are affected by drought. Actions that could increase our supply of water are our 'supply side actions'. We can implement most of these actions without any special permissions but there are some options that would require either Government or Environment Agency approval.

Our plan also describes how we may choose to apply for drought permits and drought orders. These allow us to abstract and / or discharge water in different ways to what we do in non-drought conditions. We have 5 locations

¹ We consider that there is less water available than 'normal' when any of our drought levels, such as reservoir storage, are in Level 1 or below – we explain our drought levels and associated actions further in section 2.

where we may choose to implement a drought permit or drought order if needed, including a new site at our Dove reservoirs.

Communication is a key part of our plan. We have set out how our communications plan will operate at different stages before, during and after a drought. Effective agile communications can help to reduce demand in a drought, for example, by raising customer awareness of the limited availability of water resources.

We have planned our system so that it can withstand any drought that is as severe as those we have seen over the last 95 years and up to a 1 in 200-year event. We have also tested our investment proposals against a range of plausible future droughts not seen in the historic record that have quantified probabilities for drought severity and duration. We are confident that our plans represent a good balance between cost, environment, and resilience to severe droughts. Our stochastic drought modelling indicates that we are resilient to a 1 in 200-year drought without the need for emergency drought orders. We are assessing our resilience to a 1 in 500-year drought in preparation for our 2024 Water Resource Management Plan.

Reports to accompany this plan

To accompany the drought plan we produce several other reports which provide further information on how we will supply our customers in a drought whilst protecting the environment. The following reports can be found on our website:

- Non-technical summary
- Strategic Environmental Assessment (SEA) of the drought plan

In addition, the following reports are available on request:

- Habitats Regulations Assessment (HRA) of the drought plan
- Water Framework Directive (WFD) assessment

Section 1 Introduction

1.1 About Severn Trent

Our purpose is to take care of one of life's essentials, delivering an outstanding customer experience, best value service and environmental leadership. We are one of the largest water companies in the country and provide high quality drinking water and sewerage services (taking wastewater away) in the Midlands. For further information on our business, please visit www.stwater.co.uk.

1.2 What is a drought?

Droughts are naturally occurring events. There is no single definition of drought, but all droughts involve an extended period of lower than average rainfall. Whether the impact of any particular drought falls on the environment, on public water supply or on other water users in the wider economy will depend on the individual characteristics of each drought. All droughts differ in severity, extent, and duration. The effect of droughts will also be different depending on whether the majority of the water sources affected are rivers, reservoirs or groundwater.

For the purposes of this drought plan, we are referring to an event that lasts a minimum of two or three months. This means that a few days or weeks of particularly hot and / or dry weather do not constitute a drought. Periods of this sort will class as heatwaves if there are prolonged periods of higher than average temperatures. Heatwaves can cause water companies short term issues by drawing down levels in treated water reservoirs. However, events like this may be too short term to fall within the scope of this plan.

We expect climate change to lead to more extreme climatic events in the future – these will include severe droughts as well as severe flooding events. Extreme droughts are low likelihood, but high consequence, events.

1.3 What is a Drought Plan?

Droughts are naturally occurring events and we plan to minimise the impacts that they might have. We produce a drought plan to explain how we will manage both supplies and demand for water during a drought in our region. Our plan aims to balance the interests of customers, the environment and the wider economy. The plan helps us and our stakeholders to make the right decisions at the right time and shows how we will provide a continuous supply of drinking water to our customers during a drought.

Under Sections 39B and 39C of the Water Industry Act 1991, as amended by the Water Act 2003 and in accordance with the Drought Plan Regulations 2005 and the Drought Plan Direction 2020, we are legally required to prepare and maintain a drought plan. This drought plan sets out how Severn Trent Water will “continue, during a period of drought, to discharge its duties to supply adequate quantities of wholesome water, with as little recourse as reasonably possible to drought orders or drought permits.” This definition is consistent with the Water Industry Act 1991.

We are required to consult with the public on the content of the plan, assess the representations we receive and prepare our statement of response within 15 weeks of the draft plan publication date. The published Statement of Response following the consultation on the draft drought plan can be found on our website.

The structure of this plan is based on the recommended structure provided in Appendix I: Advice on the structure and format of your plan in the EA guidance ‘Water company drought plan guidelines’ dated December 2020.

1.3.1 Consistency with the EA and NRW drought plans

When preparing our drought plan we have considered and referred to the 2017 Drought Response Framework produced by the Environment Agency (EA). We have also referred to the EA area and/or NRW (Natural Resources Wales) drought plans as appropriate and where they are available. We can confirm that there is consistency between the EA/NRW drought plans that we have reviewed and our own plans.

1.4 Overview of process

Appendix C of the EA guidance note 'Water company drought plan guidelines' dated December 2020 provides a useful overview of the Drought plan process. We have reproduced it in Figure 1 below.

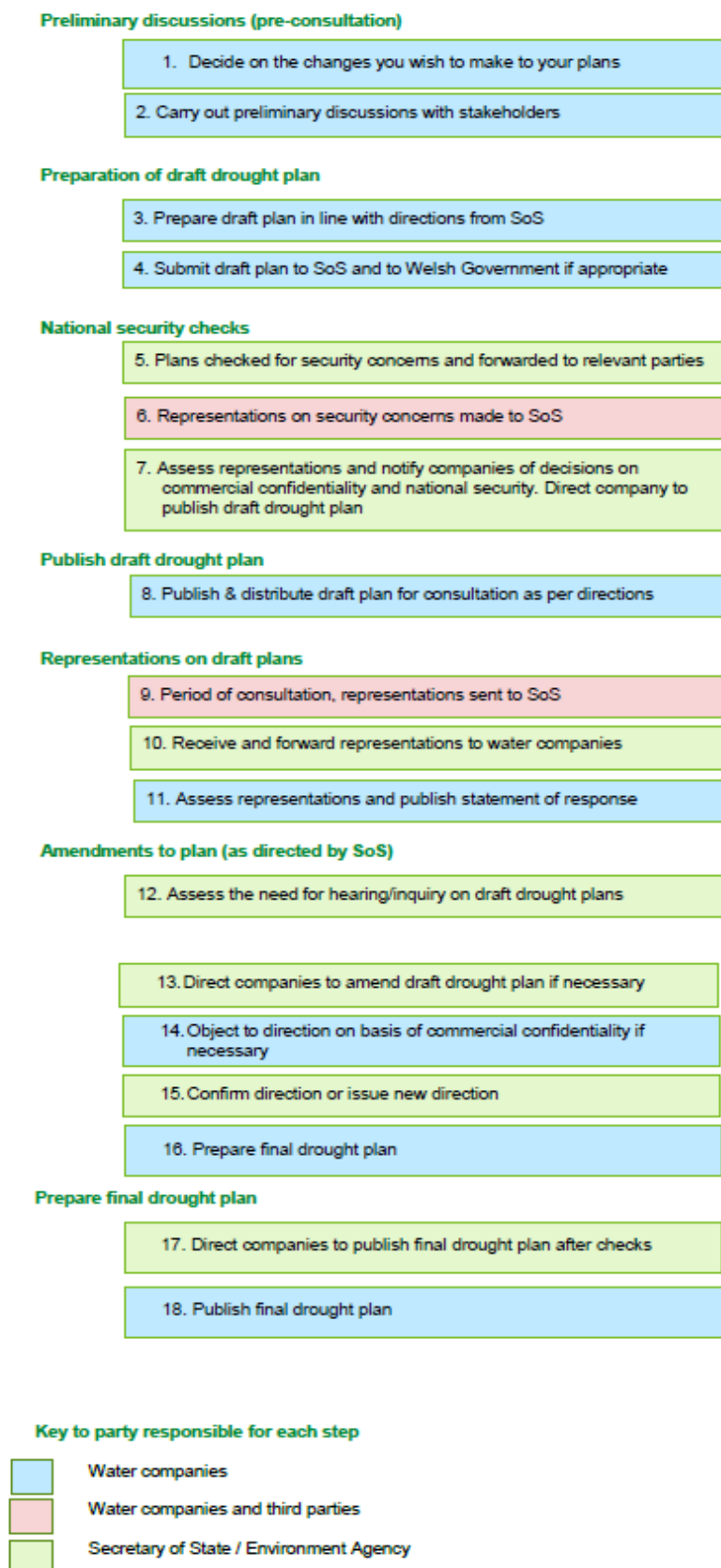


Figure 1 Process flow diagram from EA guidance

1.5 Severn Trent & Hafren Dyfrdwy

In February 2017, Dee Valley Water became part of the Severn Trent group. In May 2018, Ofwat approval was received to align the boundaries of Severn Trent Water and Dee Valley Water to the national boundaries of England and Wales (Figure 2). In line with this approval, we launched the new name, Hafren Dyfrdwy on 1st July 2018. Both Severn Trent and Hafren Dyfrdwy customers can expect their respective drought plans to provide information on how water supplies and demand are managed during a drought in their region. We will continue to work closely with the Environment Agency and Natural Resources Wales to ensure consistency between plans for our customers. We published the Hafren Dyfrdwy Drought Plan in 2020. It can be found here: <https://www.hdcymru.co.uk/about-us/plan-and-strategy/water-resource-planning/drought-plan/>

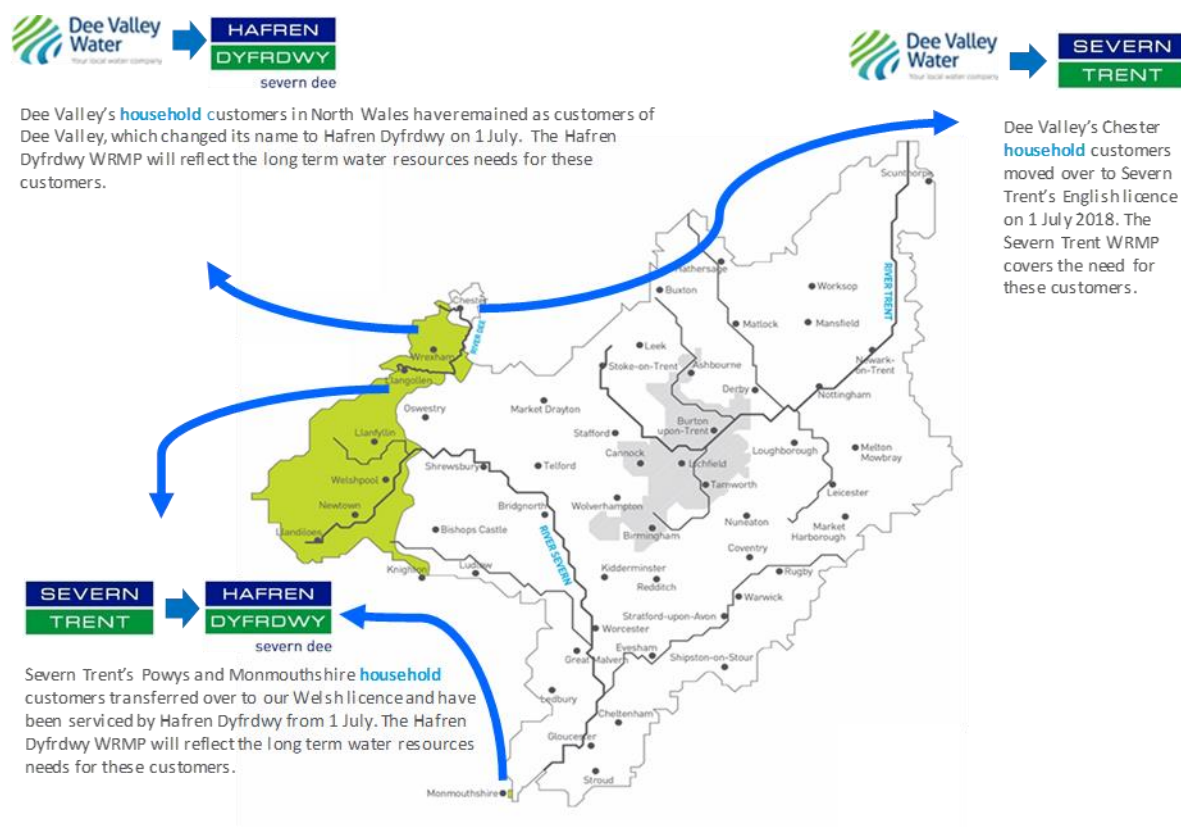


Figure 2 Map illustrating company changes between Severn Trent & Hafren Dyfrdwy

1.6 Baseline water resources situation, levels of service and customer views

We have described our baseline water resources situation in our 2019 Water Resources Management Plan (WRMP19), and in the annual review information that we provide to the EA and Defra. As a company we produce other plans that overlap to some extent with drought management. For example, we produce water resource management plans (WRMPs) and business plans. We have included a table in Appendix G that describes why we produce these other plans and summarises what they contain. As stated in that table, this drought plan is not an investment plan. Any assessment of, or proposal for, investment for drought resilience is in our business plan or WRMP.

Figure 3 shows the WRZs within our Severn Trent region following the creation of Hafren Dyfrdwy. These 15 zones vary widely in scale, from the Strategic Grid zone which supplies the majority of our customers, to the small zones of Mardy and Bishops Castle which supply much smaller populated areas. These zones have very

different water resources challenges, with some requiring significant investment in the long term to ensure secure supplies, while others require minimal investment to maintain the current assets and infrastructure.

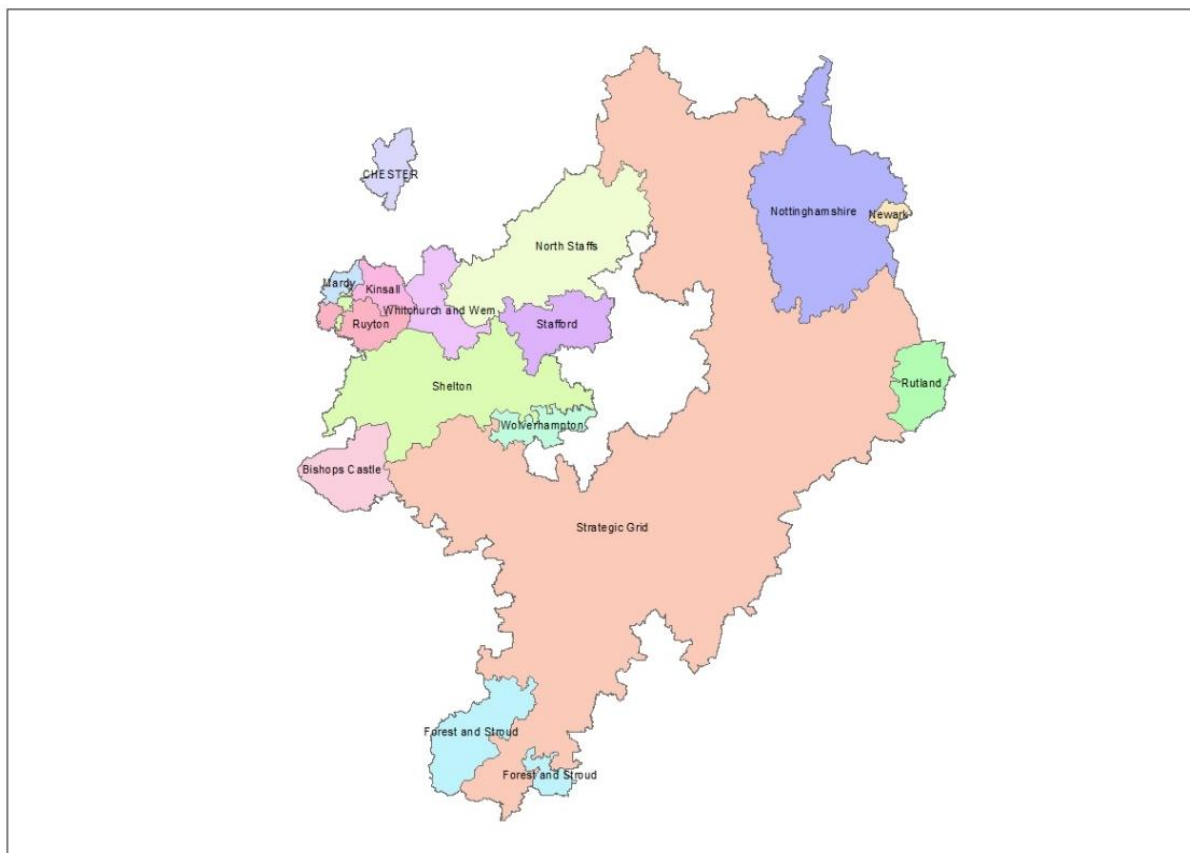


Figure 3 Severn Trent Water Resource Zones

1.6.1 Levels of service

Our stated levels of service set out the standard of service that our customers (household and non-household) can expect. Section 5.1.3 also sets out how we can help those in the region on private supplies. The levels of service stated for this drought plan are consistent with those recognised by Ofwat at the Price Review of 2019 (PR19). These levels of service that our customers in each of our WRZs can expect as a response to drought are:

- We will restrict our customers' use of water, on average, no more than three times every 100 years. This applies to both temporary use bans (TUBs – level 2 restrictions) and non-essential use bans (NEUBs – level 3 restrictions). We explain these in section 3.1.5.
- We consider that rota cuts / standpipes for our customers are unacceptable. Note that rota cuts and standpipes are often referred to as 'level 4 restrictions' or emergency drought (order) measures. As we would only need to consider using such measures in an extremely severe drought we do not have a planned frequency for them.

These stated levels of service are consistent with those we have quoted in previous Severn Trent publications, such as our 2014-19 drought plan and are consistent with the WRMP19 that we published on our website in 2018/2019. We are reviewing this information in WRMP24 due to the new requirement to plan to 1 in 500 year drought events and our new stochastic modelling methodology. We set out the sensitivity of our system (in terms of deployable output) to different levels of service in our WRMP. Table 1 shows the modelled frequency* of customer restrictions:

Table 1 Modelled frequency of restrictions on customers' use

	Our levels of service	Length of record (years)	Company states LoS frequency
Level 2: Temporary Water Use Ban (TUB)	3 (1976 and 1984: Elan Valley Group, 1934: Tittesworth)	95	Not more than 3 in 100
Level 3: Non-Essential Use Ban (NEUB)	1 (1984 for Elan Valley)	95	Not more than 3 in 100
Level 4: Rota cuts/standpipes	0	95	Not acceptable / no planned frequency

** The 1995-96 drought does not trigger restrictions in our modelled scenarios and therefore does not appear in this table. We have shown the modelled results for this drought in section 2.5.*

Our company wide levels of service (Table 2) are based on water resources modelling that we have carried out using flow series which extend from 1920 to 2019. This annual average risk value has been calculated based on the frequency of Temporary Use Bans (TUBs) and Non-Essential Use Bans (NEUBs) water use restriction that we used in our calculation of deployable output in our Aquator water resources model. We have provided more detail on how we use this flow record in section 2. This drought plan makes no explicit allowance for the impacts of future climate change. This is consistent with our 2014-19 drought plan. However, we are carrying out a further rigorous assessment of climate change for our WRMP24.

Table 2 Company Level of Service and Annual Average Risk of Drought Restrictions for each AMP from 2020 to 2045

Drought restriction	Our levels of service	2020-25	2025-30	2030-35	2035-40	2040-45
Temporary Water Use Ban	3 in 100 years (3% annual risk)	3%	3%	3%	3%	3%
Ordinary Drought Orders (Non-Essential Use Restrictions)	3 in 100 years (3% annual risk)	3%	3%	3%	3%	3%
Emergency Drought Orders	We consider these unacceptable	<0.2%	<0.2%	<0.2%	<0.2%	<0.2%

1.6.2 Customer and stakeholder views

We sought the views of our customers and stakeholders on drought resilience through our PR19 business planning process and through research conducted following the hot weather and high demand during the initial Covid-19 lockdown in 2020. A few examples that informed our PR19 plan are described below.

Willingness to Pay (WTP) work. This is similar to the work we carried out for WRMP14. The WTP research we carried out prior to PR19 showed that our customers were willing to pay £3.8m to halve the risk of standpipes. This may sound like a large amount of money, but it was actually smaller than the WTP values for some of the other improvements we asked customers about.

Immersive research. We carried out research like this for PR19 as it has many advantages over the other approaches as it means we can 'immerse' selected customers in more detail so that they are properly informed before we ask them for their views on these (often technical and complex) issues. This work also allows customers to better consider competing priorities.

Overall, customer awareness of drought and the water resources supply / demand challenge is very low. According to our customer tracker, only 7% of customers think that we won't have enough water in 10 years' time and 10% in 20 years' time. By inference, severe drought is therefore not something that customers anticipate will affect the UK.

As drought is not something most customers consciously consider, we used deliberative research to discuss and understand our customer's informed views (in line with our strategic research framework). We used a drought 'story board' to help customers imagine the development of a drought situation over time, with progressively more serious customer impact as outlined in Figure 4.

To obtain their informed feedback, we showed participants information on STW's plans for when long periods of dry weather put water sources under stress...

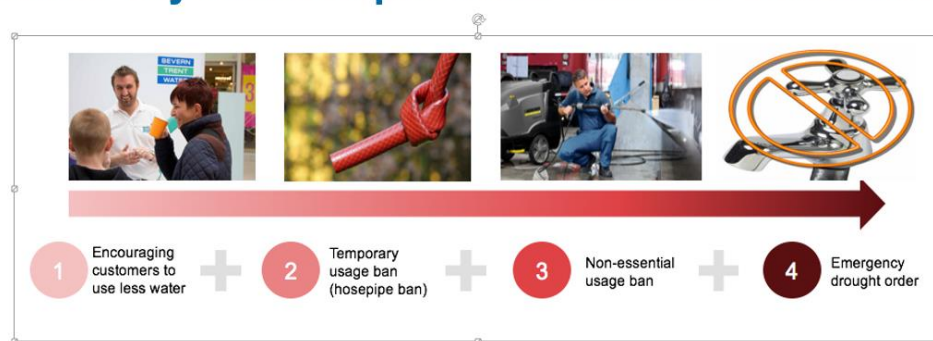


Figure 4 Material used for PR19 immersive customer views' research

In summary the customers we engaged generally felt that:

- Drought is not an issue they anticipate will affect the UK
- Due to the perceived minimal impact of temporary use ban (TUB) restrictions, the expected frequency is mostly seen as acceptable
- They do not see non-essential use bans (NEUBs) as having direct impact on them, but worry about the impact on businesses
- Level 4 is seen as extreme, although probably proportionate and very unlikely to occur (we described the frequency of this as 'never / once every 200 years').

We think that this useful and in-depth customer insight work has shown that the current levels of service we provide and those that we plan for in our drought plan and WRMP are in line with customer views and expectations. Customers expect us to be prepared to address any long-term challenges which may affect water supply, such as climate change or population growth. Customers also expect us to meet our statutory obligations, including those related to restoring unsustainable abstraction and ensuring no environmental deterioration. Further information on our PR19 customer research can be found here:

https://www.stwater.co.uk/content/dam/stw/about_us/pr19-documents/sve_appendix_a1_engaging_customers.pdf

As suggested in the 2017 Water Resources Planning Guidelines (WRPGs), we considered using the UKWIR (United Kingdom Water Industry Research) risk-based planning report directly in our customer research in relation to drought resilience. We did not think that this work was suitable for the WTP phase of our work, but

we have adapted elements of it to assist with our immersive research. We are aware that there are challenges involved in helping customers to better understand the likelihood of extreme drought events.

In addition to this customer engagement work we have shared our extreme drought scenario work, described in section 2, with our Water Forum. Our Water Forum includes experts in this field. We have also presented our drought resilience work at WRMP external stakeholder forum meetings. For example, we held one of these multi stakeholder WRMP19 events in Coventry on 6 October 2017. We provide more details on the extensive stakeholder engagement we have carried out in our 2019 WRMP.

One of the organisations represented at our stakeholder events, and that responded to our pre-consultation and draft plan consultation, is the Consumer Council for Water (CCWater). CCWater is a statutory consumer body for the water industry in England and Wales. In addition to gathering views from CCWater, we have sought customers' views on the priority that they place on never having level 4 restrictions such as standpipes/ rota cuts. We have done this in different phases. We carried out some work of this sort in preparation for our WRMP14 but we adapted our approach in the research we did to support our PR19 plans. For example, our PR19 WTP work focused on emergency drought measures such as rota cuts and standpipes whereas the PR14 work asked about restrictions on hosepipe use. We expected customers to have stronger views on rota cuts and standpipes than they did on 'hosepipe ban' frequency. We also carried out research at the request of CCWater following the hot weather high demand in the initial Covid-19 lockdown between March – June 2020 (see section 5.2.3). We believe that using research we conduct for our Water Resource Management Plan and our Business Plan which link well with our Drought Plan, as well as other customer research on hot weather/high demand we are able to effectively ensure our customer's views on drought are taken into account in our Drought Plan.

1.7 Alignment with Water Resource Management Plan and Regional Plans

In developing this drought plan we have ensured we are consistent with our draft WRMP24 where possible, however the alignment with WRMP is complex as the WRMP24 timeline is different to that of this drought plan and we are earlier in the process in terms of developing our WRMP24. To this effect, there are elements of this plan that are aligned with WRMP24 as the analysis has already been carried out, but other elements that are based on WRMP19. The assumptions and data used are consistent and aligned with our draft WRMP24 for the new drought level curves which have been developed utilising a longer data set. These are included in this drought plan. However, this drought plan utilises our drought vulnerability analysis based on the outputs of our WRMP19 which has assessed our drought vulnerability to droughts of various return periods, types and severities.

Severn Trent's geographical position means that we interface with each of the new regional water resources groups. As a company we are situated within Water Resources West (WRW). Through engagement with the relevant regional groups, and by contributing to the Regional Coordination Group (RCG), we have ensured that our drought plan aligns with the other water companies within WRW and is consistent with the approach being taken by the other regional groups. All WRW water company members, including Severn Trent, propose to adopt a consistent form of notice for Temporary Use Bans; to use regionally consistent data and assumptions for their drought plan where appropriate; and to align our drought communications where appropriate. Full information on this alignment that Severn Trent have agreed to can be found in Appendix H.

1.8 Pre-draft and draft consultation details

We sent a pre consultation email on 23rd July 2020 to interested parties, neighbouring water companies and statutory consultees. These organisations included:

- CCWater (Consumer Council for Water)
- CRT (Canals and River Trust)
- Defra
- Environment Agency
- Environmental charities
- Local authorities
- Natural England
- Non household water retailers
- NRW (Natural Resources Wales)
- Ofwat
- Regional water resource groups

We requested early views on the issues these organisations want us to address in our plan. We asked for these responses no later than the 14th August 2020. We accounted for these responses, produced our draft drought plan and submitted it to the Secretary of State in March 2021.

Section 2.4. of the Environment Agency's water company drought plan guidelines state that we should make paper copies of our draft plan available for inspection at our offices during the consultation on the draft Drought Plan. However, in light of Covid-19 to help maintain social distancing, we made hard copies available for posting on request. We decided in the event a member of the public wishes to inspect a non-redacted version of the draft plan or its associated appendices, which is not suitable to be posted, then we would make provisions to allow access to our Head Office in Coventry following Covid-19 rules.

Following permission from the Secretary of State, we published our draft drought plan for public consultation for eight weeks from 1st June 2021. We received eight representations on our draft drought plan. We produced a revised draft plan following updates made on the original draft plan which was published at the same time as our Statement of Response (SoR) – 15 weeks since publishing our original draft drought plan. We have now produced and released this final drought plan following approval to publish from Defra in August 2022.

Section 2 Drought triggers

2.1 Historic droughts and other drought scenarios

When preparing this plan we have considered a wide range of drought scenarios. For example, all of our WRMP19 modelling, which uses our historic record, includes flows across our region from 1920 to 2014. Companywide the 1975-76 drought is the most extreme in our hydrological and hydrogeological record. This is the drought that we have based much of our current plans on. However, we have also looked at what the impacts might be if we were to experience a more severe drought than the 1975-76 drought and the other drought events present in our baseline modelling period e.g. 1933-35, 1995-96.

If we experience a drought more extreme than the droughts we currently plan for it could lead to emergency measures such as standpipes in the street or rota cuts for our customers. As we said in section 1.6.1, we do not plan for level 4 restrictions such as rota cuts or standpipes. In an extremely severe drought we would consider using them, and from WRMP24 onwards we will have a planned level of service for these types of drought.

Please see Appendix D for the technical detail around how we investigated our water resource system to cope with a variety of droughts.

2.1.1 Chester WRZ and Drought Resilience

Now that the Chester WRZ has been incorporated into the wider Severn Trent plan, we have carried out the modelling necessary to understand the level of service for the Chester WRZ during a 1 in 200 year drought scenario.

The only sources in the Chester WRZ are the River Dee and the Mickle Trafford borehole. The borehole is resilient to drought and the River Dee abstraction is protected from Dee General Direction (DGD) cut-backs by augmentation from the Pen Y Cae Lower reservoir in Hafren Dyfrdwy's Wrexham WRZ. Stochastic modelling of the Natural Resources Wales (NRW) River Dee model has shown that flow levels in the River Dee have high resilience to droughts and abstractions from the River Dee are not affected by severe and extreme droughts. This indicates that the Chester WRZ deployable output and levels of service during severe and extreme droughts will only be determined by the resilience and capability of Pen Y Cae Lower reservoir to augment the River Dee as per the DGD rules.

To assess this, testing was undertaken by running the stochastic data that has been prepared for deployable output modelling (i.e. 8,700 years) through the Wrexham water resources model, with the Wrexham zonal demand set at a level above forecast demand plus target headroom for that zone.

