

# Draft

# Drought Plan

# 2020

March 2019



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## A. Executive Summary

### i. Overview

At Welsh Water, our vision is; “To earn the trust of customers, every day”. That vision reflects our unique ownership structure: we have no shareholders and so can concentrate solely on delivering the best possible value for money to our customers. All the profits that we make are reinvested in the business to improve outcomes for our customers and the natural environment, or are used to benefit customers. We need to hold to this way of working every day, especially during stressful periods such as droughts which can be challenging for both ourselves and customers.

We are trusted to plan for drought and trusted to deliver these plans if and when drought periods occur – we must continue to earn that trust every day.

Welsh Water’s long term ambitions have been set out in our Water 2050 document and this places the maintenance of wholesome water supplies at its heart. One of our key strategies is what we have titled “Enough Water For All”. In essence, this is to ensure that we always have sufficient water in line with our customers’ expectations, even in times of drought.

Our Water Resources Management Plan and our Drought Plan are at the centre of this strategy. Producing and maintaining a Drought Plan is a statutory process required by Government who have set out the legal basis for this in The Water Industry Act 1991. We are directed by Welsh Government who also provide the guiding principles for our plan. We have worked closely with Natural Resources Wales who produce the Drought Planning Guidance for water companies in Wales.

Of most importance to our customers is the impact that a drought might have on them and in particular their expectation of how we might restrict water use through our powers to impose hose pipe bans (in legal terms,

known as ‘Temporary Use Bans’) or more stringent measures that might limit non-domestic supplies called ‘Non-essential Use Bans’.

We have engaged with our customers to understand their expectations on how resilient they feel our supply systems should be to drought, how often it is acceptable to impose such restrictions and how these measures should be put in place. We have used this information to inform our plan.

As demonstrated through history, our supply area is not immune from drought. In 1976, around a million people in south east Wales were subject to rota-cuts in order to ration supplies. It is clear from our customer engagement that such measures are now generally considered unacceptable.

With such events in mind, Government has asked the water industry to better understand the likelihood and impact of such measures being needed again. Furthermore, Government has challenged the industry to increase levels of drought resilience. In response, we have taken a new approach to our understanding of drought risk for this Plan and have tested it against more severe droughts than observed in our historic records.

Although the drought of 2018 was fairly short in duration it was intense with very low rainfall. We therefore, had significant concerns that this could impact our customers and we put our current plan into practice. This experience, has given us greater insight into how we need to operate to manage our supplies in a drought and how additional network connectivity can provide increased system resilience. We installed a number of additional links within zones to maximise our water resources and treatment capability to meet peaks in demands and in some cases between zones to enable water resources to be shared.

We have subsequently built this learning into our updated Drought Plan and will be making permanent improvements to our network connectivity through our forthcoming investment planning work.

## ii. Background

Welsh Water supplies on average around 800 million litres of water every day. Most of our water is supplied from our impounding reservoirs but we also obtain significant volumes from our lowland river sources. Groundwater accounts for less than five percent of our supplies at a Company level, but at a local level may be the whole supply.

This reliance on surface waters can make us vulnerable to relatively short periods of very low rainfall as experienced during 2018.

Although Wales has a relatively high rainfall compared to the rest of the UK the overall regional picture masks important geographical differences within our supply area: for example, at up to 3,000mm rainfall per year in Snowdonia, this can be more than four times the levels recorded in the border areas and Herefordshire, where 700mm per year is typical.

The diversity of our water supply systems reflects these regional variations, which can range from discrete small-scale local supplies, through to large scale multi-source integrated networks that are more typical of many other water company areas.

The amount of water that we take from the environment has fallen by around 12% since 2000 as demand for water has fallen due to lower customer use and because we have reduced leakage from our 27,400km network of pipes by around 40% in the same period. We are planning to reduce the leakage from our systems by a further 15% over the next 6 years.

As the water undertaker for Wales we are faced with some unique challenges in developing our drought plan:

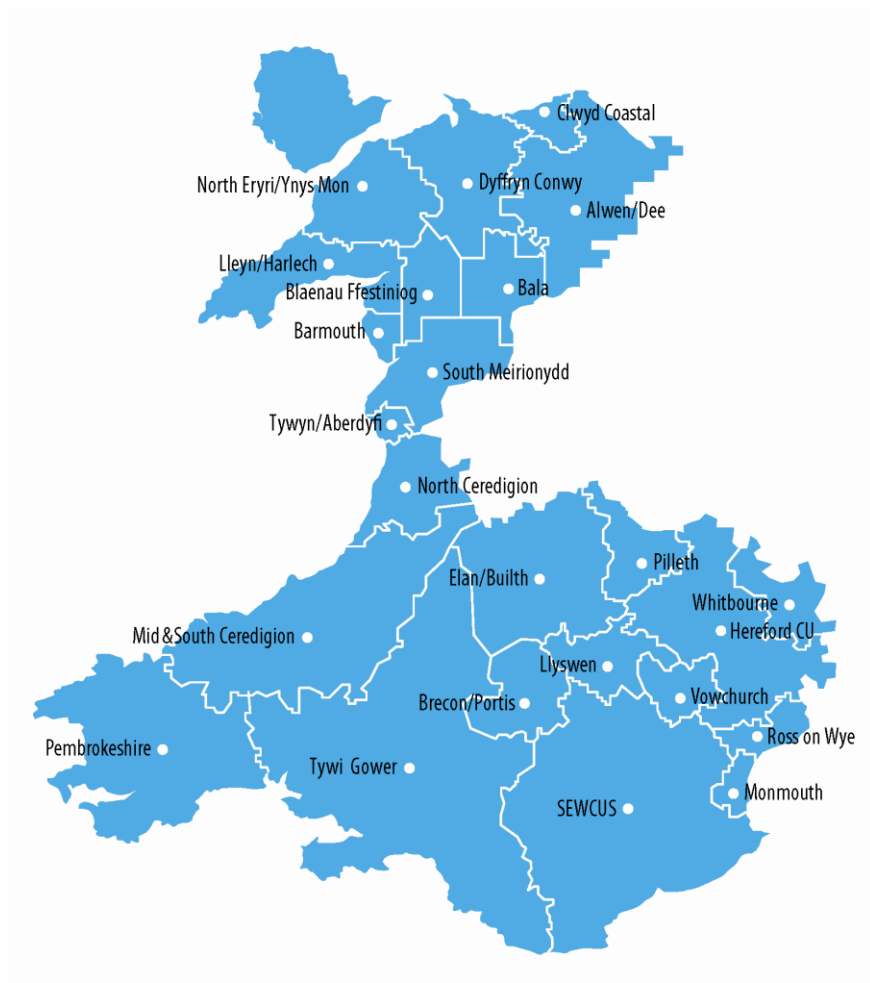
Because of the topography of Wales, Welsh Water has a high number of “water resource zones”. Our 24 water resource zones represent a fifth of the total for England and Wales (see figure below).

The landscape means that each of these zones is essentially self-contained with only limited opportunity to transfer water across zonal boundaries. This results in less flexibility to manage potential drought impacts and may require local measures to be put in place even if the overall position with regard to water availability in Wales is healthy.

The aquatic environment in Wales is of exceptionally high quality, with many sites of special scientific interest and a number of rivers designated at a European level as Special Areas of Conservation. Any drought measures therefore must balance our twin responsibilities of protecting the environment and maintaining public water supply.

These geographic and environmental constraints mean that, despite the relatively high rainfall in parts of Wales, drought can present a significant risk that we need to plan for adequately.

This document sets out how we will deal with drought conditions within both the urban and rural parts of our supply area, and how we will monitor the effect of any actions that we take on the natural environment.



*Welsh Water's Water Resource Zones*

### iii. The Drought Plan

#### a) Introduction

Our customers and stakeholders would like to understand our proposals, particularly how a drought might impact upon our water supplies and how we will communicate messages to them during periods of prolonged dry weather.

Therefore, we have written this Plan with customers, stakeholders and our regulators in mind. The latter require sufficient technical detail to understand the level of risk, if any, to our customers during drought and to be satisfied that our drought plans are rigorous and achievable.

Our Plan aims to do this through clearly setting out our response to drought in terms of;

- The way in which we monitor indicators so that we know a drought is happening.
- Defining the trigger levels at which we will take action and;
- Identifying the specific actions that we will take as trigger levels are met.

To support the drought planning process, a UK Water Industry Research (UKWIR) project was completed in 2013 to provide a voluntary Code of Practice and guidance to water companies. It provides advice on a potential staged approach to the implementation of demand restrictions such as Temporary Use Bans and Non-essential Use Bans with the aim of creating a more consistent approach between water companies across Wales and England. This general approach seeks to minimise the social and economic effects of water use restrictions, with restrictions placed initially on domestic customers before affecting commercial customers.



This Code of Practice was produced in collaboration with, and supported by representatives from regulators, consumer groups, trade bodies and customers. Welsh Water have signed up to this Code.

## b) Drought Indicators

Droughts are a prolonged period of little or no rainfall which, when combined with the usually hotter temperatures experienced, puts severe pressure upon our water resources and our ability to meet high customer demand for water.

Droughts by their very nature are highly variable in terms of their timing, duration and severity but they all begin in the same way with a period of below average rainfall that continues for longer than expected. There are a number of indicators that show when a drought is developing and an important requirement of a drought plan is to identify those that we will monitor and use to trigger drought action. We use the following indicators across our water resource zones:

- Rainfall
- River flow
- Reservoir storage
- Groundwater levels
- Level of demand

Our regional water situation is monitored on a weekly basis and provides both rainfall and reservoir storage data. These are circulated widely both within Welsh Water and shared with external stakeholders, including Natural Resources Wales (NRW) and the Environment Agency (EA). Routine hydrometric monitoring is also carried out by NRW and the EA who share relevant data for rainfall and river flows with us. We also track zonal and sub-zonal demand across our water supply network on a daily basis.

A comparison of these indicators under current conditions against historical norms provides a measure of the drought severity.

## c) When do we take action in a drought (Drought Triggers)

It is important to establish when action should be taken during droughts to protect public water supply. We have developed drought triggers to identify when we should consider implementing specific drought actions to reduce demand and, if necessary, obtain additional water resource. These triggers are used as decision making tools as part of the overall drought management process.

Drought indicators have been developed to identify when the water resource situation is moving into a drought. Drought trigger levels have been defined, aligned with drought guidance, to ensure that that drought actions are proportionate to the level of drought risk. These are:

- Stage 1 - Normal operation
- Stage 2 - Developing drought
- Stage 3 - Drought
- Stage 4 - Severe drought
- Stage 5 – Emergency Measures

## d) Managing Drought

The approach we take within Welsh Water to managing all incidents, whether they are short term events such as a burst water supply main, or longer term events such as the loss of an asset, is to try and ensure little or no disruption to our customers' supplies whilst ensuring that our actions have minimal, if any, effects upon the environment.

Applying this approach during a drought event means we firstly take actions that are immediately available to us, such as reconfiguring our supply networks and increasing our leakage activity. We escalate communications activity when incidents or our actions impact upon our customers and in the case of drought, to ask for our customers support in using water wisely or to inform them of water use restrictions.

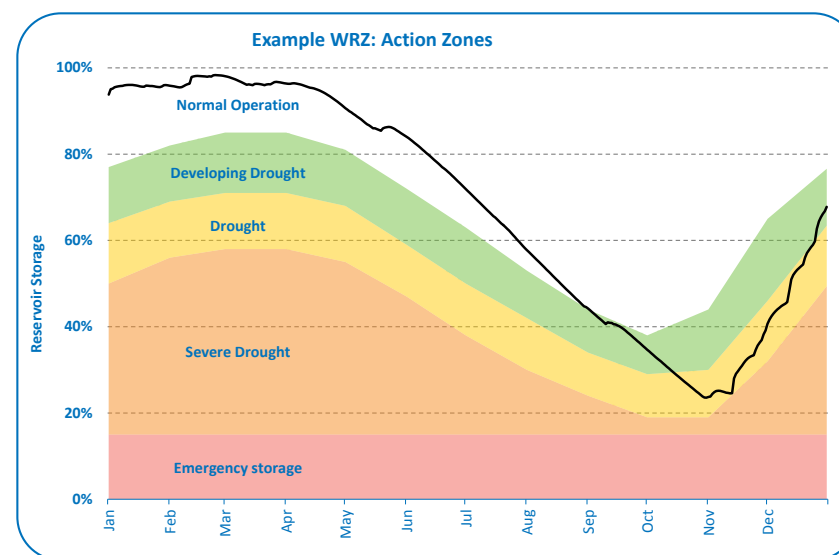
Our drought plan needs to be flexible in its approach as each drought is different in terms of its duration, severity and the areas it affects. It is not necessarily the case that all parts of our supply area would experience a drought at the same time, however we plan for a scenario where all our systems are under stress. We recognise that multiple events occurring simultaneously increase the magnitude and severity of an emergency situation. In an incident situation, our procedures require the separated but integrated operation of the following internal command centres; aligned to our emergency response manual.

Centre	Purpose
<b>Retail Centre</b>	for customer communications
<b>SMART 'HUB'</b>	for operations communications and real-time operations data
<b>Silver Command Centre</b>	for local tactical and operational management and response
<b>Gold Command Centre</b>	for strategic response and management
<b>Crisis Management Team</b>	for executive management and external agency support

These structures provided effective coordination and management of all internal and external activities in managing the events of 2018 and so we will take this approach in future drought events.

#### e) Reservoir drought triggers and actions.

The stocks available in our impounding reservoirs are critical in assessing our water resource position at any point in time. We track the levels in each of our reservoirs, against a series of pre-defined 'drought control lines', as shown by the black line in the next figure. These help us to understand our level of risk and the actions that we should be taking in relation to drought.



Example WRZ Drought Action Zone Plot

### Normal Operation

Over the late Autumn/Winter period our reservoirs will typically fill and overtop due to rainfall. It is important that we make best use of our cheapest and environmentally preferred water sources during this period which are predominantly our impounding reservoirs. We use our lowland, river sources under these conditions but they are operated below their peak capacity.

As storage levels fall we start taking action to maximise the amount of water resource by increasing the use of the lowland river sources which in turn preserve our upland storage in case of drought.

### Developing Drought

As we encounter a drought our reservoir storage will fall below that normally expected for the time of year. This is because less water than normal will be captured by reservoirs under dry conditions whilst the water demand leaving the reservoir stays the same or increases. We monitor this position and, as we move towards the 'Developing Drought' action zones of our reservoirs, the focus of operation switches to not only preserving and balancing water resource but to actions that will manage demand.

In general, we aim to maximise the water resource across each zone and this can require significant adjustments to our treatment works output and the reconfiguration of our trunk mains networks. Great care and planning is needed to ensure that the transition to new configurations is, from our customers' perspective, seamless.

As drought continues we will increase our demand management effort through enhanced and targeted leakage control and/or pressure management. We will also be increasing our messaging to inform customers of the current water situation and the need to protect water supplies and the environment.

As the management of our systems becomes more complex, we establish our 'Silver' and 'Gold' command centres to manage this change process. We will also make our regulators aware of the situation and form appropriate lines of communication with Government, industry groups and our regulators. The 'Gold' and 'Silver' command centres manage the development and delivery of action plans with the objective of maximising the water resource available to meet customer need whilst taking a measured response to managing customer demand.

### Drought

If dry weather conditions persist, we are encountering a drought and must respond accordingly, including by preparing for potential severe drought conditions.

If storage levels continue to decline then we will take further action to preserve storage until levels recover back to normal. We will be maximising our leakage effort and we will have introduced all supply side measures that do not need to take more water from the environment. We will have taken action through new schemes or possibly bulk water tankering to resolve any local pinch points.

At this stage we will seek to implement a Temporary Use Ban ("Hosepipe Ban"), which will restrict certain uses of water. This is inevitably a difficult decision as this will impact directly on some customers, but once made we will work with Welsh Government and Natural Resources Wales to effectively communicate the need to increase demand management in this way.