In our modelled scenarios, augmentation from Pen Y Cae Lower reservoir was fully maintained throughout all plausible severe and extreme droughts in the stochastic data. Therefore, the Chester WRZ was found to be resilient to plausible severe and extreme droughts, and the deployable output at all return periods is consistent with the historic, asset capacity / licence-based deployable output of 29.3 MI/d. Therefore we can conclude that the 1 in 200 year deployable output for Chester is 29.3MI/d and the Level of Service remains consistent with the baseline level of service. These results are available in table 10 of our final WRMP19.

We have not quantified a risk of level 4 emergency drought orders as we do not feel these are acceptable to include in our 'business as usual' planning, and therefore they would only be used as part of our Emergency Plan. However, we have calculated the likelihood of this level of restriction and our drought resilience analysis demonstrates that we are able to meet Defra's reference level of service (a 1 in 200-year drought) without the use of emergency drought orders, as shown in Table 3.

Table 3 Chester WRZ Annual Average Risk of Drought Restrictions per AMP from 2020 to 2045

Drought restriction	DGD Stage	Our levels of service	2020-25	2025-30	2030-35	2035-40	2040-45
Temporary Water Use Ban	Stage 2 / 3	1 in 40 (2.5% annual risk)	2.5%	2.5%	2.5%	2.5%	2.5%
Ordinary Drought Orders (Non-Essential Use Restrictions)	Stage 3	We do not plan for NEUB	0.47%	0.47%	0.47%	0.47%	0.47%
Emergency Drought Orders	N/A	We consider these unacceptable	<0.01%	<0.01%	<0.01%	<0.01%	<0.01%

For information on our drought triggers and actions for Chester, please see appendix B.

2.1.2 Drought Resilience Statement

We have planned our system so that it can withstand any drought that is as severe as those we have seen over the last 95 years and up to a 1 in 200-year event. We have also tested our investment proposals against a range of plausible future droughts not seen in the historic record that have quantified probabilities for drought severity and duration. We are confident that our plans represent a good balance between cost, environment and resilience to severe droughts. Our stochastic drought modelling indicates that we are resilient to a 1 in 200-year drought without the need for level 4 emergency drought orders. As detailed in section 1.6.1 we are reviewing this information in WRMP24 due to the new requirement to plan to 1 in 500 year drought events.

2.2 Triggers, data sources and arrangements

There are a number of indicators that a drought period is developing. The following indicators affect the hydrological conditions within our region:

- Rainfall deficits, particularly comparisons against long term averages (we discuss this further in section 3.3.3)
- Soil moisture deficit (SMD) - high soil moisture deficits occur when soils are dry. This indicates that drought conditions may be building and demand could increase
- Low river flows; however, our resource rivers are, with only one exception, supported by impounding or pumped fill reservoirs. It is because of this that our operations can generally survive a short sharp drought, such as the one in 2003, when river flows fell markedly
- Falling groundwater levels
- Falling reservoir storage

We are grateful to both the EA and NRW for providing us with some of the information listed above. For example, the EA provides us with regular flow data at many locations and NRW provides flows for sites such as the Wye at Redbrook. Should we wish to vary any of these arrangements then we will contact the relevant organisations. It is important to all parties that we continue to share the most accurate and up to date information that is available. This collaborative working helps us to make decisions with the best information possible.

We also use publicly available data such as that found in the Centre for Ecology and Hydrology (CEH) UK drought portal (see references for link). Figure 5 shows a map from this portal in which we have selected the June 2020 spatial data:

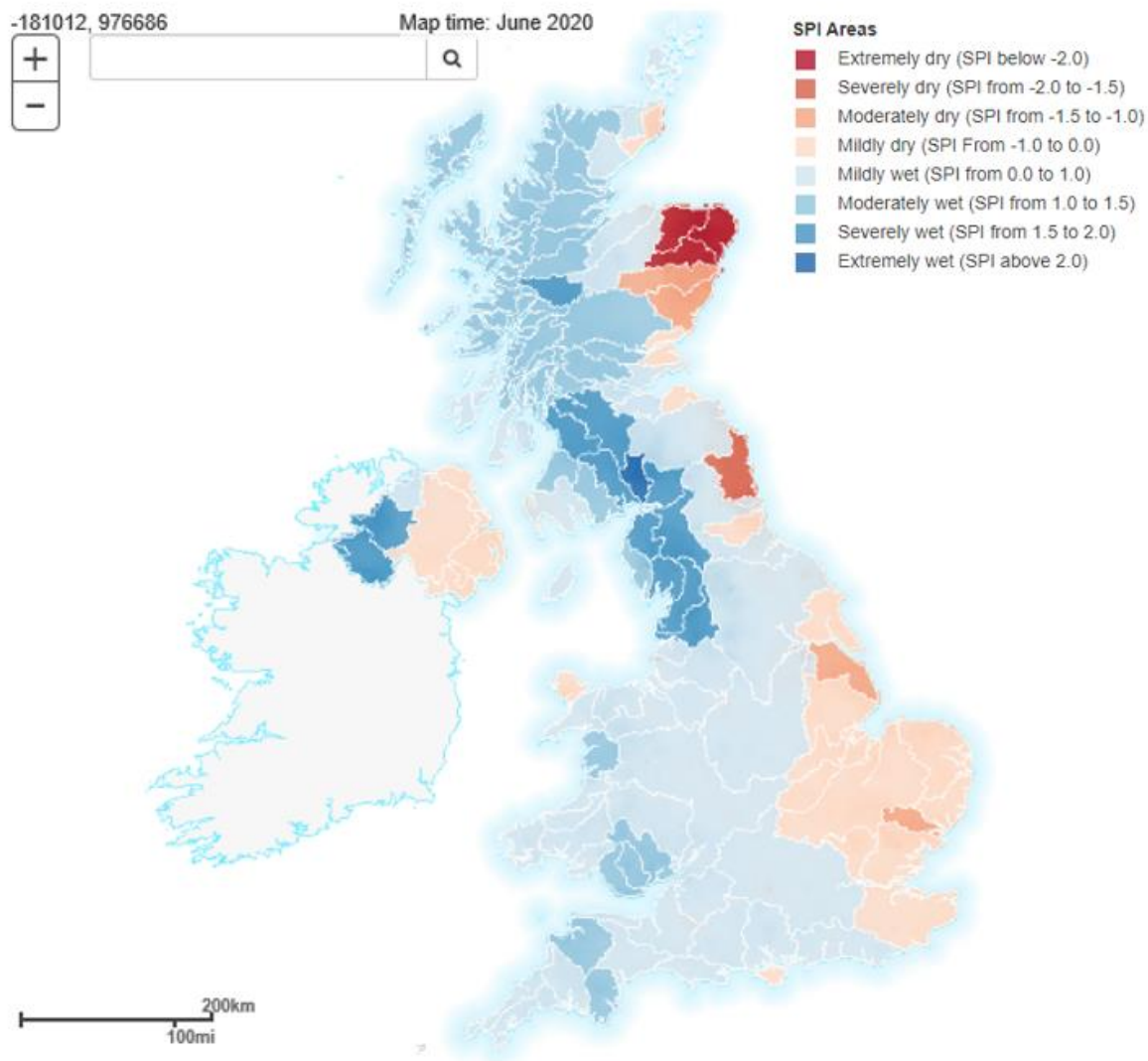


Figure 5 Drought portal information on CEH portal

As part of our normal operations we monitor the indicators listed above and we also monitor:

- Levels of customer demand
- Leakage, and
- The quantities of abstraction at surface and groundwater sources, for instance we monitor the amount of our annual licence that we have used.

2.2.1 Surface water triggers

We have managed droughts by using reservoir drought triggers in the following three water resource zones (WRZs):

- Strategic Grid
- Nottinghamshire
- North Staffordshire

Taken together, these three WRZs make up over 85% of the total population of our region. We have derived drought action triggers for the major reservoirs in our Strategic Grid and North Staffordshire WRZs. We have split our Strategic Grid WRZ into 3 zones (East, West and South) for drought plan purposes as it assists our tactical and operational teams to manage our resources and response in a drought situation. We also include the Nottinghamshire WRZ here as it receives a significant supply from the Strategic Grid. Therefore, the water resources position in the Nottinghamshire zone depends upon the resources position in the Strategic Grid. We describe the approach that we take in our other WRZs in section 2.2.2.

In the three WRZs listed above we regard the variation in reservoir storage as the fundamental, operational measure of any drought situation. We base our drought triggers on this (an example of these drought trigger levels can be seen later in this section and the complete set are presented in appendix B).

We use surface water sources as drought action triggers only when they are of strategic importance. We consider that our larger raw water reservoirs or reservoir groups are strategic whereas our smaller sources are not. For example, we own and operate numerous service reservoirs which store treated water and provide supply for localised areas. These assets are not strategic in nature and it is not appropriate for us to use them as drought triggers.

To take the appropriate drought management action at the correct time we monitor reservoir levels and quickly identify when any of these levels enter into the specified trigger levels. As a drought situation develops there is a risk that storage will fall through the predefined trigger levels. However, we are proactive and instigate several operational responses to try to head off any issues before storage falls too far. This is part of our BAU (Business as Usual) operations. Taking this action early does not guarantee that storage will recover but it puts us in the best possible position if the lack of rainfall were to continue. The responses we take when as a result of indicators crossing triggers are both supply-side and demand-side. This means that they either increase the amount of water that we have available or reduce the amount that we need to supply.

Water company members of Water Resources West have agreed to consistently adopt Level 1 to 4 definitions to categorise their drought actions. To assist in comparing to our previous drought plan we detail in Table 4 our previous drought trigger zone labelling against the new drought restriction levels. The Level definitions encompass more than one of our previous drought trigger zones in certain instances for example where we have split level 1 into 1(a) and 1(b).

Table 4 Definitions of the drought trigger zones

Drought trigger zone	Drought restriction level	Comment
A	0	Above normal - storage is above average for the time of year
B		Normal - storage is in the average range for the time of year
C	1(a)	Below normal - storage is below average for the time of year
D	1(b)	Low storage - storage is low for the time of year
E	2	Notably low storage - storage is notably low for the time of year. If storage is in this zone for more than 7 days between April and October we may be considering implementing a TUB. On average, we would not expect more than 3 of these in 100 years. We may also need to implement drought permits in this zone.

F	3	Exceptionally low storage* - storage is exceptionally low for the time of year. In this zone we consider, and potentially implement, drought orders to restrict non-essential demand. If necessary, we would then consider the use all possible actions to avoid emergency drought orders.
Emergency storage	4	If we reach Level 4 then we would look to implement Level 4 restrictions at some point within Level before dead storage

Figure 6 illustrates the operational measures we may take in North Staffordshire as Tittesworth reservoir storage reduces and passes through the trigger levels. We have provided a summary of all surface water data triggers and drought management actions in appendix B.

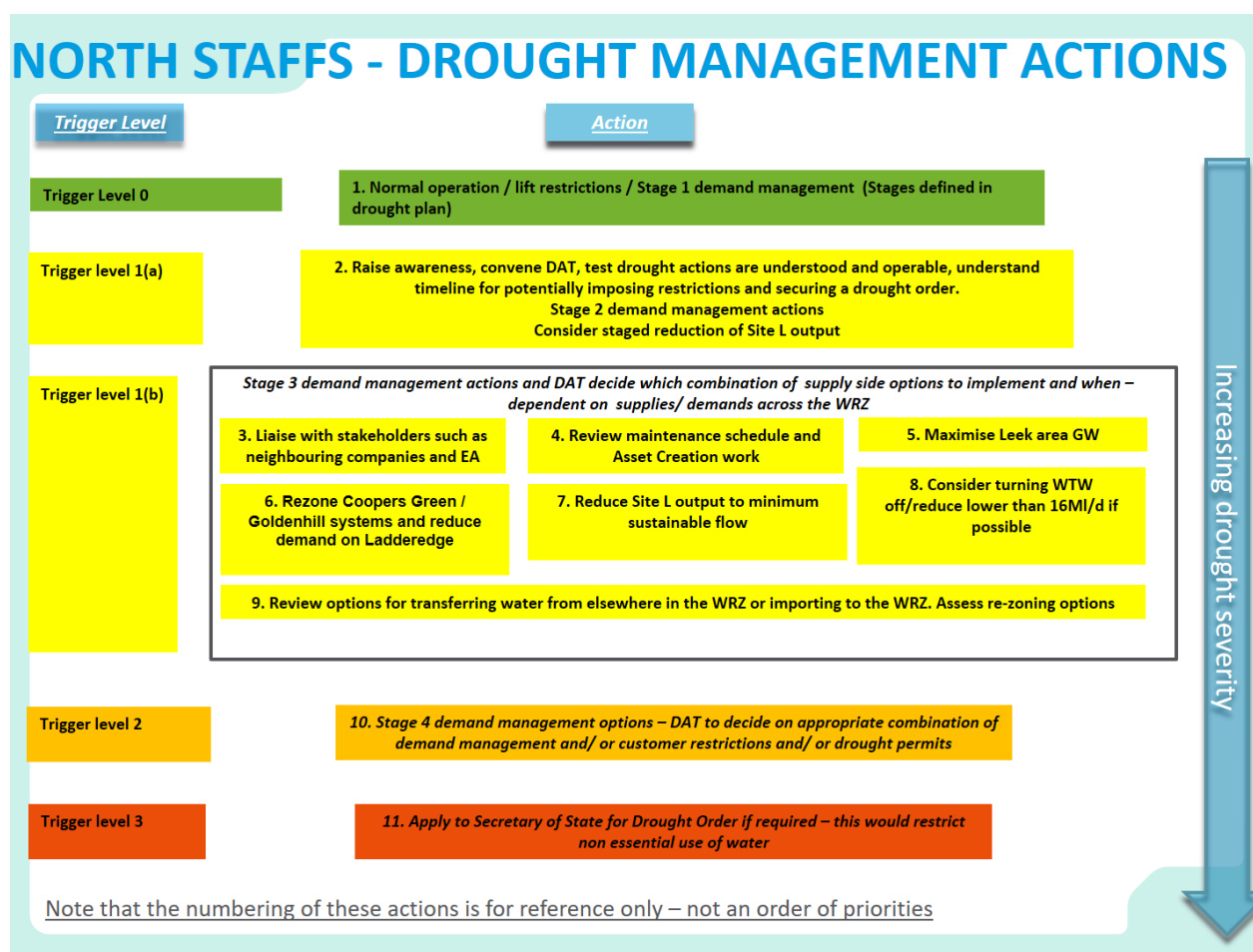


Figure 6 Decision flowchart showing drought management actions for North Staffordshire

Since we published our 2014 drought plan we have reviewed our reservoir drought level zones. Figure 7 shows the drought level zones for Tittesworth reservoir in North Staffordshire.

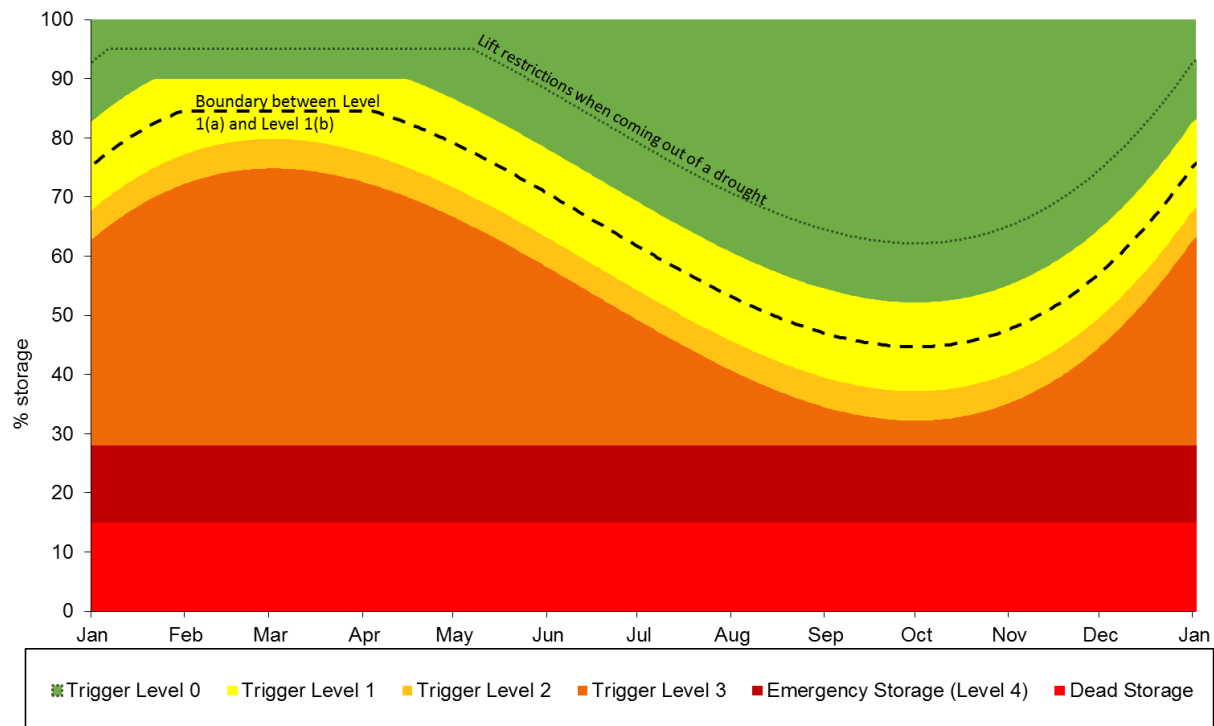


Figure 7 Graph showing drought level zones for North Staffordshire

The reason for drought levels is to alert the business and our stakeholders when we expect to implement drought management options. In particular we use them to trigger potential implementation of restrictions e.g. temporary use bans (TUBs), drought permits and/or drought orders. Since we produced our 2014-19 drought plan we have reviewed and updated the drought levels that we use.

To review our reservoir drought levels we used our Aquator water resource model. Updating our drought levels is one of many improvements and updates that we have made to our water resources planning capability since PR19.

This company-wide Aquator model includes all five of the reservoirs or reservoir groups for which we produced revised trigger level curves. These are:

- Carsington and Ogston
- Derwent Valley
- Elan Valley
- Tittesworth and
- Draycote

We have updated these levels for WRMP24 and these updated levels are used in this drought plan.

The process we followed had the following stages:

- Analysis of the Aquator modelled results for the 100 year run with no demand restrictions applied on customers. It was essential for this run not to have demand restrictions in as it would mean that the previous levels would have an effect on the generation of the new, improved levels
- Comparison and verification of the levels to take account of:

- modelled crossing frequency of curves
 - target crossing frequency, which is based upon our stated levels of service,
 - overall system behaviour (in terms of percentiles) and
 - historical records of drawdown
- Internal ‘sense check’ of the levels against operational experience and knowledge. We then used these finalised trigger level curves to produce the trigger levels shown above and in appendix B.

We carried out a review to determine what levels we should use for the dead/ emergency storage in our (strategic) raw water reservoirs. The results of this review can be found in our WRMP19.

2.2.2 Triggers in water resource zones that do not have reservoir triggers

In the 11 WRZs that have no reservoir levels to trigger actions, we use a different approach (we do not include our Chester WRZ here – see section 2.2.2.2). These WRZs predominantly get their supply from either groundwater, bulk imports, river abstractions or a combination of these sources (conjunctive use). The WRZs and their predominant source of supply are as follows:

- Bishops Castle – groundwater
- Forest & Stroud – conjunctive use
- Kinsall - groundwater
- Mardy - groundwater
- Newark - groundwater
- Rutland - bulk import
- Ruyton - groundwater
- Stafford - groundwater
- Shelton – conjunctive use
- Whitchurch and Wem – groundwater
- Wolverhampton – conjunctive use

We have developed groundwater triggers for six of the aforementioned water resource zones: Bishops Castle, Kinsall, Mardy, Ruyton, Stafford and Whitchurch and Wem. (see section 2.2.2.3). We have also outlined drought triggers for our Forest & Stroud and Wolverhampton water resource zones. For the remaining zones (Newark, Rutland and Shelton), we have developed some high-level triggers. These are included in Figure 8. The flows and groundwater levels are taken from the EA’s Water Situation Reports.

For our WRZs where we have developed high-level triggers (Newark, Rutland, Shelton), we do not expect to need a drought order to increase supply in these zones. Our approach to making drought management decisions at specified trigger levels in these WRZs is shown in Figure 9. We have included more detail on these drought management actions in the completed tables in appendix B. In these WRZs we use manual dip and telemetry data, as well as external sources of information on groundwater levels to monitor approaching drought conditions. For example, we use information from CEH or the EA that show the groundwater picture for the Midlands region. We use data from regionally representative observation boreholes, such as Weir Farm, to support our drought indicator monitoring. When levels in observation boreholes start to cross into “below normal” conditions (as detailed in the Environment Agency’s Water Situation Report), we inform our Drought Action Team (DAT). This is the equivalent of our Level 1(a) trigger.

We were advised by regulators for our final plan to develop drought management actions and triggers for our Forest & Stroud and Wolverhampton conjunctive-use water resource zones. This information is detailed in section 2.2.2.1.

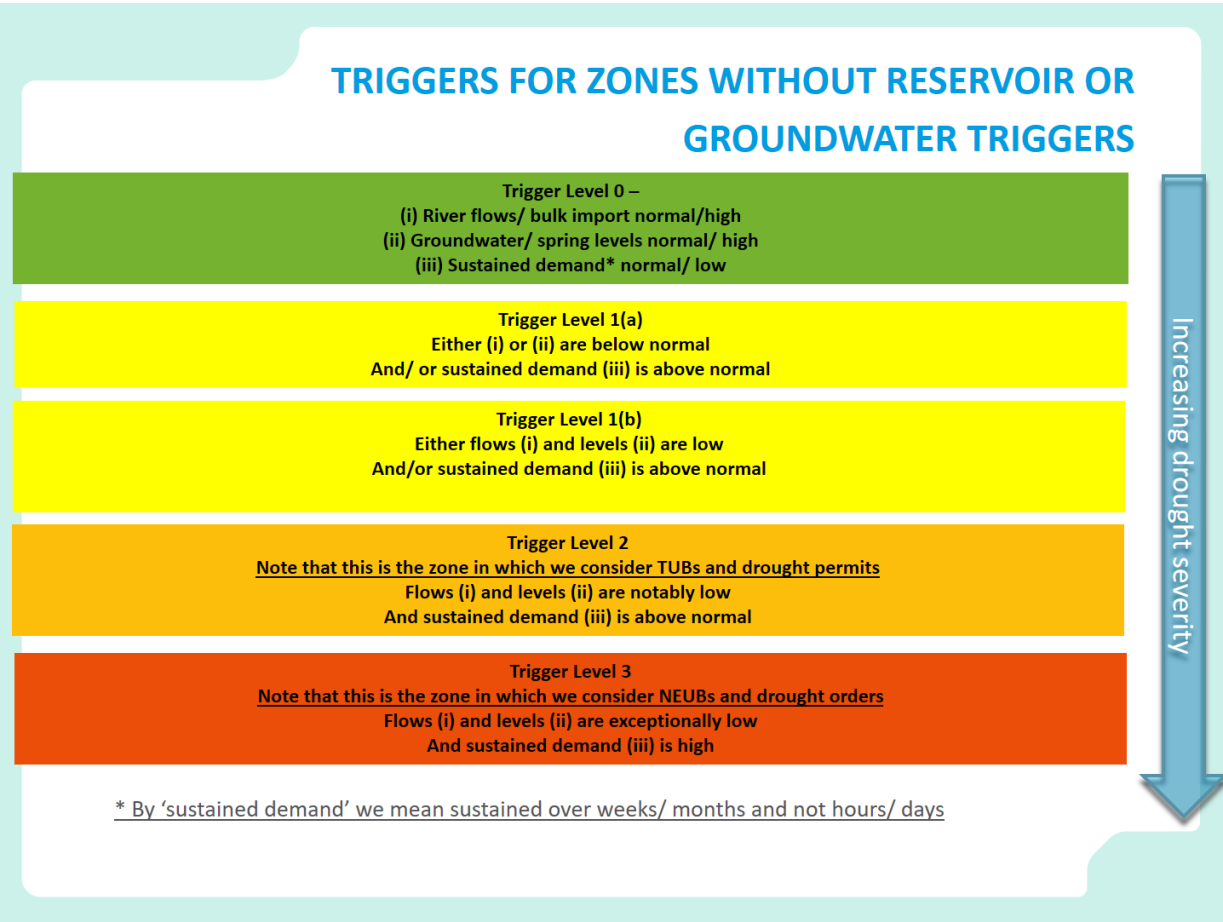


Figure 8 Illustrative triggers for WRZs without reservoir or groundwater trigger levels (Newark, Rutland, Shelton)

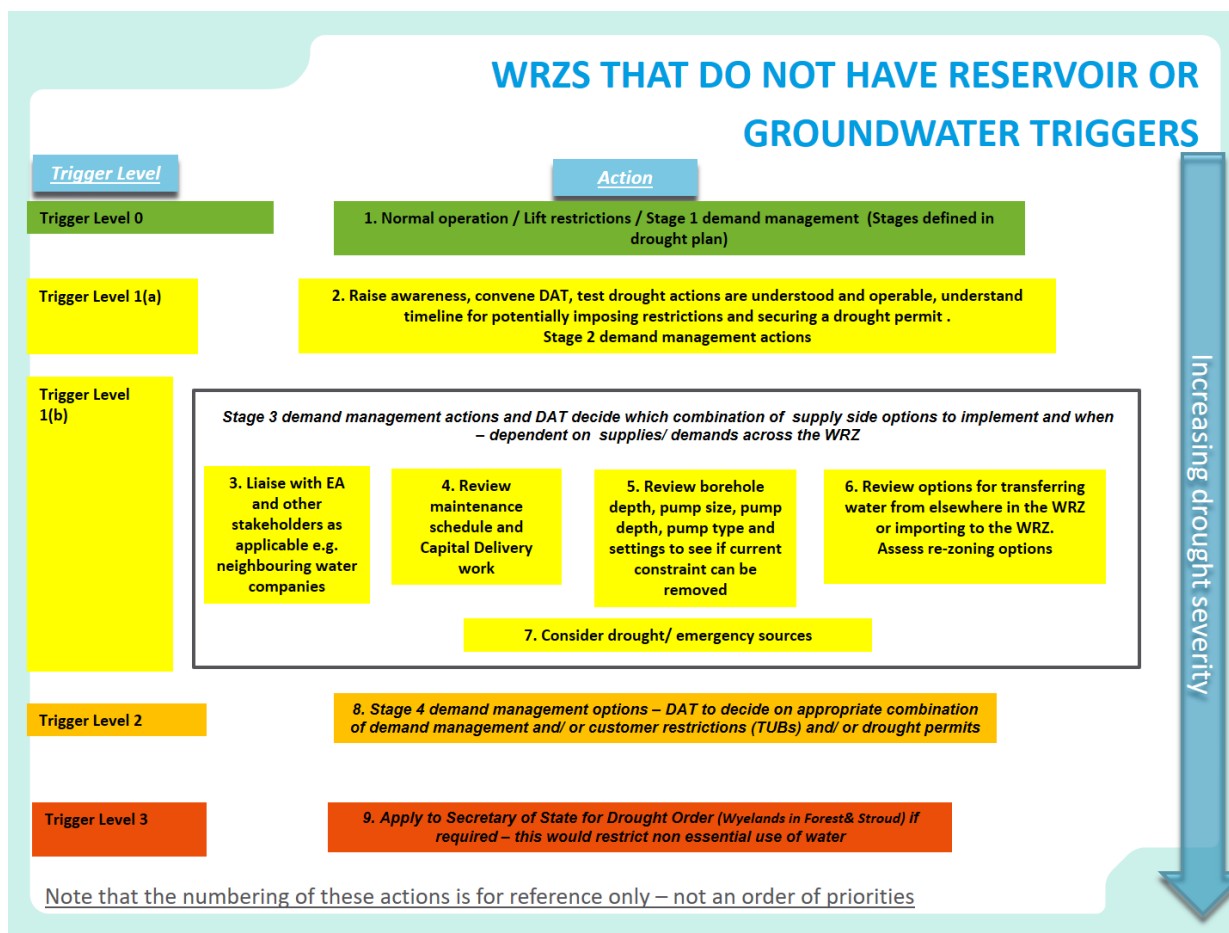


Figure 9 Decision flow chart showing drought management actions for our other water resource zones (Newark, Rutland, Shelton)

2.2.2.1 Forest & Stroud and Wolverhampton

Our Forest & Stroud zone does not rely directly on reservoir storage and it receives raw water from our River Wye abstraction at Wyelands and from groundwater sources. Although we usually refer to this river abstraction as Wyelands some documents refer to it as the Lydbrook abstraction. Both names refer to the same abstraction. During wet or average conditions we abstract up to 55 MI/d at this site but our maximum abstraction becomes restricted if storage in the Elan Valley reservoirs is low and the 'hands off flow' conditions in our licence are triggered by low flows at Redbrook gauging station.

Table 5 illustrates the licence conditions that govern this abstraction. The revised licence conditions applied from 1st April 2018 onwards and are being used in our WRMP24 modelling.

Table 5 Rules governing our River Wye abstraction

Redbrook GS flow (MI/d)	Elan storage	Regulation release for Lydbrook (MI/d)	Maximum Lydbrook abstraction (MI/d)	Max transfer to Ross	Max transfer to STW
> 1,400	Independent of storage	Not required	55.0	9.1	45.9
1,209 – 1,400			45.5	9.1	36.4
< 1,209	Above Abs control Line	27.3	45.5	9.1	36.4
	Below Abs Control Line		39.8	9.1	30.7

The combined outputs of the groundwater sources in this WRZ are not sufficient to meet demand. If we forecast that there is a high drought risk to the groundwater sources in our Forest and Stroud WRZ, it becomes more important that our Wyelands abstraction is not limited or that we can increase the amount of water transferred into this zone from our Strategic Grid. This river abstraction is limited when river flows at the Redbrook gauging station are low. Our abstraction licence at Wyelands is also linked to the storage in the Elan Valley reservoirs.

We have developed drought management actions for Forest & Stroud based around the risks described above which can be seen in Figure 10.

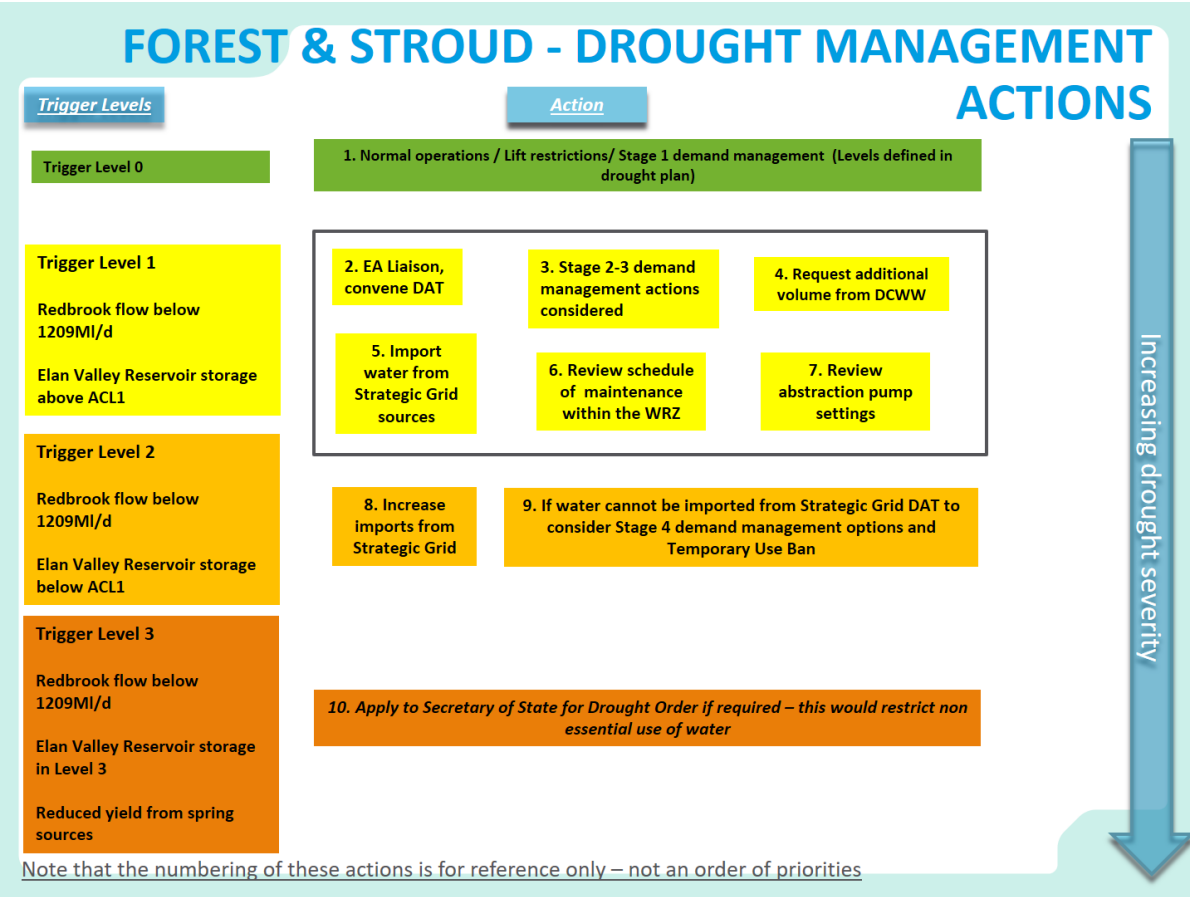


Figure 10 Decision flow chart showing the drought management actions for our Forest and Stroud Zone

Our Wolverhampton water resource zone relies on the import of treated River Severn water from the shared South Staffordshire asset abstraction and the Wolverhampton groundwater sources. The river Severn is a regulated river and the shared South Staffordshire asset abstraction can be limited by specific low flows and licence conditions and the terms of operating agreements. We have developed our drought management actions predominately around the risk to the zone in line with the river Severn regulation impacts which is show in Figure 11.

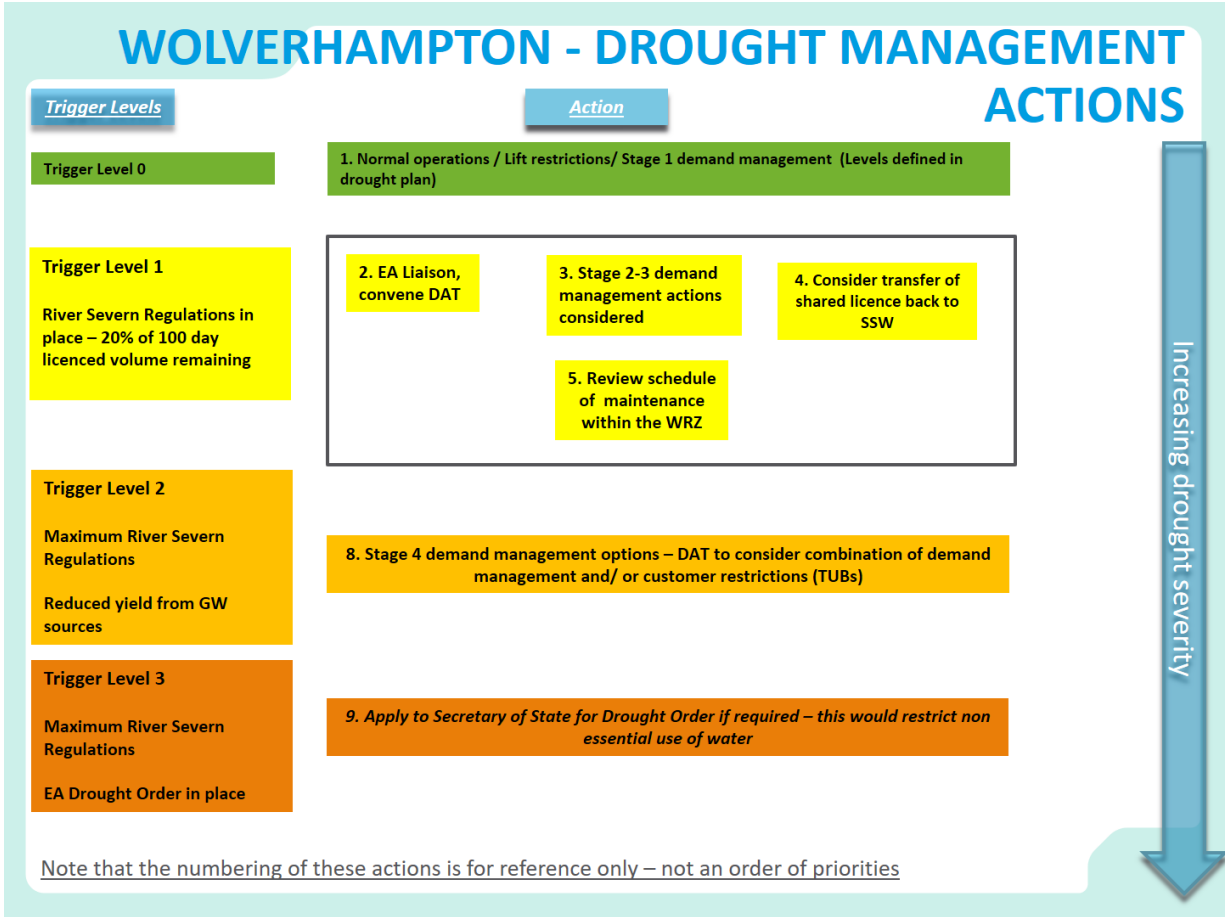


Figure 11 Decision flow chart showing the drought management actions for our Wolverhampton Zone

2.2.2.2 Chester WRZ trigger levels

As detailed in section 2.1.1, Chester WRZ has been incorporated into the wider Severn Trent area since the previous publication of our previous drought plan. The drought triggers for the Chester WRZ are dictated by the Dee General Directions (DGD) which govern the Dee Storage system. The DGD specify the principles and detail under which the prescribed flows and abstractions must be reduced in a drought. As stocks decrease, trigger points are crossed which prompt drought management actions to be taken. The triggers we would follow and drought management actions that we would take in the Chester WRZ as governed by the DGD are detailed in Appendix B.

2.2.2.3 Groundwater triggers

We have developed an approach to defining triggers for groundwater only water resource zones. The new technique has been applied to six water resource zones: Bishops Castle, Kinsall, Mardy, Ruyton, Stafford and Whitchurch and Wem.

The technique applied has utilised individual groundwater source performance diagrams (SPDs). These diagrams, that include both operational abstraction/water level data plus existing asset constraints, such as borehole pump capacity, have been used to describe groundwater level trigger points that relate to specific drought management actions at each site and source. Monitoring of such water levels will enable us to predict whether changes could affect the output of the borehole source and take action to ensure that supplies to customers can be maintained.

A worked example of how these triggers will work in practice is shown in Table 6 along with an example SPD diagram and the trigger levels that have been described for the source in Figure 12. We would expect that groundwater levels would remain in Levels 0-2 for the majority of sites but recognise that there could be occasions where levels could fall further. It is worth noting that the drought curve shown on this figure is based on actual or predicted operational performance during a drought.

Multi-year severe drought sequences may not be represented on the current version of the SPD diagrams but we intend to use the outputs of our WRMP24 analysis on the impacts of climate change and extreme droughts to validate the groundwater trigger levels developed.

This new approach relies on the collation and analysis of groundwater level monitoring data. We use a combination of telemetry and manual dips to monitor our groundwater sources. We are in the process of improving the instrumentation at all our borehole sites which will provide enhanced real-time data.

Table 6 Example of groundwater level related triggers and associated drought management actions

Trigger	Water Level Range [metres below ground level]	Level definition	Drought management actions considered
Level 0	0.0 – 23.0	Typical range of known operation from existing rest water level and pumping water level data. Considered to represent both normal or short-term dry weather/high demand periods. Levels monitored on monthly basis	No drought management actions necessary
Level 1-2	23.0 - 26.5	The top of this level can be defined in a number of ways depending on the source specific data, e.g. as the lowest historical groundwater dip data on record or the intersection between the drought curve and known pump capacity. Similarly, the base of this level can be defined in a number of ways depending on the source specific data, e.g. as the intersection between the drought curve and the known pump capacity. In all cases, groundwater levels in this zone would be considered to be lower than normally expected.	<ul style="list-style-type: none"> Commence enhanced water level monitoring programme (moving to weekly from monthly dip frequency). Cross-check levels with other sources at the same site, within the same WRZ and adjacent WRZs to determine whether source specific or wider aquifer water level change is occurring. Raise issue at DAT of the occurrence of lower than expected groundwater levels and possible preparation for network rezone to reduce the reliance on the source if groundwater levels cross over into Level 3.
Level 3	26.5 - 32.0	The base of this level can be defined in a number of ways depending on the source specific data, e.g. as the intersection between the drought curve and the daily abstraction licence condition. Sometimes, the DAPWL (Deepest Advisable Pumping Water Level) is used to define this horizon.	<ul style="list-style-type: none"> Maintain enhanced water level monitoring programme at weekly intervals moving to more frequent sub-weekly data collection as required. Consider network interventions to reduce demand on the source if this can be achieved to prevent groundwater levels from multiple

		In all cases, groundwater levels in this zone would be considered to be exceptionally low.	boreholes entering Level 4 conditions. <ul style="list-style-type: none">• Begin preparations for lowering of BH pump in order to be able to continue to abstract.
Level 4	32.0 - 34.0	The base of this level is the current pump intake depth plus 3 metres above the pump (minimum safe hydraulic head for continued operation). This can sometimes be combined with the DAPWL.	<ul style="list-style-type: none">• Maintain enhanced water level monitoring programme at sub-weekly interval.• Consider additional network interventions to further reduce demand on the source.• Consider lowering of BH pump within the borehole and emergency supply arrangements as required.

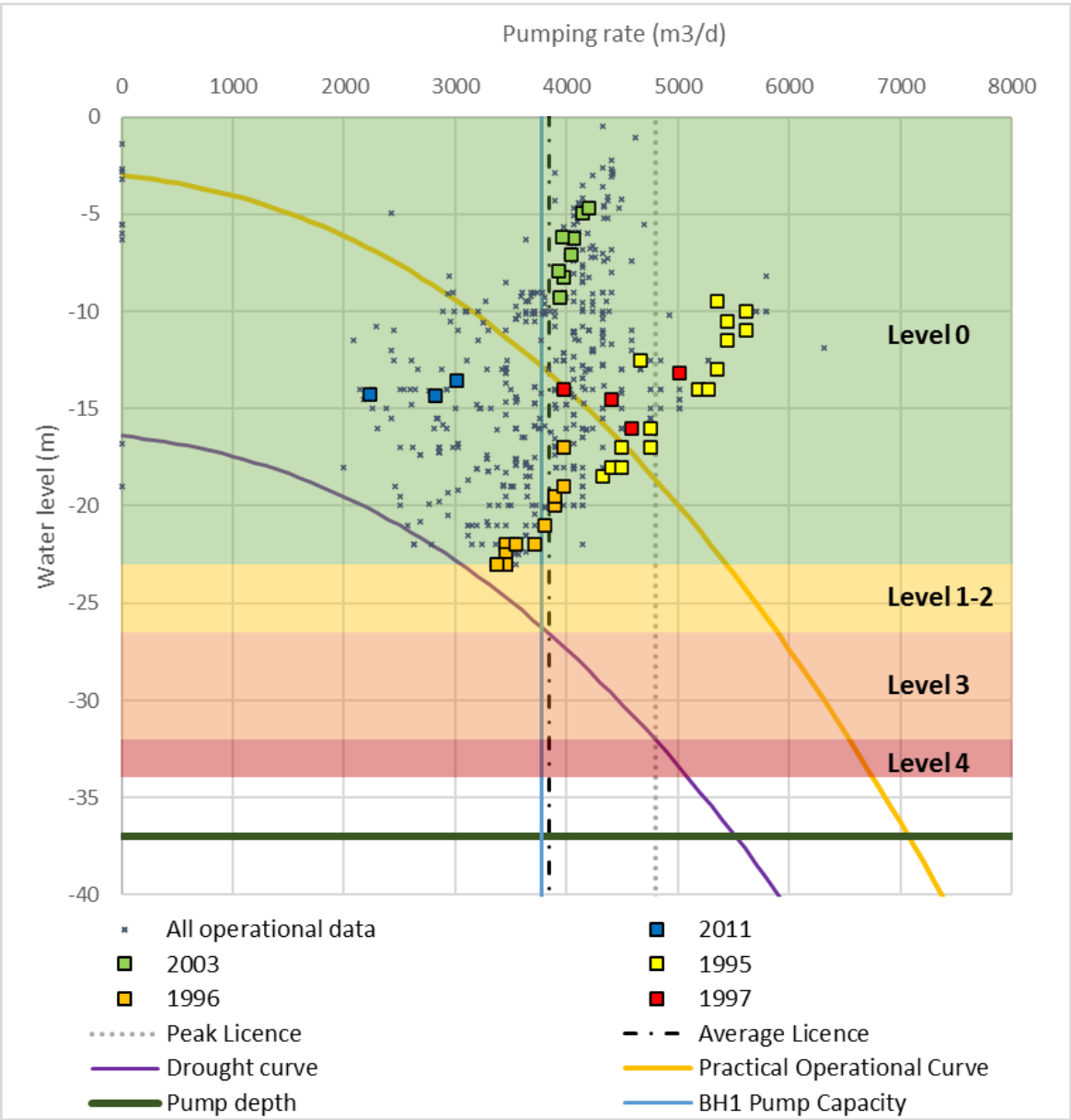


Figure 12 Example of modified SPD curve used to define potential drought management actions for groundwater only WRZs

2.3 Forecasting

As part of our business as usual (BAU) activity we produce forecasts of how we expect water resources to change in the month ahead. For example we do this for key reservoir sources such as the Derwent Valley reservoir group. We circulate these water availability information packs monthly and we share the raw water availability section of this with the EA. When we produce these information packs we use all of the latest hydrological and operational information we have as well as weather forecasts from sources such as the Met Office. In addition, we refer to the latest hydrological outlook (see reference to website in references section).

2.4 Links to actions/measures with timing information

We have described the actions we consider when resources fall into certain drought trigger zones in section 2.2 and section 3. We have included all of the reservoir drought trigger levels and the associated drought management actions in appendix B.

We do specify when we would take each drought management action in section 3.4.2 and appendix B. However, in order to retain flexibility, we allow our Drought Action Team to choose which action or combination of actions is most suitable when resources are in a specific drought level. For the majority of drought actions we do not specify exactly how long they would take to implement as this may vary depending on factors like customer demands, outages and water availability in different locations. However, there are some drought management actions such as drought permits/ orders and customer restrictions where we have given estimates of lead in times and/ or implementation timings. Refer to sections 3.1 and 3.3 for this information.

2.5 Testing our drought triggers

Modelling various drought events including those on the observed record and synthetic droughts provides us with a number of scenarios to test our drought triggers and proposed actions (as described in section 2.1). The following three sub-sections present plots of modelled reservoir storage data with our drought trigger levels for reservoirs across our Strategic Grid and North Staffs WRZs using three different drought scenarios. Each drought event has unique characteristics which allow us to evaluate how our drought triggers and proposed actions perform under different scenarios. For this analysis we have selected an event from our baseline modelling period (1995/96), a historic drought (1887/88) and a stochastically generated 1 in 200-year 30 month drought.

2.5.1 Baseline Data

Figure 13 below presents the modelled storage of the Elan Valley, Derwent Valley, Carsington/Ogston and Tittesworth Reservoirs during the 1995/96 drought. These plots highlight the variation of drought impacts on our reservoirs with notable impacts on storage on the Elan Valley Reservoirs, Derwent Reservoirs and Tittesworth Reservoir. Storage in the Elan Valley Reservoirs enters drought Level 2 for 15 days in December 1995. Proposed drought actions under trigger level 2 include the implementation of a TUB (level 2 restriction) if reservoir storage enters trigger level 2 for at least 7 days however, we limit the introduction of TUBs to the start of April to the end of October. In this scenario we would not impose a TUB on customers but would carry out other “stage 3” demand management actions as well as maintain our supply-side drought options which are associated with our drought trigger level 1(b) (see section 3 for more detail).

Modelled storage in Tittesworth Reservoir drops throughout 1995 reaching a minimum storage of 39% (drought trigger level 2) in October 1995. Despite some storage recovery during the autumn/winter of 1995/96 drought trigger level 3 is crossed in December 1995. At this stage drought measures in the North Staffordshire WRZ include applying for a drought order to introduce a non-essential use ban (NEUB – level 3 restriction) if

appropriate. In this scenario it is likely that we would not impose a NEUB due to the time of year that level 3 is crossed but we would continue to monitor the situation very closely and be prepared to submit a drought order application to the Secretary of State.

In the Derwent Valley Reservoirs modelled storage reaches a minimum of 31% and moves into drought trigger level 3 from December 1995 to February 1996. Drought management actions under trigger level 3 are the same as the detail above for Tittesworth. Note that the black lines (which represent modelled storages in the figure below) reflect the impact of the drought actions we have mentioned in this plan with the exception of the drought permits and the drought/ emergency sources.

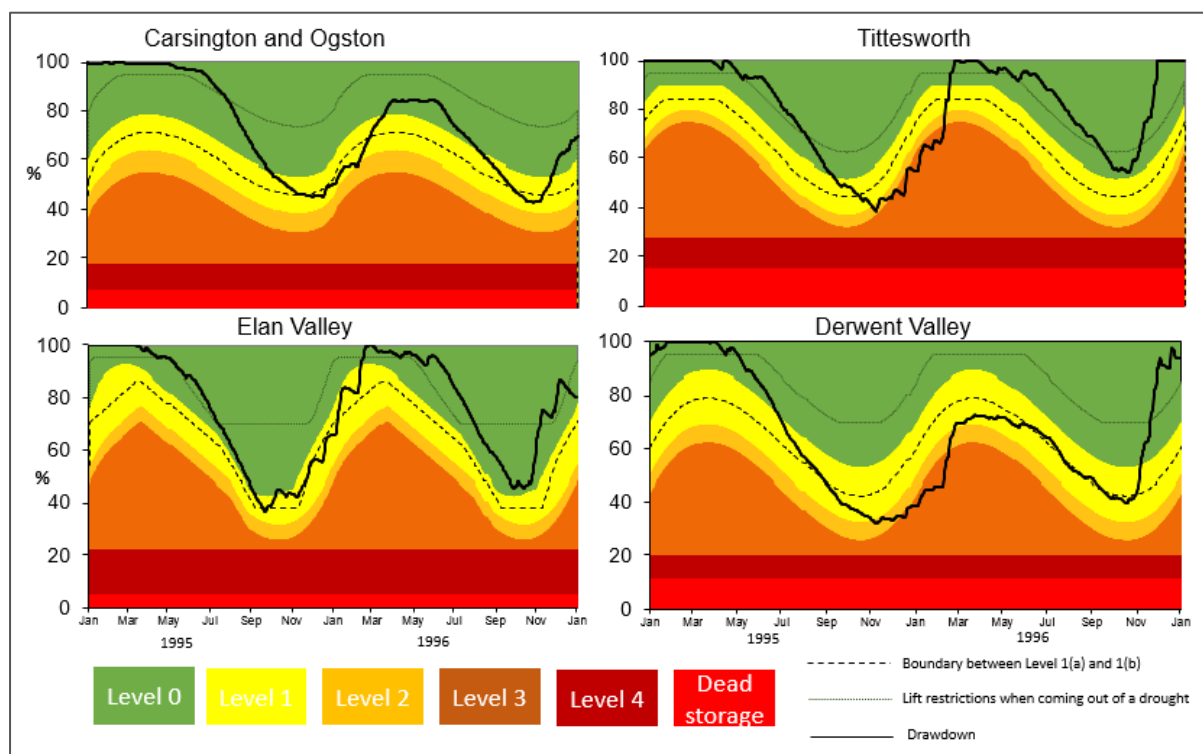


Figure 13 Modelled reservoir storage and drought trigger levels for the 1995/96 drought

2.5.2 Historic Drought

Figure 14 shows the modelled reservoir storage for four reservoirs during the 1887/89 drought. This scenario was selected because innovative research in collaboration with the University of Liverpool highlighted the severity of this drought event in the north of our region (see section 2.1 for more information). This is reflected in the modelled reservoir storage of both the Derwent Valley and Tittesworth Reservoirs. During this event Tittesworth reservoir modelled storage reaches drought trigger level 3 in January 1888. As outlined in section 2.5.1 our drought actions under trigger level 3 include the option to impose level 3 restriction NEUBs if appropriate. Again in this scenario it is likely that we do not impose a NEUB due to the timing of the reservoir storage entering trigger level 3 but would have an application ready to submit in order to impose a NEUB if storage level throughout January continued to decrease.

In the Derwent Valley Reservoirs modelled storage remains in drought trigger level 0 for much of 1887 and entering level 1(a) for only a short period during that year. In this scenario there are no notable drought impacts on the storage levels in the Elan Valley and Carsington/ Ogston Reservoirs. This highlights how the spatial variation of droughts in our region can have different impacts on our supply system.

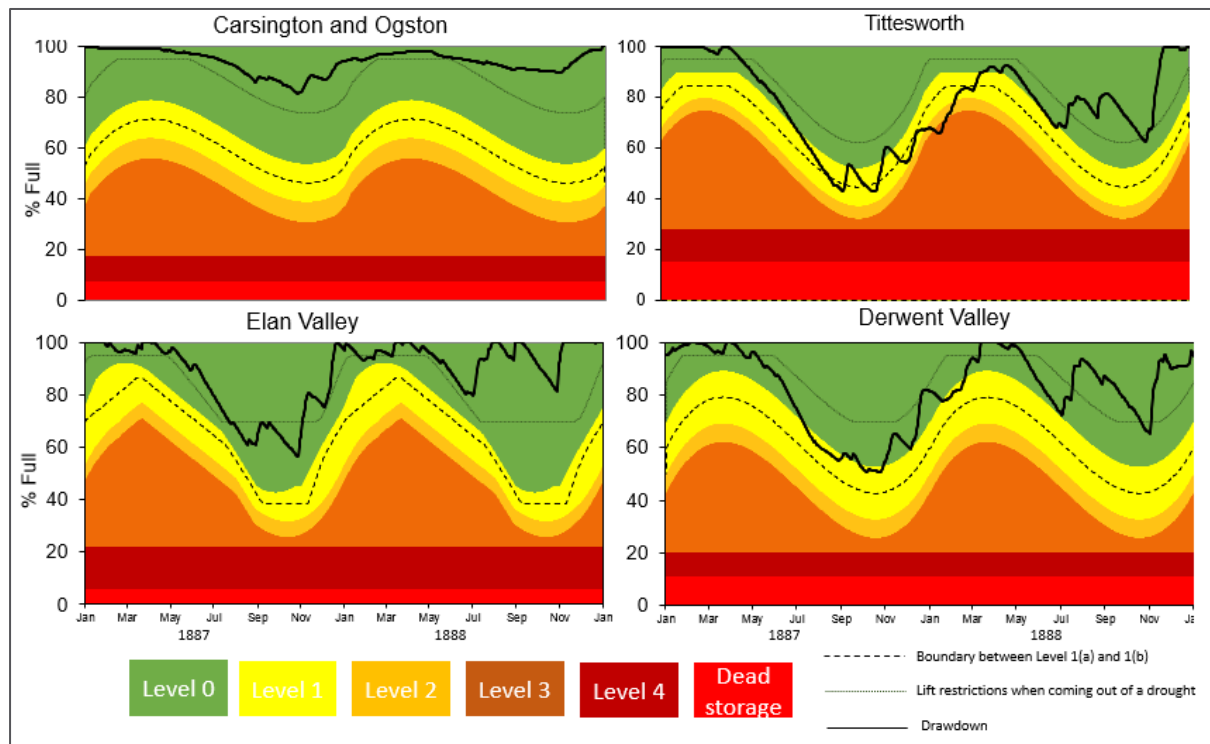


Figure 14 Modelled reservoir storage and drought trigger levels for the 1887/89 drought

2.5.3 Stochastic Drought

Figure 15 shows the modelled reservoir storage during a stochastically generated 1 in 200-year return period 30-month drought (see Appendix D for more information). In the Elan Valley Reservoirs modelled storage falls rapidly crossing into drought trigger level 1(b) in July 1961. It does not reach drought trigger level 2. There are a variety of drought management actions associated with drought trigger level 1(b) including a review of scheduled works maintenance and changing operations at site G and the reservoirs at site U to support storage in the Elan Valley reservoir system (more information can be found in Appendix B). From August 1961 modelled storage in the Elan Valley Reservoirs moves into trigger level 0 and remains there for most of the year.

In the Derwent Valley Reservoirs modelled storage falls throughout 1961 crossing into drought trigger level 1(a) in July 1961. Storage remains in trigger level 1(a) until the end of the year. Possible drought management actions associated with this level include a number of options to maintain reservoir storage and reduce treatment works output. Tittesworth Reservoir modelled storage also crosses and remains in drought trigger level 1(b) for a substantial period from September 1961. In the North Staffordshire WRZ trigger level 1(b) drought management actions include reducing output from Site L and reviewing water import options. Tittesworth Reservoir storage enters drought trigger level 2 for a limited number of days in November 1961. This falls within the criteria for implementing a level 2 restriction TUB under the management action associated with drought trigger level 2. However, as this occurs outside of TUB implementation period (the start of April to the end of October) under this scenario we are unlikely to introduce a TUB but would implement other drought management actions linked to drought trigger level 1(b) and discuss further actions that could be taken to minimise further reductions in reservoir storage.

Modelled reservoir storage in Carsington/ Ogston reaches its lowest level (50%) of the three scenarios presented in section 2.5. Modelled storage remains in drought trigger level 1(a) for only a couple of weeks towards the end

of the year. Under drought trigger level 1(a) drought management actions include stage 2 demand management, the convening of DAT and a review of drought management actions.