Within this 'Drought' action zone we may also submit applications to our environmental regulators (Natural Resources Wales and the Environment Agency) to allow us to gain more water in addition to that currently permitted. It will be clear to the general public at this stage that water supplies are under stress and this will doubtless attract media interest.

### Severe Drought

There would need to be very dry weather patterns for an exceptionally long period for reservoir storage levels to fall in to the 'Severe Drought' action zone.

Our actions will be proportionate to such severe weather and we would seek further help from our customers, both domestic and non-domestic through implementation of a 'Non Essential Use Ban' to restrict certain public and commercial uses of water.

Assuming our Drought Permit/Drought Order applications have been successful, we would implement these schemes immediately and begin monitoring in line with our pre-prepared Environmental Monitoring Plans and Environmental Assessments. In preparing this Drought Plan, we have re-examined the environmental impact of potential Drought Permit/Drought Orders, so that we now have a better understanding of the need for monitoring and environmental mitigation measures to be put into place

### Emergency Storage

Our planning for drought includes a reserve supply of water known as 'Emergency Storage'. This volume is designed to meet around 30 days of customer demand, as well any environmental requirements.

If we reach the stage where this is the only storage we have remaining in our reservoirs, we are in an exceptional drought event and we may need local 'extreme' measures such as water rationing to preserve supplies for as long as possible.

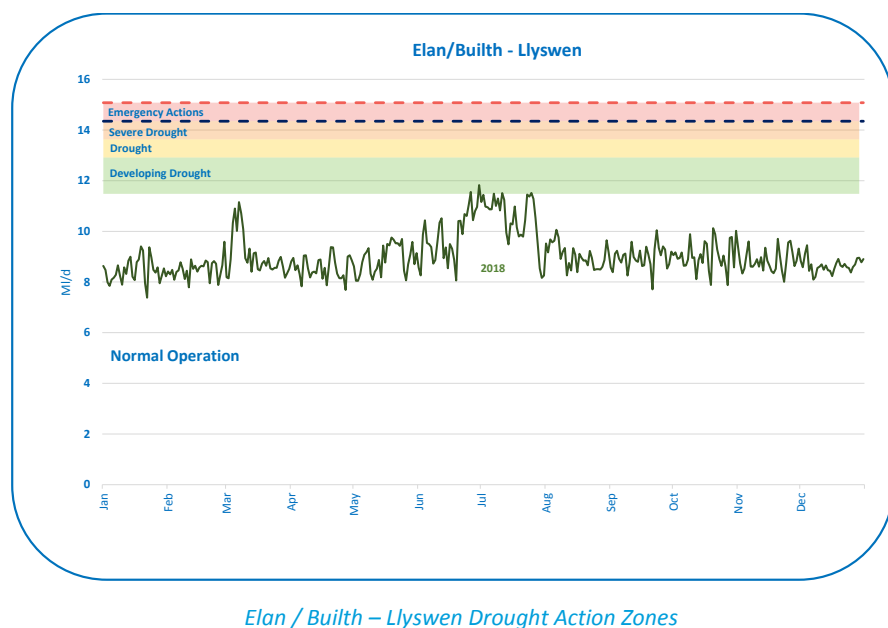
The table below summarises the measures that we will take in line with our Drought Action Zones.

Drought Zone	Action	Supply Side Actions	Demand Side Actions	Communications Key Messages
Normal		Weekly monitoring of rainfall, reservoir and river levels.  Optimise sources to minimise the costs of operations whilst remaining within licence, operation and quality constraints	Daily and weekly monitoring of demand levels and review of supply/demand situation.	<b>Use the water that you need but please don't waste it.</b>  General Water Efficiency Campaigns via: <ul style="list-style-type: none"> <li>• Company website water efficiency page</li> <li>• Social media</li> <li>• Press Releases</li> <li>• Organised events</li> <li>• Education Centres</li> </ul>
Developing Drought		Targeted leakage management. Convene 'Gold incident' command centre.  Implementation of dry weather operations to optimise water supply.  Liaison in line with Management and Communication Plan	Continuous monitoring of demand levels and review of supply/demand situation.  Implement demand side options: <ul style="list-style-type: none"> <li>• Media Campaigns with Water Efficiency Device Offering</li> <li>• Enhanced Leakage Management</li> </ul>	<b>Weather has been drier than normal therefore reservoir levels aren't where we would expect them to be for time of year.</b> <b>Introducing temporary use restrictions is a last resort. We would like to avoid this so are asking customers to work with us to help conserve water resources.</b>  Continuation of Normal Activities plus: <ul style="list-style-type: none"> <li>• Website – dedicated web page ready to go live as soon as required</li> <li>• Welsh Water spokesperson film clips</li> <li>• Targeted social media</li> <li>• Press releases - to be issued to relevant media.</li> <li>• Paid for adverts - to appear in relevant media</li> <li>• Letters to customers</li> <li>• Roadshow / local exhibition</li> <li>• Face to face meeting with stakeholders</li> </ul>
Drought		Continue to optimise current dry weather operational activities to preserve resource.  Review feasibility of bringing mothballed sources back in supply.	Continuation of preceding actions. Effectiveness of demand side measures estimated.  Preplanning for the implementation of Temporary Use Bans.	<b>Weather has been drier than normal therefore reservoir levels aren't where we would expect them to be for time of year.</b> <b>Introducing temporary use restrictions is a last resort. We would like to avoid this so are asking customers to work with us to help conserve water resources.</b> <b>We may have to introduce a temporary hosepipe ban as a last resort to help conserve water supplies.</b>
Drought		If applicable:	If applicable:	

	<p>Preparation of supply side application for Drought Permit/Drought Order from Natural Resources Wales/ Environment Agency and or Welsh Government/Defra.</p> <p>Commence baseline environmental monitoring</p>	<p>Implement demand side options:</p> <ul style="list-style-type: none"> <li>Temporary Use Bans (saving of up to 5% of demand anticipated).</li> </ul>	<p>Continuation of Developing Drought Activities with enhanced messaging plus:</p> <ul style="list-style-type: none"> <li>Media interview with senior managers</li> <li>Water efficiency lessons</li> <li>Billing call centre recorded messages</li> </ul>
<b>Severe Drought</b>	<p>Continuation of preceding actions.</p> <p>Bring mothballed sources back in supply where feasible.</p> <p>If applicable: Implement supply side options.</p>	<p>Continuation of preceding actions.</p> <p>Implement demand side options:</p> <ul style="list-style-type: none"> <li>Temporary Use Bans (saving of up to 5% of demand anticipated).</li> </ul> <p>Preplanning for the implementation of Non Essential Use Bans.</p> <p>Preplanning for the implementation of Emergency Drought Order.</p> <p>If applicable: Implement demand side options:</p> <ul style="list-style-type: none"> <li>Non Essential Use Bans (saving of up to 10% of demand anticipated).</li> <li>Emergency Drought Order (saving of up to 17.5% of demand anticipated)</li> </ul>	<p><b>Weather has been drier than normal therefore reservoir levels are exceptionally low for the time of year.</b></p> <p><b>Temporary use restrictions are in place. We thank customers for observing these to protect water supplies.</b></p> <p><b>We may have to introduce non-essential use restrictions as a last resort to help conserve water supplies.</b></p> <p><b>We may have to implement alternative water supply options under drought permit/order.</b></p> <p>Continuation of Drought Activities with enhanced messaging, details below:</p> <ul style="list-style-type: none"> <li>Website – dedicated web page ready to go live as soon as required</li> <li>Welsh Water spokesperson film clips</li> <li>Targeted social media</li> <li>Press releases - to be issued to relevant media.</li> <li>Paid for adverts - to appear in relevant media</li> <li>Letters to customers</li> <li>Roadshow / local exhibition</li> <li>Media interview with senior managers</li> <li>Water efficiency lessons</li> <li>Billing call centre recorded messages</li> <li>Face to face meeting with stakeholders</li> </ul>

## f) Demand Triggers

In a number of Water Resource Zones, our primary concern is about the capacity of our infrastructure to meet increased demand from customers, rather than the availability of the raw water. Our Water Resources Management Plan and annual performance reviews look at the capability of our systems to meet peaks in demand. It is therefore unlikely that we will encounter such difficulties but to be prudent, we set water demand related triggers.



The figure above shows an example for our combined Elan/Builth and Llyswen zones. The graph plots our peak supply capacity against historic and predicted maximum demand. If demands approach our peak capability for unprecedented reasons this indicates that we need to take actions to address this through demand management measures.

## g) Our Communication Plan

Welsh Water's Drought Communications Plan (DCP) has been developed to ensure the effective flow of information to customers and stakeholders during the various stages of a drought. The strategy is designed to ramp up in response to the escalating stages of drought and crucially trigger behavioural changes from customers to help conserve water supplies. While we have not had a hosepipe ban for a number of years, and have successfully reduced our leakage rates, as a company we fully appreciate how impacted we can be by events such as the hot summer experienced in 2018. Our DCP will ensure we are in a position to respond immediately in the event of similar conditions occurring in future.

The key to the effective management of any drought situation will be engagement with customers and stakeholders. Their cooperation - and crucially behavioural changes - during such times is essential to help protect water resources for everyone. To achieve this we will need to ensure our communications are effective - particularly to generate understanding of the situation and actions we require customers to take.

We cannot however expect customers to play their part without also being explicit about all of the activities our company will undertake to keep them in supply, so this forms an important part of our messaging.

Our communications strategy also has flexibility to adapt to varying drought situations by using appropriate communication techniques and messaging. Multiple communication channels are utilised to ensure the most effective is used for the targeted audiences.

This also includes ensuring communication is fully bilingual to cater for our customers' language of choice. The company has also incorporated learning from the 2018 summer into the plan. We are confident that our not-for profit operating model will have a positive impact on our call for customer support in managing drought in our supply area.

## h) Understanding our Drought Risk

The view from Government is that our water supply systems should be resilient to at least a 1:200 drought event before ‘extreme’ measures, such as water rationing, are taken to manage demand.

In order to understand the level of drought resilience we can provide to our customers, we have undertaken drought vulnerability assessments for all of our Water Resource Zones, in accordance with the Drought Vulnerability Framework (DVF) guidance that was jointly published by Natural Resources Wales and the Environment Agency in 2017.

This drought analysis work is relatively complex but the results are extremely useful and can be conveyed in reasonably simple terms. This is essentially an evaluation process that seeks to identify the level of drought risk that is faced by an individual zone across a range of drought scenarios of varying durations and severities. The DVF is a risk based approach with the initial phase of the assessment to screen out zones of low risk.

The table below provides a high level summary of the estimated risk for each Water Resource Zone of needing to implement customer water use restrictions. The return periods are not exact but are based on the results of our drought risk analysis; we have tried to interpret these into a ‘simple’ figure to present a high level view.

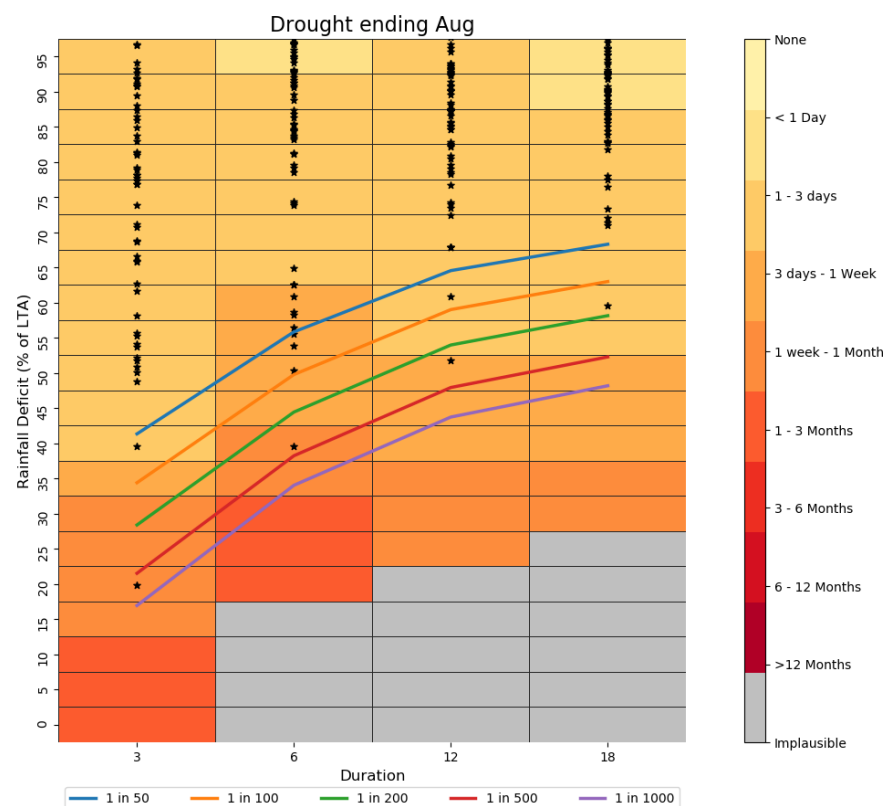
Of particular importance to Government is our system’s performance to the most extreme droughts and new targets have been set to ensure that water supplies are resilient to droughts that might be expected one in every 200 years or 0.5% likelihood. For zones where there is a risk of not achieving this we have undertaken further work to understand the types of drought that are cause for concern and the likelihood that our systems may fail to meet this target.

We have defined a failure in our models as the point at which we can no longer meet the demands of our customers without the imposition of extreme demand management measures. This is the point on our reservoir drought control charts at which only ‘Emergency Storage’ is available to us, a position that we would never want to reach as this is an unacceptable risk to our customers. The extent of failure is how long we would remain in this position of relying on ‘Emergency Storage’.

The water industry has developed a standard way to show this information called a Drought Response Surface (DRS) chart. This collates the output of the assessment and helps in communicating the findings. A DRS chart (below) is a visual presentation of the sensitivity of a zone to a range of droughts. Each drought is expressed in terms of rainfall deficit as a measure of drought severity (defined as the percentage of Long Term Average Rainfall, as shown on the y-axis, and the duration of the drought assessed in 6 monthly intervals on the x-axis of the chart).

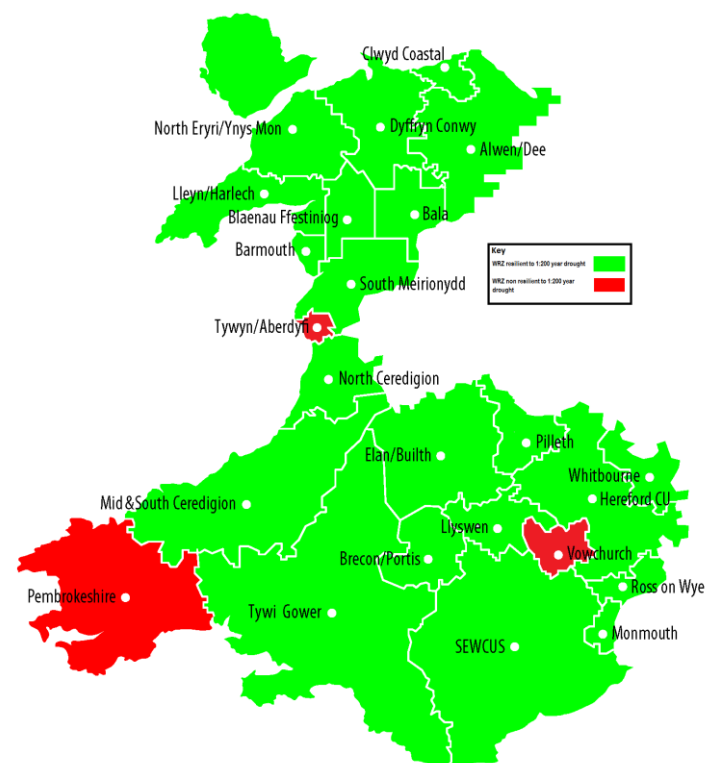
The risk of water supply ‘failure’ and drought frequency are plotted on these axis for comparison. The chart then can be used to understand, for example, the likelihood of zonal water supply failure for a 1:100 year return period type of drought.