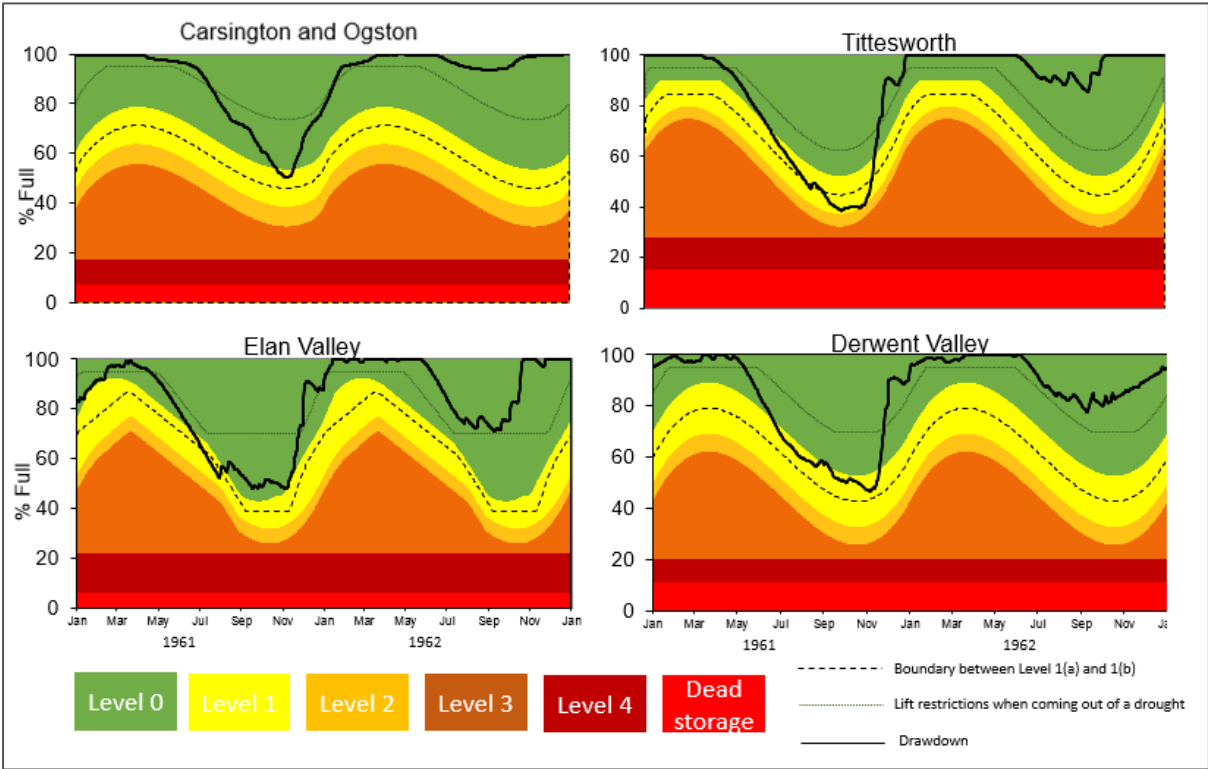


Figure 15 Modelled reservoir storage and drought trigger levels for a stochastic 1 in 200-year drought

Section 3 Drought actions

There are several actions we can take to manage the effects of a drought. We broadly split these into two groups: demand-side and supply-side. The supply-side actions increase the amount of water we have available during a drought. The demand-side actions are ones that reduce the demand from our customers for water during a drought. We would implement our demand saving actions first and prioritise the use of those supply actions where we have high confidence they are the least damaging options to the environment.

3.1 Demand-side actions

Our drought management action flow charts show how we would expect to phase in the different demand management options available to us. In addition, section 5 of this plan shows how decreasing reservoir storage triggers an escalation from 'Stage 1 demand management' to 'Stage 4 demand management'. Section 5 also provides detail on how we would increase our focus on demand management progressively in line with our communications strategy.

We consider that demand-side actions can be applied anywhere in our supply region. However, we will select the appropriate combination of options and target them depending on the extent to which different parts of our region are affected by drought. The following list shows some of the options available to us:

- Raise awareness within the company, convene DAT and alert works managers
- Liaise with the Environment Agency (EA) and other stakeholders about emerging drought and flexibility of available options
- Closely monitor demand, flows and abstraction/ releases
- Increase leakage detection and management
- Increase water conservation campaign (e.g. extra distribution of water saving devices, water audits for non-household customers).
- High profile promotion of meter option
- Media appeals for customer restraint

And, in the most severe drought conditions:

- Temporary water use bans (Level 2 restrictions), which are discussed in section 3.1.5 and, ultimately
- Restrictions on non-essential use through a drought order (Level 3 restrictions).

We consider that pressure optimisation and working with our customers to encourage the efficient use of water are routine activities that we carry out as part of our normal operation. This equates to 'Stage 1' demand management as defined in section 5. The water conservation campaign mentioned above is over and above our 'normal' water efficiency work. We provide details of our water efficiency and leakage activities in the following sections.

3.1.1 Promoting Water Efficiency

We promote water efficiency in various ways from offering free and subsidised products, top tips and information leaflets, home audits and working with schools through our education team. Information on these are available from our website: <https://www.stwater.co.uk/wonderful-on-tap/save-water/love-your-water/>.

We run proactive and extensive campaigns promoting water efficiency focussing on areas where we can achieve the most benefit for customers. This includes toilet flushing, gardening and, in some years, frost protection. We also focus on education and engage customers to advise them on how they can reduce their water consumption and how to avoid blocking pipes. We use multiple communication channels including literature, advertising, our

website, face to face contact, telephone contact and social media. Our campaigns are a key component of the company's communications which aim to reduce long term demand by our customers. We will continue our extensive business as usual promotion of water efficiency. Please note that because of the Covid-19 pandemic our home water efficiency audits were put on hold.

We also want to highlight that we will also continue to actively promote customers to register as Priority Services Customers when distributing water efficiency communications. We also have ambitions to provide water efficiency audits to potentially vulnerable customers in social housing and offer free internal repairs on leaks. These ambitions are dependent on council and customer agreement.

3.1.2 Reducing Leakage on our network

Leakage currently makes up around 23% of the total water we put into supply. We have a strong track record of reducing leakage, and over the past 10 years this has helped us to meet the water needs of a growing population without having to increase the amount of water we abstract and put into supply. Our AMP6 leakage performance, as well as our AMP7 and longer-term leakage targets associated with the National Infrastructure Commission (NIC) 50% leakage reduction target can be found in our WMRP and Business Plan submissions.

Enhanced leakage management during periods of drought is an effective way of conserving water and maintaining supply to our customers. We will redirect staff from other tasks onto leakage work in specific geographic areas during periods of drought where the risk to supply is greatest. We can also hire in external contractors if necessary. This additional emphasis on leakage is considered once we enter drought trigger zone C. It is hoped that this proactive demand-side action will encourage positive actions from our customers in terms of their demand as we are demonstrating we are doing all we can as a company through leakage management. It is difficult to generalise about exactly how much further we could reduce leakage in a drought as it will depend on the severity or extent of the drought and our leakage performance as we enter the drought period. However, we will still look to enhance our leakage management.

3.1.3 Effects on Fire Service

There are a small number of actions we take that could affect fire hydrants. The most obvious of these is when we lower pressure during a drought to reduce leakage. In this reduced pressure scenario we will mitigate the potential problems for the fire service in the following ways:

- As happens during non-drought periods we will communicate with the fire service during incidents - this is usually via our 24hr call centre.
- If appropriate, we advise them of alternative locations to take a supply from that have higher pressure/ flow. For example, we may suggest that they connect to a larger main or bypass anything (PRV) that is creating a head loss.
- In addition, if needed, we will send a Severn Trent technician to the area to assist.
- In the future we intend to be more proactive so we will inform the fire service which areas we will lower pressure in before we do it.

3.1.4 Bulk imports and exports

We have common boundaries with seven other water companies and bulk supply agreements with six of these companies. Table 7 summarises the strategic bulk supply agreements that we hold with neighbouring water companies. We use a threshold of 1 Ml/d to determine whether an import or export classes as strategic, meaning that we do not consider transfers of less than this magnitude as being strategic. There are 3 new transfers since our last Drought Plan, due to change in company boundaries and inclusion of Hafren Drfrdwy.

Table 7 Bulk supplies with neighbouring water companies

Neighbouring company	Location	Basic details of transfer	How would this supply operate in a drought?
Anglian Water	Import from East Midlands into our Strategic Grid and Rutland WRZs	We import up to 18 Ml/d of treated water from Anglian Water	There are no drought conditions in this agreement but, if entered a drought, we would engage with Anglian Water and, if we are able to, we may reduce our import.
Dŵr Cymru Welsh Water (DCWW)	Export from our Forest and Stroud WRZ	We provide DCWW with up to 9 Ml/d of treated water. This volume is supported by regulation releases from the Elan Valley.	This is not usually variable in a drought due to licence conditions. However, in a drought we would communicate with all other water companies to help with message consistency and to see if we can assist each other
Dŵr Cymru Welsh Water (DCWW)	Import from the Elan Valley reservoirs	DCWW provide partially treated water to our Strategic Grid WRZ.	This import reduces when storage in the Elan Valley reservoirs crosses specified storage triggers.
South Staffordshire Water	Import of treated River Severn water to the Wolverhampton WRZ	We import up to a peak daily rate of 48 Ml/d.	The River Severn is a regulated river and the shared South Staffordshire asset abstraction can be limited by specific low flows and licence conditions and the terms of operating agreements.
United Utilities	Import to our Shelton WRZ	We have an agreement that states we can receive a supply of treated water from UU in case of an emergency failure of our ability to supply customers in this area.	The primary aim of this import is to provide resilience to other sources in this WRZ for a relatively short period of time. It is unlikely this would be able to be utilised in a drought scenario.
Yorkshire Water Services	Export from our Derwent Valley reservoirs	We export up to 68 Ml/d of untreated water to Yorkshire Water Services from our Derwent Valley reservoirs.	The quantity that we export (and the amount we treat ourselves) reduces as reservoir storage reduces.
Hafren Dyfrdwy	Import from HD's Wrexham WRZ	We import from Hafren Dyfrdwy (Wrexham) to our Chester WRZ*	The Chester WRZ, which was formerly part of Dee Valley Water has been transferred to Severn Trent which we now receive an import from.
Hafren Dyfrdwy	Export from our Chester WRZ	We export from our Chester WRZ to Hafren Dyfrdwy's Saltney WRZ*	The Chester WRZ, which was formerly part of Dee Valley Water has been transferred to Severn Trent which we now export from.
Hafren Dyfrdwy	Export from our Shelton WRZ	We export from our Shelton WRZ to Hafren Dyfrdwy's Llanfyllin WRZ*	Part of the existing Shelton WRZ now lies within the HD Llanfyllin WRZ and therefore a new bulk export from the Shelton zone has been created.

**Volume of transfer will be confirmed once full metering is in place.*

Under drought conditions, there are some transfers that can be varied in accordance to the agreement and offer a degree of flexibility if required. Where these are possible, they are illustrated as drought management actions in appendix B.

There are also limitations to our imports and exports under normal and drought conditions. For example, we are aware that transferring raw water from catchment to catchment could cause the spread of invasive non-native species (INNS). Any changes to these transfers are also restricted by the maximum capacity of the infrastructure, and none of our transfers are bi-directional so are limited to one direction.

3.1.4.1 Severn Trent's Derwent Valley agreement with Yorkshire Water

In 1989 Severn Trent Water and Yorkshire Water entered into an agreement with regards to the quantity of raw water each company is entitled to take from the Derwent Valley.

The quantity of water that can be taken by Severn Trent Water and Yorkshire Water is set through operating guidelines. In 'normal' conditions, Severn Trent are entitled to 75.9% of the annual licensed quantity from the reservoirs for us; Yorkshire Water are entitled to 24.1% of the annual quantity licenced for abstraction and it resets to zero at the start of each calendar year. As part of the operating guidelines there are five control lines (or 'states') which dictate the quantity of water both Severn Trent Water and Yorkshire Water are entitled to abstract at different times of the year depending on the quantity of water stored within the Derwent Valley reservoirs. The quantity of water permitted for abstraction by each company, including in a drought situation, based on the 5 states is shown in Table 8. The agreement does also allow either party to increase abstraction in agreement with the other at times of high demand, or when other resources are temporarily unavailable. We utilised this part of the agreement in 2018 & 2020 during hot weather events.

Table 8 Abstraction entitlements in each Derwent Valley reservoir state

State	Severn Trent entitlement (MI/d)	Yorkshire Water entitlement (MI/d)
1	185	68
2	175	50
3	155	45
4	135	40
5	115	35

Yorkshire Water have agreed with Severn Trent Water that they will endeavour to reduce their minimum transfer to 15MI/d in the lowest band (i.e. below State 5). When in a drought situation Severn Trent Water and Yorkshire Water will consult on short term bulk transfers. The availability of any such transfers will be dependent on Severn Trent Water's own water situation.

Figure 16 below shows how the 'States' change over the course of the year.

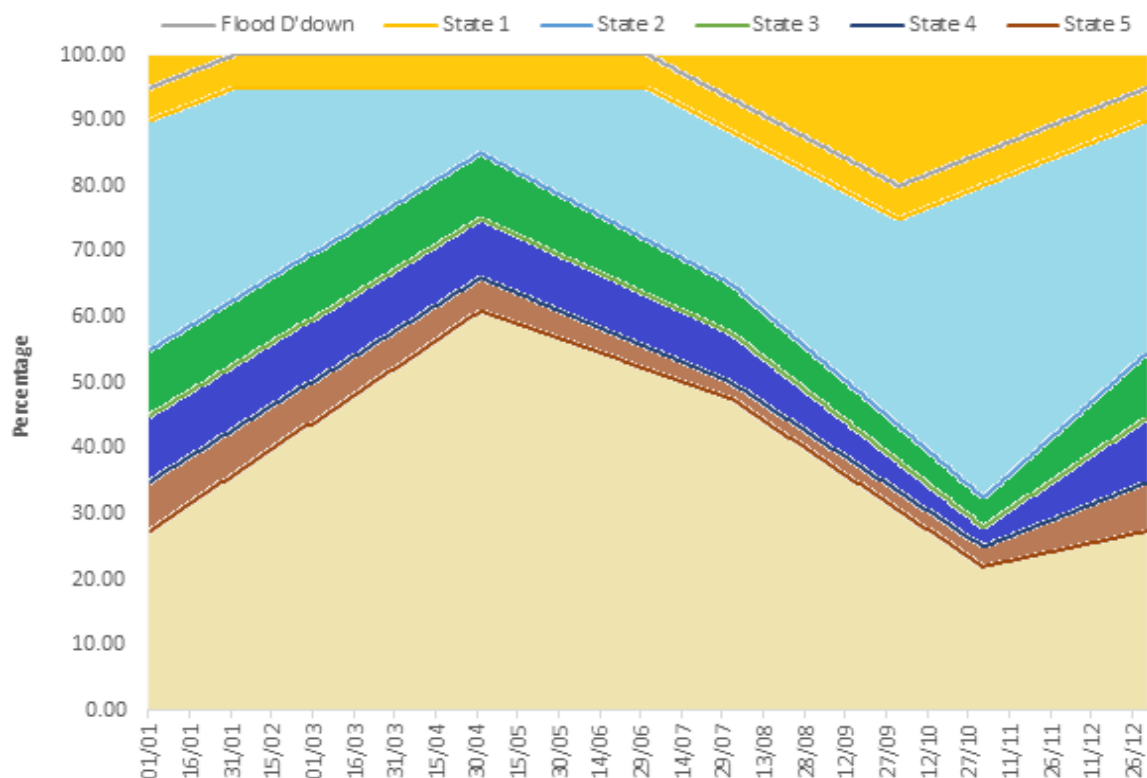


Figure 16 Derwent valley reservoir state curves

A minimum compensation flow of 54 MI/d from Ladybower reservoir should be provided when the River Derwent flow at Derby is above 340 MI/d.

If the reservoirs are in State 1 and the Yorkshire Water requirement is less than 68 MI/d then up to 18 MI/d can be added to the “Yorkshire Bank”, provided that the bank does not hold more than 270 MI.

When the reservoirs are in States 2 or 3 and there is sufficient water in the bank then Yorkshire Water can take up to 5 MI/d on top of the entitlement, to be deducted from the bank.

3.1.5 Temporary water use restrictions

If extended drought conditions mean that reservoir storage or other drought indicators are in drought trigger Level 2, we may need to temporarily restrict certain uses of water. Before making a decision to impose restrictions our DAT will review current resources and how the outlook is likely to change. For example, DAT will use the reservoir storage forecasts that we described in section 2.3.

Prior to the Water Use (Temporary Bans) Order 2010, water companies were only allowed to restrict the use of a hosepipe if it was to water a garden or wash a private car. Since 2010 water companies have had wider and more far reaching powers to restrict water use. It is worth clarifying that we refer to temporary use bans (TUBs) in this plan although we may use the phrase ‘hosepipe ban’ in other communications. We have changed our terminology to better reflect the current legislation. As well as being able to bring in level 2 restrictions e.g. TUBs if we need to we can also apply for a drought order to bring in a non-essential use ban (NEUB – level 3 restriction). For clarity, we define:

- A temporary use ban (TUB – level 2 restriction) as a way in which we can reduce customer demand for water during a drought by banning specified activities;
- A non-essential use ban (NEUB – level 3 restriction) as a more severe measure to reduce demand by banning even more specified activities, including commercial uses of water.

We would only consider imposing a level 2 temporary water use restriction between April and October because they would have little impact outside of that period. It is worth noting that, whilst level 3 restrictions such as drought orders/ NEUBs and drought permits require that we demonstrate exceptional shortage of rainfall, this is not true for TUBs. The legislation governing TUBs allows a water company to impose a TUB if “it is experiencing, or may experience, a shortage of water for distribution”. A drought is one reason for such a shortage but it is not the only possible cause. We have listed the activities that we will restrict using a TUB or NEUB in the following sections of this plan.

3.1.5.1 Temporary use bans (TUBs)

Table 9 shows the 11 activities that the legislation now allows us to restrict under a temporary use ban (TUB – level 2 restriction). See Appendix E for the full detail regarding the statutory and discretionary exceptions relating to these activities.

Table 9 The activities we will restrict under a TUB and the exceptions we expect to make

Number	Activity restricted by TUBs
1	Watering a garden using a hosepipe
2	Cleaning a private motor-vehicle using a hosepipe
3	Watering plants on domestic or other non-commercial premises using a hosepipe
4	Cleaning a private leisure boat using a hosepipe
5	Filling or maintaining a domestic swimming or paddling pool
6	Drawing water, using a hosepipe, for domestic recreational use
7	Filling or maintaining a domestic pond using a hosepipe
8	Filling or maintaining an ornamental fountain
9	Cleaning walls, or windows, of domestic premises using a hosepipe
10	leaning paths or patios using a hosepipe
11	Cleaning other artificial outdoor surfaces using a hosepipe

The exceptions listed in Appendix E are necessary for us to comply with legislative requirements (statutory exceptions), but others are at our discretion (discretionary exceptions). The discretionary exceptions that we have included in the table above includes all of the ‘discretionary universal exceptions’ and some of the ‘suggested discretionary concessional exceptions’ shown in table 3.2 of the 2013 UKWIR Code of practice and guidance on water use restrictions. What this means is that we have granted more exceptions than the minimum industry standard. We have done this to minimise the impacts of restrictions on specific groups such as customers on our ‘vulnerable customers list’.

We contributed to the development of the 2013 UKWIR Code of practice and guidance on water use restrictions (CoP). The Water UK board signed off this CoP in July 2013. The 2013 CoP is an update to the 2009 version. The 2013 version includes learning from the drought which ended in 2012 during which seven companies in the South and East of England implemented restrictions. It is also consistent with the current legislation and regulatory policy. We support and follow the principles of the 2013 CoP which are to:

- Ensure a consistent and transparent approach
- Ensure that water use restrictions are proportionate

- Communicate clearly with customers and the wider public/ users
- Consider representations in a fair way

Following the 2013 Code of Practice also helps us to delay the economic impacts of restrictions on business customers for as long as we can. By following this CoP we will also ‘phase’ in restrictions on use in a way that is consistent with other companies in the UK.

In most drought scenarios we think that the clearest way to impose restrictions on customers is on a company wide basis. However, circumstances mean that if this is not in our customers’ best interests, especially Priority Services Customers, we want to keep open the option of imposing restrictions at a WRZ level.

3.1.5.2 Non-essential use bans (NEUBs)

Table 10 shows the activities that the legislation now allows us to restrict under a Non-essential use ban (NEUB –level 3 restriction). See Appendix E for the details around the exceptions related to each activity.

Table 10 The activities we will restrict under a NEUB and the exceptions we expect to make

Number	Activity restricted by NEUBs
1	Watering outdoor plants on commercial premises
2	Filling or maintaining a non-domestic swimming or paddling pool or hot tub/jacuzzi
3	Filling or maintaining a pond
4	Operating a mechanical vehicle-washer
5	Cleaning any vehicle, boat, aircraft or railway rolling stock
6	Cleaning non-domestic premises
7	Cleaning a window of a non-domestic building
8	Cleaning industrial plant
9	Suppressing dust
10	Operating cisterns (in unoccupied buildings)

If we need to impose restrictions like TUBs or NEUBs, customers can contact us to ask for exemptions or for more information. After we receive these representations, we will consider these and whether it is appropriate for us to vary our policy to discretionary exceptions. If we impose restrictions and we become aware that some customers are not complying, we will try to work with them to understand why this is. If this does not work, then we will explore the enforcement options open to us. However, we expect that by demonstrating that we are reducing leakage and doing everything that we can, that the overwhelming majority of our customers will also ‘do their bit’.

As we described in section 1.6 our stated levels of service are that we expect to impose restrictions no more than three times every 100 years. When talking to customers we do not distinguish between a TUB and a NEUB. However, as our decision flow charts show we would not impose a level 3 restriction i.e. a NEUB until drought trigger level 3. This means that we will not impose a NEUB unless we have already imposed a TUB. The table of modelled and stated frequency of TUBs and NEUBs we included in section 1.6 shows that there can be a difference between stated levels of service and the modelled.

Our baseline deployable output (DO) modelling for WRMP19 of the 95-year period from 1920 to 2014 shows that the two most critical droughts in our region in terms of causing level 2 & 3 restrictions (TUBs and NEUBs) are those that included the following years: 1976 and 1984. Our water resource modelling shows that these are the droughts when we would have needed to impose customer restrictions. Our modelling also shows that reservoirs such as the Derwent Valley reservoir group and Tittesworth reservoir cross the TUB and NEUB triggers, but they do so outside of ‘summer’ period in which we would impose restrictions. These ‘winter’ crossings at Tittesworth and Derwent occur in the 1933-34 and the 1995-96 droughts. Figure 17 shows Tittesworth Reservoir

storage in the 1995-96 drought. Our modelling has also demonstrated that in 1975-76 our storage at Elan Valley entered drought levels 2 and 3 in summer (see Figure 18). The modelled TUB and NEUB frequency shown is consistent with the levels of service we state to customers as both are 3 in 100 or less.

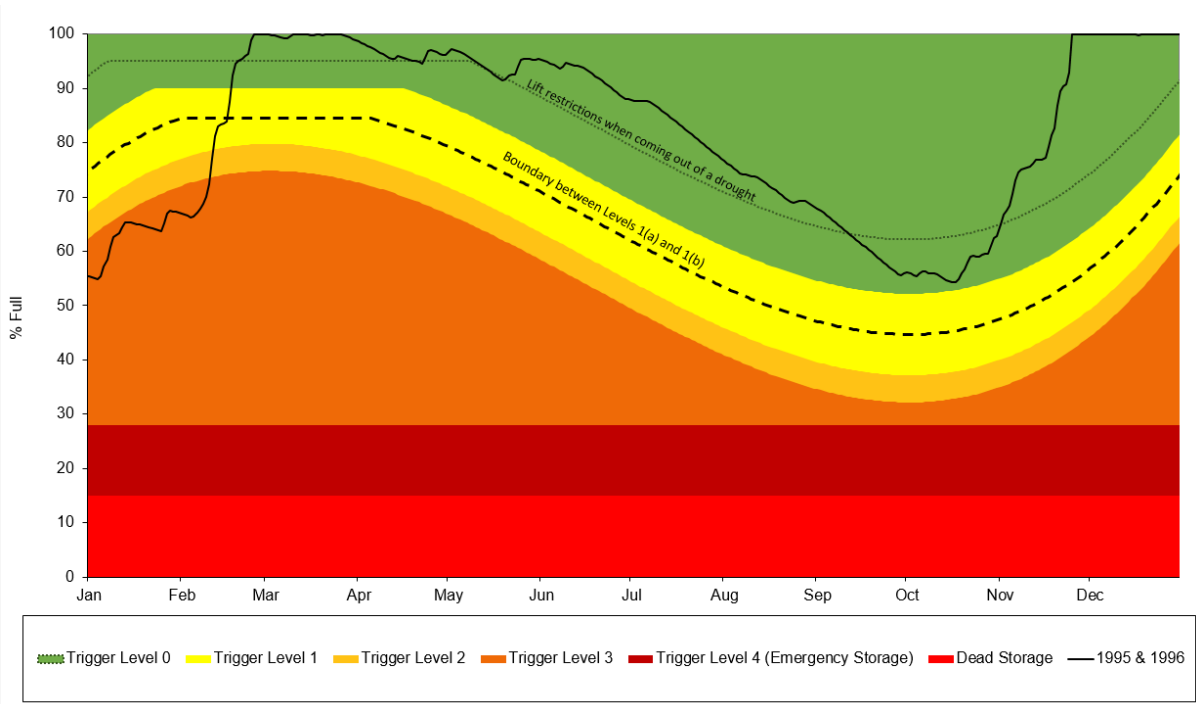


Figure 17 Tittesworth modelled storage entering drought trigger level 2 and 3 in the 1995-96 'winter'

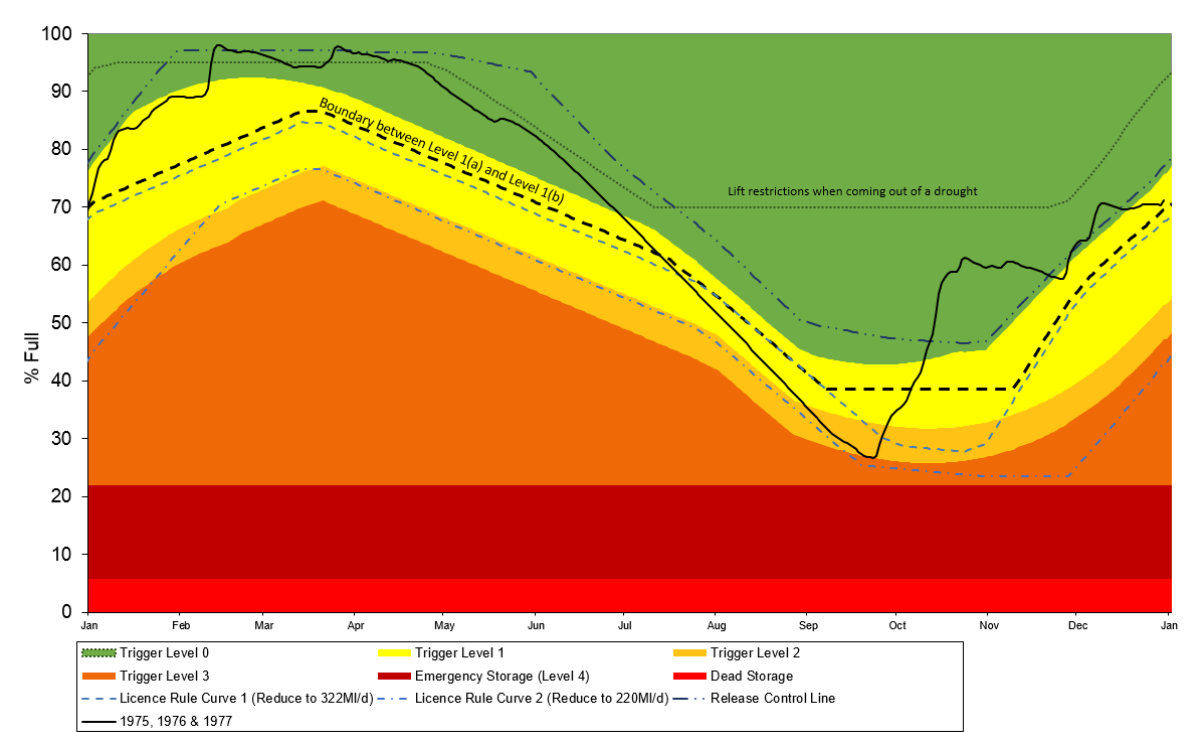


Figure 18 Elan Valley modelled storage entering drought level 2 and 3 in the 1975-76 'summer'

We have considered the results of UKWIR research as well as company specific factors when deciding what reduction in demand to expect as a result of temporary water use restrictions. The 2007 UKIWR report (Drought and demand: modelling the impact of restrictions on demand during drought) suggested that a full hosepipe

ban could reduce demand in the summer by between 5% and 9.5%. There is some uncertainty associated with these results and they were gained from companies in the South East of England, where average water consumption is significantly higher than in our region. We believe that a 5% demand saving is a reasonable assumption for demand savings across the Severn Trent region. This reduction in demand is consistent with our previous drought plan. It is also consistent with the Aquator modelling we carry out in support of our water resources management plan (WRMP).

We plan on the basis that we will not impose a level 2 restriction TUB if reservoir storage or other indicators have been in level 2 for less than 7 days and that we would need a 'lead in' time of 14 days before we introduce restrictions on our domestic customers. This timescale allows sufficient, but not excessive, time for this engagement with our customers. We understand that there is no other formal process for objecting to restrictions imposed under a TUB, unless a customer requests a judicial review under the Human Rights Act. If any customers have any concerns about how and when we might restrict use we would welcome them to approach us at any time. We have given more detail on our communication plan and associated engagement in section 5.

3.1.5.3 Compensation arrangements for drought measures

Interruptions to water supply through a Drought Order

The compensation that we may make to household and non-household customers because of a Drought Order are defined by condition Q of our Instrument of Appointment. When a supply of water is interrupted or cut off due to a Drought Order, the affected customer(s) may be entitled to compensation payment or account credit. However, like all water companies if Ofwat determined all reasonable steps were taken to avoid the circumstances that gave rise to the Drought Order then Severn Trent would not be required to issue compensation.