*Example drought response surface*

Overall, the results of our drought risk analysis demonstrates that our resilience to drought is high in all but three zones (see map overleaf). Once we complete our investments planned for the next 3 years, this will improve to high across the Welsh Water region. This means that there should be a very low chance of us needing to implement customer water supply rationing.



*Results of 1:200 year drought response surface testing*

The advanced statistical approaches we have used for this testing are very new to the industry and further analysis of the data we have undertaken outside of this Plan indicates that we should be mindful of the uncertainties inherent within this approach. We have, therefore, provided a range of drought risks in the summary table below.

WRZ	Temporary Use Ban	Non Essential use	Extreme Measures Ban
North Eryri Ynys Mon	Around 1:200	Around 1:200 to 1:500	>1:500
Clwyd Coastal	<1:200	Around 1:200 to 1:500	Around 1:500
Alwen Dee	Around 1:200	Around 1:500	>1:500
Bala	>1:500	>1:500	>1:500
Tywyn Aberdyfi (without planned WRMP19 scheme)	<1:20	<1:40	<1:50
Tywyn Aberdyfi (with planned WRMP19 scheme)	Around 1:200	Around 1:200 to 1:500	Around 1:500
Blaenau Ffestiniog	Around 1:200	Around 1:200 to 1:500	>1:500
Barmouth (As now connected to Llyn Harlech)**	<1:200	Around 1:200	Around 1:200 to 1:500
Llyn Harlech (As now connected to Barmouth)**	<1:200	Around 1:200	Around 1:200 to 1:500
Dyffryn Conwy	<1:200	Around 1:200 to 1:500	>1:500
South Meirionnydd	Around 1:200	Around 1:200 to 1:500	>1:500
Ross on Wye	N/A*	N/A*	>1:500
Elan Builth	N/A*	N/A*	>1:500
Hereford	N/A*	N/A*	>1:500
Llyswen	N/A*	N/A*	>1:500
Monmouth	N/A*	N/A*	>1:500
Pilleth	N/A*	N/A*	>1:200
Brecon Portis	N/A	N/A*	>1:500
Vowchurch (without planned WRMP19 scheme)	N/A*	N/A*	<1:100
Vowchurch (with planned WRMP19 scheme)	N/A*	N/A*	Around 1:500
Whitbourne	N/A*	N/A*	>1:200
SEWCUS	Around 1:200	Around 1:200 to 1:500	Around 1:500
Tywi CUS	Around 1:200	Around 1:200 to 1:500	Around 1:500
Mid & South Ceredigion	Around 1:200	Around 1:200 to 1:500	Around 1:500
North Ceredigion	Around 1:200	Around 1:200 to 1:500	Around 1:500
Pembrokeshire (without planned WRMP19 scheme)	<1:100	<1:100	<1:100
Pembrokeshire (with planned WRMP19 scheme)	Around 1:200	Around 1:200 to 1:500	Around 1:500

\*The WRZ has sufficient water resource and the trigger for action is on levels of demand. We are only likely to impose TUBs and NEUBs in line with actions in the wider region, principally the SEWCUS zone.

\*\*This high level of resilience is based on the temporary schemes from the 2018 drought being made permanent and the two zones are joined together.

Summary results of the Drought Vulnerability Assessment for all 24 WRZs

## i) End of drought

As the water resources situation at the end of a drought returns to the normal level, we will continue to undertake similar risk assessments as those made during the drought period but with greater attention to the longer term impact. We will look both at the prospect of the weather turning dry once again and the likelihood that our reservoirs will re-fill over the winter/spring period and not lead to further issues the following year. At this stage we will look at the need to apply for additional drought permits aimed at securing water supply for the following year.

For these reasons, the initial recovery out of the Drought Action Zone would not typically be the point at which all measures would be lifted. A more likely point for declaring the end of a drought would be in the approach to the Normal Action Zone, where reservoirs are well stocked for the time of year and, in demand trigger zones, abstraction quantities fall below the developing drought trigger level.

As with the onset of drought, it is important that we take a flexible approach to the lifting of restrictions imposed on our customers or in taking additional water from the environment outside of our permitted volumes. We may also choose to lift restrictions on an area basis in a proportional manner. These decisions will be led by the Gold incident team and further discussed with government through the Wales Drought Liaison group and the National Drought Liaison Group. The factors that will be taken into account in making this decision will be:

- The results of risk forecasts for individual Water Resources Zones
- The time of year and anticipated savings from demand side measures
- Forecast weather conditions
- Natural Resources Wales and the Environment Agency, environmental drought status

Throughout the post-drought stage as conditions recover, post-drought environmental monitoring will be undertaken as part of the suite of actions to ensure we have the fullest possible understanding of the impact that any supply side drought actions have had. This post-drought environmental monitoring also informs our decision making so that appropriate measures can be taken to support the recovery of the environment after a period of drought.

Once we are confident that conditions have recovered and we are able to 'stand down' our incident response teams, we will hold a number of internal meetings involving all the members of our Gold and Silver centres to review the drought event.

The extent of the review will be dependent upon the level of drought encountered. We will review the effectiveness of the drought management actions we took to understand any impacts on customers and the environment.

For more severe droughts where we have put Temporary Use Bans in place, we will prepare a 'lessons learnt' report.

Once we have completed our internal review we will meet with Government and regulators to review how effective they felt our drought management was, how well we worked together across organisations and whether improvements could be made, particularly in terms of communication and support to other sectors.

# 1 Introduction

## 1.1. Dŵr Cymru Welsh Water

At Welsh Water, our vision is; “To earn the trust of customers every day”. That vision reflects our unique ownership structure: we have no shareholders and so can concentrate solely on delivering the best possible value for money to our customers. All the profits that we make are reinvested in the business to improve outcomes for our customers and the natural environment, or are used to benefit customers. Earning the trust of customers every day is especially important during stressful periods such as droughts which can be challenging for both ourselves and customers. We are trusted to plan for drought and trusted to deliver on these plans if and when drought periods occur.



Figure 1 - Welsh Water's operating area

## 1.2. Water resources in our supply area

We are the sixth largest of the ten regulated water and sewerage companies in England and Wales and provide an essential public service to over three million people across most of Wales, and adjoining parts of England (Figure 1). About forty per cent are concentrated in the south east of Wales around Cardiff and Newport, with much of the remainder located in the other main population centres around the coast. These are in sharp contrast to the sparsely populated areas of mid-Wales, where population densities are among the lowest in the UK.

Wales has a relatively wet climate when compared to other parts of the UK but this does not mean that we are immune to drought. The overall regional picture masks important geographical differences within our supply area: for example, at up to 3,000mm rainfall per year in Snowdonia this can be more than four times the levels recorded in the border areas and Herefordshire, where 700mm per year is typical. In 2018 however, data from our rain gauge at Llyn Alaw reservoir in Anglesey recorded only 1,140 mm whilst at our Broomy Hill water treatment works rain gauge in Hereford, the annual rainfall total for 2018 was 677mm. When analysing rainfall data to understand drought risk, it is the timing and duration that is important to understand, not just the total volume. Of the 1,140 mm recorded rainfall in 2018 at our Llyn Alaw rain gauge, 70% occurred in January to March and October to December, meaning that only 30% fell in the remaining six months through April to September. This partly explains why in the summer of 2018 we were concerned about our reservoir levels in North West Wales.

The diversity of our water supply systems reflects these regional variations, which can range from discrete small-scale local supplies, through to large scale multi-source integrated networks that are more typical of many other water company areas.

We abstract water from a variety of sources under a number of environmental licences to supply our customers. Most of our water is supplied from our impounding reservoirs; these are reservoirs which fill naturally with water from the land surrounding them. We also obtain significant volumes from our lowland river sources such as those on the Rivers Wye and Usk in south east Wales, the River Towy in south west Wales and the River Dee in north Wales. Groundwater accounts for less than five percent of our supplies at a Company level, but at a local level may be the whole supply.

A significant proportion of the water bodies that are key to our supplies, are designated under national and international law in recognition of their nature conservation importance. To protect these features of the natural environment, we have a duty to comply with the terms of our abstraction licences granted by Natural Resources Wales and the Environment Agency. As drought conditions develop we work increasingly closely with our regulators to ensure that we fully meet our environmental obligations stated within any drought order/drought permit that we obtain.

### 1.2.1. Water Resource Areas

For operational purposes we divide our water supply area into three regions; North Wales, South West Wales and South East Wales. However, for water resource planning purposes we further subdivide these regions into Water Resource Zones (WRZ). A WRZ is defined as the largest area in which water resources can be shared such that all customers, with some limitations, experience the same risk of water resource failure.

Figure 2 shows our 24 WRZs. Taken together our two largest zones, the South East Wales Conjunctive Use System (SEWCUS) and the Tywi conjunctive use system, supply around 64 per cent of our customers. In stark contrast, the eight smallest zones together supply just 1.6 per cent of our customers.

We have a relatively large number of WRZs when compared to other water companies, only Scottish water having more. This is due to the mountainous geography of Wales making upland reservoirs our primary source of water and strategic connectivity more costly. However, isolated zones are inherently less operationally flexible and we are seeking to increase water supply resilience in the long term through the linking of WRZs where appropriate. The experience in operating our water supply systems during the 2018 drought has highlighted where the merging of zones can provide significant benefit and we will be making permanent improvements to our network connectivity through our forthcoming (AMP7) investment planning work.

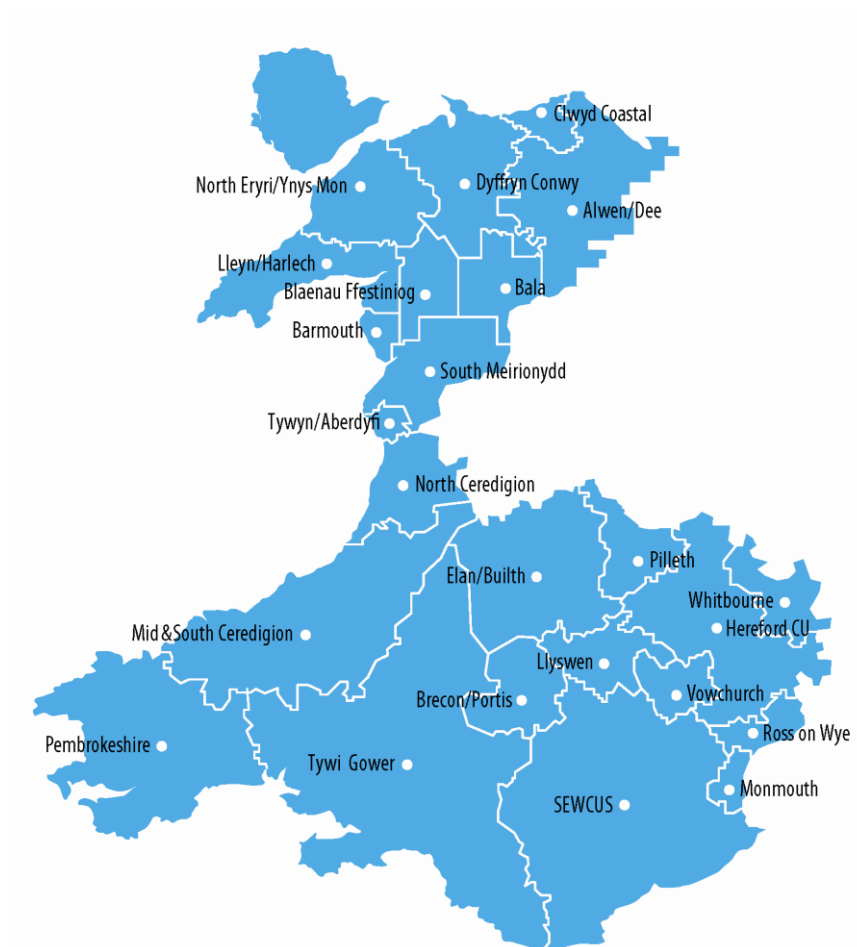


Figure 2 - Welsh Water's Water Resource Zones

### 1.3. The Drought Planning Process

Welsh Water's long term ambitions have been set out in our Water 2050 document<sup>1</sup> which places the maintenance of wholesome water supplies at its heart. One of our key strategies is what we have titled "Enough Water For All". In essence, this is to ensure that we always have sufficient water in line with our customers' expectations, even in times of drought.

<sup>1</sup> <https://www.dwrcymru.com/en/Company-Information/Business-Planning/Welsh-Water-2050.aspx>

At the head of this strategy are our Water Resources Management Plan and our Drought Plan. Producing and maintaining a Drought Plan is a statutory process required by Government who have set out the legal basis for this in The Water Industry Act 1991. We are directed by Welsh Government who also provide the guiding principles for our Plan. We have worked closely with Natural Resources Wales who produce the Drought Planning Guidance for water companies in Wales.

We have also signed up to the voluntary Code of Practice (CoP) as developed by UKWIR with support from regulators, consumer groups, trade bodies, customers and water companies across England and Wales. The CoP provides a consistent approach across water companies to the staged implementation of restrictions on customers' use of water in drought conditions.

Prior to producing our draft Drought Plan, we run a pre-consultation exercise with our stakeholders to help identify any key issues that we need to account for in the development of our Plan.

This is undertaken early in the process so that the results can influence the drought management strategies we include in the Plan. As with our other strategic plans, full consultation is an essential component in the production of our Drought Plan. We submit our draft Drought Plan to the Welsh Government at the end of March 2019 and, subject to there being no outstanding issues of national security or commercial confidentiality, we anticipate being directed to commence public consultation on our Plan by June/July.

The statutory consultation period lasts for 15 weeks in total, at the end of which we will submit our Statement of Response (SoR) and a revised draft Drought Plan, if required, to Welsh Government. To allow us sufficient time to prepare the SoR and revised Plan we will publicly consult on the plan for 8 weeks. We estimate our SoR will be submitted to Welsh Government around September/October and we will then wait further direction as to whether we have satisfactorily taken account of all representations received on the Plan and are able to publish a Final Drought Plan in early 2020.

## 1.4. Our Drought Plan 2020

We appreciate that some of our customers and stakeholders would like to understand our proposals for managing water supplies during a drought and particularly how a drought might impact upon them and how we will communicate messages to them during periods of prolonged dry weather. Drought Assessment is a technical subject, but in order to ensure the broadest possible understanding, we have written this Plan with customers, stakeholders and our regulators in mind. The latter require sufficient technical detail to understand the level of risk, if any, to our customers during drought and to be satisfied that our drought plans are rigorous and achievable.

This introduction provides the context for our Drought Plan and introduces some of the concepts involved in drought planning. This includes a background to the droughts that we have experienced historically, including that of 2018 and the lessons we have learnt from that particular event.

Of importance to our customers is the impact that a drought might have on them and in particular their expectation of how we might restrict water use through our powers to impose hosepipe bans (in legal terms, known as Temporary Use Bans (TUBs)) or more stringent measures such as Non-Essential Use Bans (NEUBs). We have engaged with our customers to understand their expectations and the findings of this work are presented later in this chapter.

The technical part of our Plan is held in Chapters 2, 3, 4 and 5 which mirror our activities as dry weather is encountered. Chapter 2 details the information that we track to understand the onset and growing severity of a drought.

Our drought plan needs to be flexible in its approach as each drought is different in terms of its duration, severity and the areas it affects. It is not necessarily the case that all parts of Wales would experience a drought at the same time, however we plan for a scenario where all our systems are under stress. Chapter 3 describes our drought management team structure and how we will work with stakeholders and regulators to ensure effective management during a drought. Our experiences of managing operational incidents in 2018, including the drought, has provided us with a management structure that has proven to be effective. Our operational response has been improved following our experiences in 2018 as we now have better knowledge of the risks around any changes to our operations e.g. catchment raw water quality, customer network risks.