If applicable, for household customers we would pay a sum of £10 multiplied by the number of days during which, or part of which, the supply of water to the premises is interrupted - up to the maximum average water charge for the previous year. For non-household customers we would pay/credit a sum of £50 multiplied by the number of days during which, or part of which, the supply of water to the premises is interrupted - up to the maximum amount of water charges for the previous charging year, or £500 if the customer is not liable (i.e. third party) to pay the charges.

Adverse impacts, damages and losses by drought management actions

Abstractors or occupiers/owners of land who suffer adverse impacts, damages and losses through Severn Trent's drought management actions from a drought permit or order are entitled to claim for compensation under the Water Resources Act (WRA) 1991. These rules are set out under Schedule 9 of the WRA, where abstractors must submit a claim within six months of the expiry date of the permit or order.

We would always follow the appropriate regulations and standards in relation to compensating customers or other organisations potentially affected by our actions. However, there may be times during a drought when we would like to go above and beyond these standards. We would make these decisions during a drought by considering the specific circumstances of each case. More information can be found using the link below.

<https://www.legislation.gov.uk/ukpga/1991/57/schedule/9>

Guaranteed Standards Scheme

Severn Trent follow the Guaranteed Standards Scheme (GSS) set out by Ofwat which determines whether we may be required to pay compensation to a household or business customer.

3.1.6 Level 4 Restrictions - Emergency drought orders/ emergency plans

We do not class droughts as emergencies unless there is a major environmental or other acute incident requiring activation of multi-agency major incident response arrangements or a serious threat of emergency drought orders.

Legally, emergency drought orders allow companies to “prohibit or limit the use of water for such purposes as (they) see fit” and to supply water by means of standpipes or water tanks. The timing of applications and the determination on these applications is the same as for ordinary drought orders. However, emergency drought orders are granted for a period of up to three months and may only be extended to last a maximum total of five months. Emergency drought orders are described in the water industry as ‘level 4 restrictions’.

This drought plan covers the actions we might require up to the classification of an emergency. At this stage we will activate our emergency plans to deal with a loss of supply and maintaining essential water supplies. Due to their sensitivity our emergency plans are not publicly available, but they describe the measures we would consider during emergency scenarios. Scenarios of this type are outside the scope of a drought plan. However, it is vital to stress that the probability of a drought causing such plans to be implemented is extremely low.

3.2 Supply-side actions

This plan not only includes measures for reducing demand during droughts but also ways in which we can increase our supplies of water. Since we published our 2014-19 drought plan there are some supply-side actions which we know are no longer available. For example, in the North Staffs WRZ we had an option that involved recommissioning Meir but, due to water quality reasons, we have revoked this abstraction licence and we no longer own the site. As this is no longer a viable drought option we have removed it from our plan. There are also some options that we have included in this drought plan that we did not include in our 2014 plan.

3.2.1 Drought / Emergency Sources

As we are considering more extreme droughts in this plan to those we considered in our 2014 plan we think that it is essential to explore a wider range of potential drought sources. We currently consider the following to be drought sources that may provide a supply-side benefit in a drought (or another emergency that threatens our ability to supply piped water supplies to all of our customers):

- Blackbrook reservoir
- Linacre reservoir group
- Monksdale borehole
- Norton emergency borehole
- Witcombe reservoir
- Stanley Moor borehole

3.2.1.1 Deploying these sources

Some of the sources listed above could be deployed at short notice whereas others have a long lead in time and would require (temporary) infrastructure, environmental assessments, hydrological studies and water quality assessments. Table 11 shows how ‘ready’ each of these drought/ emergency sources is. In appendix F we also include some additional information relating to these sources.

Table 11 Potential requirements to deploy our drought/ emergency sources

Source	WRZ that would benefit	Estimated peak yield (MI/d)	Estimated average yield (MI/d)	What is needed to get it into supply	Comments / timescale
Norton borehole	Strategic Grid (West)	N/A	0.7	Standard internal processes for bringing into supply a source that has monthly water quality samples taken but is not normally used for public supply	Expect it would take around 3 – 6 months to bring into supply.
Blackbrook reservoir	Strategic Grid (East)	14.5	6	Need to test water quality of the reservoir and build infrastructure to either transfer to Site B or, less likely, install on-site treatment and construct infrastructure to get treated water into our grid.	Expect it would take in excess of 9-12 months to bring this into supply. We recognise that this site is a Site of Special Scientific Interest (SSSI) but we do not believe this changes are timescales.
Linacre reservoir group	Strategic Grid (East)	9	6.8	Need to test water quality of the reservoir and build infrastructure for on-site treatment and construct infrastructure to get treated water into our grid.	Expect it would take in excess of 12 months to bring this into supply.
Monksdale borehole	Strategic Grid (East)	N/A	1.5	Need to test water quality of the raw water, build on-site treatment and construct infrastructure to get treated water into our grid.	Due to the long lead-in time to deploy (9-12 months), the modest yield available (on an annual average basis) and the lack of environmental data available we expect to need this source less frequently than we would use NEUBs.
Stanley Moor borehole	Strategic Grid (East)	N/A	0.5	As above.	As above.
Witcombe reservoir	Strategic Grid (South) – possibility to supply Forest & Stroud via existing transfers	8.7	1.4	As above.	As above.

It is important to note that the drought resilience we described in section 2.1.2 does not rely on our ability to use any of the sources listed in the table above. As a result, if we decide to use sources such as Linacre or Blackbrook as WRMP24 options we would still be resilient to a 1 in 200 year drought without the need for level 4 restrictions.

We note that there is a continuum between the sources that we use the most and those which we never use (see Figure 19). This means that although it is fairly straightforward to tell which sources are at either end of this spectrum it is less obvious what to call the sources that fall in between these two categories. For example, there are several groundwater sources that we use to support river flows during periods of low flows. We operate these sources too frequently to class them as ‘drought sources’, but not frequently enough for them to be classed as constant sources of supply.

The timescales and requirements of a drought management option are different to those of an emergency plan option. We discuss our emergency contingency planning process in section 3.1.6. Although our drought action flow diagrams (in Appendix B) state that we would “consider use of drought/ emergency sources” in drought trigger level 1, the long lead in time means that we would be very unlikely to fully implement these actions until we had entered into drought trigger level 2/3. As described in section 1.6 we do not expect to enter into drought trigger level 3 in the 95 year record that we model in Aquator. We discuss the WFD implications of using these sources in section 6.5 of this plan as well as in the separate WFD assessment that accompanies this plan.

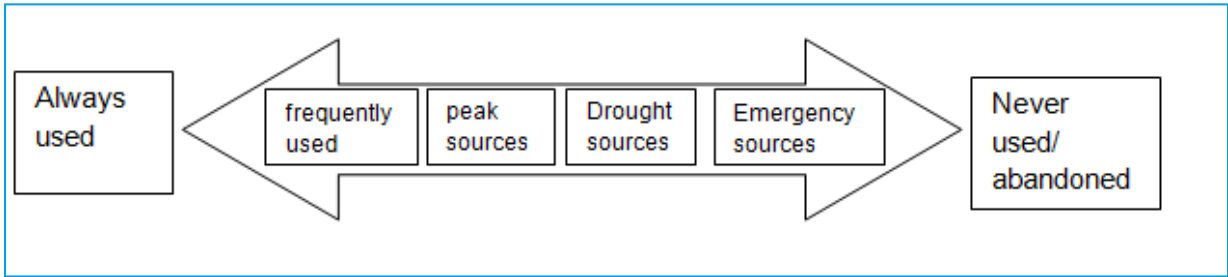


Figure 19 Frequency that we expect to use our various sources

We assess the feasibility and viability of all of our sources including drought and emergency sources. If we find that sources cannot be of value to us in the future, we have a site abandonment procedure that releases the source, and its abstraction licence, for alternative and more productive use.

In Section 4 we detail our extreme drought actions that are available to us in extreme circumstances. These are actions we would implement after using non-essential use bans (i.e. level 3 drought restrictions) and before needing to apply for and implement level 4 emergency restrictions. We have split out our extreme drought actions from our emergency sources, however in the most extreme drought scenario we would consider utilising any of these actions that are available to us simultaneously. It is likely that the extreme drought action demand-side measures would be implemented before the emergency sources listed in section 3.2.1 are in supply. Our emergency sources differ from our extreme drought actions as our emergency sources are unused sources of water with existing abstraction licences that we would need to recommission.

3.3 Drought orders and permits

There are some plausible drought scenarios when we will need to apply to the Environment Agency for level 3 restrictions such as drought permits or to the Secretary of State for drought orders. We have prepared our drought plan so that we will need to implement these measures as infrequently as is reasonably possible. In this section when we talk about drought orders we refer to ordinary drought orders (level 3 restriction) and not emergency drought orders. We explained our approach to emergency drought orders in section 3.1.6.

The main differences between drought orders and drought permits are that:

- 1) Drought permits allow companies to take water from specified sources and vary or suspend abstraction licence conditions
- 2) Drought orders do this, but also allow companies to discharge water to specified places and to modify or suspend discharges or filtering/ treating of water
- 3) Drought permits are normally determined within 12 days of the application
- 4) Drought permits are determined by the EA
- 5) Drought orders are determined by the Secretary of State/ Welsh Ministers
- 6) Drought orders are normally determined within 28 days
- 7) Drought orders allow water companies to restrict non-essential uses of water for their domestic and commercial customers

Table 12 shows our modelled frequency of crossing through levels 2 & 3, (triggering potential drought permits & drought orders, respectively) at our strategic reservoirs using our WRMP19 data.

Table 12 Modelled frequency of crossing trigger levels 2 & 3 at strategic reservoirs

	Frequency of crossing level 2 more than 7 days (drought permit action)	Frequency of crossing level 3 more than 7 days (drought order action)
Elan	5 (3 winter: 1921, 1933-34, 1995-96; 2 summer: 1976, 1984)	1 (summer 1984)
Tittesworth	3 (2 winter: 1933-34, 1995-96; 1 summer: 1934)	2 (winter: 1934, 1996)
Derwent Valley	0	0
Carsington & Ogston	0	0
Draycote	0	0

As described in the following sections and Table 12, although we may cross into drought trigger zones 2 & 3, this does not necessarily mean a drought permit or drought order will be appropriate. We may be able to source supply to customers from elsewhere in the WRZ/region, or our projections may indicate future storage recovery (e.g. increased precipitation and river flows) that would mean the permit/order would not be necessary by the time of implementation. This is why our modelled frequency in Table 12 is higher than historic drought permits/orders that have been put in place in dry years.

3.3.1 Demand side Drought Orders

The Secretary of State can grant a drought order if they are satisfied that either:

- a serious deficiency of water supplies exists or is threatened or
- there is a serious threat to any flora or fauna, and

- this has been caused by an exceptional shortage of rainfall

In our water resources modelling we assume that a restriction on these non-essential uses lowers summer customer demand by an extra 5%. This means that, in combination with the temporary use restrictions (level 2 restriction) applied to domestic customers, we model a 10% reduction in demand.

This value is consistent with the reduction in demand associated with a drought order shown in the 2007 UKWIR report Drought and demand: potential for improving the management of future droughts. The cumulative or in combination reduction in demand of 10% is towards the lower end of the range of values quoted in other industry publications. This is appropriate to our company specific circumstances as our customers use less water on average than the customers of most of the other water companies in England and Wales.

We assume 28 days as the time required for Defra to grant a drought order to restrict the use of commercial customers. However, it does not follow that there must be an equivalent volume of reservoir storage in level 3 to supply 28 days of average or peak demand. This is because as reservoir storage falls through the zones above we will implement actions to reduce the demand on the reservoir or reservoir group. For example, during the low storage experienced at Draycote reservoir in 2011-12 we were able to reduce the net outflow from Draycote reservoir to zero.

In our modelling we assume that when reservoir storage enters drought trigger level 2 (which is defined in section 2.2) for more than seven days, we will:

- reduce the modelled demand by 5%

We also assume that if storage enters drought trigger level 3 our modelled demand will:

- reduce by 10%

These reductions only occur if the modelled storage enters these zones in the summer (April to October inclusive) months as during winter there would be no significant reduction in demand. The 180 day duration for demand reductions is consistent with that assumed for a hosepipe ban when we prepared our 2019 WRMP, our 2014 WRMP and our 2014 drought plan. These demand reductions apply for a period of 180 days, unless storage recovers sufficiently before this period has finished.

We do not have a curve in our model solely for when we implement drought orders. Despite this we can predict when they are likely to occur by looking at the time of year, the reservoir current storage and our projections for future reservoir storage. If we think that there is a reasonable chance that we would need a drought order or permit we would engage with the relevant stakeholders at an early stage. For example, during the drought that ended in 2012 we contacted the Midlands Region EA to agree what we would need to provide to support any drought permit application. Table 13 illustrates some indicative scenarios:

Table 13 Indicative drought permit application scenarios

Time of year	Current reservoir storage	Projected future reservoir storage	Is a winter or summer drought permit application likely
Winter / Spring / early summer – (November to July inclusive)	Level 2	Projections indicate that storage will remain in level 2 or reduce further	Yes, although we would not apply for a summer drought permit unless we had imposed a TUB

Winter / Spring / early summer – (November to July inclusive)	Level 2	Projections will indicate that storage will increase to level 1(b) or above within 28 days	No, this would be unnecessary
Late summer / autumn (August to October inclusive)	Level 2	Projections indicate that storage will remain in level 2 or reduce further	Yes, but it is unlikely that our projections would indicate this as winter inflows are usually high
Late summer / autumn (August to October inclusive)	Level 2	Projections indicate that storage will increase to level 1(b) or above within 28 days	No, this would be unnecessary

By allowing us to restrict the non-essential uses listed in section 3.1, drought orders provide us with powers to manage the demand of more of our non-household customers. We may also apply for a drought order rather than a drought permit in locations where we consider there needs to be a decision on the grounds of imperative reasons of over-riding public interest. Decisions of this type are taken by the Government rather than the EA.

Currently we think that there are two specific locations where we may apply for a drought order for this reason. These two locations are:

- The River Severn at site G, if the EA has already applied for a drought order
- The River Churnet at Tittesworth

We describe our approach to a potential drought order on the River Churnet in section 3.3.4.5 of this plan.

3.3.2 Lead in times for drought permits and drought orders

The lead in time that we will require to prepare our drought permit or drought order applications will depend on how much information we have readily available at the time. We estimate that we will require at least seven days lead in time for us to finalise our application following the pre-application stage. We would confirm wording for press notices, formal notices and statements at the same time as preparing our formal application. If we are considering applying for either a drought permit or drought order, we will have already been collating the supporting information required. This means that some of this lead in time could occur whilst the drought indicators are still in trigger level 1(b). We would be engaging with the EA during this zone to ensure a timely pre-application is submitted and that there are 'no surprises', however we cannot define the numbers of days before needing the permit/order that a pre-application would be submitted as each drought situation is different. In section 6 we explain that we are routinely gathering the supporting environmental information that we need as part of a drought permit/ order application. Therefore, we are confident that we could quickly make an application if necessary. In the application phase we would also provide detail of the benefits of the permit and the risks to water supply if it is not granted, exceptional shortage of rainfall justification (see section 3.3.3.), and updated environmental assessments as necessary.

Table 14 below summarises our drought permit application preparation, the majority of which are already complete to allow a timely application. We hold templates/drafts of our supporting documentation for each permit location, stakeholder notices and advertisements. We have general stakeholder lists for each permit location, these are checked and further updated in trigger level 1(b) to ensure all relevant stakeholders are included.

Table 14 Steps to ensure we are drought permit application ready

Drought permit application preparation
Draft permit application form WR80
Prepare supporting documentation including justification of need, exceptional shortage of rainfall justification and location map
Completed and up to date Environmental Assessment Report
Confirm wording of press notices, formal notices, and statements
Up to date contact details of statutory and non-statutory stakeholders on whom notice would be served
Arrange a suitable venue, as necessary, if a hearing is required

There is a legislative basis for applying for a drought permit contained in Schedule 8 of the Water Resources Act 1991. We are required to follow a pre-defined process with associated timescales to allow for regulatory scrutiny. The process and timescales are shown in Figure 20. We will take into consideration these timescales when making an application to ensure the application is made in a timely manner for the drought permit to be received and utilised.

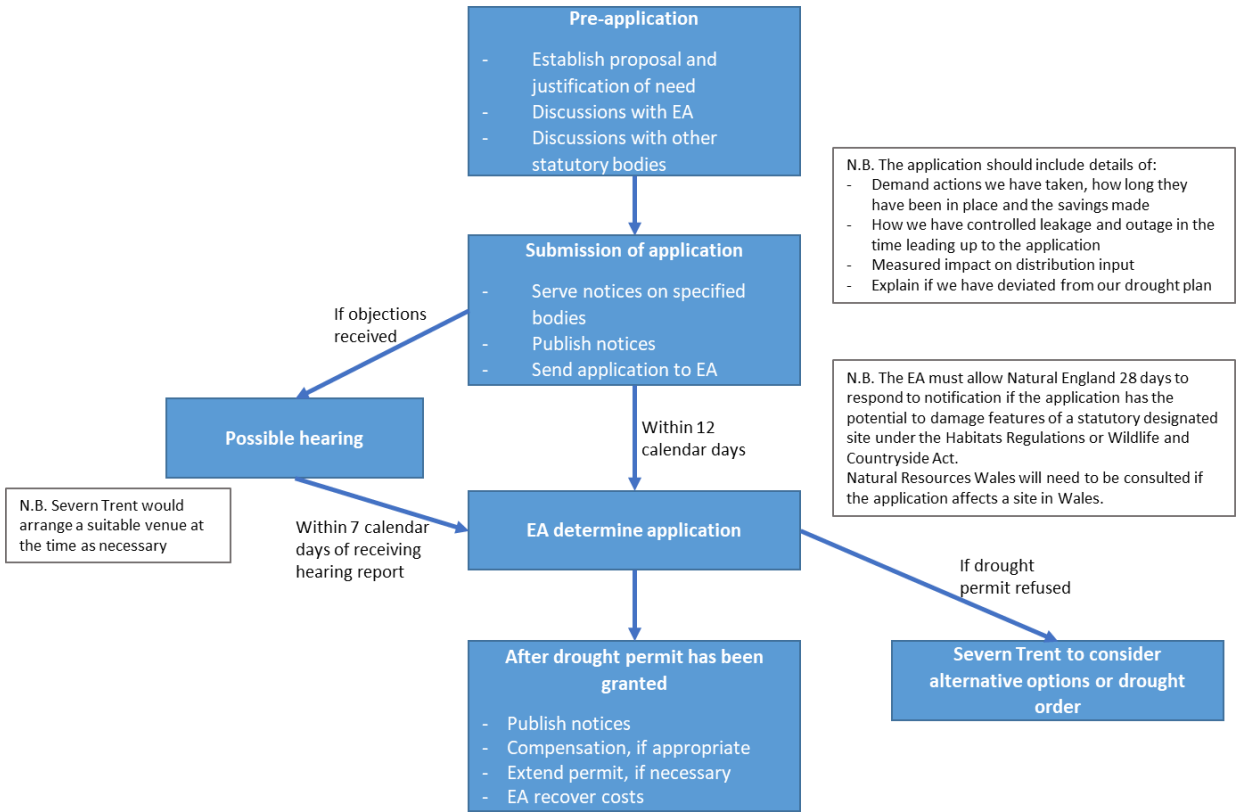


Figure 20 Drought permit application process

In the event of applying for a drought permit or order the EA may request to see sensitive Severn Trent data, such as pre-published leakage data. We will be able to make data available for the EA on secure password protected spreadsheets or alternatively permit access to our offices to view data, as necessary.

The statutory bodies that we would enter discussions with and serve notices to are: Defra, EA, Natural England, District Councils in the affected area, other water undertakers, and National Park authorities (as necessary). There are numerous other non-statutory stakeholders that are relevant to each individual drought permit/order who we would engage with including, but not limited to, area specific angling clubs, non-household users of water and non-governmental organisations. We would check and update (if necessary) our stakeholder lists early in the drought permit preparation process whilst in trigger level 1(b).

3.3.3 Drought permits

Drought permits allow us to take water from specified sources and vary or suspend conditions in abstraction licences to enable us to continue providing water for public consumption. This is a supply-side drought management option as it can increase the amount of water available to abstract. The EA will grant drought permits if it is satisfied that:

- a serious deficiency of supplies of water in any area exists or is threatened and
- the reason for this is an exceptional shortage of rainfall

Although companies need to demonstrate a “serious deficiency of supplies” and “exceptional shortage of rainfall” to obtain either a drought order or permit, there are no exact definitions of either term. This is because each drought and situation is different. To provide the industry with clarity the EA produced a guidance note entitled ‘Exceptional shortage of rain: Principles for the assessment of drought orders and permits’. We have reproduced this note in appendix I. In summary, this note states that the EA will consider the following matters when assessing drought orders or permits:

- technical analysis methods
- period of analysis
- geographic extent of analysis
- other meteorological and hydrometric measures
- relationship to the serious deficiency question
- relationship to water company system
- other sources of information
- presentation

This guidance note helps to define what the EA would expect without being excessively prescriptive. For example it states that there should be no set definition of exceptional shortage of rain and it states that the technical methods “can include return period analysis”. We believe that this note sets out a sensible and pragmatic approach. We also note that we routinely analyse and monitor some of the information mentioned in this note as part of our internal drought communications. It is important that we monitor localised as well as regional (rainfall) data. One way in which we can assess whether a rainfall deficit is exceptional is to refer to the CEH portal (see Figure 5).

A drought permit will normally be in force for a maximum period of six months, but those six months can start at any time of the year. Drought permits can be extended if necessary. However, it is an understanding between the EA and water companies that a drought permit, starting in summer, would be accompanied by a reduction in domestic customer demand through a temporary use ban (TUB). We describe the potential environmental impacts and the assessments we have carried out in section 6 of this plan.

3.3.4 Potential drought permit and order sites

In a drought we may have to apply for drought permits or drought orders at the following locations:

- Avon & Leam
- Derwent
- River Churnet
- Site G
- River Dove

Figure 21 shows the geographical locations of these sites in relation to the location of sites of special scientific interest (SSSIs), special areas of conservation (SACs) and special protection areas (SPAs) that are in our region.

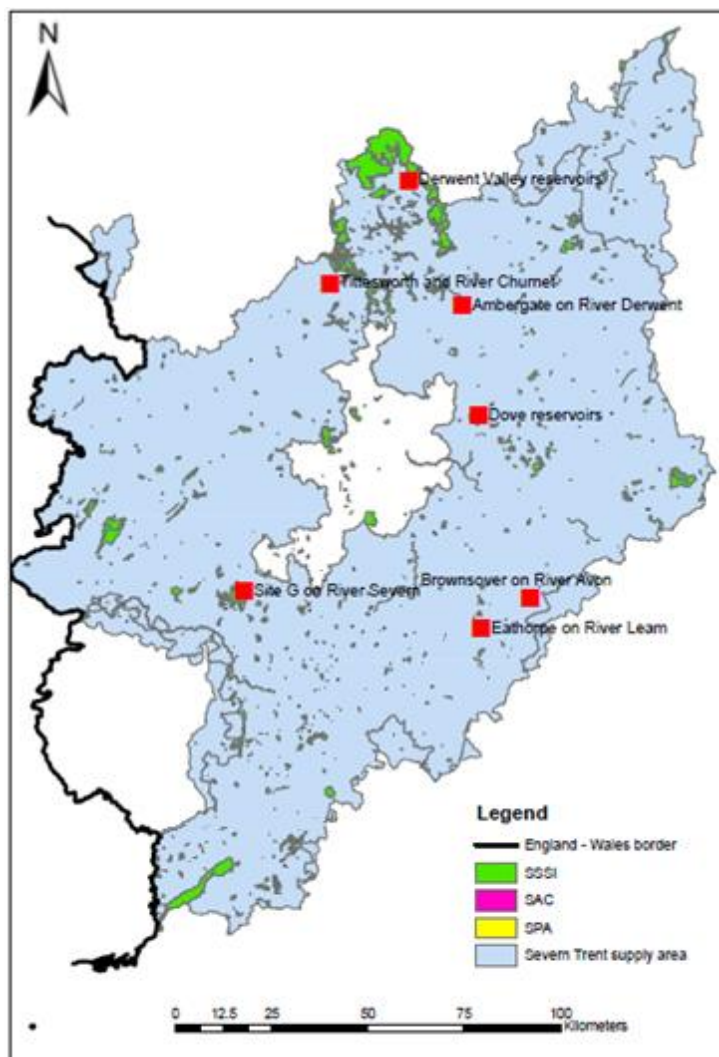


Figure 21 Location of potential drought permit and drought

These locations are unchanged from our previous drought plan apart from the addition of the Dove Reservoirs. Where the locations are unchanged, we have carried out extensive work on Environmental Assessments for the drought permits/ orders that and we have carried out the associated monitoring for several years in the catchments that include all of these sites.

However, we do not entirely rule out the need for drought permits/ orders that we do not currently list. The reason we cannot entirely rule this out is that in a drought more extreme than any we have previously experienced we do not know exactly how, where or when the effects will be most apparent. As a result, we want to keep these options open if very extreme or unexpected events or series of events occur.

3.3.4.1 River Leam and River Avon

In 'normal' conditions our abstraction licences mean that:

- We cannot abstract at Eathorpe between May and mid-September unless Draycote reservoir storage is below the summer abstraction thresholds.
- We have to operate so that, if the flow in the River Leam at Princes Drive Weir in Leamington drops beneath 18.2MI/d, we only abstract at Willes Meadow the same amount of water that we released from Draycote reservoir the previous day.
- We cannot abstract from the River Avon if the flow at Stareton gauging station is equal to or below 45 MI/d.

This drought permit will:

- Authorise abstraction at Eathorpe on the River Leam to Draycote Reservoir at any time of year when the lower storage condition at Draycote Reservoir would normally prohibit such abstraction
- Relax the flow condition in the River Leam at Princes Drive Weir in Leamington from 18.2 MI/d to 12.2 MI/d
- Reduce the hands-off flow in the River Avon at Stareton from 45 MI/d to 35 MI/d exclusively to allow us to transfer additional water from the River Avon at Brownsover into Draycote reservoir.

The full EAR (Environmental Assessment Report) can be requested from Severn Trent. A summary of the associated EAR is detailed here:

- The magnitude of DP effects was derived from water balance modelling work performed for both river catchments; hydrological and water resource analysis was therefore used to provide a time series of river flows (between June 1972 and January 2012 on the Leam and October 1962 and February 2012 on the Avon) for both a baseline condition and also for a number of drought permit scenario conditions.
- For most receptors, only negligible or minor negative impacts were predicted. The notable exceptions were in-river habitats at Offchurch on the River Leam, and some species and life history stages of fish on the River Leam, where potential moderate negative impacts were considered possible (although not necessarily probable), depending on the timing and duration of DP implementation.
- No in-combination impacts are predicted for the River Avon downstream of the Leam confluence, given the generally negligible/minor nature of the predicted impacts on the reaches upstream and the negligible nature of the predicted changes in flow in this reach.
- Additional monitoring and mitigation measures have been proposed to reduce all potential impacts to a minor negative level of significance, where possible.

3.3.4.2 Derwent Reservoirs

In 'normal' conditions our abstraction licences mean that we:

- Abstract approximately 75% of the annual licensed quantity from the reservoirs for our use.
- Approximately 25% is for Yorkshire Water's use.

- We should provide a minimum compensation flow of 54 MI/d from Ladybower reservoir (when the River Derwent flow at Derby is above 340 MI/d).
- We should provide an aggregate quantity of compensation water of 74MI/d (or 92MI/d when flow at Derby is <340MI/d) from Ladybower Reservoir and the River Noe/Jaggers Clough to the River Derwent

This drought permit will:

- Reduce the aggregate quantity of compensation water from Ladybower Reservoir to the River Derwent and the River Noe/ Jaggers Clough flows from 74 MI/d (or 92 MI/d when flow at Derby is <340 MI/d) to 51 MI/d.
- Reduce compensation water from Ladybower Reservoir from 54 MI/d to 34 MI/d.

The full EAR (Environmental Assessment Report) can be requested from Severn Trent. A summary of the associated EAR is detailed here:

- The environmental impacts of drought permit operation and impacts on water users were investigated in a staged process. Likely changes to 'pathway variables' (flow, physical habitat and water quality) were predicted numerically and the potential effects on 'receptors' (ecology and water users) were assessed using expert judgement and with reference to effects during previous low flow periods.
- Predicted flow and habitat changes arising from Derwent Valley drought permit operation were greatest between Ladybower Reservoir and Rowsley but even there impacts on the environment and on other water users were considered likely to be minor. Further downstream, changes in flow were very modest relative to the large flow contribution from the River Wye
- However, because droughts are infrequent, predictions of drought response are inevitably a little uncertain. Therefore, an updated Environmental Monitoring Plan and potential mitigation measures have been set out in consultation with the Environment Agency
- Post-Drought Permit monitoring is required to assess recovery and the success of the mitigation measures, and to check that there are no long-term effects on any environmental features.

3.3.4.3 River Derwent at Ambergate

In 'normal' conditions our abstraction licences mean that we can:

- Abstract up to 62,100 MI annually from the river at Ambergate
- We have included the daily maximum abstraction rate in Table 15.

This drought permit will:

Authorise the abstraction of up to 320 MI/d at Ambergate when the flow in the River Derwent at Derby is not less than 500 MI/d, rather than the present flow threshold of 680 MI/d.

We have taken Table 15 from the River Derwent and Derwent Valley environmental report which we discuss in section 6.1.1. This table summarises the changes that these two drought permit applications would seek to make.

Table 15 Derwent and Derwent Valley drought permits

System	Mean daily flow controls at St. Mary's Bridge Derby (MI/d)	Permissible Abstractions MI/d	Total Upper Derwent compensatory flow requirement (MI/d)
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	Normal	Drought permit	Normal & drought permit	Yorkshire Bridge		Below Noe Confluence	
				Normal	Drought Permit	Normal	Drought Permit
Derwent Valley Reservoir System	≤340		245 (daily average value)	≥72	≥34	≥92	≥51
	>340	>340		≥54	≥34	≥74	≥51
	>680	>500	320	n/a	n/a	n/a	n/a
Ambergate	≤680	≤500	≤15	n/a	n/a	n/a	n/a
	≤340	≤340	0	n/a	n/a	n/a	n/a

The full EAR (Environmental Assessment Report) can be requested from Severn Trent. A summary of the associated EAR is detailed here:

- The environmental impacts of drought permit operation and impacts on water users were investigated in a staged process. Likely changes to ‘pathway variables’ (flow, physical habitat and water quality) were predicted numerically and the potential effects on ‘receptors’ (ecology and water users) were assessed using expert judgement and with reference to effects during previous low flow periods.
- Predicted flow change arising from the Ambergate drought permit would only affect the lower river, with the impacts on the environment and on other water users all found to be insignificant.
- However, because droughts are infrequent, predictions of drought response are inevitably a little uncertain. Therefore, an updated Environmental Monitoring Plan and potential mitigation measures have been set out in consultation with the Environment Agency
- Post-Drought Permit monitoring is required to assess recovery and the success of the mitigation measures, and to check that there are no long-term effects on any environmental features.

3.3.4.5 River Churnet

In ‘normal’ conditions, our abstraction licences mean that we must:

- Provide at least 14.8 MI/d compensation flow from Tittesworth Reservoir (including Solomon’s Hollow)
- Not abstract more than to 16,000 MI annually from the reservoir.

In addition, we currently have an abstraction licence for Abbey Green borehole. If we are granted a drought order it will allow us to:

- Reduce the compensation flow at Tittesworth Reservoir (including Solomon’s Hollow) from a minimum of 14.8 MI/d to a minimum of 8 MI/d
- Abstract up to 3.3 MI/d from the Abbey Green borehole to discharge a compensation flow into the River Churnet 1.8 km downstream of Tittesworth reservoir

- No longer release a total minimum discharge of 19.32 MI/d from a combination of Tittesworth Reservoir (including Solomon’s Hollow) and Deep Hayes. It is worth noting that this clause is going to be removed from the licence in the future.

The environmental impacts of this drought order are covered in the Churnet environmental report. We describe the purpose and content of our environmental reports in section 6.1.

Should we require this drought management option we would apply to Defra for a drought order to reduce the compensation flow from Tittesworth, abstract from Abbey Green borehole for river augmentation purposes and discharge from Abbey Green borehole to the river (drought orders can contain provisions authorising discharges). We have outlined how we would demonstrate a “serious deficiency of supplies” and “exceptional shortage of rainfall” for our permit/order locations in section 3.3.3, whilst following the guidance in appendix I. The process of assessment for this location would follow our most recent Dove drought permit we applied for in 2018, where we would use HadUK climate data for the area and Environment Agency in year data for analysis.

The full EAR (Environmental Assessment Report) can be requested from Severn Trent. A summary of the associated EAR is detailed here:

- The results of the hydrological and water quality modelling and analysis have been used to assess baseline data and predict potential impacts. For most receptors, only negligible or minor negative impacts were predicted. The notable exceptions were some species and life stages of fish, where potential moderate negative impacts were considered possible (although not necessarily probable), depending on the timing and duration of drought order implementation and potential water quality effects.
- In general, the monitoring carried out during previous droughts shows that the river ecology recovers fairly rapidly after droughts.
- Additional monitoring and mitigation measures have been proposed to reduce all potential impacts to a minor negative level of significance, where possible

3.3.4.6 Site G

In ‘normal’ conditions the flow in the Severn at Bewdley is greater than 850 MI/d and our abstraction licences mean that:

- We can abstract a daily maximum of 211 MI/d at site G

However, we can also abstract an additional 20 MI/d as we have transferred this from our shared South Staffordshire asset licence. So, in ‘normal’ conditions, the total daily maximum is 231 MI/d but, we usually abstract less than this. The key constraint at site G during a drought is that our maximum daily abstraction reduces from 211 MI/d down to 91 MI/d during maximum regulation of the River Severn, and to a maximum of 9,100 MI during the first 100 days of regulation (the figures are 111 MI/d daily and 11,100 MI with the 20 MI/d currently transferred to site G from the shared South Staffordshire asset). Table 16 illustrates these restrictions upon our abstraction.

Table 16 Site G drought permit/ order

	River Severn Regulation State	Site G	Site G + 20 MI/d from the shared South Staffordshire asset
Daily	Bewdley >850 MI/d	211 MI/d	231 MI/d

Seasonal	First 100 days regulation (then pro-rata)	9,100 MI	11,100 MI
Daily	Maximum regulation	91 MI/d	111 MI/d
Annual	Maximum regulation	33,346 MI/year	404,646 MI/year

We expect to apply for this drought permit/order if we have to reduce our abstraction at site G due to the maximum regulation condition in the abstraction licence. A reduction in abstraction at site G will have the greatest impact on our operation if there is the requirement to support the Elan Valley asset S flow to site U in Birmingham from the River Severn. This is most likely to occur if the Elan Valley Reservoirs storage is below the Elan Valley Licence Rule curve and flow to site U has been reduced so that we need River Severn support to supply the demand on site U. It is worth noting there is currently a review of the EA's Shropshire Groundwater Scheme. Severn Trent are involved in this project and the implications of the outcome of this assessment on River Severn Regulation will be detailed in future drought plans.

The proposed drought permit/order will suspend:

- The daily abstraction restriction under maximum regulation.
- The constraint limiting abstraction over the first 100 days of river regulation (special conditions 2b and 2c of the site G licence).
- The joint licence constraints at site G and the shared South Staffordshire asset, under maximum regulation. The daily maximum of 303 MI/d (max regulation) will revert to 431 MI/d, and the seasonal limits equivalent to 273 MI/d (licence No 110 and 163) and 303 MI/d (licence No.110, 163 and 584) will be removed.

If the period of the drought permit/ order extends beyond 100 days of river regulation we will review the situation with the EA in light of likely future demand on site G and current storage in site T and the Elan Valley reservoirs. We have described this as a drought permit/order as the fact that the R. Severn estuary is a HD site means that we may require a drought order, rather than a permit, even if the EA has not applied for a drought order itself. In the event that the EA has already applied for a drought order on the River Severn then we would need to apply for a drought order at site G. This drought order will:

- Reverse the 5% reduction on abstraction that would have been introduced by the EA's River Severn drought order
- Potentially make the other temporary changes that we would apply for in a drought permit application.

We will engage with the EA before the latter applies for its River Severn Drought Order (RSDO) or before we seek our own drought permit/order. This engagement will be with the relevant EA area hydrology team and Integrated Environment Planning team. We would also notify the Canal and River Trust (CRT) of any proposed changes if we apply for this drought permit.

The full EAR (Environmental Assessment Report) can be requested from Severn Trent. A summary of the associated EAR is detailed here:

- The Environmental Assessment Report for the River Severn at Site G used a combination of measured and modelled flow, water quality and ecological data to analyse the response of the water environment to drought and low flows.
- In the event that a Drought Permit at Site G was implemented in advance of a River Severn Drought Order being implemented, it was determined there would be no effect of the Site G Drought Permit/Order acting alone on the riverine reaches, since any effects would be counterbalanced by additional regulation releases. There is a very small risk of reduced freshwater inflows to the Severn Estuary under such a scenario but any such effects would be expected to be of extremely short duration and very unlikely to occur.
- In the event that a Site G Drought Order were to be implemented after implementation of a River Severn Drought Order, the results indicate a low to negligible impact on river flow and riverine habitats; flows are reduced at times of drought but the baseline scenario also shows similar reductions indicating that the changes are due to the normal flow recession that would be expected during a dry period.
- Mitigation measures have been proposed to reduce the potential impacts to a minor negative level of significance. Post Drought Permit monitoring has been recommended to confirm that any impacts would be minor and of a temporary nature.

A commitment has been made not to use the Site G drought option on the River Severn, given the volume of water involved, until an Appropriate Assessment considering in-combination impacts has been completed. The scope of the work and ongoing programme will be agreed with Natural England, Natural Resources Wales and the Environment Agency by winter of 2022, ready for summer 2023. Further information on this is included in our HRA.

3.3.4.7 Wyelands – removal of the drought order

In previous versions of our Drought Plan and our draft Drought Plan 2022-2027 published for consultation in 2021 we had a Drought Order at Wyelands to increase abstraction at this site dependent on flow in the River Wye and if the Elan Reservoirs storage was to drop below the Elan Storage Licence Rule Curve.

Representations were received from regulators and key stakeholders during the consultation of the draft Drought Plan for the Wyelands Drought Order regarding the HRA Appropriate Assessment for the River Wye/Avon Gwy SAC. Due to concerns raised over the assessment conclusions we made the decision to remove the Wyelands Drought Order from our 2022-2027 plan.

We believe our drought plan remains robust without this option as there are other drought options that can support this zone. Our WRMP19 has shown that there is no supply demand deficit in this zone over the life of this drought plan, including if we don't use this option in historical drought modelling. Should a drought worse than historically modelled occur in this zone, we have the option to increase the amount of water transferred into this zone from our Strategic Grid, where we have many more drought options that can help to support this transfer if required.

For our WRMP24, we will further review the supply demand balance for the forest and stroud zone under other levels of drought severity such as 1 in 500 using stochastic modelling, and include in our plan any options that may be required to allow us to achieve that level of service.

3.3.4.8 Dove Drought Permit

In 'normal' conditions our abstraction licences for the Dove Reservoir system means that we can:

- Abstract a maximum volume of 296 MI/d from the river Dove.
- Abstract a maximum aggregate volume of 73,200 MI/yr from the reservoirs and river, to be transferred to the local water treatment works.

- The daily river abstraction has a prescribed residual flow of 159 MI/d dependant on the flow at two upstream EA gauges.
- There is a second licence condition on the daily river abstraction that reduces the residual flow to 90 MI/d to enable more abstraction under certain low reservoir storage conditions.
- We provide a compensation flow downstream of the reservoirs.

If we were granted a Drought Permit at this site, it would mean:

- The daily river abstraction would need to remain at or above the prescribed flow rate of 159 MI. I.e. we would not abstract at the prescribed rate of 90 MI even if combined reservoir storage reached the lower storage threshold, to protect the aquatic ecosystem from deterioration due to abstraction in drought conditions.
- Abstract a maximum aggregate volume of 77,200 MI/yr from the reservoirs and river, to be transferred to the local water treatment works.
- We would not take the reservoir levels below historic lake levels.

The compensation flow downstream of the reservoirs will remain unchanged and because the reservoirs are pumped storage, and designed not to spill, there would be no change to the flow regime downstream of the reservoirs.

The drought permit assessment has focussed on the potential impacts of a change in reservoir drawdown and how that might affect the aquatic environment associated with the reservoirs.

The full EAR (Environmental Assessment Report) can be requested from Severn Trent. A summary of the associated EAR is detailed here:

- Using measured reservoir level data during a previous drought permit implementation to predict hydrological impacts in comparison to a modelled baseline scenario. The results of the hydrological analyses were used to assess baseline data and predict potential impacts for receptors including designated sites, protected and water-level sensitive species and recreational users.
- Predicted changes in water level and shoreline exposure during drought permit implementation in March 2019 were largely within the range of recent historical variation. For all receptors under the proposed Drought Permit, no impacts were predicted in comparison with the baseline
- There will be no impacts on the water bodies downstream of the reservoirs, nor on the River Dove.
- Routine operational monitoring will continue to be undertaken and will allow the effects of the proposed drought permit to be captured.

3.3.5 Management Structure / role and responsibilities

Water availability and our raw water position is tracked as business-as-usual (BAU) by our Water Availability Team (WAT). This monitoring ensures that we have early sight of any potential drought developing. As we move into a drought situation it is essential that we have a clear management chain and line of communication. This is necessary so we can make informed decisions quickly and effectively, and can agree and implement these actions. Overall control of our response to a drought is managed by our Drought Action Teams (DATs). We have four different levels of DAT:

- Operational bronze
- Operational silver
- Tactical DAT

- Strategic DAT

We judge which level of DAT we need to convene by monitoring levels of raw water against our drought trigger levels (described in section 2.2). If resources are in:

- Trigger Level 0 and tracking normally we manage through our normal operating rhythm (within WAT)
- Trigger Level 0 but trending towards Level 1(a), we will manage our system via operational bronze DAT (separately to WAT)
- Trigger Level 1(a) we will manage our system via operational silver DAT
- Trigger Level 1(b) we will manage our system via tactical DAT
- Trigger Level 2 or below we will manage our system via strategic DAT

3.3.5.1 Operational bronze DAT

This team meets fortnightly separately to WAT if condition (ii) above applies. We have set out the composition of this DAT in Table 17.

Table 17 Bronze Drought Action Team (DAT)

DAT member	Role
Strategic Asset Management – Water Resources Lead (Chair)	Overall responsibility for managing the response to a drought whilst in trigger Level 0
Principal Hydrologist	Provide technical advice on hydrology and licensing
Water Resources and Production Manager	Controls interventions on the grid and daily production requirements
Strategic Network Optimisation Advisors	Support water resources and production manager
Hydrology and Modelling Analysts	Provide technical advice on hydrology and modelling
(Principal/Senior) Hydrogeologist(s)	Provides technical advice on hydrogeology and groundwater assets

3.3.5.2 Operational silver DAT

Our Silver DAT is made up of the same members as our Water Availability Team (WAT), but when a drought is impending, and we are in drought trigger level 1(a), this team meets separately. We have set out the composition of this DAT in Table 18.

Table 18 Operational silver Drought Action Team (DAT)

DAT member	Role
Head of Network Control (Chair)	Overall responsibility for managing the response to a drought and network management
Head of Asset Strategy and Performance (Chair)	Responsibility for Asset Strategy & Planning and water resource management planning
Head of Asset Creation Non-Infra	Responsible for engineering projects on our non-infrastructure assets
Strategic Asset Management – Water Resources Lead	Lead on implementation of drought plan measures
Strategic Grid and Resilience Manager	Advice on grid resilience and capacity head of asset management

Area Production Operations Lead (for the areas affected)	Responsible for managing water production operations
Principal Hydrologist	Provide technical advice on hydrology and licensing
Hydrology and Modelling Analysts	Provide technical advice on hydrology and modelling
(Principal/Senior) Hydrogeologist(s)	Provides technical advice on hydrogeology and groundwater assets
Process Design Engineering Lead	Advice and sign off on water treatment processes
Network Control – water resources lead	Supports Head of Network Control
Water Resources and Production Manager	Controls interventions on the grid and daily production requirements
Operation Control Centre – Response Lead	Supports Head of Network Control
Head of Regulatory Performance and Assurance – if needed	Responsible for contact with EA and environmental permitting
Customer Strategy and Experience – if needed	Responsible for customer experience
External communications – if needed	Responsible for all external customer communications

3.3.5.3 Tactical DAT

The Water Availability Team expands to become the tactical DAT if any sites enter drought trigger level 1(b). We have set out the composition of this DAT in Table 19.

Table 19 Tactical Drought Action Team (DAT)

DAT member	Role
Head of Network Control (Chair)	Overall responsibility for managing the response to a drought and network management
Head of Asset Strategy and Performance (Chair)	Responsibility for Asset Strategy & Planning and water resource management planning
Head of Asset Creation Non-Infra	Responsible for engineering projects on our non-infrastructure assets
Strategic Asset Management – Water Resources Lead	Lead on implementation of drought plan measures
Strategic Grid and Resilience Manager	Advice on grid resilience and capacity head of asset management
Area Production Operations Lead (for the areas affected)	Responsible for managing water production operations
Principal Hydrologist	Provide technical advice on hydrology and licensing
Hydrology and Modelling Analysts	Provide technical advice on hydrology and modelling
(Principal/Senior) Hydrogeologist(s)	Provides technical advice on hydrogeology and groundwater assets
Process Design Engineering Lead	Advice and sign off on water treatment processes
Network Control – water resources lead	Supports Head of Network Control
Water Resources and Production Manager	Controls interventions on the grid and daily production requirements
Operation Control Centre – Response Lead	Supports Head of Network Control
Head of Regulatory Performance and Assurance – if needed	Responsible for contact with EA and environmental permitting
Customer Strategy and Experience – if needed	Responsible for customer experience
External communications – if needed	Responsible for all external customer communications

Security and Resilience Lead	Responsible for security, emergency plans, incident management, engaging with mutual aid and Local Resilience Forums
Legal Counsel (Legal) – if needed	Responsible for legal issues
Water Regulations and Public Health Lead – if needed	Responsible for water quality considerations

3.3.5.4 Strategic DAT

This is the highest level of DAT and it is chaired by the Production Director or an appropriate deputy. The silver, tactical and strategic DATs include senior managers who have expertise in water resources, water treatment, water quality and communications. These managers are supported by extensive technical expertise from within their departments. Strategic DAT includes all of the members of tactical DAT as well as the people listed in Table 20.

Table 20 Strategic Drought Action Team (DAT)

DAT member	Role
Production Director (Chair)	Overall responsibility for managing the response to a drought
Head of Customer Network Operations	Responsible for managing the distribution network in our region
Deputy Chief Engineer (represents Chief Engineer)	Responsible for engineering and providing a 2 nd line assurance of DAT decisions
Deputy General Counsel (Legal)	Responsible for legal issues
Head of Finance and Performance Production	Responsible for financial and performance issues
Head of Customer Strategy and Experience	Responsible for customer experience
Head of Asset Creation Infrastructure	Responsible for engineering projects on our infrastructure asset
Head of Communications	Responsible for all communications

Our DATs allow us to monitor and evaluate the effectiveness of our drought management actions. It also provides the benefit that it is a forum for technical discussions as well as for understanding the implications to our communication activities. We also use DAT to liaise with the relevant technical leads in the Environment Agency and NRW throughout an emerging drought, to inform them of the status of the specific drought management actions we are undertaking. By ensuring consistent internal and external drought messages, we are in a stronger position to join-up our communications with those of our relevant stakeholders. Please refer to 5.1 for further information.

3.3.5.5 Annual Review


This drought plan does not only apply during drought years. We have a regular 'raw water availability' agenda item at our Strategic Grid Steering Group. This helps to remind staff of the processes described in this plan, to assess the need for any further proactive mitigating actions and to ensure that our drought plan remains both current and achievable.

3.4 Drought plan action categorisation and trigger annotation

3.4.1 Action categorisation

Each of our drought plan actions have been categorised using level 1 to 4 definitions. Table 21 below shows the level at which we would consider initiating each of our drought plan demand and supply actions. We have only included actions up until level 3 (i.e. extreme drought management actions). Level 4 actions are included in our company emergency plans.

Table 21 Our drought plan actions categorised based on level definitions

Severity of the drought	Level	Demand side actions	Supply side actions
Drought Plan 	Level 1a	Liaise with the EA (ongoing throughout)	Liaise with the EA (ongoing throughout)
	Level 1b	Increased leakage control Communications campaign.	Review maintenance schedule Drought actions with minor environmental impacts (optimising sources, outage). See section 2.2. and Appendix B Optimise supply network e.g. rezones All supply side emergency sources (see section 3.2)
	Level 2	Temporary use bans	All possible actions including drought permits and orders (see section 3.3 and section 4) i.e. tankering, trades/transfers; effluent re-use; network changes; fast track of WRMP schemes
	Level 3	Non-essential use bans All possible actions to avoid emergency drought orders (see section 4) i.e. pressure management; tariff changes; removal of exemption under TUBs & NEUBs	Continuation of level 2 actions
Emergency Plan	Level 4	Emergency drought orders (such as standpipes)	

3.4.2 Drought trigger annotation

Annotated drought trigger graphs have been created to provide clarity regarding the drought actions (both supply and demand) we would take at different stages of a drought as reservoir storage changes. The reservoir drawdown curves are based on our historical records.

Figure 22 shows our Derwent Valley reservoirs with the observed 1995 - 1996 drawdown and the demand-side and supply-side actions that we would now take in that scenario. It is worth noting that each drought situation will be different and so we will use the annotated graph as a guide but will endeavour to implement the right actions at the right time. We would liaise with the Environment Agency in each situation.

The graph shows an example of the timing and actions we may need to take in a 2-year drought. In the first year we only enact level 1 restrictions and do not implement a temporary use ban as reservoir storage does not hit level 2 until November, so it would be unlikely to give any demand savings at this time of year. We show that we may apply for a winter drought permit at this site at this time. As the storage does not recover over the winter, leading into a second year of drought; we may also apply for a non-essential use ban as storage reaches level 3. As storage recovers but is still in level 1 in March year 2 we may choose to enact drought management actions earlier than we would in a first year drought e.g. a temporary use ban. As we are not able to fully recover reservoir storage over the summer due to lack of rainfall we may choose to apply to extend the drought permit currently in place to a 12-month term. Usually we would specify return to normal operation we reservoir storage reaches level 0, however in this case the drought permit is still in place so it is marked when this ends.

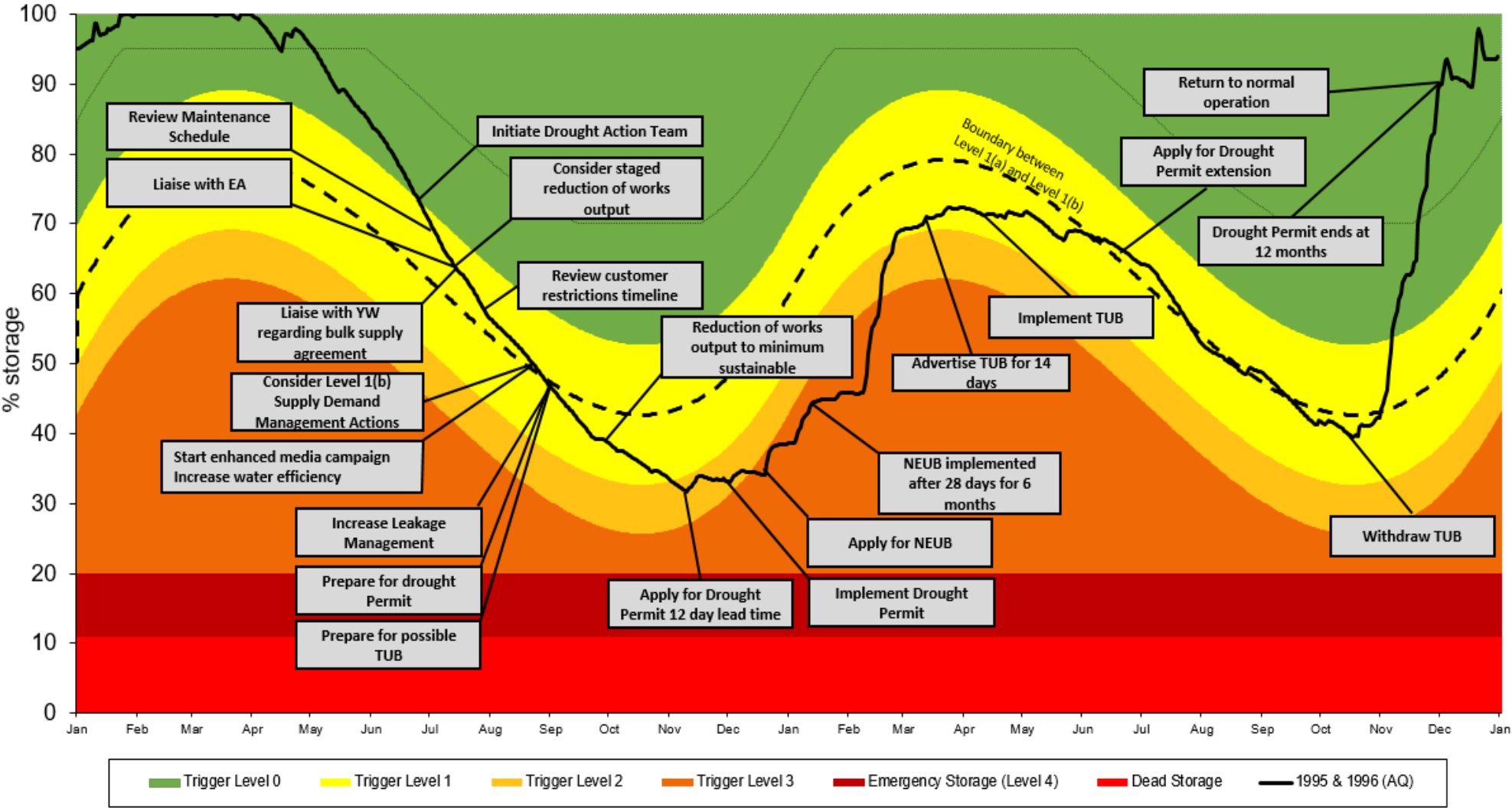


Figure 22 Derwent Valley reservoirs with the observed 1995 - 1996 drawdown and the annotated demand-side and supply-side actions

In appendix B we have included several other drought curves annotated with supply and demand actions in different droughts. The following reservoirs and the year(s) of the historic drawdown we have annotated are detailed below:

- Derwent Valley – 2018
- Elan Valley – 1975-76
- Tittesworth – 2010-11

As detailed in Section 3.3.5 our Drought Action Team (DAT) will manage a drought and the relevant actions to ensure we maintain supply to customers and these annotated graphs will form a key part of the decision-making process.

We have shown several drought scenarios in Figure 22 and appendix B where supply and demand actions are implemented at different times. When we advertise a Temporary Use Ban there is a 14-day lead-time from advertisement to implementation, and we state as a general rule the earliest we would implement a Temporary Use Ban would be 7 days into Level 2. In most circumstances this would give us sufficient time to implement the Temporary Use Ban, assess the benefit within Level 2, and then apply for a drought permit for an initial 6 months if necessary/applicable. However there are many factors that could change when we decide or need to utilise these options, for example:

- If we were to see rapid storage decline during a drought at one of our more sensitive reservoirs, we would consider that we may require one of our drought permits after a Temporary Use Ban, and we would assess projections of how quickly storage could reach Level 2 & 3. We may decide we need to implement a Temporary Use Ban as storage enters Level 2 to be able to determine in good time if it has aided storage recovery, which would impact whether we would need to apply for a drought permit and also inform the permit application.
- Once storage decreases to Level 1b we would be preparing for a Temporary Use Ban and a drought permit (if applicable for that area), and depending on the drought severity and rate of storage decline it may mean we advertise a Temporary Use Ban within Level 1b. In extreme circumstances - for example the severe 2nd year Drought as illustrated in figure 22 - we may choose to implement a Temporary Use Ban in Level 1b even if we don't reach Level 2 after 14 days.

3.5 Actions in a drought not impacting public water supply

Our commitment to being both environmentally and socially responsible means we will look to mitigate impacts of environmental droughts or support other sectors in a drought (droughts not affecting public water supply). It is worth noting that we do not believe there will be many instances where droughts are not affecting public water supply when they are affecting other sectors.

We would engage with the Environment Agency throughout all instances of drought to ensure that any proactive actions taken are the appropriate ones for the individual circumstance to support the environment or other sectors. We do have multiple abstraction licence conditions where we have an obligation to augment rivers with additional flow once certain low flow conditions are met. We would be in breach of these licence conditions if we were to compensate sooner than we are permitted to do so however operating these augmentation sources in line with their abstraction licence conditions will help to minimise the possible environmental impacts of drought.

Section 4 Extreme Drought Measures

In the instance of an extreme drought, we have identified actions that we could implement to delay the need for level 4 severe drought restrictions. These are actions that we could take in the event of an extreme drought, after using non-essential use bans (i.e. level 3 drought restrictions) and before needing to apply for and implement level 4 emergency restrictions. We have identified actions that are/will:

- Practical to implement during an extreme drought
- Likely to be temporary
- Technically feasible
- Generally not result in permanent increases to deployable output

The extreme drought actions that we would look to implement are both supply and demand actions. Table 22 below details the type action (supply or demand), the water resources zones in which it would apply, a description of the action and the likely trigger for needing it, an indication of the likely benefit or saving, identification of significant barriers, and an indication of the timescale for implementation.

In the event of implementing one, or more, of our extreme drought actions we would endeavour to make sure that our demand actions are implemented before our more extreme supply side actions. We have identified a priority order for the actions however we would consider all of them as necessary and implement the measure(s) we believe to be the right one(s) for the circumstance.