The chapter then details the actions that we will take to help manage water demand, for example through our enhanced leakage activity and customer messaging. It also clarifies how our customers could be affected if we need to use our powers to restrict types of water use.

To improve our understanding of when actions are required during a drought, we have undertaken work to update some of our drought triggers. We now have a set of drought action zones for our North Eryri Ynys Mon zone which looks at the combined storage position in Llyn Alaw, Llyn Cefni, Llyn Cwellyn and Llyn Ffynnon Llugwy. We have produced a combined set of control lines for our Elan/Builth and Llyswen zones and have also now combined drought triggers for our Hereford, Ross on Wye, Pilleth, Vowchurch, Whitbourne and Monmouth zones. These changes all reflect our experiences from the 2018 drought where the delivery of new infrastructure and confirmation of our ability to mobilise a large number of water tankers, has made our supply areas more conjunctive. We have revised our Tywyn Aberdyfi drought triggers as we now have a much better understanding of what drives our drought risk in the zone.

A key improvement over our previous Plan is in our understanding of drought risk gained through the use of new statistical techniques. Chapter 4 details these new methods and summarises the findings for each of our WRZs. The chapter then describes how we have tested our Plan against a range of drought types so that we can develop the actions needed if we encounter droughts of different severities. The last part of Chapter 4 describes the actions we might have to take in the event of very extreme droughts that could require us to further restrict water use or to increase the supplies from the environment.

It is important that we plan for every foreseeable eventuality especially with the uncertainties associated with climate change. If we encounter an extreme drought then we may need to take more water than normal from the environment. To do this we need additional permits from our regulators and/or Government that will ensure our actions are undertaken with full knowledge of their environmental impact and that we will mitigate against these where possible. Chapter 5 details the options available to us and the work undertaken to prepare for such an event.

The risk of drought varies significantly across our operating area due to the hydrological conditions and the nature of our water supply systems. Annex 1 provides a high level operational overview of each WRZ and how we would manage the zone during drought. We have assessed the risk of drought for each zone, which provides us with the likelihood of needing to impose water use restrictions. We have further assessed the resilience of each area by modelling the impact of different types of drought and examining the impact on reservoir levels and the actions that we would take if we encountered drought. In this way we are testing the robustness of our plans.

Annex 2 provides further detail around our drought communication plan and the messaging to our customers to make them aware of the dry weather conditions and how they can work with us to preserve water in case these conditions continue. Annex 3 describes the improvements made to the environmental assessments undertaken of our twenty five Drought Permit/Drought Order options, as described in Chapter 5.



## 1.5. Customer Engagement

As the actions outlined in this Drought Plan have the potential to impact upon our customers, it is essential that we engage with them as fully as possible during its preparation. To support this, during the production of our 2019 Water Resources Management Plan (WRMP19) we sought our customers' (household and commercial) views on the frequency at which we may need to restrict their use of water, through the imposition of Temporary Use Bans (TUBs) and Non Essential Use Bans (NEUBs). We also asked for our customers' views on the level of resilience we currently offer to the risk of supply interruptions as a result of a severe drought.

Although our research partners Accent, who undertook the survey work, concluded the results were not statistically significant, their general view was that there is some positive WTP from customers for improvements in their levels of service. The results showed that customers were willing to pay £0.41 per year on top of their current bills, on average, for a reduction in the chance of a TUB from once every twenty years, to once every thirty years, and were willing to pay £0.62 per year, on average, for a reduction in the chance of a TUB from once every twenty years, to once every forty years.

From the WRMP19 research, Figure 3 below shows that our customers would like to see an improvement to our resilience to a frequency of less than 1:100 years for the implementation of extreme drought measures - many customers attached a high value to the improvement in resilience from 1 in 100 years to 1 in 200 years. However, the results of our companywide survey work on our investment plans for 2020-2025 gave a mixed view on the acceptability by our customers of higher bills and so these particular results must be viewed in this context. The level of resilience we have as a company towards the implementation of these extreme drought measures is currently a key question that is being asked of us by Government and our regulators.

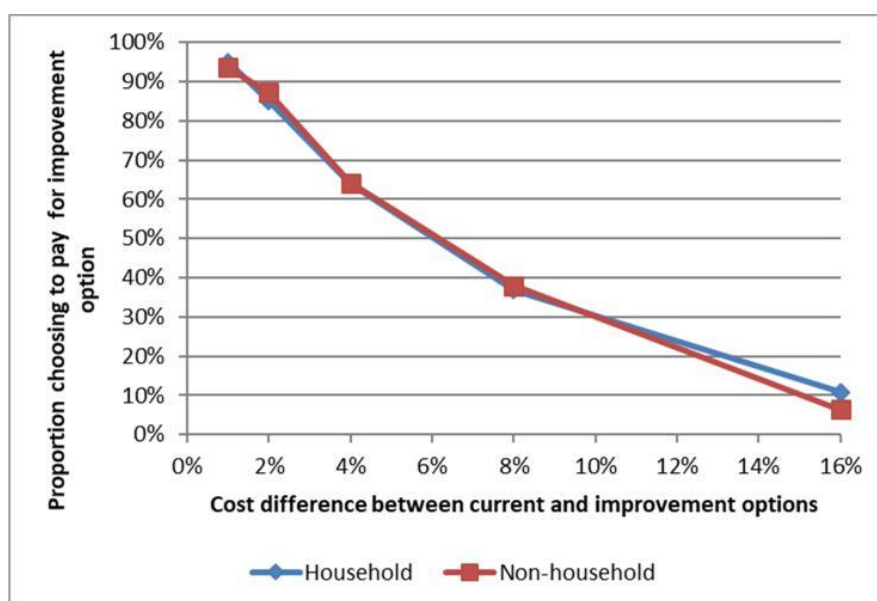


Figure 3 - Willingness to pay for improvements in resilience

Although not explicitly linked to drought, our engagement surveys found that customers across our supply area expect us to enhance biodiversity and the environment in general, not least as this contributes to the well-being of the communities we serve.

We are also mindful of the environmental legacy we will leave for future generations, as demonstrated in our Welsh Water 2050 long term vision. For the Drought Plan we try to minimise as far as possible any potential impact from our proposed options upon the natural environment in which we operate.

Early and full consultation together with detailed assessment is key to ensuring this objective is met. Since the publication of our 2015 Drought Plan we have undertaken much work in better understanding the environmental impacts of our proposed actions, the results of which are described in Chapter 5.

#### 1.5.1. Stakeholder Engagement and Pre-Consultation

To inform the development of this Plan we ran a formal pre-consultation exercise between June and September 2018. We contacted 56 consultees seeking their general views on what we should include in the Plan, alongside four specific questions designed to help us shape some of its key themes:

The questions we asked were:

- Do you agree with the factors that we need to take account of in the development of our Drought Plan for 2020?
- What are the key actions we should be undertaking to manage our supplies and our customers' demand for water during a drought?
- How can we try to ensure the environment is not negatively impacted during the implementation of our Drought Plan actions?
- Are there any issues or ways in which you feel we can improve on our current Drought Plan?

A summary of the main pre-consultation responses received is shown in Table 1. In response to the comments raised, we have completed a Strategic Environmental Assessment (SEA), Habitats Regulations Assessment (HRA) on our Plan and Environmental Assessments of all our proposed supply side Drought Permit/Drought Order options. We have fully utilised the Drought Vulnerability Framework (DVF) methodology to provide us with a better understanding of our drought risk. Throughout the Plan development we held regular meetings with Natural Resources Wales (NRW) and the Environment Agency (EA) as required, to keep them abreast of technical developments and outputs as these were progressed.

The SEA and HRA are themselves subject to their own pre-consultation process, further details of which are provided in Chapter 5.

Consultee Type	Consultee Number	Consultee Reply	Feedback Summary	Respondent
<b>Government</b>	5	1	Ensure SSSI protection, in combination assessment and HRA, prompt demand control. Provide details of extent of mitigation, end of drought impact on Usk and Wye and impact on brackish waters and other features. Consider previous consultations and Court of Justice of the European Union judgement on likely significant effects under the Habitats Directive.	Natural England
<b>Councils</b>	22	1	Considers proposed actions appropriate. Supports rainwater harvesting for water conservation purposes	Conwy Council
<b>Regulators</b>	8	2	Recommend compliance with WG/EA/NRW guidelines inc inclusion of DVF, SEA/HRA, EAR, in-combination assessment to consider bulk supply. Suggest that lessons learnt include freeze-thaw events and 5 yearly drought exercise be done. Promote ongoing communication, data exchange and consultation. Ensure consistency with WRMP19.	Natural Resources Wales, Environment Agency
<b>Utilities</b>	8	2	Shared details of drought options and approaches to bulk supplies and customer exemptions.	Severn Trent Water, Hafren Dyfrydwy
<b>Other</b>	8	1	Wishes for ongoing open communication	Canal & River Trust

*Table 1 - Results of draft Drought Plan pre-consultation*

## 1.6. Technical Assessments to Support the Plan

Effective drought planning relies on having a good understanding of the likely drought risk we have across our supply area. The bulk of the technical assessment work for the development of this Plan has been to improve our water resource modelling to a range of drought events more extreme than those we have in our historic records. To facilitate this, we have undertaken the following improvements:

### *Updates to water resources models*

We currently utilise the software package WRAPsim to simulate the performance of our water supply systems under a range of historical drought events. Following our experiences during the drought of 2018, before any further modelling was undertaken for this Plan, our existing models were reviewed and changes made to reflect how our systems actually performed during 2018 and to account for any new assets that were put in place. This ensured that the results of our advanced modelling were more representative of operational reality and gave us confidence in our predictions of system performance during more extreme drought events.

We have made improvements to our SEWCUS, Mid & South Ceredigion, North Eryri Ynys Mon, Alwen Dee, Lleyn Harlech and Barmouth WRZ models. Updated Deployable Outputs as a result of these model changes will be reported in our 2019 Annual Review submission.

### *Updates to hydrological data*

A key input into our water resource models are long term time series of hydrological data, principally inflows into our reservoirs and flows at our river sources. Our time series are generally around forty to sixty years in length and encompass the drought events of 1976, 1984, 1989 and 1995. Using industry leading statistical techniques, we have taken these existing rainfall and river flow records and extended them to produce up to 10,000 year records. Modelling these longer records allows us to test our systems against a wider range of more extreme drought events to help understand where we may encounter supply issues.

To facilitate the generation of these much longer time series, for a number of our WRZs we had to amend the method by which we generate our hydrological data. We have used the Catchmod software in four WRZs, namely Mid & South Ceredigion, North Eryri Ynys Mon, Lleyn Harlech and Barmouth, replacing the use of either the HYSIM software or the simple transposition of flows from a nearby gauging station. Details of the methodologies used to generate the new hydrology are provided in Appendix 2.

### *Drought Vulnerability Framework*

As required by guidance, for this Plan we have utilised the UKWIR Drought Vulnerability Framework (DVF)<sup>2</sup> to improve our understanding of the level of drought risk that we face across our supply area. Building on the improvements made to our hydrological data, the Framework provides a methodology for quantifying the risk to a supply failure caused by drought, expressed as a probability return period in years ranging from 1:50 to 1:1,000 against a duration of failure, ranging from 1 day to 1 year. The results of the DVF assessment for all our WRZs are provided in Appendix 1 to this report.

### *'Smarter' environmental supply side options*

The information gained from the above analysis has allowed us to better target where we need supply side options to mitigate the predicted risks from the more severe drought events we have assessed. Compared to previous Drought Plans, improvements have been made in two key areas for the assessment of our environmental supply side options:

1. For WRZs where we have identified there is no risk to customers' supply from a lack of water resource, we have been able to remove any supply side options that may have previously been included;
2. For WRZs where we have identified a risk from insufficient water resource, we have been able to analyse when these risks may occur and refine supply side options accordingly.

The approach in 2) above has meant that our environmental assessments (see Chapter 5) are more targeted in helping our understanding of the potential impacts as we are better able to define the likely timing and duration of the scheme being implemented. This in turn means that our assessment of environmental risks is greatly improved, so improving our ability to identify appropriate mitigation measures where required. Our improved analysis has also allowed us to redefine a number of options to improve the benefit we may gain during a drought.

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<sup>2</sup>Environment Agency/Natural Resources Wales 2017, UKWIR Report Ref. No. 17/WR/02/12

## 1.7.Drought Plan terminology

Throughout this Plan, when referring to drought events we use the terms ‘worst historic’, ‘severe’ and ‘extreme’ to indicate differing levels of severity. Until recently, we generally planned on the basis of ‘worst historic’ i.e. the worst hydrological event, in terms of a shortage of rainfall, that we had in our records to ensure that if there were a repeat event, our water supply systems are resilient to these within the level of expectations of our customers.

Understanding of these events has formed the basis of our planned Levels of Service that we offer to customers, with our ‘worst historic’ event having an estimated return period of around 1:100. However, Government and regulators have challenged the industry to go further in the levels of drought resilience we provide to customers, and so for this Plan we have assessed our ability to cope with drought events having a return period of 1:200 (‘severe drought’) and 1:500 (‘extreme drought’). As described above, we have generated longer hydrological time series with which to test our plans under these more extreme drought scenarios.

Following changes in legislation, the term “Temporary Use Ban” has now replaced a “Hosepipe Ban” to refer to a range of watering activities undertaken by households that we can now restrict during a drought. These terms are somewhat interchangeable as most of the water saving activities that we can impose on our customers involve restriction of hosepipe use, just for different uses. Our regulators also use the term “Extreme Supply Side Measures” to refer to actions we would take to ration our customers’ use of water (e.g. widespread pressure management or water rationing) during a particularly serious drought in order to help preserve our supplies should the dry weather continue for much longer than expected.

## 1.8.Historic droughts in the Welsh Water region

Despite its relatively wet climate, Wales has suffered historically from a number of challenging drought events that have caused disruption to our customers. There has not been a hosepipe ban imposed since 1989, following those implemented in 1976 and 1984. Although 1995 saw an extremely dry summer and autumn, improvements made to our operational systems as a result of learning from the previous droughts, meant water supplies were maintained without the need for customer restrictions.

The drought of 1976 is generally seen as the worst experienced within Wales with around a million people in south east Wales subject to rota-cuts in order to ration supplies. This followed the implementation of a hosepipe ban and numerous drought orders that allowed us to take additional water from the environment. However, these were insufficient in providing enough water to meet demands and so the decision was taken to implement extreme measures that restricted supplies to customers for a few hours each day. This allowed the remaining reserves of water to be used until it finally rained in late September and began the refill of our reservoirs.

It is clear from our customer engagement that such measures are less acceptable nowadays and would be very difficult to undertake on a large scale. Network pressure management along with local water rationing activity has the potential to support demand management but extreme care would be needed to ensure that minimum supplies would be available to all, especially our vulnerable customers and that we continued to meet the high water quality standards required of us.

We utilise the data from these historic drought events within our water resource models to test our current capabilities and assess whether any further improvements are required in order to provide a better service to our customers. Our models tell us that if we were to experience a repeat of the 1976 hydrological conditions then we would not need to enforce any restrictions upon our customers other than a hosepipe ban in a handful of our 24 water resource zones. This is a much better position for our customers in that we can offer a good level of service even during drought events.

Whilst 1976 is the most severe event we have on record, these are relatively 'short' hydrological records and we are fully aware there are likely to be more extreme droughts that we either have not experienced or have no data for, hence why we have followed the DVF methodologies outlined in Chapter 4.