Table 22 Extreme drought actions

Type of action	Water Resource Zone	Summary of action	Trigger for action to be used	Likely benefit / saving	Barriers	Environmental impacts	Timescales	Priority order
Demand	All zones as necessary	Increased media & comms	After implementing TUBs & NEUBs and if the raw water position fails to improve	2% demand reduction assumed	No significant barriers however we would need to be conscious of the level and regularity of our comms with customers as over-information can sometimes be viewed negatively	Will only lead to a positive environmental outcome	Ready to implement	1
Demand	All zones as necessary	Pressure management i.e. further reduce pressure while still maintaining essential services, night time reductions.	Once we increase our media & comms we will consider this as it should form part of additional ongoing coms	We assume limited savings	Customer communication to ensure awareness of this	Neutral to positive - reduced leakage through pressure management	Ready to implement	2
Demand	All zones as necessary	Reward scheme for using less water, incentive scheme e.g. bill rebate, postcode scale targets and reward for all if target met, or charitable giving if target met	Once we increase our media & comms we will consider this as it should form part of additional ongoing coms	We assume limited savings	Metering	Neutral to positive - would hope for reduced demand therefore less raw water required to be put into supply	Ready to implement	3
Demand	All zones as necessary	Removal of exemptions under TUBs and NEUBs (as detailed in	After implementing TUBs & NEUBs and if the raw	We assume limited savings	Customer communication to ensure awareness of	Neutral to positive - reduced usage by removing exemptions	Ready to implement once approval	4

		Tables 10 and 11 of this drought plan)	water position fails to improve		this. Potential representations.		received and correct comms determined	
Supply	Strategic Grid	Use Beechtree Lane abstraction licence for drought purposes by obtaining a drought permit	After implementing TUBs & NEUBs and if the raw water position fails to improve	At least 10 MI/d	DWI standards. Drought permit granted by EA	Negligible - temporary use will not have WFD No Deterioration impacts	Ready to utilise as soon as drought permit granted	5
Supply	Dependent on the Drought Order location	Drought Orders	As we continue to move through the drought trigger zones after a TUB/NEUB is in place	Dependent on the Drought Order	Environmental impacts. WFD objectives	Dependant on the location but consideration over any impact would be needed. However, mitigation measures have been proposed in Section 6 of this drought plan which could be used to mitigate against any impact	Minimum achievable timescale of 10 days (timescales rely on Environment Agency approval)	6
Supply	Dependent on the trade/transfer location	Trades/transfers	After implementing TUBs & NEUBs and if the raw water position fails to improve	Dependent on the trade/transfer	Donor areas also experiencing extreme drought conditions therefore limiting their ability to transfer raw (or treated) water	These would be seen in the donor location, however we believe they would be negligible if the donor has the capacity to trade surplus water	Ready to implement as soon as agreement between Severn Trent and donor reached	7
Supply	All zones as necessary	Tankering	After implementing TUBs & NEUBs and if the raw water position fails to improve		Logistics. Available water elsewhere within our supply area	Negligible – we would use water abstracted within our abstraction licence limits		8

Supply	Dependent on the location of the re-use scheme	Effluent re-use i.e. redirecting discharge (relocate to other watercourses).	After implementing TUBs & NEUBs and if the raw water position fails to improve	Dependent on the specific sewage treatment works discharge	Customer perception. Infrastructure constraints	Direct re-use would reduce the quantity of water discharged to watercourses thereby potentially reducing flow to a level which can cause environmental deterioration	Months	9
Supply	All zones as necessary	Network changes i.e. temporary pipelines, new supplies, speed up construction process e.g. overland pipes.	After implementing TUBs & NEUBs and if the raw water position fails to improve	Dependent on the changes implemented	Planning consents. Distances. Network constraints	Would need careful consideration if temporary pipelines are constructed for example. Dialogue with the relevant environmental bodies would be required	Month to year	10
Supply	Dependent on the WRMP scheme location	Fast track WRMP supply schemes	After implementing TUBs & NEUBs and if the raw water position fails to improve	Dependent on the WRMP scheme	Feasibility. Cost. Understand the environmental impacts fully	Potentially unknown if full assessment not undertaken. Would need careful consideration and dialogue between Severn Trent and the relevant environmental bodies	Months to years	11

Section 5 Customer communications

5.1 Communications plan

It is vital that we have a clear communications route to our customers and other stakeholders so that we communicate the correct messages at the correct time. This section of our plan sets out the communications plan that we would follow at different stages before, during and after a drought.

Effective communications can help to reduce demand in a drought, for example, by raising customer awareness of the limited availability of water resources. Conversely, poorly prepared messages can have a detrimental effect on the public response to appeals for restraint.

We use the DAT to prevent this from happening. For instance, the communications team attend DAT meetings and work with the DAT to provide clear briefings for internal communication, ensuring our employees communicate appropriate messages and advice to customers. External methods of communication available to us include social media, leafleting, mailed letters, radio and/or television, local and national press and by updating our website.

We also use DAT to work closely with the Environment Agency in all instances of drought. We commit that we will agree the frequency and structure of liaison with the Environment Agency at the beginning of emerging drought or hot weather events to maintain regular and informed communications throughout. In previous hot weather events we have held fortnightly liaison meetings in trigger level 1(a) increased to weekly if required from level 1(b). We also will utilise joint communications with the Environment Agency, where necessary, to communicate with customers during all stages of a drought if required. This could be in the form of joint press briefings for example, but the format of any joint communications will be agreed during each event. Furthermore we commit to working the Environment Agency and South Staffordshire Water via the River Severn Drought Management Group during a drought. We acknowledge that the Canal and River Trust are actively involved in this group too.

As detailed in Section 1.7 we have worked closely with other water companies who are also members of Water Resources West to agree to align our drought communications where appropriate.

5.1.1 Stakeholders

Table 23 provides a list of stakeholders that we expect to communicate with during a drought. In this list, we have included all of the groups mentioned in Appendix I of the EA guidelines regardless of whether these are statutory or non-statutory consultees. Please refer to Table 24 for how we escalate our messages during a drought. Although we expect to contact most of the non-statutory groups in a drought there may be circumstances (for example geographical reasons) when we do not need to specifically contact every one of these groups. This list is not exhaustive and we may contact other bodies not included in this table.

We endeavour to ensure that the stakeholder information we have is up to date at the point that it is needed in a drought. We updated our stakeholder information following our draft drought plan pre-consultation email sent in July 2020. In each instance of consultation or in the event of a drought we will have the most up to date record of stakeholder information (based on previous correspondence) and we will investigate and confirm correct information in any instance where communication is undeliverable.

Table 23 Stakeholders that we expect to contact in a drought

Group	Stakeholder
Domestic and commercial customers	Private customers
	Non household retailers
	Consumer Council for Water
	Citizens Advice Bureau
Regulators	Drinking Water Inspectorate (DWI)
	Ofwat
	Defra
	Ministry for Housing, Communities and Local Government (MHCLG)
	Environment Agency
	Natural England
	Natural Resources Wales/ Cyfoeth Naturiol Cymru
Environmental and other relevant interest organisations and groups	Local wildlife groups and campaign groups
	Waterwise
	Local fisheries bodies and groups
	Angling Trust
	Campaign to Protect Rural England
	RSPB
	WWF
Local authorities and political representatives	Councils
	MPs
Representative bodies	Primarily Water UK but also others such as: Confederation of British Industry, NFU, Chambers of Trade and Commerce, Countryside Landowners and Business Association, Horticultural Trade Association
Energy companies	For example: RWE Generation UK, EON, SSE, Energy UK
Community based institutions and organisations	Parish Councils
	Town Councils
Water companies	For example, neighbouring water companies like Yorkshire Water, Anglian Water, South Staffordshire Water, DCWW, United Utilities, Thames Water
Public services	Fire service
	Health authorities
	Police services
	Local Resilience Forums (LRFs)
Press and media	Newspapers
	Television
	Radio
Sports and interest groups	Angling clubs
	Canoe / boating clubs
Waterways and navigations	Canal and River Trust
	Canal authorities
Other relevant water undertakers	New appointees and variations (NAVs)

In addition to the public consultation, we invited the following statutory stakeholders to comment on our draft drought plan during the 8-week consultation phase from 1st June 2021:

- Environment Agency
- Natural Resources Wales/ Cyfoeth Naturiol Cymru
- Ofwat
- Secretary of State/Welsh Ministers

- Any licensed or appointed water supplier which supplies water in the Severn Trent region via our supply system.

Once Strategic DAT has recommended that we impose restrictions on our customers' water use we will send regular briefing statements to Defra, CCWater and Ofwat. If drinking water quality could be affected, we will contact the DWI. All such communications will be approved by Strategic DAT.

We will report on the situation regularly to Water UK particularly if other UK water utilities are suffering similar drought problems. It is important that Water UK co-ordinate any reporting of the national situation and present it in a consistent manner in the national news media. Regular conference calls will ensure this is handled consistently.

Similarly, we will involve other external bodies if supplies are under extreme risk. For example, if tankering to outlying areas becomes necessary, we may ask the police and county highways departments for advice. We will make contact with the Local Resilience Forums (LRFs) to ensure full public awareness of the situation.

5.1.2 Escalation of messages

Communications and engagement will:

- Show customers that their contribution to water efficiency is worthwhile
- Explain to customers in simple terms how they can save water
- Demonstrate to customers that we are doing our bit to manage water resources wisely
- Be increased in frequency through the different stages dependent on the drought or hot weather situation

Throughout an emerging drought we will share with our regulators what communication messages from Table 24 have been conducted or utilised, and whether they have been enhanced in any areas. This also includes any reactive messaging, e.g. text messaging in areas of high demand. We would also share the reach and impact once the data is available.

Table 24 Escalation of messages

Stage of communication	Trigger
Stage 1- first fall in resources <ul style="list-style-type: none"> • Ongoing water efficiency communications continue as per normal water efficiency campaign plan Includes standard marketing of: • Save-a-flushes • Water butts and other products (e.g. shower heads, timers) • Guide to saving water (print and web) • Education activity • Opportunistic media and PR 	Reservoir storage / other indicators moving towards Level 1(a)
Stage 2 – projections show likelihood of continued fall in resources <ul style="list-style-type: none"> • Specific and targeted focus on promoting water efficiency through regional media, exploiting existing relationships • Social media campaigns, e.g. ask customers for their best water saving tips • Extra emphasis on leakage. We provided some information on the enhanced leakage management in Section 3.1. but we will start this extra emphasis on leakage in stage 2 and will continue with this work in stage 3 and 4. 	DAT convened/ indicators in Level 1(a)

- We will showcase our work in finding and fixing leaks, promotion of leakline, reporting leaks online and report a leak app. We believe it is necessary to demonstrate to our customers we are doing all we can on leakage during periods of drought to encourage them to reduce their usage
- Show good examples of our customers taking action to reduce consumption
- Working with the gardening industry to promote saving water in the garden
- Frost awareness PR
- Work with WaterWise, Water UK and other water companies to ensure joined up and consistent messaging
- Working closely with non-household retailers to understand their predicted water use profiles over the coming weeks

Stage 3 – one to two weeks leading to proposed restrictions on use <ul style="list-style-type: none"> • Specific focus in the regional media on water usage and efficiency • Possible radio campaign showing what we do and what customers can do • This would include paid for elements of advertising, including features and promotions • Possible increased activities such as water efficiency product giveaways via radio and TV • Higher profile of water saving on the website, including front page banner • Increased use of social media including Facebook and Twitter campaigns • Press features on water resources activity, summarising how we plan for dry spells and how customers can help • Water efficiency adverts in newspapers • Formal media appeals to conserve water • Possible sponsorship of weather section in print, tv and radio media • Participate in any joint national media campaigns on water efficiency • One to one media briefings • Setting out what actions are likely to happen over the coming days/weeks so that nothing comes as a surprise to people • Close liaison with stakeholders and regulators in Table 23 to maintain “no surprises” • Close working with other water companies – consider joint statements and adverts • Asking large commercial customers if there is scope for them to reduce demand 	DAT decision/ indicators in Level 1(b) or Level 2
Stage 4 – restrictions imminent or in place <ul style="list-style-type: none"> • We plan to give a notice period (14 days) to customers before we put any restrictions in place • We will use at least two local newspapers as well as social media and our website to advertise restrictions. • We will give details of how customers can make representations • Daily updates on water resources levels to manage high volumes of reactive interest • Intense local broadcast activity – All traditional media (TV / radio / newspapers) as well as social media. This activity will reach far more people than those who see the adverts in the local newspapers and on our website 	DAT decision/ indicators in Level 2 or Level 3

- Advertising in the media in areas where there is a known supply/demand imbalance
- Close contact with stakeholders detailed in Table 23 on a regular basis
- Withdrawal of softer messaging to avoid any confusion as hard messaging introduced.

Stage 5 – removal of restrictions

- Strong message in the media - thank you to our customers for their help at this time
- Close liaison with stakeholders to ensure messaging is consistent

 DAT decision/ indicators in Level 0 (above lift restrictions line)

Our multiple channels of communication mean that we are confident in our ability to reach customers who are vulnerable or in potentially vulnerable circumstances with effective water efficiency messaging during all stages of a drought. We have highlighted in Section 3.1. that we are active in encouraging eligible customers to sign up to our PSR, but we believe our detailed communications plan will be effective in promoting drought messaging to all our customers.

When we communicate with customers during a drought or a period of extremely hot weather we are able to measure the number of people accessing information on our website, the number of tweets that people click to request further information and the number of water efficiency packs that we distribute. We also know how many people different newspapers or radio programmes reach and we record what communications activities we do and when. In addition to this we measure how demand changes across the company and over time.

However, there is not always an obvious correlation between the extent and type of communications work and the demand for water. This makes monitoring the effectiveness of our communications a challenging exercise. For example, in response to periods of hot weather we increase the amount of proactive media work that we did. In addition, we also devote additional resources to our leakage reduction work. We describe this in more detail in section 3.1.2.

Waterwise published a report in July 2013 on the 2010-12 drought (see appendix for full reference) and one conclusion of this was that “The impacts on the public of communications and promotion are difficult to measure but by most measures, there seems to have been a positive reaction both in terms of action and understanding”. This supports our point that it is not easy to measure the effectiveness of this type of communications.

5.1.3 Private supplies

We have prepared this drought plan to show how we intend to provide our customers with water during drought. However, we are aware that some people in our region depend on ‘private supplies’. For example, householders or businesses may have their own borehole. About 1% of the population of England and Wales use a private water supply.

If a drought adversely affects these people then we encourage them to contact their local authority first and then Severn Trent for advice. If this scenario arises we will consider how we can help without putting our own customers’ supplies at risk. A person’s Local Authority has the relevant duties and powers under the relevant legislation. Further information on this can be found in the following documents:

1. Legislation of private water supplies and drought, and Managing Insufficiency of Private Water Supplies. Drinking Water Inspectorate (DWI). <https://www.dwi.gov.uk/private-water-supplies/regulations-guidance/guidance-documents/>

2. Water Industry Act 1991, Chapter III, Section 80-84, UK Government.
<https://www.legislation.gov.uk/ukpga/1991/56/contents>

The Local Authority responsible will consider whether the circumstances pose a danger to life or human health. In such a case we may be required to supply water by means other than in pipes, if practicable, and at reasonable cost for a specified period.

The needs of vulnerable people shall be taken into account. Water needs for vulnerable people should be agreed with the Local Authority, accounting for the water companies capabilities at the time, and provided accordingly.

It is expected that large domestic private water supplies (more than 10,000 litres a day) and commercial private water supplies (including farms) make their own arrangements for alternative supplies.

In the event of widespread requests for support, for say animal welfare, from individuals or from Local Authorities, we would expect directions from the relevant industry regulators or government departments. We may elect to support a request for alternative supplies as long as there is no adverse effect on its ability to provide mains or alternative supplies to our customers.

5.1.4 Support for Non-Household customers

In April 2017 the non-household water market was opened to competition, this means that business customers may now choose their water retailer. Severn Trent formed a Joint Venture with United Utilities called Water Plus. On the 1st of April 2018 Severn Trent transferred their business customers over to Water Plus. This means that business customers must now contact their retailer for any billing or metering issues, however they may still contact Severn Trent directly for network related issues.

In periods leading up to and during drought we extensively communicate with our household customers as detailed in this section. Due to the opening of the non-household retail market it is more difficult, legally, for us to be able to communicate in the same way with non-household customers and retailers. We do recognise the need for non-household customers to also reduce their water usage during a drought, in line with what we are asking our household customers, and have a number of mechanisms by which we can do this.

We have expanded the efforts on our website to offer more information on water saving guides and videos. As part of weather preparedness (i.e. imminent hot weather events) we have household comms that we alter to make more relevant to our non-household customers that retailers can publish on their websites. Non-household customers have been involved in strategy groups to work proactively in terms of what the general comms should be and contain. Furthermore the Retail Wholesale working Groups (RWGs) are working with retailers to obtain emergency contact details for non-household customers to be able to share water efficiency messaging, however retailers are not obliged to share these details with us. We are constrained by what we can do with regards to non-household/retailers comms due to competition law however we are proactive in areas where we are legally allowed to be.

In an incident which affects water supply, not limited to drought circumstances, our first priority is to look after our most vulnerable customers and priority sites (e.g. hospitals), and to provide alternative supply to these customers. Support for non-household customers through alternative supplies (tankers, bowsers and bottled water) depends on the nature of the incident and the resource capacity available (both human and physical).

Where we do have capacity, any support we provide will be distributed in a fair and equitable way. We have developed a hierarchy of types of business customers (based on their nature) to prioritise the order in which we would offer support where available. We are currently reviewing this with respect to businesses which care for livestock (farms, vets, rescue centres etc.), however there is no guarantee that we will be able to provide alternative supplies during an incident. As a wholesaler we have no legal obligation to provide a certain amount of water to livestock in a certain amount of time, but we will provide support wherever possible. For example, we have invested in equipment, namely upwards of 30 specialised bowsers specifically for the use of livestock on farms and use these to deploy on farms that are under particularly severe water supply problems.

Businesses must therefore look at what contingency they can put in place, many already have storage tanks and we know there are some who have private contracts for alternative supplies such as tankering etc. Some retailers are beginning to offer contingency supply support, however this is not a requirement on retailers and is therefore a business decision for them and any support is likely to come at a cost to the customer.

We support Defra's advice on their website that any person that is responsible for any animal welfare must have their own 24 hour contingency plan. Our rural business customers are able to contact us and we will offer advice when possible. Nevertheless, we have been working with the National Farmers Union (NFU) to advise their members on water provision and after major periods of dry weather we have sent out member of the fittings teams to advise those struggling farms about their private networks and water provisions for their livestock.

5.1.5 Targeted agile communications

With the onset of drought, and once we move into our silver operational DAT mode (details of this are found in section 3.3.5.2), our communications team are fully involved to ensure that we can communicate in an appropriate manner and at an appropriate time over the course of each individual drought. This includes targeted agile communications taking into consideration the different circumstances that arise in each drought, and during hot weather high demand.

As a drought progresses, we can utilise data and evidence to target our communications to areas and customers with particularly high demands. We can use the loggers on our network to determine areas of high consumption and we can also use these loggers to determine areas of low water pressure which can also be a sign of high water usage.

We can use this data to send direct text messages and/or emails to customers in certain geographical locations which ask them to try to reduce their water usage due to high demand in their area. This form of agile communications is generally beneficial for a short-term event where customers are at imminent risk of a supply interruption rather than for long term drought awareness. We can use targeted radio and television adverts, as well as social media and direct emails for longer term messaging about water usage in a drought.

We plan a range of different communication techniques in our general summer strategy to tailor water efficiency communications towards different demographics and groups of customers. The demographics of an area of focus – whether that be due to higher water use, engagement or sensitive areas – may influence the choice of media channels we will choose for communications. We use campaigns that are across the entire Severn Trent region, and tactical regional campaigns for proactive and reactive (if required) messaging over the summer. For example, in 2021 we ran our Water Saving Hero's campaign across the whole region in June and July, and we used social media influencers to promote water saving messaging which gave us reach in a new channel. We also ran a targeted environmental campaign in the Staffordshire area focused on reaching a younger age group (18-34) via social media and Spotify as they resonate more with environmental and sustainability messaging and are better reached through the chosen media channels. Table 24 also shows the escalation of messages we use through emerging drought or hot weather events, and some of these were specifically enhanced in the

Staffordshire area last year due to storage levels at our Tittesworth reservoir, for example in addition to the campaign we also enhanced our leakage messaging through social media and press releases in the area.

The impact of agile communications on demand is difficult to quantify as there can be multiple factors for a change in customer water use. As detailed in Section 5.1.2 “The impacts on the public of communications and promotion are difficult to measure but by most measures, there seems to have been a positive reaction both in terms of action and understanding”. However, we did utilise direct text messaging during May/June 2020 when a period of hot weather and high demand coincided with the first national Covid-19 lockdown. In the areas where we had low pressure and high demand, we trialled sending text messages to all customers within specific geographical areas where we had mobile telephone contact numbers. In the June hot weather peak we sent out 250,000 text messages. The overall reduction in demand was a success. We saw demand in these geographic locations after these targeted text messages decrease by between 2 – 4%.

The positive outcome of this use of agile communications is an approach that will be carried forward for future events, but it is worth highlighting that other factors may also be involved with this demand reduction such as antecedent weather conditions (i.e. a drop in temperature and increased rainfall). There is more to do internally to ensure that any savings from targeted text messages are monitored in real-time. For example it might indicate if we should bring level 2 restrictions e.g. TUBS on earlier than planned, however it is worth noting that the targeted text messaging is likely to be most beneficial during a hot weather high demand period as opposed to a sustained drought event. We are also looking at more sustained coms with our metered customers about saving money on their bills following a 12 month marketing trial with metered customers in selected District Metered Areas (DMAs) to provide them with advice and devices to save water in order to save money on their bills.

Section 5.2.3 also details additional information on the communications reach during the hot weather in the first Covid-19 lockdown in May/June 2020 and brings to life some of the other targeted agile communications that we used at that time, and will continue to utilise in future scenarios.

5.2 Lessons learned from previous droughts and events

5.2.1 1995

We have not had to restrict our customers’ use of water since the 1995-96 drought. Therefore when we look to learn from our experiences of previous droughts, this is the drought we often refer back to. For example, when we analyse reservoir storage information we frequently show the actual drawdown records from 1995 and 1996 as these are useful comparators. As a result of this two year drought we restricted the use of all of our customers in 1995 and the use of approximately half of them in 1996.

As well as implementing this form of demand management we also sought to increase the supplies available to us. Although there have been several changes since 1996, for example legislation has changed, we think that we can still learn lessons from this unusually dry period when we have level 2 & 3 restrictions. In the 1995-96 drought we applied for a Drought Order relating to the refill of the Derwent Valley and Carsington reservoirs. In 1996 we applied for a drought permit for the Derwent catchment but we withdrew our application due to changed weather conditions. In the Churnet Valley we were granted a drought order from December 1995 to June 1996 to aid the winter refill of Tittesworth reservoir. We used Abbey Green borehole to compensate the River Churnet in a way similar to how we may do so if we needed a drought permit or order here in the future. However, we are aware that different legal and regulatory requirements exist now and we address these in the Churnet environmental report.

Since the 1995-96 drought we undertook a comprehensive review of the areas where providing a reliable supply was most difficult. Since then we have invested significantly to improve our infrastructure. As described in section 3.1 our investment and the commitment of our staff have reduced leakage to its lowest ever. Other examples of where we have invested in our network since 1996 include enhancements to the network by duplication or upsizing of mains and provision of new local booster pumps. We assigned the investment to where it would have the most impact in making our sources more robust in terms of treatment and deployability.

We continue to invest in the construction of permanent infrastructure. We target this investment in proportion to the risk of loss of supply during extreme events such as droughts. As we prepared our PR19 business plan submission we assessed what we need to invest to provide the optimal level of resilience for our customers. When we talk about resilience in this context we mean making our network better able to cope with the challenges posed by extreme events that are beyond the control of Severn Trent.

To help us manage our drought communications in the most effective way we collected local demand data at sub-daily time intervals during previous drought years. We have collected valuable information, some examples of which are shown below:

- In summer 1995, peak demands in local networks tended to occur at 9 o'clock in the evening, which we assume was associated with use of sprinklers and hose pipes for garden watering
- For small areas of mainly detached houses the ratio of peak flow to mean daily flow was over 7 to 1
- For small areas of terraced and semi-detached properties the ratio was 3.6 to 1
- For a mixed suburban area of properties, the ratio was 2.6 to 1
- Nationally, customer awareness campaigns during 2006 demonstrated the benefits of media awareness campaigns in reducing total demand, despite no restrictions on use in our region. One of the most effective ways of reducing peak demands is to reduce dependence upon the public water supply by gardeners. This can be achieved through encouraging alternative practices.

As described above we have learned lessons from managing previous droughts and used this knowledge to prepare this plan. We learned some specific and some general lessons from implementing various drought management actions since 2014. Table 25 summarises the lessons and provides references to the relevant part of this drought plan.

Table 25 Lessons learned since previous drought plan

Lessons learned since publication of our 2014-19 drought plan	Section of Drought Plan
We need updated environmental reports to accompany any drought permit / order application and we realise that the timescales for these are longer than we had estimated in 2014	Section 6
We have more 'drought / emergency / extreme sources and options' available now than we included in our 2014-19 drought plan	Sections 3 and 4
We have revised the drought actions from our 2014-19 drought plan and removed ones we know are no longer available to us	Reflected in flow charts and tables (section 2 and appendix B)
We have improved understanding of the EA's requirements for drought permit / order applications especially in relation to the associated environmental reports / monitoring requirements. For example, we know more about the water quality issues and what needs to be in place before we can use Abbey Green borehole to support flow in the River Churnet	Section 3 and 6

We remain committed to learn, review and improve our processes and will do so if / when we experience droughts in the future. For example, we note that in the 2015 EA 'National drought framework' the EA states that it will use the www.gov.uk website to publish drought maps. As described in the communication plan section we will work closely on communications with the EA and, where appropriate, we will direct queries to this source of information. Figure 23 illustrates how these might look:

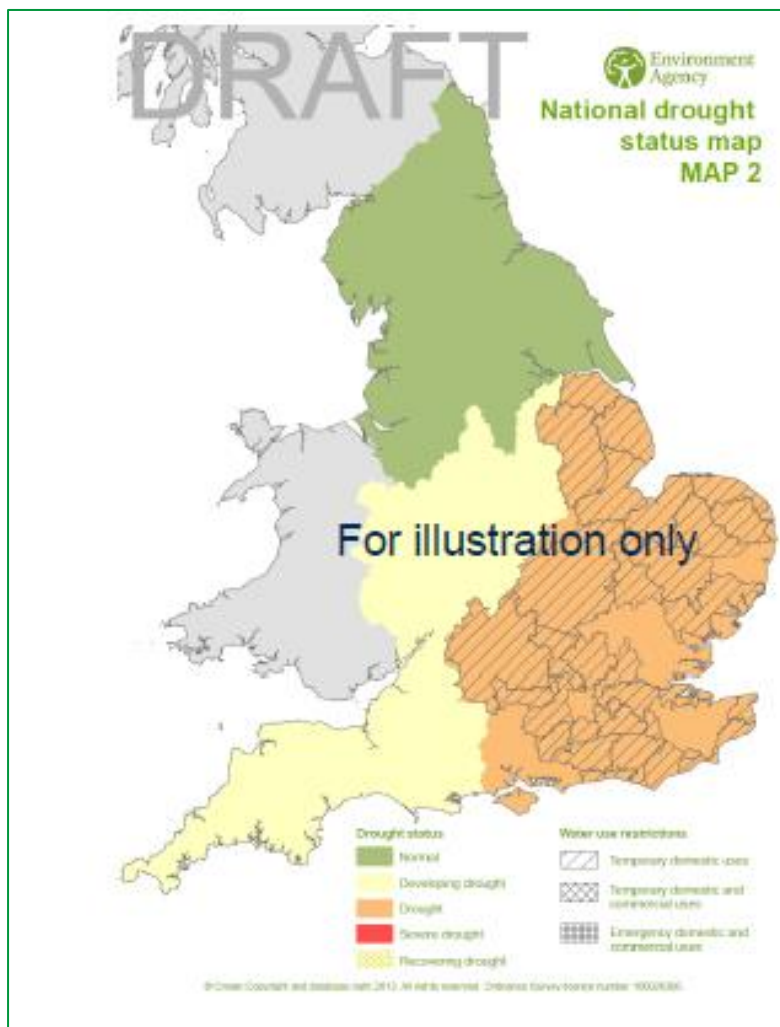


Figure 23 EA drought maps

5.2.2 2018

During the publication of our draft Drought Plan (2019-2024) we experienced a 'Hot/Dry weather event' in summer 2018 with some impacts lasting until spring 2019 due to an unusually dry Autumn/winter. We have included our learnings from this event, to ensure this latest Drought Plan is the most up-to-date for our customers.

Conditions seen throughout 2018-2019:

The summer of 2018 saw below average rainfall across the United Kingdom. The Severn Trent region received below average rainfall in eight out of nine months from May to January 2019, with exceptionally low rainfall occurring in June (22% of long term average across the entire region). Exceptionally low rainfall continued into the winter, with January 2019 receiving just 46% of long term average rain. During the summer, customer

demand increased due to the combination of very hot and very dry weather over a prolonged period. The total company demand in June/July 2018 was the highest recorded since the hot summer of 2006.

Our reservoirs were close to 100% full in April 2018, however the prolonged low rainfall coupled with high demand affected our reservoir storage, notably across our supplies in the East Midlands.

Our experience of managing our water supply system during the hot and dry weather conditions uncovered additional drought management options that were not previously included in the 2014-2019 plan, or our draft 2019-2024 plan. We held internal post-event reviews and a further session with the EA in spring 2019, as per our 'post-drought' process described in section 7. The following section will describe the actions undertaken in 2018 and Table 26 highlights the lessons learnt.