### *The 2018 Drought*

Between April and July 2018 we experienced a very hot dry spell with rainfall around half of normal levels across most parts of our supply area. Temperatures were above average for most of this period, with Wales experiencing the hottest June on record, culminating in levels of demand from our customers of over 1,000 MI/d; approximately 20% higher than normal. The highest demands occurred earlier than we have seen in previous dry summers. Potentially therefore, demands could have been even greater if high temperatures had continued through late July into August when we normally expect peak demands.

Rainfall from the end of April to the end of July was lower than experienced during 1976 across Wales as a whole, with parts of North and West Wales experiencing exceptionally low levels of rainfall, as shown in Table 2.

NRW Catchment	May-18	Jun-18	Jul-18	3 month average
<b>Ynys Mon</b>	67%	19%	84%	57%
<b>Alwen</b>	102%	23%	79%	68%
<b>Dee</b>	68%	41%	69%	59%
<b>Clwyd</b>	77%	20%	93%	63%
<b>Valleys &amp; Vale of Glamorgan</b>	71%	18%	85%	58%
<b>Usk</b>	74%	15%	86%	58%
<b>Pembrokeshire</b>	80%	47%	108%	78%
<b>North Ceredigion</b>	62%	16%	72%	50%

*Table 2 - May to July 2018 Rainfall as a % of Long Term Average<sup>3</sup>*

By early July 2018, our routine water resource monitoring was showing a consistently dry picture across Wales. In response to this, and in order to ensure that our water resources were managed in the best way possible to minimise the need to introduce hosepipe bans during 2018, we convened our Gold Command centre, and proactively managed our activities affecting the supply of, and demand for water, while increasing communications with customers to encourage water efficient behaviour and regulators to ensure consistent messaging and understanding of risk.

<sup>3</sup> <https://naturalresources.wales/guidance-and-advice/environmental-topics/water-management-and-quality/resources/water-situation-report-2018/?lang=en>

This company-wide response resulted in a great deal of learning about the best ways to manage drought, as well as revealing capability within our network that had never previously been tested. The learning that we gained has been incorporated into the development of this drought plan, and reference is hence made throughout this document to 2018.

### 1.8.1. Lessons Learnt

#### *Water Resources Management*

We recognise that some of our triggers for taking operational drought action need some improvement in light of the 2018 drought and this is a piece of work that we will progress as a priority. We have amended our drought triggers for our North Eryri - Ynys Mon for this Plan.

As mentioned earlier in the report, the lack of zonal connectivity can restrict zonal resilience. The linking or merging of zones will increase overall resilience to drought and outages as available water resource can then be shared between the zones.

The dry weather in 2018 was particularly acute in north and west Wales and we needed to respond rapidly to balance water resources. In our North Eryri - Ynys Mon zone we needed to significantly reduce demand on the Cwellyn reservoir using existing links but also developing new temporary connections within the zone. This allowed water from our Alaw reservoir to meet additional demand on Anglesey which in turn enabled water from the Cefni reservoir to be pumped through temporary network connection to the north Wales mainland. In addition we made further links to support Cwellyn treatment works from Mynydd Llandegai treatment works and allow us to balance the resource between Llyn Cwellyn and Llyn Ffynnon Llugwy. These actions significantly increased the resilience and conjunctive nature of the zone and has given us confidence in our operations whilst maintaining good water quality to our customers. We are planning to make these network enhancements permanent over the next few years with the knowledge that the temporary works can be reinstated at any time if needed.

In a similar way, we added connectivity between our Llyn Harlech and Barmouth zones and our Alwen Dee and Clwyd Coastal zones. Some innovative thinking allowed water from our Cilfor water treatment works in the Llyn Harlech zone to feed water southwards, supporting the Rhiwgoch treatment works in delivering water to the Barmouth zone. We will now merge these two zones within future Plans and have shown the increased resilience that this provides within the risk sections of this report.

A number of network enhancements were made between the Alwen Dee and Clwyd Coastal zones during the 2018 drought. These will again be made permanent and we will look at whether we can consider these zones as one into the future given the definition of a WRZ. These additional links are relatively small, so this may not be possible.

In south west Wales we reinforced a key network link across the Cleddau bridge in our Pembrokeshire zone to make sure that we could meet peak demands in that area if these had increased through the holiday period.

#### *Drought Risk Understanding*

Our prediction of reservoir levels using our water supply models generally performed well, although there are a couple of zones where we identified concerns with observed reservoir drawdowns being more severe than those predicted by our models, and so we will continue to improve the hydrological representation within our models.



## *Demand*

The drought of 2018 has reinforced our understanding of the peaking in demand by around 200 MI/d above normal levels during hot, dry years. We are analysing the 2018 data to understand if this is a more representative 'dry year' profile of demand to use when forecasting how our customers' water use may change in response to increased temperatures.

However, it has been difficult to gain information regarding the impact of our customer communications in helping to manage demand. We are currently part of a national study which aims to explore whether better understanding can be gained from the demand data collected by companies across Wales and England. This study will report on its findings in the summer of 2019.

## *Environmental Response*

We fortunately had no requirement to take additional water from the environment beyond our permitted levels, although as a precaution we did commence some environmental monitoring at the sites of greatest concern. We have updated our Environmental Assessment Reports based on the learning from 2018, and in sharing experiences with other water companies, have a better understanding of the likely timelines involved for implementation.

## *Customers*

With no disruption to our customers, the 2018 drought was successfully managed. However we have identified ways we can improve our communications to customers. Fuller details are set out in Chapter 3 but a few examples are the way we enhanced the water efficiency messaging on our website and also 'letter dropping' customers in areas where we had the highest concern for future water resource levels.

## *Operational*

During Storm Emma in 2018 a number of our customers faced a prolonged and highly regrettable period of service disruption. We identified that our remote network monitoring in rural areas was not consistent. This led us to invest in the implementation of monitors across the whole network, down to hamlet-sized residential areas: implementation is currently in progress.

Our response to the 2018 drought was highly adaptable to the changing circumstances by using our tanker fleet and deploying an extra 150 contract staff to undertake this work to ensure other day to day tasks were not impacted. We were the first company to provide drinking water to people not connected to the mains in a drought event, working in partnership with the Local Authorities who distributed bottled water provided by us. As well as this, we have a new communications role in our Silver Centre teams with a focus on identifying problem areas from social media traffic.

During the drought, we were able to mobilise significant additional staff from across the business functions to directly support our operational activity where needed. Much of this learning came from our response to Storm Emma earlier in the same year.

### *1.8.2. Testing of the Drought Plan*

The drought of 2018 provided us with a first-hand opportunity to test our existing Drought Plan and this updated Drought Plan reflects all of the learning that we gained. We previously ran a drought exercise in 2014, the recommendations from which were incorporated into the 2015 Plan. In the absence of a drought event between now and the next update to our Drought Plan in 2024, we will review the need for a drought exercise to ensure that our Plan remains current and up to date.



## 2. What Happens in a drought

### 2.1. How we know a drought is happening; Drought Indicators

Droughts are a prolonged period of little or no rainfall which, particularly when combined with hotter temperatures, put severe pressure upon our water resources and our ability to meet high customer demand for water. This Chapter details how we know when we are in a drought, demonstrated by our experiences during 2018.

Droughts by their very nature are highly variable in terms of their timing, duration and severity but they all begin in the same way with a period of below average rainfall that continues for longer than expected. There are a number of indicators that show when a drought is developing and an important requirement of a drought plan is to identify those that we will monitor and use to trigger drought action. We use the following indicators across our water resource zones;

- Rainfall
- River flows
- Reservoir storage
- Level of demand

Our regional water situation is monitored on a weekly basis and provides both rainfall and reservoir storage data. This is circulated widely both within Welsh Water and shared with external stakeholders, including Natural Resources Wales (NRW) and Environment Agency (EA). Routine hydrometric monitoring is also carried out by these two organisations and they share with us relevant data for rainfall and river flows. We also track zonal and sub-zonal demand across our water supply network on a daily basis.

A comparison of these indicators under current conditions against historical norms provides a measure of the drought severity.

#### 2.1.1. Rainfall

The amount of rainfall that we receive affects the performance of our raw water resources and so we closely monitor the quantities that land in our reservoir and river catchments. Lower than average rainfall is an indication that our supplies may come under stress and will provide less water than normally available. One or two consecutive months of below average rainfall will not cause water supply issues but as in the drought of 2018, this will raise significant concerns in case the dry weather continues.

The assessment of rainfall data helps us to understand the severity of the drought event we are facing and we feed this information into our water resource models to gain a prediction of the likely impacts upon our supplies. Figure 4 is an example taken from NRW's Monthly Water Situation report<sup>4</sup> which shows the rainfall for June 2018 across Wales, as a percentage of the long term average, highlighting the severity of that particular month with rainfall volumes being some of the lowest on record.

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<sup>4</sup> [https://cdn.naturalresources.wales/media/685980/nrw-monthly-water-situation-report-june-2018\\_english.pdf?mode=pad&rnd=131755964040000000](https://cdn.naturalresources.wales/media/685980/nrw-monthly-water-situation-report-june-2018_english.pdf?mode=pad&rnd=131755964040000000)

Figure 5 is taken from the Centre for Ecology and Hydrology (CEH) UK Drought Portal<sup>5</sup> which looks at the severity of rainfall events at durations of 1, 3, 6, 12, 18 and 24 months on a specified month ending basis, compared to the long term average for the corresponding period.

In contrast to Figure 4 which shows just how dry the month of June was, Figure 5 shows that rainfall totals for the three months cumulatively (April, May, June) were just below the long term average for that particular period.

Assessment of rainfall is crucial in helping us to manage a drought. Its uses are as follows:

- 1) It aids with our communications to customers if we are encouraging them to conserve water. This is where Figure 4 is particularly useful.
- 2) We can compare the current rainfall conditions to historic records to help identify relevant forecast scenarios to run through our water supply models.
- 3) If we apply for Drought Permits/Drought Orders to help maintain storage then we need to demonstrate to our Regulators and Government we are experiencing “an exceptional shortage of rain (ESOR)”. The type of rainfall analysis presented in Figure 5 provides a good example of this and will form the basis of our assessment of ESOR to support any Drought Permit/Drought Order application.

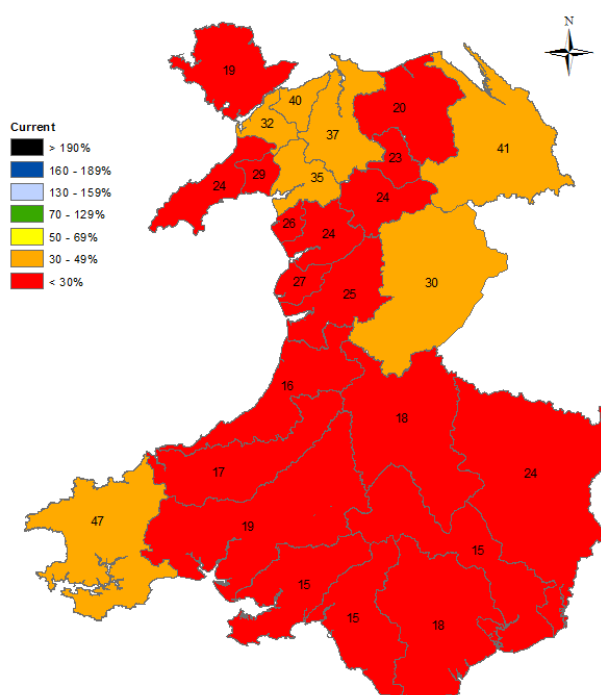


Figure 4 - Calculated catchment average June rainfall totals as a percentage of the 1961-90 June long term average<sup>6</sup>

<sup>5</sup> <https://eip.ceh.ac.uk/apps/droughts/>

<sup>6</sup> for Natural Resources Wales catchments, using NCIC (National Climate Information Centre) data (Source: Met Office © Crown Copyright).

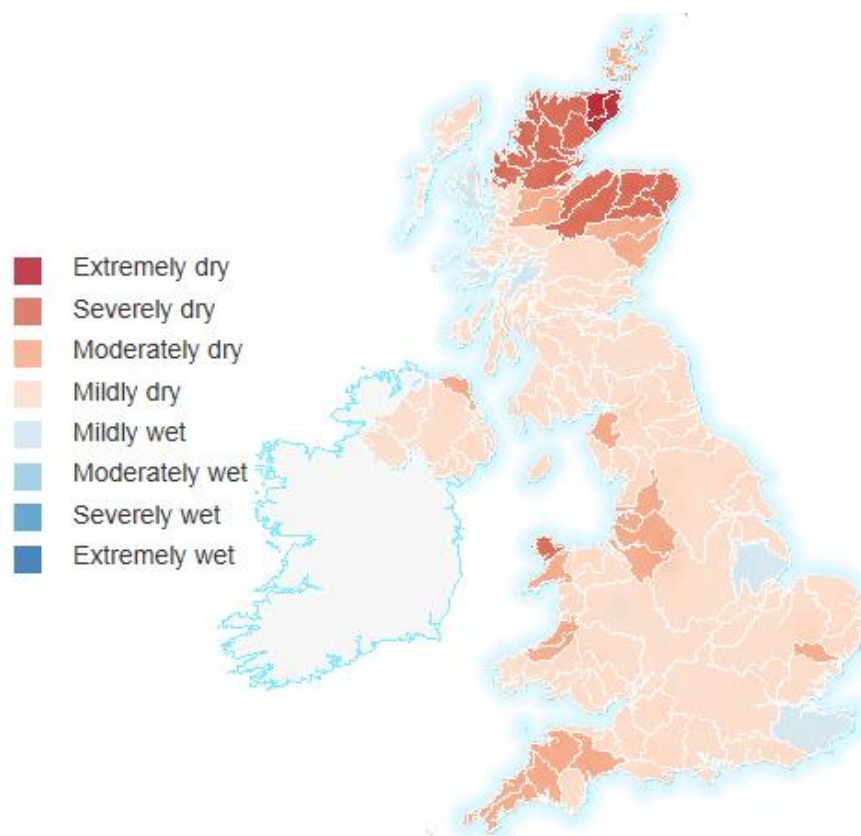


Figure 5 – CEH, Standardised Precipitation Index (SPI), three months ending June 2018

### 2.1.2. River flows

We take significant quantities of water from more than 20 river abstractions that operate either in conjunction with impounding reservoirs to provide a zone's water supply or are the entire source of supply for a zone. It is important therefore that we monitor the river levels upstream of our abstraction sites to be certain that the assumptions we have made regarding water availability are accurate. Many of our river abstractions have licence conditions that restrict the volumes we can take during periods of low river flow. It becomes more critical during a dry period when flows are low and the riverine ecology is placed under environmental stress, that we maintain compliance with our abstraction licence conditions so as not to worsen the situation.

### 2.1.3. Reservoir storage

Although rainfall and river flows are a primary indicator of drought these can only provide an understanding of current hydrological conditions and not the complete water resources situation, which is also dependent upon water captured within our reservoirs. Reservoir storage levels are monitored through our regional telemetry system and reported on a weekly basis in the water resource situation report.

Most of our reservoirs are managed by operating control lines that indicate when storage levels are below normal for the time of year. These are used each year to trigger normal operational changes in order to optimise the use of stored water and to balance reservoir storage. Under normal water resource conditions and reservoir operation, the amount of water in storage in our reservoirs declines during the summer months and recovers again over the winter period.

In addition to the operating control lines, Drought Action Zones have been developed for reservoirs across our WRZs. These action zones indicate when storage levels are reduced to a volume that may require the implementation of drought actions to preserve water supplies. The control lines are used as triggers for implementing these (see section 2.2).

#### 2.1.4. Groundwater levels

Although groundwater accounts for less than 5% of our total water supply, locally it is often 100% of the zonal supply. Using our network of observation boreholes, we monitor levels in and around our abstraction site to assess any risks from depleted groundwater levels which may impact the volumes that we can pump from our boreholes. Figure 6 is an example of how we tracked and reported on groundwater levels during 2018 at one of our production boreholes in the Vowchurch WRZ. We have no evidence to suggest that the supply from our groundwater sources have been impacted historically but the evidence for this is limited.

We have determined the Deepest Advisable Pumped Water Level (DAPWL) of our boreholes in accordance with UKWIR guidance<sup>7</sup>. Where known, we set the DAPWL at pump cut-outs or physical features of the boreholes that should not be dewatered (e.g. adit levels or significant inflow horizons). Where information is sparse or uncertain, we set the DAPWL at 70% of the saturated aquifer thickness, and use a level of 50% as an indicator level.

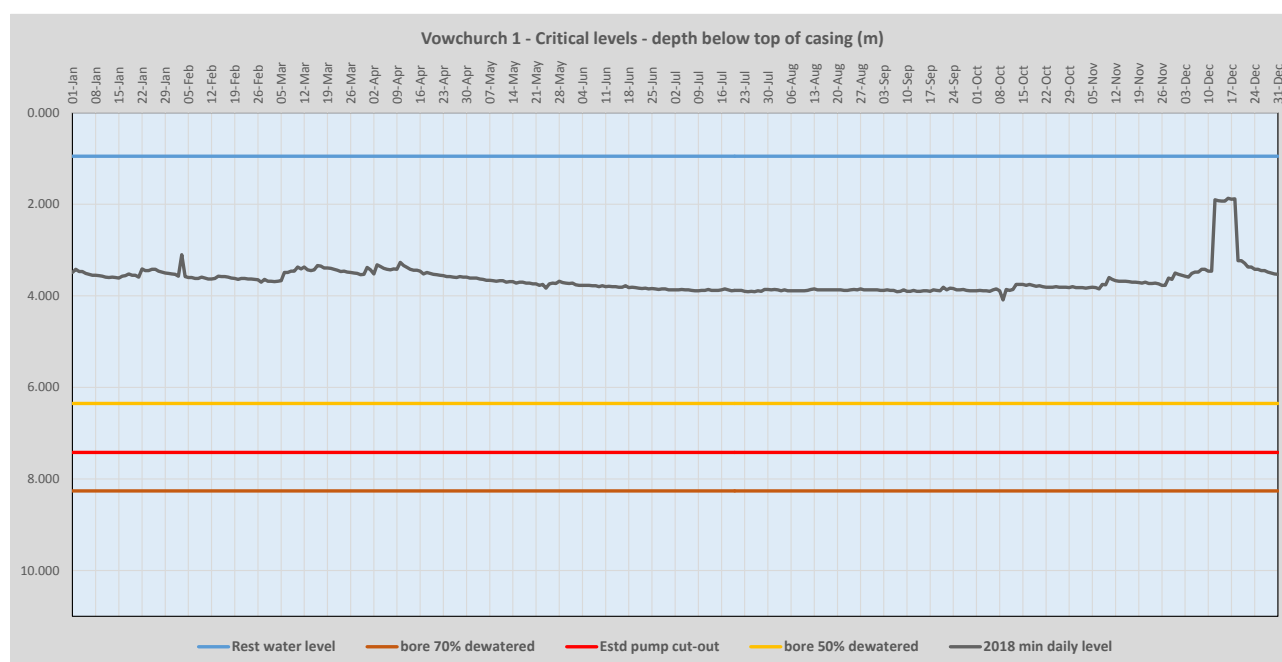


Figure 6 – Monitoring of Vowchurch borehole levels during 2018

<sup>7</sup> UKWIR (2002). A Methodology for the Determination of Outputs of Groundwater Sources. Report ref:95/WR/01/2

### 2.1.5. Demand and abstraction

During dry weather conditions, customer demand increases. As demand increases, so does the pressure on our water resources. Abstraction and demand can therefore be used to indicate when our supply systems are being stretched. This is particularly important in WRZs where there is no reservoir storage as demand should not exceed the capability of the supply system in these zones.

In accordance with our abstraction licence conditions, we record the volume of water abstracted from each of our sources. Additionally, we continuously monitor the demand from our water treatment works and report this data on a daily basis using our telemetry network. In WRZs without impounding reservoirs, triggers are set in relation to supply capability in order to ensure that demand management activity is undertaken where necessary if developing drought conditions occur (see section 2.2).

## 2.2. When we take action in a drought; Drought Triggers

It is important to establish when action should be taken during droughts to protect public water supply. We have developed drought triggers to identify when we should consider implementing specific drought actions to reduce demand and, if necessary, obtain additional water resource. These triggers are used as decision making tools as part of the overall drought management process through our internal 'Gold' and 'Silver' command centres and external 'Drought Liaison Group' governance. In a drought situation, professional judgement, drought scenario modelling and available data and information in the form of the drought indicators discussed above, will also be used in the drought management decision making process.

Drought indicators have been developed to identify when the water resource situation is moving into a drought. Drought trigger levels have been defined, aligned with drought guidance, to ensure that that drought actions are proportionate to the level of drought risk. These are:

- Stage 1 - Normal operation
- Stage 2 - Developing drought
- Stage 3 - Drought
- Stage 4 - Severe drought
- Stage 5 – Emergency Measures

This section describes the trigger levels we use, based upon reservoir storage and water demand.

### 2.2.1. Reservoir drought triggers

With the majority of water supply originating from our impounding reservoirs, the monitoring of storage levels is critical in assessing our capability at any point in time to meet customer demands if drought conditions prevail. We track the levels in each of our reservoirs, as shown by the black line in Figure 7, against a series of pre-defined "drought control lines". These help us to understand our level of risk and the actions that we should be taking. These actions are described further in Chapter 3.

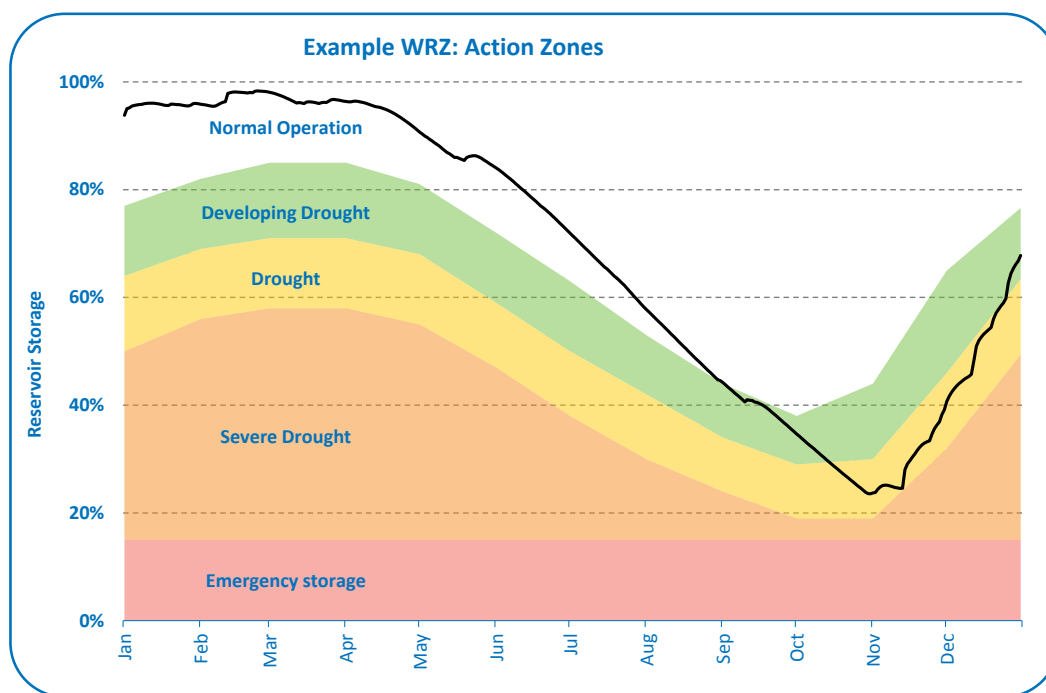


Figure 7 – Example WRZ Drought Action Zone Plot

### Normal Operation

Over the late Autumn/Winter period our reservoirs will typically fill and overtop due to the higher volumes of rainfall we generally receive at this time. It is important that we make best use of our cheapest and environmentally preferred water sources during this period which are predominantly our impounding reservoirs. This is due to the lack of pumping needed with stored water treated in upland areas and gravitated down to customers.

We use our lower level, geographically speaking, river sources under these conditions but they are operated below their peak capacity. If reservoir storage levels are 'high' then we will look to use our supply systems as cost efficiently as possible but in line with operating rules that are designed to not overdraw the resource and leave us vulnerable to dry weather.

As storage levels fall we start taking action to maximise the amount of water resource by increasing the use of the lowland river and stream sources which in turn preserves our upland storage in case of drought.

### Developing Drought

As we encounter a drought our reservoir storage will fall below that normally expected for the time of year. This is because less water than normal will be captured by reservoirs under dry conditions whilst the water demand leaving the reservoir stays the same or increases. We monitor this position and, as we move towards the 'Developing Drought' action zones of our reservoirs, the focus of operation switches to not only preserving and balancing water resource but to actions that will manage demand.

In general, we continue to reduce the amount of supply from our more vulnerable sources (generally our smaller, upland impounding reservoirs) and increase the supply from our lowland river sources or those impounding reservoirs with larger storage.

This full maximisation of preferred resources can require significant adjustments to our treatment works output and the reconfiguration of our trunk mains networks, and so great care and planning is needed to ensure that the transition to this new configuration is, from our customers' perspective, seamless. We may also look to deliver new infrastructure schemes or use water tankers to resolve any localised issues.

At this stage we will be increasing our demand management effort through increased and targeted leakage control and/ or pressure management. We will also be increasing our messaging to inform customers of the current water situation and the need to protect water supplies and the environment.

It is therefore, essential that our 'Silver' and 'Gold' command centres are established to manage this change process. We will also make our regulators aware of the situation and form appropriate lines of communication with Government, industry groups and our regulators. The 'Gold' and 'Silver' command centres manage the development and delivery of action plans with the objective of maximising the water resource available to meet customers' need whilst taking a measured response to managing customer demand.

### *Drought*

If dry weather conditions persist, we will be aware through our water situation monitoring that we are encountering an exceptional drought event. For our systems this will be an event that is likely to occur greater than one in every 20-60 years dependent upon the Water Resource Zone.

Our storage levels will continue to decline into the "Drought" action zone and alongside our operational actions, we will take further action to preserve storage until levels recover back to normal. We will have introduced all supply side measures that do not need to take more water from the environment than our legal entitlement and will also have maximised our effort on network leakage reduction.

The next stage in this process is to seek to implement a Temporary Use Ban across pre-defined zones (see Chapter 3), which will restrict certain uses of water. This is inevitably a difficult decision as this will impact directly on some of our customers, but once made we will work with Welsh Government and Natural Resources Wales to effectively communicate the need to increase demand management.

Within this "Drought" action zone we may also submit applications to our environmental regulators (Natural Resources Wales and the Environment Agency) to allow us to gain additional water over that currently permitted, as described in Chapter 5.

It will be clear to the general public at this stage that water supplies are under stress and this will doubtless attract both media and Government interest.

### *Severe Drought*

There would need to be very dry weather patterns for an exceptionally long period for reservoir storage levels to fall in to the 'Severe Drought' action zone. Our actions will be proportionate to such severe weather and we would seek further help from our customers, both domestic and non-domestic through implementation of a 'Non Essential Use Ban' to restrict certain public and commercial uses of water. Assuming our Drought Permit/Drought Order applications have been successful we would implement these schemes immediately.

Our planning for drought includes a reserve supply of water known as 'Emergency Storage'. This volume is designed to meet around 30 additional days of customer demand, as well as meeting any environmental requirements. Reaching the stage where this is the only storage we have remaining in our reservoirs is an indication that we are in an exceptional drought event and we may need local extreme supply side measures in order to preserve supplies for as long as possible.

Of our twenty four WRZs, the drought status of fourteen is based wholly upon our reservoir storage position, as shown in Table 3.

Water Resource Zone	Reservoirs with Drought Action Zones
<b>North Eryri/Ynys Mon</b>	Llyn Cefni, Llyn Ffynnon Llugwy Llyn Alaw , Llyn Cwellyn (all combined)
<b>Clwyd Coastal</b>	Llyn Aled & Aled Isaf combined
<b>Dyffryn Conwy</b>	Llyn Conwy, Llyn Cowlyd
<b>Alwen Dee</b>	Alwen
<b>Bala</b>	Llyn Arenig Fawr
<b>Blaenau Ffestiniog</b>	Llyn Morwynion
<b>Barmouth</b>	Llyn Bodlyn
<b>Lleyn Harlech</b>	Llyn Cwmystadrlllyn & Tecwyn Uchaf combined
<b>South Meirionnydd</b>	Llyn Cynwch
<b>North Ceredigion</b>	Llyn Craig y Pistyll & Llyn Llygad Rheidol combined
<b>Mid &amp; South Ceredigion</b>	Llyn Teifi Llyn Egnant & Pondygwaith combined
<b>Pembrokeshire</b>	Llysyfran, Rosebush
<b>Tywi Gower</b>	Llyn Brianne, Ystradfellte, Crai
<b>SEWCUS</b>	The 'Big 5' – (Taf Fawr, Taf Fechan, Usk, Llandegfedd, Talybont all combined)

*Table 3 – WRZs that use reservoir storage to indicate drought status*

### 2.2.2. Abstraction and demand triggers

In a number of Water Resource Zones, our primary concern is about the capacity of our infrastructure to meet increased demand from customers, rather than the availability of the raw water. Our Water Resources Management Plan and annual performance data looks at the capability of our systems to meet peaks in demand. It is therefore unlikely that we will encounter such difficulties but to be prudent, in case customer behaviour is outside of our planning assumptions, we have set water demand related triggers.

As an example, Figure 8 shows the increased demand experienced during summer 2018 compared to the maximum treatment capability we had available to us, in our Llyswen WRZ. Demands peaked around 3.4 MI/d in June 2018, compared to a potential limit of 4 MI/d. The Llyswen WRZ is supplied from an abstraction point on the River Wye and Figure 9 shows that at the nearest gauging station a few km upstream at Erwood, the minimum flows recorded in the River Wye at that point are around 80 MI/d. Therefore, water resource availability is never going to be a constraining factor in the Llyswen zone, only the limitations of our assets in the event that customer demands increase above our infrastructure's design capability.