Table 26 Lessons learned since publication of our 2019-24 draft drought plan

Lessons learned since publication of our 2019-24 drought plan	Section of Drought Plan
A new drought permit site has been identified – Dove Reservoirs. During 2018/19 this was implemented to increase our annual aggregate abstraction licence so we could maintain security of supply. This location is now included and an EAR is being finalised.	Sections 3.3.4.8 and 6.1.2
Abstraction licence changes can help maximise water into supply by rebalancing across sources	Further explained below
The 2016 Derwent Valley drought trigger curves in the original draft 2019-24 drought plan were too precautionary	Further explained below
There are new drought management actions that were used throughout 2018 for our assets that have now been included. This included enhanced maintenance of structures, early clearance of hindrances to abstraction, and works capacity variation	Section 3
We will improve drought permit readiness e.g. updating our EARs so they are 'on the shelf' versions, learning from previous application, update stakeholders, include enhanced monitoring at Derwent Valley	Sections 3.3 and 6

5.2.2.1 Licence changes

As part of our Drought Management Actions, we have the option of transferring abstraction licences, with EA consent, between our assets to support continued supply to our customers.

For example, in 2018 Birmingham experienced particularly high levels of demand, and due to flow levels all abstractors along the River Severn were restricted by the Environment Agency through the River Severn Regulations. A decision from our Drought Action Team initiated liaison with the Environment Agency to enable a short-term partial licence transfer from one of our WTWs to another further downstream on the River Severn.

Another licence change was completed for our Derwent Valley reservoirs in Derbyshire, as explained in section 3.3.4.2, we export raw water from these reservoirs to Yorkshire Water. During the summer and autumn Derwent Valley storage levels impacted our ability to meet the required export, therefore we needed to use additional temporary pumps in addition to our permanent assets already in place. The licence change was to allow the additional abstraction location for the temporary pumps. This ensured we kept supply to Yorkshire Water who were also impacted by the hot/dry weather event.

5.2.2.2 Derwent Valley

Our Derwent Valley Reservoir drought curves have been updated for our draft WRMP24 baseline water resources modelling.

During the 2018 drought, because our 2018 drought plan was still only in its draft form, we continued to use the drought curves for the Derwent valley reservoirs from our 2014 drought plan. It can be seen from Figure 24 that had we used the updated drought level curves, both a Temporary use ban and a summer drought permit, may have been triggered.

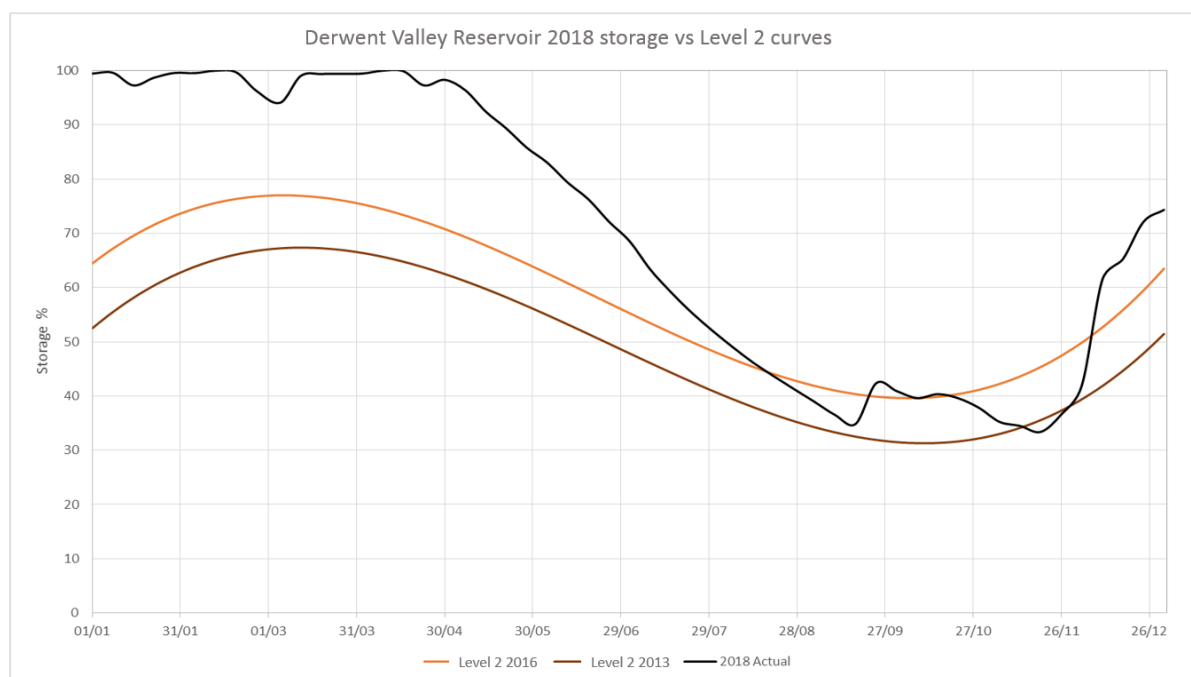


Figure 24 Graph showing Level 2 'TUB' curves for previous drought plan (2014) vs current draft drought plan (2016). 2018 actual storage is included

Following the experience gained during the 2018 drought, we decided that for the Derwent valley reservoirs the 2014 drought plan level curves were more suitable triggers for TUBS and NEUBs, and that the 2016 levels may be too precautionary. As the 2016 levels were used for WRMP19, we also tested the effects of using the 2014 drought level curves in our baseline WRMP19 model. This showed that the change between these levels does not affect our DO for the Strategic Grid water resources zone or the level of service within the zone, and therefore this change does not represent a material change to the WRMP.

For this drought plan and our 2022 draft WRMP, we have updated the flow series used in creating our drought level curves, this includes the 2018 drought hydrological data. We have used this most up to date information available to review and updated the drought level curves on all of our reservoirs, including Derwent. Again, this update does not affect our DO for the Strategic Grid WRZ or the level of service within the zone. Our updated level curves are now actually similar to the original 2014 ones.

5.2.3 2020

During May/June 2020, the United Kingdom was in a national lockdown due to the Covid-19 pandemic. This in itself increased demand but was further exacerbated by the hot weather experienced at the time. This had an impact on some customers' supply. We have undertaken a review of the causes and impact of this event(s) and have externally reported on the recommendations from this review. These recommendations explain how the supply challenges we faced have led us to reconsider a number of aspects of our operations to avoid repetition, particularly with regards to vulnerable customers and during a drought.

The recommendations from the review (Table 27) are categorised into three categories:

- 1) Continue current approach
- 2) Tweak current approach
- 3) New approach

Table 27 Recommendations from Covid-19 lockdown demand review

Continue current approach	Tweak current approach	New approach
<ol style="list-style-type: none"> 1) Continue risk-based investments – the high-risk areas in 2018 were not at risk in 2020. 2) Undertake annual executive ‘deep dive’ of summer preparations in forecasting, supply, demand, customer and incident management. 3) Maintain approach of running incidents from the Head Office. Seeking to operate remotely (albeit in exceptional circumstances) added extra complexity. 4) Plan maintenance when higher probability demand will be low with regular reviews and options to re-instate production. 5) Maintain new approach of having customer team ‘manage’ pockets of customer contact, comparing notes with Network Control who might miss small pockets caused by airlocks and the like 6) Continue to broaden customer contact options (social media, self-help, bots, WhatsApp etc.) to enable call centre to focus on vulnerable customers at peak times 7) Continue to strengthen PSR 8) Continue ‘peace time’ relationship building with LRFs and other key stakeholders as a priority – it pays exceptional dividends in incidents 	<ol style="list-style-type: none"> 1) Keep incident triggers under review in light of Covid-19 (or other exceptional circumstances). Peak demand is not following normal patterns. 2) Allocate and provide regular volunteer incident roles in advance – support volunteers need clarity and to be well-practiced. 3) Introduce spot checks for third party suppliers (e.g. bottled water) to ensure they can deliver against the SLAs. 4) Activate software to prevent contacts being delivered to customers outside the 0900 to 2100 window (except in exceptional circumstances). 5) Pro-actively brief MPs and councillors in high risk areas, asking for their help to spread key messages 	<ol style="list-style-type: none"> 1) Make ST demand forecasting ‘open source’ and readily available on our website, inviting scrutiny and challenges (and also encouraging water efficiency). 2) Undertake a review of demand management options – linked to WRMP24 demand actions

During this period of increased demand, we increased our proactive communication with household customers. We trialled emails, social media, digital adverts, PR, and internal communications to highlight water efficiency and leakage. Over the course of 2020 we had more than three times the number of unique visitors to our 'free ways to save' website than in 2019. To give a specific example, on the 13th May 2020, we emailed 200,000 customers on a water meter aged 25-36. Over 97,000 customers opened the email (49% open rate) and over 24,000 clicked through to our website driving an increase in water saving device orders from 54 per day to over 5,000 in 24 hours. Up to May 2020 we had fulfilled 23,269 orders for free water saving products in the 5 months of 2020, compared to 29,470 orders for the whole of 2019. In May 2020 alone the number of unique visits to our 'save water' website pages increased by more than 1000% compared to May 2019. In terms of social media activity, the number of engagements across our platforms increased by 220%. We also featured in 25 articles: two television, 20 radio, and three paper/web reaching 1,983,617 people. We also used a combination of organic and paid social media posts to reach 130.4 million people in 2020 and have prompted over 102,500 engagements. We also ran text message alert trails, the details of this can be found in section 5.1.5. These types of targeted and increased communications campaigns are an approach that we will maintain into the future during instances of hot weather, high demand and drought. We do acknowledge that using information such as social media reach shows the impact of our comms campaigns but not necessarily a direct link to demand.

5.2.4 Short term incidents

There may be instances where parts of the Severn Trent region experience short-term heatwaves and higher demand, or outages at some of our assets. These instances can happen outside of a drought year, or coincide/be a result of a recognised drought. In these cases we have a short term incident management process that is led by our tactical network control team. We have internal scenario documents for each of our control groups, which also include the incident response options that will be needed for each scenario, e.g. rezoning part of our network, tankering etc. If these scenarios coincide in a drought period some of our drought management actions may also be considered. Examples and more information about what do in these situations are shown in sections 5.2.2 & 5.2.3 and in our agile communications section 5.1.5.

Section 6 Environmental Assessment

As mentioned in sections 3.3.1 and 3.3.3 there are some specific locations where we may apply for level 3 restrictions - either a drought permit or a drought order. Section 6.1 provides the details of the environment assessments that we would use in support of these applications. We also consider the environmental impacts of all the other drought measures included in this plan within the associated Strategic Environmental Assessment (SEA). This is an important step to ensure we comply with the Drought Plan Directions.

The Strategic Environmental Assessment Directive (2001/42/EC) requires a formal environmental assessment of certain categories of plans and programmes which are likely to have significant effects on the environment. Government has transposed the Directive into appropriate Regulations to apply to England and Wales. We are the responsible authority and have to judge whether our drought plans fall within the scope of the SEA Directive. We carried out an SEA for our 2014 Drought Plan and we have done so for this plan too. This SEA will report on the likely significant environmental effects of implementing this plan. We have produced this SEA and have published it alongside this drought plan.

We have also undertaken a Habitat Regulations Assessment (HRA) for this drought plan. This assesses the likely effects of the drought plan on European sites, alone or in combination with other plans. This HRA considers whether actions in a drought plan would adversely affect the integrity of any European sites. The consultation on the SEA and HRA is separate to the draft drought plan consultation although there is some cross over, for example, in terms of the sites affected. The HRA can be requested from us directly.

6.1 Environmental assessment reports (EARs)

The EA's 2020 Environmental assessment for water company drought planning supplementary guidance states that we must demonstrate that we have met our responsibility to monitor, assess and where possible mitigate for the environmental impact of all our supply side drought management actions.

One of our responses to this is to produce EARs to assess the possible environmental impacts of the potential drought permit / order sites we listed in sections 3.3.1 and 3.3.3. Figure 25 is taken from the EA's 2020 environmental assessment supplementary guidance and gives an overview of the environmental assessment process.

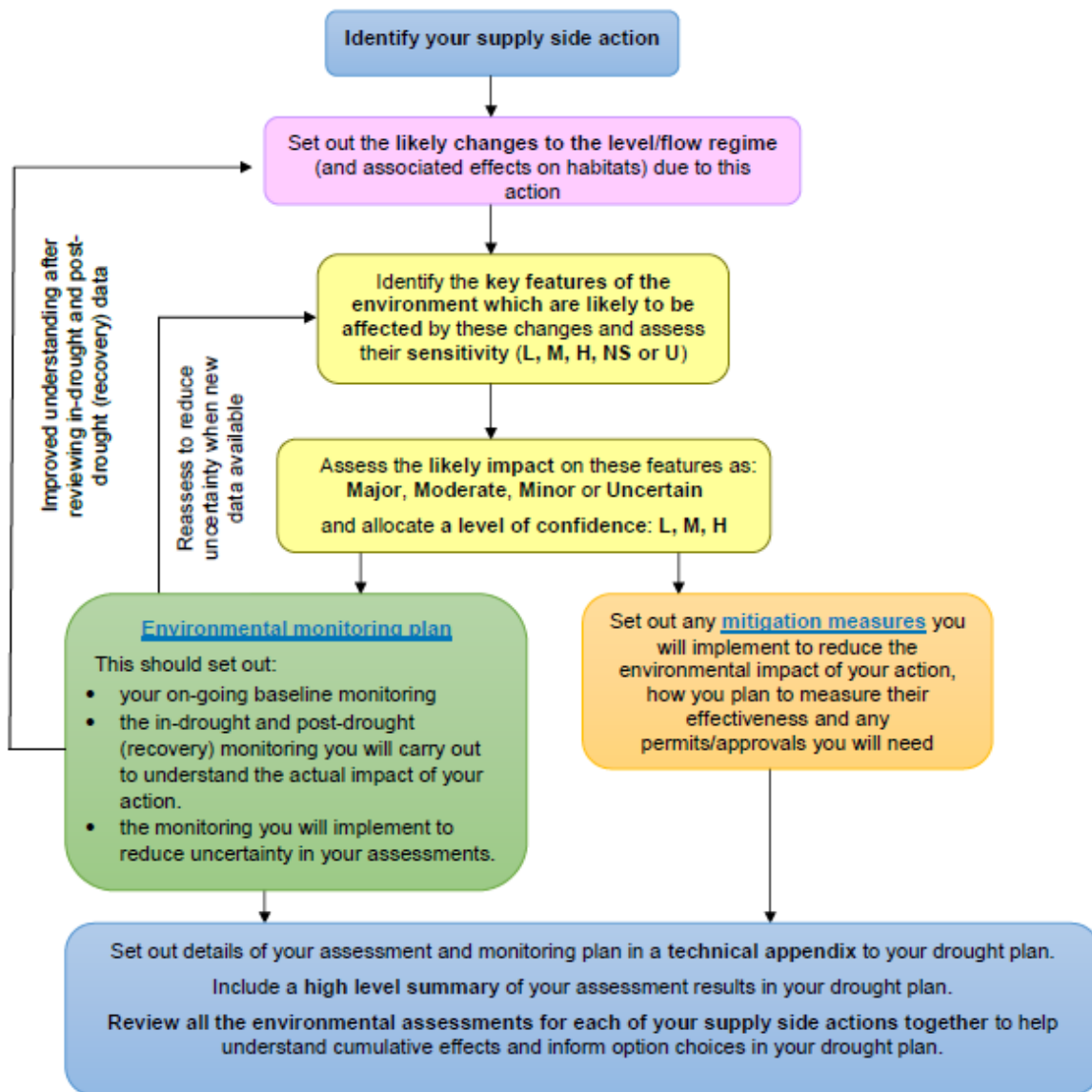


Figure 25 EA flow chart of the high level approach to develop our environmental assessments for our supply side drought management actions

In agreement with the Environment Agency we have prioritised the updates to our EARs. The intention is that we will have finalised versions, subject to regulator approval, of the following EARs either at the same time as final plan publication or within the same year:

- River Churnet (pathways report)
- River Derwent and Derwent Reservoirs
- Dove
- Avon & Leam

Since we published our 2014 drought plan we have completed the EARs for our site G abstraction. The EAR for site G was finalised in February 2017. This EAR is therefore the lowest priority for updates and is not planned before the final drought plan is submitted.

During the process of producing the site G report we learned that they are complex assessments and we should not underestimate the time that they take to produce. We concluded we needed a programme for updating EARs that keeps them fit for purpose and as current as possible but ensures that we only make wholesale changes when significant changes occur either in the catchments themselves or within the applicable legislation/regulations. We note that we carry out ongoing monitoring at each of the drought permit/ order sites and this will highlight to ourselves and the EA the occurrence of any 'step changes'.

The EA's 2020 document entitled 'drought permits and drought orders' sets the expectation for water companies to include details of all possible drought permit options in our drought plan and to be application ready as part of our drought plan development. Because we carry out ongoing monitoring at all of the drought permit/ order sites and due to the timescales involved in producing full updates of our EARs we consider that we are as application ready as is pragmatic.

One difference between the EARs we are updating and those we produced to accompany our 2014-19 drought plan is that the drought plan guidance asks us to focus more on droughts of a greater severity than those in our current record. We described in section 2.1 how we have modelled these more extreme drought to support this drought plan and our 2019 WRMP. We have used this modelling of more extreme drought scenarios to select an extreme drought for each of the catchments (Derwent, Churnet, Avon / Leam, Severn, and Dove). As we have modelled the impact of the drought permits/ orders on flows in our historic record as well as in a severe drought event derived from our stochastic drought analysis; for each catchment we have covered a full range of plausible drought scenarios.

6.1.1 Environmental assessment reports (EARs) - River Derwent and Derwent reservoirs; River Churnet

We have described what these drought permit/ orders will do in section 3.3. We produce EARs to assess the possible environmental impacts of drought permit/ orders. We note that these EARs assess the incremental impact of the drought permit/ orders on the environment and not the impact of the drought itself. We expect to have completed these EARs in line with the publication date of this plan. We note that this timescale may vary depending upon how many reviews and revisions are required in order to produce reports that meet both our internal requirements and those of regulators such as the EA and Natural England. These EARs, or non-technical summaries of them, are available on request.

6.1.2 Environmental assessment report (EAR) - Dove

This is a new drought permit site following on from the hot/dry weather event of 2018/2019. We implemented a drought permit for less than one month until 31st March 2019 to increase the aggregate annual abstraction licences at this site. This was accompanied by an Environmental Statement as opposed to a full EAR. The report used measured reservoir level data to predict hydrological impacts under the baseline and proposed Drought Permit. The results of the hydrological analyses were used to assess baseline data and predict potential impacts for receptors. It is expected at time of publishing this plan an EAR for this site will be available for review.

6.1.3 Environmental assessment report (EAR) – River Leam & Avon

We expect to have completed the updated EAR for this site within the same year of publishing the final drought plan. We have described what the drought permit will do in section 3.3. The EAR summary detailed in that section is as per the current EAR and will be updated as necessary.

6.1.4 Environmental assessment reports (EAR) – site G

We have described what this drought permit will do in section 3.3. We produce EARs to assess the possible environmental impacts of drought permits and orders. We note that the EAR is to assess the incremental impact of the drought permit on the environment and not the impact of the drought itself. We expect to not have completed an updated EAR by the time the final plan is published, as agreed with the EA. This EAR is available on request and the primary conclusions can be found in section 3.3.

The EAR for site G does note that although Severn Trent applied for a site G drought permit in September 1984 it was never used as site T and the Elan reservoirs started to refill.

6.2 Environmental considerations for supply actions without an EAR

An EAR is required, and has been or is the process of being updated and completed, for each of the sites where we may apply for a future drought permit or drought order. We are also required to carry out environmental assessments for our other supply actions (including our Beechtree Lane extreme supply action drought permit) detailed in section 2.2 and Appendix B. Our SEA, HRA and WFD assessments have assessed these actions, and we provide a high-level overview of the environmental assessment details within the tables in Appendix C. We have also considered our emergency sources detailed in section 3.2. For each of these sources we have also completed a high level table within Appendix C, but it is worth noting that the long lead in time for these sources means it is likely we will be able to agree with the EA the necessary environmental actions (i.e. monitoring; mitigation) to use the source. Our environmental data provision and monitoring plan is detailed in section 6.3, and our mitigation measures are detailed in section 6.4.

6.3 Environmental data provision and monitoring plan

As part of our drought management work we have collected, and continue to collect, environmental data at all of our potential drought permit/ order sites. For each site there is a Site Investigation Plan (SIP) which we share with the EA for comment. We share this to ensure we do not duplicate work between us. These agreed monitoring plans will allow us to assess the environmental impact of any changes to our normal operations that we make as a result of the drought. This phase of monitoring is often referred to as ‘baseline’ monitoring to distinguish it from ‘in-drought’ or ‘post-drought’ monitoring. Our environmental monitoring records:

- The feature(s) we monitor
- The location of survey sites
- The timing and frequency of monitoring
- Who undertakes the monitoring.

The SIP details sites to monitor for:

- Spot flow
- Permanent flow
- Water quality
- Groundwater levels (where necessary)
- Macro invertebrates
- Fish

- The river habitat as part of a RHS (river habitats survey)
- The habitat during habitat walkovers and
- White clawed crayfish.

For each year monitored we have produced a stand-alone monitoring report, which we use to track whether significant changes (step changes) have occurred.

6.4 Mitigation measures, compensation requirements

As we described in section 3, we are investing significant resources every year to manage customer demands, promote water efficiency and reduce leakage. We have committed to devote even more resources to demand management during a drought. This work reduces the likelihood of needing drought permits or drought orders, or other supply-side actions. However, when we have exhausted all of the demand management options available, we will have to use supply-side measures like drought permits. We would not impose water use restrictions between November and March as we do not think they would be an effective way of reducing demand.

When we implement any drought management action we seek to avoid any adverse environmental damage. In addition to trying to prevent any environmental harm from occurring we have also considered numerous environmental mitigation measures. Some of these mitigation measures are generic and can apply to any location where we may apply for a drought permit/ order.

The following list shows generic mitigation measures that we will consider if we have to implement a drought permit or drought order:

- Fish rescue
- Aeration (for example, of discharges)
- Reduction of other abstractions, if possible
- Freshet releases (these are releases of water from reservoirs for environmental purposes)
- Other forms of flow augmentation (potentially from rarely used / emergency / resilience sources)
- Increase the frequency / coverage of monitoring – this constitutes ‘in- drought’ monitoring
- Ensure there is adequate ‘post-drought monitoring’
- Habitat restoration.

The list above is neither exhaustive nor prescriptive. This means that we may not necessarily need all of these measures in every drought. It also means that if there are measures not listed here that will provide an environmental benefit then we may still implement them. We will decide on the precise combination of measures that is most appropriate to the circumstances of any given drought. We will discuss any necessary mitigation measures with the EA during the drought permit application process to determine the most appropriate monitoring and mitigation regime.

We have not included compensation in the list of mitigation measures above as we do not think that any of our proposed level 3 restrictions of drought permits / orders will cause adverse impacts that our mitigation does not address. However, we are open to discussions on this topic during or after a drought because every drought is different and we would want to account for the specific circumstances of each case.

The mitigation measures that we propose using are appropriate for the level of impact predicted and the importance of the receptor. We design our measures to minimise the impacts occurring as a result of

maintained, or increased, abstraction during a drought. As a result we would expect the majority of them only to be in place for the duration of the drought permit/ order.

The mitigation measures we implement will mitigate the impacts of the drought permit or drought order and not the impacts of the drought itself.

We have also carried out more detailed site specific assessments of mitigation measures in each of the environmental assessment reports we described in section 3.3 and 6.1.

For example, section 5 of the environmental assessment report (EAR) for the Derwent describes mitigation. It illustrates how we plan to:

- Understand the baseline condition of the hydrology and ecology at the location
- Set appropriate monitoring and
- Mitigate against any adverse impacts if they occur.

In the Avon and Leam EAR we propose additional monitoring and mitigation measures to reduce all potential impacts to a minor negative level of significance, where possible. This EAR describes measures which include:

“A repeat habitat walkover survey and spot gauging will facilitate the identification of temporal minimum flow requirement thresholds for all species and life stages. This will facilitate assessment of the minimum flow required to protect fish populations during key periods of sensitivity, whilst still optimising the supply resource;

Temporary return to normal abstraction rates in the event of a pollution incident, evidence of ecological distress, or evidence of serious detrimental environmental consequences on downstream watercourses;

Funding of appropriate reasonable measures (e.g. habitat restoration) in the event of ecological damage occurring on watercourses affected by increased abstraction; and

Provision of appropriate assistance and / or funding of reasonable additional measures to protect habitats and sites or species of special ecological interest affected by the DP.”

We also provide the detail of our mitigation measures in the other completed environmental assessment reports i.e. the River Severn and River Wye EARs.

In the unlikely event that we need to use any of the drought / emergency sources / extreme actions (apart from Norton) described in Table 11 and Table 22 the long lead in time will allow time to carry out a hydrological and environmental assessment. We will consider what, if any, mitigation is necessary as part of these environmental assessments in conjunction with the EA.

6.5 Consideration of Water Framework Directive (WFD) article 4.6

Article 4.6 of the WFD provides an exemption for temporary deterioration of water bodies caused by “exceptional” events with “natural causes”. Extreme droughts could fall into these categories but as we cannot prevent droughts from occurring, this plan needs to consider whether any of the actions that we, Severn Trent Water, take could cause temporary deterioration. On this topic, the 2020 EA ‘Environmental assessment for water company drought planning supplementary guidance’, recommends that drought plans should:

- *“clearly identify all actions that could cause temporary deterioration using appropriate assessment methods*
- *clearly describe why the circumstances are exceptional using hydrological data and any other relevant indicators*

- *clearly justify why an action that causes temporary deterioration is preferable to the alternatives*
- *include details of planned mitigation to minimise the impacts of such actions before during and after*
- *set out what action you will take to restore the water body following the drought.”*

We have addressed all of these points within:

- the relevant parts of section 3 of this drought plan
- the SEA, HRA and WFD assessments that accompany this plan (the SEA is published separately alongside this plan; the HRA and WFD assessments can be requested)
- the Environmental Assessment Reports (EARs) described in section 3.3 and 6.1

For ease of reference we have summarised how and where we have addressed these points in Table 28.

Table 28 How we have considered the actions in this plan against WFD deterioration

Action	Does this cause temporary WFD deterioration	Where do we provide more details?	Other comments
All actions from business as usual, standard demand management through TUBs and NEUBs, awareness raising and supply / transfer options covered in our Baseline DO modelling	No	The SEA / HRA discuss all of our drought options. There is also some information in section 3 and section 6 of this plan	These don't apply here because they are reasonably foreseeable
Drought permits (Dove, Avon & Leam and Derwent)	Unlikely	The primary source of information for these is the EAR reports (both the existing version and the ones we are currently preparing). The data sources above also apply. Mitigation is covered in section 6.4. of this plan	There is a low likelihood of needing these permits and we would not apply for them unless we had to
Supply-side drought orders (Site G and Churnet)	Potentially	The data sources above apply	There is an even lower likelihood that we would apply for these and they are very much last resort options. When we are in this territory we will have started or be about to consult our emergency plans
Drought / emergency sources, and other supply sources without an EAR	Potentially	Section 3.2.1 and 6.2	We have assessed the WFD impacts of a number of these following dialogue with the EA but as there is such a long lead in time before we may need to use them, we would have time to do undertake required environmental assessment/monitoring. If we need these options our emergency plans will be active

Section 7 End of Drought

We define the end of a drought as when our water resources availability has returned to 'normal'. Indicators of the end of a drought are that:

- There have been several months of average or above average rainfall (winter rainfall usually provides greater recharge).
- Reservoir storage has recovered, for example, storage in the majority of reservoirs is above the appropriate trigger curves. We have detailed our actions during the abatement of droughts, and as reservoir storage recover on the curves shown in sections 3.4.2 and Appendix B.
- River flows have returned to normal.
- Groundwater levels have returned to the normal range.

We will analyse these and other relevant indicators (such as those described in section 2) before we conclude that conditions have returned to 'normal'. Due to the long term impacts that droughts can have, for example on our groundwater sources, there may be a significant delay before we can say definitively that a drought is over. We will liaise with the EA, NRW and Water UK/other companies before we formally declare a return to 'normal' conditions. We will consult with other stakeholders if necessary before declaring a drought is over. This is part of the consistency in messaging that our communications plan discussed.

Once normal conditions have resumed and all restrictions lifted, our DAT will undertake a review of our drought management processes against those as outlined in this drought plan. There will be a post-drought review to learn lessons, review the ongoing effectiveness of our drought planning, communications, drought management and environmental management. If we have used customer restrictions, drought permits or drought orders we will review these in detail. The reviews will consider both operational performance as well as customer impact including implications for Priority Services Customers (see section 5.2.3). Should there be any information relevant to our WRMP work or to other areas of the company then we will pass this directly to those teams. Where necessary and requested to do so we will release results of any review as a 'lessons identified' report. We will also ensure that we act on any results of the reviews of our drought management process by updating our drought plan as necessary.

Following the drought that ended in 2012 we engaged with other companies and stakeholders. For example, we contributed to a Water UK drought resilience workshop on 23 July 2012 as well as the joint Water UK and EA workshop 'Drought resilience – Securing the future' on 16 August 2012. We have maintained links with the National Drought Group (NDG) ever since 2012. These links involve both drought communications as well as more technical hydrological and hydrogeological situation reports.

Within our customer communication section 5.1.2., we detail the end of drought communications messaging that we will undertake to ensure our customers are informed if, and when, restrictions that we have implemented are removed i.e. TUBs or NEUBs.