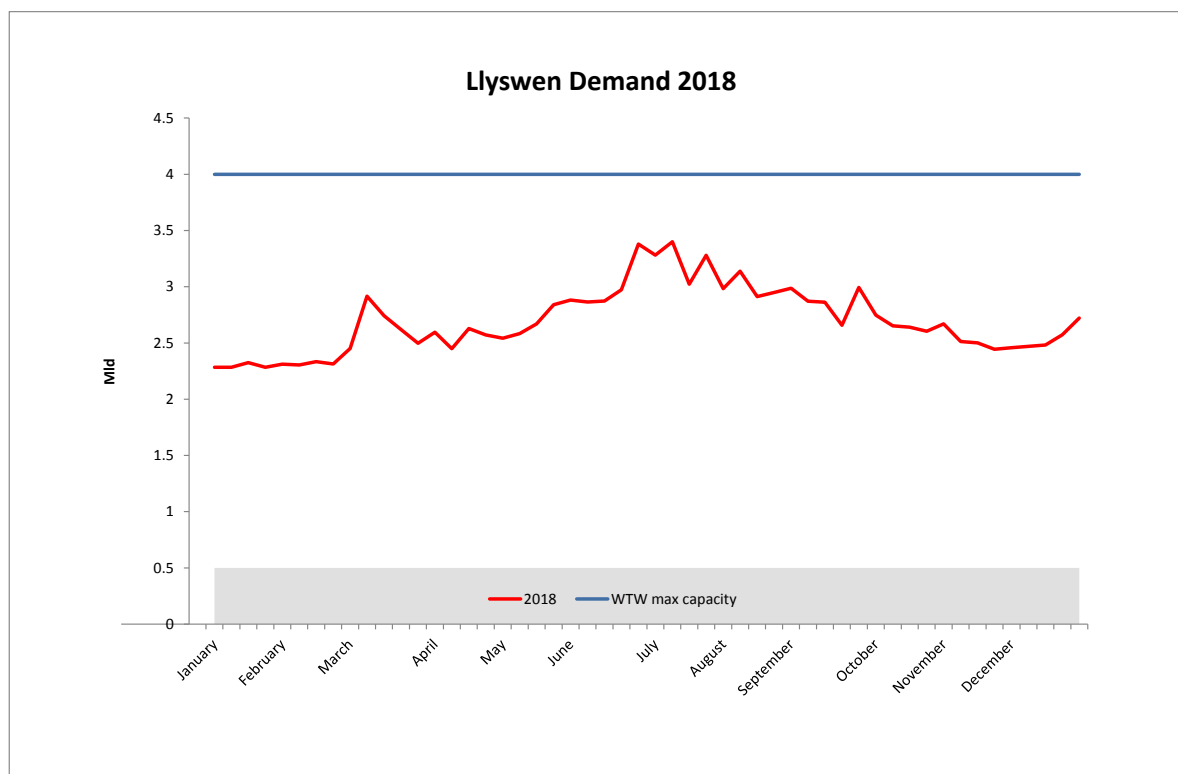


Figure 8 - 2018 Demand for the Llyswen WRZ vs maximum treatment capability

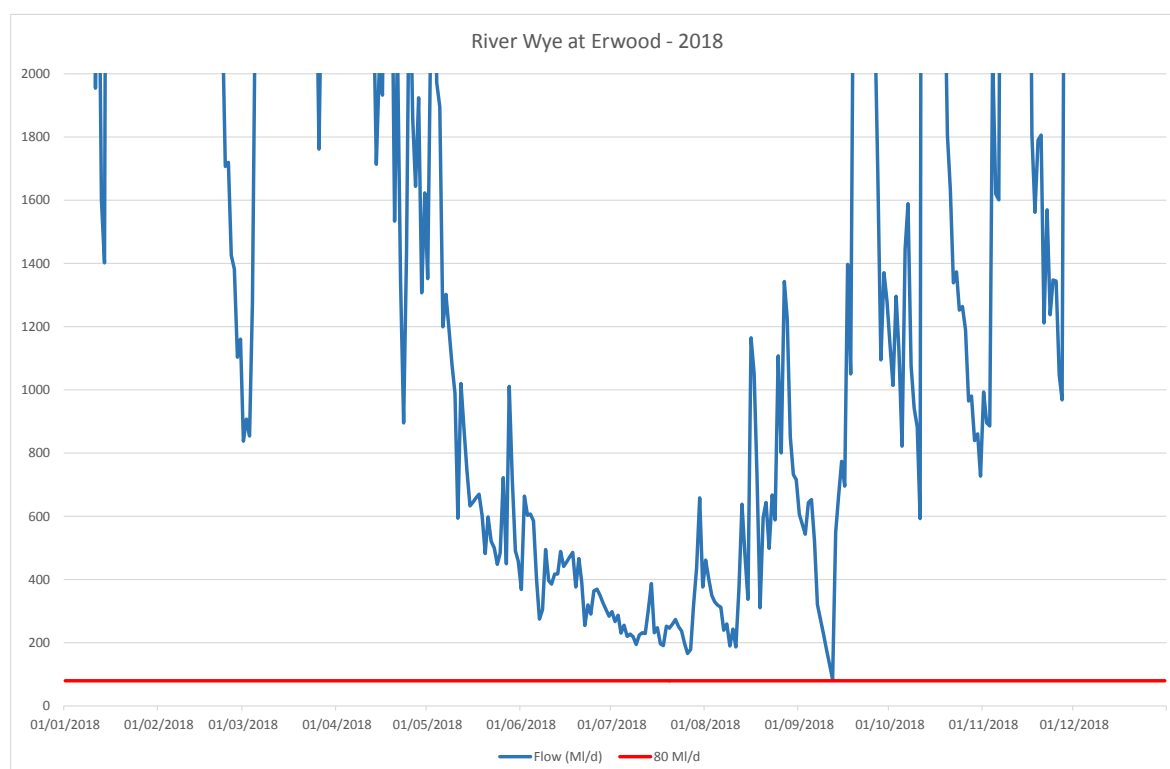


Figure 9 - River Flows at Erwood gauging station (data from NRW)

We have therefore looked at our peak supply capability for the zones that do not have significant reservoir storage and developed demand triggers for action to mitigate against meeting unprecedented levels of demand. Figure 10 is an example of these triggers that have been produced for our Elan/Builth and Llyswn zones combined, with the dashed blue line representing our current limit of water treatment works capability - if demands are reaching this level then we need to take actions to address this.

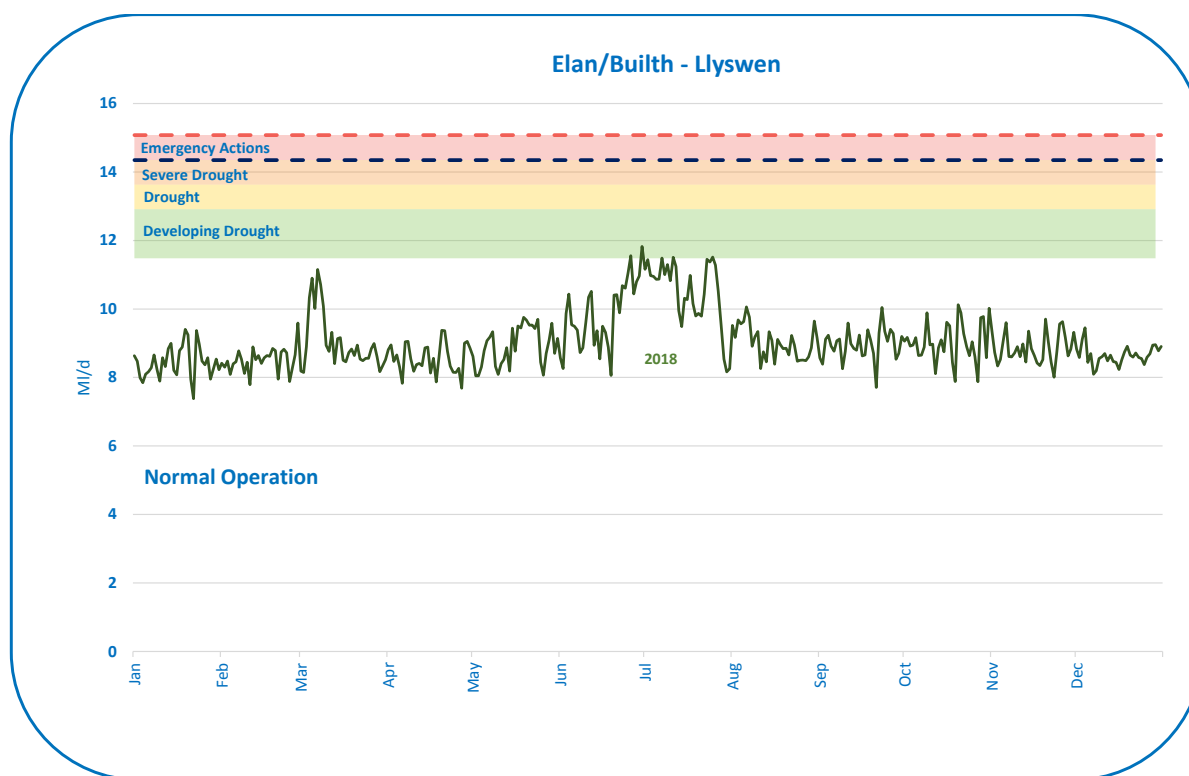


Figure 10 - Elan/Builth-Llyswn Drought Action Zones

In terms of monitoring, as discussed earlier in this Chapter we continually track our demand levels and from experience, the point at which action might be needed to manage peaks in demand is mid-June. However, from the spring bank holiday in late May we review the current and forecast weather information and examine the associated increases in demand against our trigger levels.

The next key date in monitoring demand and preparing to manage peaks is the first week of July, which is approximately two weeks in advance of the start of the school summer holidays. This date is important as we anticipate a lead in time of about two weeks once a media campaign is started, before it impacts demand. Hence, starting a campaign two weeks before the beginning of the summer holidays affords us enough time to reduce the summer peak. If weather driven demand has remained high to the end of June, a media campaign would be started in July along with a two week consultation on how we propose to implement TUBs.

Throughout July, we would closely monitor the impacts of the media campaign on demand and track any savings. If demand remains high through this period, then the end of July would mark the point at which we would implement TUBs.

Table 4 below shows these WRZs and the type of source. There are times in the year when demand rises predictably, such as summer holidays and so it is important to monitor customer demand to ensure that normal hot weather isn't misinterpreted as developing drought.

Water Resource Zone	Source of Water
<b>Tywyn Aberdyfi</b>	River
<b>Ross on Wye</b>	River (technically a bulk import of treated water)
<b>Elan / Builth</b>	Combined river and reservoir
<b>Hereford CUS</b>	Combined river and groundwater
<b>Llyswen</b>	River
<b>Monmouth</b>	Combined river and groundwater
<b>Pilleth</b>	Groundwater
<b>Brecon / Portis</b>	Combined reservoir and groundwater
<b>Vowchurch</b>	Groundwater
<b>Whitbourne</b>	River

*Table 4 - Non-storage zones and source types*

Using the example in Figure 10 we have produced four drought action zones for the above ten zones. As Tywyn Aberdyfi is a relatively isolated zone and the main drought risk relates to availability of raw water, the drought action zone has defined triggers based on flows in the Afon Fathew. We have developed a standalone set of Drought Action Zones for our Brecon-Portis WRZ as support could be provided from either our Tywi or SEWCUS WRZs, should customer demands exceed our treatment capability and tankering of additional supplies is required.

We have produced a combined set of triggers for the Elan-Builth/Llyswen WRZs as their geographic proximity to each other means that tankering support would be provided to and from these zones as required. Using the same principle but on a larger scale, we have developed a combined set of triggers for our Hereford/Monmouth/Ross/Pilleth/Vowchurch/Whitbourne zones as their geographic locations means that tankering support would be provided from within this group, principally from our Broomy Hill treatment works in Hereford.

## 3. Managing a Drought

### 3.1. Introduction

Chapters 1 and 2 illustrate how we will know when we are in or approaching a drought, together with our approach to triggering drought actions. This Chapter details how we will mobilise in response to a drought event, including how we will communicate to our customers, building on our 2015 Plan and our experiences of the 2018 drought.

The approach we take within Welsh Water to managing all incidents, whether they are short term events such as a large water supply main burst, or longer term events such as a significant asset outage, is to try and safeguard our customers' supplies whilst ensuring that our actions have minimal, if any, effects upon the environment.

Applying this approach during a drought event means we firstly take actions to preserve resource that are immediately available to us, such as reconfiguring our supply networks and increasing our leakage activity.

We escalate communications activity when incidents or our actions in response to these, impact upon our customers. In the case of drought, we escalate communications activity to ask for our customers' support in using water wisely or to inform them of water use restrictions.

Given the relatively wet climate of Wales, we know that an initial spell of dry weather can quickly be replaced with rainfall and so we need to exercise some caution before conveying these concerns to our customers.

As described in Chapter 2, our actions should be proportionate to the level of risk that our customers face. Our approach will ensure that we only seek additional water from the environment, via the use of Drought Permits/Drought Orders, once all other options have been exhausted and appropriate customer demand restrictions are in place.

When we encounter local issues particularly in our smaller zones, our experiences during summer 2018 have given us confidence that we are able to use road tankers to move water between our supply systems to support zones experiencing high demands or low water resources.

We are also able to quickly mobilise delivery of new infrastructure to, for instance, improve our network connectivity. As an example, we enhanced the connectivity between Anglesey and the mainland in North West Wales in the drought of 2018, to help better manage our supplies and reduce the risk of customer and environmental impact. We have taken forward the learning gained from our management of the 2018 drought and this improved approach is set out in the following sections.

### 3.2. Drought Management Structure

We recognise that multiple events occurring simultaneously increase the magnitude and severity of an emergency situation. Droughts are normally widespread and can involve complex operational changes across our region. In an incident, our procedures require the separate but integrated operation of the following internal command centres:

Centre	Purpose
<b>Retail Centre</b>	for customer communications
<b>SMART 'HUB'</b>	for operations communications and real-time operations data
<b>Silver Centre Command</b>	for local tactical and operational management and response
<b>Gold Centre Command</b>	for strategic response and management
<b>Crisis Management Team</b>	for executive management and external agency support

*Table 5 – DCWW Incident Centre Setup*

Based on the above structure and drawing on our experience of managing the February/March 2018 so-called 'Beast from the East' event, we implemented a similar structure during the summer of 2018, as shown in Figure 11. This provided effective coordination and management of all internal and external activities related to the 2018 drought so we are therefore confirming this as the approach we would take during future drought events.

During the drought of 2018 one of our key external activities (in accordance with the NRW Drought Plan) was to provide representation on the "All Wales Drought Liaison Group". This group was led by Welsh Government and attended by Natural Resources Wales together with representatives from other relevant sectors. The Group met weekly to discuss the current drought situation, the actions that were being taken by all organisations including customer and stakeholder communications, and where support could be provided across sectors. The establishment of this Group provided a key focal point for drought management in Wales and at each meeting our Managing Director of Water Services was able to provide reassurance that all necessary actions were being taken to maintain customer supplies whilst safeguarding the environment. Welsh Government would coordinate the interactions between this Group and Local Resilience Forums.

In addition, and in accordance with the Environment Agency Drought Plan, we provided representation to England's "National Drought Liaison Group" although this was less frequently attended as we were not suffering from any form of drought in our English supply areas in 2018. We recognise that in future droughts this may not be the situation and so representation on this Group provides an important forum for us to raise any concerns in the border areas of Herefordshire and Deeside that we supply.

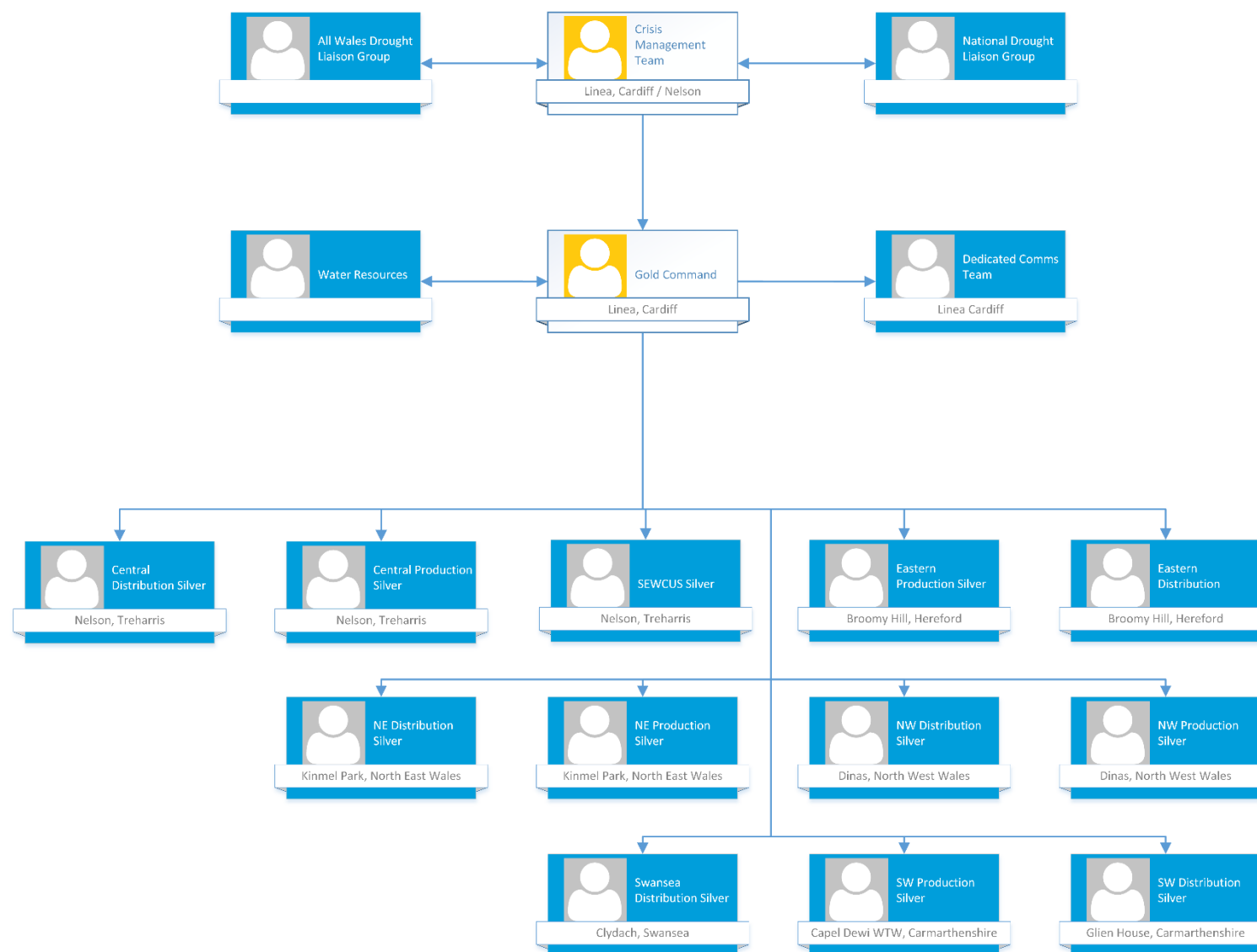


Figure 11 – Welsh Water Internal Drought Management Structure

Table 6 below identifies the core group of the Welsh Water Executive that would form the 'Crisis Management Team' with specific expertise from within or outside the business invited to join if required.

The Crisis Management Team will be responsible for:-

- High level liaison with external bodies e.g. Welsh Government.
- The strategic co-ordination of companywide emergencies
- Fast track approval of major funding
- Large scale media response
- High level decision making

Job Title
Chief Executive Officer
Managing Director Water Services
Managing Director Wastewater Services
Managing Director Household Customer Services
People and Change Director
Director of Customer Strategy and Communications
Director of Capital Delivery

*Table 6 – Welsh Water Crisis Management Team*

Table 7 identifies the leadership staff that would form the 'Gold' centre incident management team. The Gold Command centre is responsible for providing a strategic overview of drought management across our three operational areas (North, South West, and South East) and is the focal point for external liaison with Government and regulators. The overall function of the Gold Centre during a drought event is to give direction to our operational and capital delivery teams on which actions to take within each supply area such as setting water production targets, the re-configuration of our supply network, establishing the focus of our leakage effort and the delivery of any schemes necessary to augment our existing water supplies. The Gold Centre will direct on the level of communication activity required with our customers and also represents Welsh Water on the "All Wales Drought Liaison Group" and the Environment Agency led "National Drought Steering Group" for England.

Area of Responsibility	Job Title	Department
<b>Drought Management</b>	Managing Director of Water Services	Water Services
<b>Water Resources</b>	Head of Water Resources	Water Services
<b>Demand Management</b>	Head of Water Engineering	Water Services
<b>Communications</b>	Head of Strategic Communications	Communications
<b>Water Production</b>	Head of Water Production	Water Services
<b>Water Distribution</b>	Head of Water Distribution	Water Services
<b>Water Quality</b>	Head of Water Services Science	Water Services
<b>Scheme Delivery</b>	Head of Alliance Water Programme	Capital Delivery
<b>Reservoir Management</b>	Head of Dam Safety	Water Services
<b>Emergency Planning</b>	Director of Operational Services	Water Services

*Table 7 – Welsh Water Gold Centre Drought Management team*

### 3.2.1. Silver Command Centre

Reporting directly in to the Gold Command Centre are seven Silver Command Centres that are responsible for undertaking the necessary supply side actions within their area. As shown in Table 8, for management purposes our three operational areas are further subdivided to create more localised centres that can respond quickly to the drought as it progresses and deliver the necessary actions.

Area of Responsibility	Job Title	Department
<b>Water Resources</b>	Area Water Resources Manager	Water Services
<b>Water Production</b>	Production Manager	Water Services
<b>Water Distribution</b>	Distribution Manager	Water Services
<b>Treated Water Quality</b>	Process Science Manager	Water Services
<b>Raw Water Quality</b>	Catchment Risk Coordinator	Water Services
<b>Demand Management</b>	Leakage Delivery Manager	Water Services
<b>Scheme Delivery</b>	Capital Delivery Lead	Capital Delivery
<b>Reservoir Management</b>	Dam Safety Engineering Manager	Water Services

*Table 8 – Welsh Water Silver Centre Drought Management Team*

### 3.2.2. Welsh Water Drought Responsibilities

#### *Operational Services*

To effectively manage any incident it is vitally important that we have robust, up to date information on our operational systems. Our Operational Services team ensures the provision of continuous monitoring of our water treatment works and network for management and control of our water supply systems. Our Smart Hub monitors the telemetry systems across all our sites and escalates any warning alarms to our Water Production and Distribution teams so they can respond accordingly. They are responsible for control centre management and the links to our call centres dealing with day to day customer care.

To support the management of an incident, our Emergency Planning Team supports our incident centres, manages our road tanker fleet, the distribution of bottled water and any other support that may be required to help maintain customer supplies.

#### *Water Services Science*

Our Water Services Science Team (which includes our Catchment and Process Science teams) is responsible for ensuring, as far as possible, the quality of raw water that comes into our water treatment works and the quality of the water received by our customers. Should any standby or new sources of raw water be brought into operation during a drought, our Catchment Team will ensure that sufficient sampling and risk assessment (through the form of a Drinking Water Safety Plan) is in place prior to us starting to use these new supplies. The Process Science Team gives advice on any adjustments required to the treatment processes (e.g. increased chemical dosing) to ensure that we continue to supply high quality drinking water even if the quality of the raw water supplied to the works has been changed.

#### *Water Resources*

The Water Resources Team is responsible for tracking the water situation during a drought and providing short term (week to 6 month) forecasts of the likely water resource position. Reports are produced weekly



for the Gold Centre to review and then instruct the Silver Centres on the actions to be taken in response to the updated forecasts.

These reports will advise on the quantity of raw water available and how this is forecast to change through the drought. The Water Resources Team will also lead on the application process for our Drought Permit/Drought Order schemes and will act as the key point of contact with local NRW and EA staff, together with overseeing any environmental monitoring and mitigation activities that are required.

### *Dam Safety*

The Dam Safety Team will be responsible for any adjustments required to the valves that control both the releases we make to the downstream river (compensation and regulation) and those that control the supply of water into our treatment works. Given the importance of our impounding reservoirs for public water supply, it is crucial that any change in their operation (e.g. change in the point of abstraction to the treatment works) is carefully managed to ensure no risk to the integrity of the dam structure.

### *Water Production*

The Production Team operate our 62 water treatment works (WTW) and associated raw water pumping stations. During a drought they are responsible for increasing/decreasing the amount of water produced at our WTW in response to the changing raw water resource position and ensuring that the water into our network is maintained to high standards.

### *Water Distribution*

The Water Distribution Team is responsible for managing and operating our network of 27,400km of water mains. This network also includes around 570 treated water reservoirs and 700 water pumping stations. The Water Distribution Team will undertake the series of actions in our network that effectively re-zone supplies, changing the source of supply to our customers. Changing the operation of a water supply network can lead to water quality issues if it is not managed correctly and so our Water Distribution Teams ensure these activities are undertaken during a drought with no impact to customers.

### *Water Engineering*

Within Welsh Water, responsibility for delivering our demand management activities sits with the Water Engineering team. During a drought they are responsible for increasing and focusing our leakage detection and repair activity and enhancing water efficiency effort, focussing on those areas experiencing high demands and/or reduced water resource.

### *Capital Delivery*

During the summer of 2018 our Capital Delivery team played a key role installing new assets (water mains, pumping stations) that enabled us to better utilise our existing supplies. Any schemes that require new or upgraded infrastructure will be identified by the Water Resources/Water Production/Water Distribution teams and our Capital Delivery team will manage the construction and installation works.

## **3.3.Managing Water Demand in a Drought**

In order to assess the risk of needing to implement temporary use bans, non-essential use bans, options which take more water from the environment, or, as a last resort, water rationing, we make assumptions around the amount of water used during a drought. If water demand is greater than our assumptions, the risk of having to implement any of these options is higher than in our assessment. Furthermore, peaks in demand may also cause water supply difficulties if infrastructure outages occur. It is therefore prudent to

manage water demand during a drought as this will help to ensure adequate water supplies will be available and that any risk to the environment is properly understood and minimised.

We manage demand in two ways, firstly by limiting the wastage from our systems through increased and targeted leakage reduction effort and secondly, by influencing customer behaviour so that they use less water. The main actions available to us to affect customer behaviour are:

- 1) Advising customers on water efficiency
- 2) Imposing Temporary Use Bans
- 3) Imposing Non-essential Use Bans
- 4) Directly constraining the amount of water that can be taken by customers through more 'Extreme' measures.

These measures are increasingly restrictive on our customers and we time their implementation proportionately to water supply risk faced during a drought through the use of the triggers described in Chapter 2. The following sections provide background to our thinking and how these measures will be implemented and communicated to our customers.

### 3.3.1. UKWIR Code of Practice

An UKWIR project was completed in 2013 to provide a voluntary Code of Practice (CoP) and guidance to water companies on the implementation of TUBs and NEUBs. It provides advice on a potential staged approach to the implementation of restrictions with the aim of creating a more consistent approach between water companies across the Wales and England. This general approach seeks to minimise the social and economic effects of water use restrictions, with restrictions placed initially on domestic customers before affecting commercial customers.

This CoP was produced in collaboration with, and supported by representatives from regulators, consumer groups, trade bodies and customers. In order to collate an evidence base of the impact of the 2012 restrictions upon commercial customers, certain stakeholder organisations and industry groups were consulted to gain their views. The selection was made from a list of contacts that had made representations on the previous CoP, Company Drought Plans, and the imposition of restrictions in early 2012.

These can provide evidence on the impact of the drought on businesses, and feedback on the nature and phasing of communications that occurred. Discussions with the consultees centred on the potential impact that water use restrictions could have upon that particular commercial industry or sector, the concerns of the industry/sector and the desired outcome. The consultees that were contacted and provided feedback are as follows:

- Car Wash Association;
- Federation of Window Cleaners;
- Horticultural Trades Association;
- Turf Grass Growers Association;
- National Farmers Union;
- Racecourse Association;
- Kent Cricket Board;
- England Golf;

- Wandsworth Borough Council; and
- British Swimming Pool Federation.

The responses to consultation are provided in the CoP. We have signed up to this CoP. We agree with the four principles outlined in the CoP and have retained this thinking in our updated Plan. These are:

- Ensuring a consistent and transparent approach
- Ensuring that water use restrictions are proportionate
- Communicating clearly with customers
- Considering representations in a fair way

The CoP sets out how water companies can grant exemption from TUBs and NEUBs to certain customers. Customers who meet the criteria for these exceptions can continue to use water without restriction and do not need to make a representation to Welsh Water. The Code also endorses the use of representations whereby customers may make a case for not having to adhere to restrictions. Our proposals on representations are given later in this section. There are also five actions set out in the CoP that have been developed to help establish a more consistent approach in terms of implementing water use restrictions. These are:

- For water companies, regulators and government to work together
- To coordinate communications
- To adopt a common phased approach, considering socio-economic factors
- To adopt a common approach to exceptions
- To promote understanding and good practice

We will endeavour to work to these and in the summer of 2018 we maintained close liaison with Welsh Government and Natural Resources Wales as the dry weather continued. Although we believe that the core aspects of the CoP are still relevant, we recognise that the expectations of the water industry and our customers are changing over time. The code is likely to be updated in the future and, when that happens, we will take a view on any changes suggested and discuss them with our stakeholders.

### 3.3.2. Customer Research

During the preparation of our WRMP19, we undertook research<sup>8</sup> to measure customers' views on the types of water use restrictions that we should employ as part of either a TUB, for households, or an NEUB, for non-households. The output was a measure of their relative acceptability to customers.

The potential water use restrictions tested were directly based on those listed in section 76 of Water Industry Act 1991 (as amended by the Flood and Water Management Act 2010) in the case of TUBs, and on those in the Drought Direction 2011 in the case of NEUBs. Table 9 shows the water use restrictions tested in the research, by customer type.

Household Customers	Non-Household Customers
Watering a garden using a hosepipe	Watering outdoor plants on commercial premises
Cleaning a private vehicle using a hosepipe	Filling or maintaining a non-domestic swimming or paddling pool
Watering plants using a hosepipe	Filling or maintaining a pond

<sup>8</sup> Dŵr Cymru Welsh Water WRMP Research, Final Report, Accent/PJM Economics, December 2017

Cleaning a private leisure boat using a hosepipe	Operating a mechanical vehicle-washer
Filling a swimming pool or paddling pool with a hosepipe	Cleaning any vehicle, boat, aircraft or railway rolling stock
Drawing water using a hosepipe for recreational use	Cleaning non-domestic premises
Filling or maintaining a pond using a hosepipe	Cleaning a window of a non-domestic building
Filling or maintaining an ornamental fountain	Cleaning industrial plant
Cleaning household walls or windows using a hosepipe	Suppressing dust
Cleaning paths, patios or outdoor surfaces using a hosepipe	Operating a cistern in any building that is unoccupied and closed.
Cleaning other artificial outdoor surfaces using a hosepipe	

*Table 9 - Water use restrictions tested in the customer research*

### Customer Survey Results

The results are similar to those collected prior to our 2015 plan. They show that the restrictions that customers are most willing to pay to avoid are those which offer the greatest potential savings of water, namely bans on the use of hosepipes for garden use and car washing. The results for Temporary Use Bans are presented in Figure 12 and in Figure 13 for Non Essential Use Bans below.

### 3.3.3. Enhanced leakage reduction

#### Normal conditions

During normal weather conditions, our leakage strategy is based upon each Water Resource Zone achieving the targets laid out in our Water Resources Management Plan, based upon achieving the Sustainable Economic Level of Leakage (SELL) for the zone and our stakeholders' views. Company leakage is calculated on a daily basis and summarised into weekly, monthly and yearly values to enable an assessment of performance to be made and interventions to be implemented if required.

#### Drought Conditions

Our internal process to increase our leakage management as drought conditions continue is set out below. We will:

- Target leakage reductions beyond the levels agreed with our regulators.
- Increase our leakage detection and repair activity to reduce leak run times and increase targeting of customer side leakage.
- Increased customer communications to encourage the reporting of potential leaks either on the distribution network or customer side.
- Enhance our pressure management activity which will also include a review of existing levels of water pressure being delivered to customers and whether these can be reduced lower to deliver minimum levels of service, and beyond in cases of severe drought.
- Accelerate the delivery of new leakage repair schemes ahead of planned schedule.

Alongside our enhanced leakage activity we will increase our offering and distribution of water efficiency products using our existing engagement streams to encourage interest, such as our website and water efficiency portal. The website and portal would also inform customers of water saving tips. Our 'Cartref' project (summarised below) will also be targeted at customers in zones where there are concerns over the water resource position.

### 3.3.4. Influencing customer water efficiency

Welsh Water has already made a long term commitment to help reduce the amount of water used by our customers, called per capital consumption, which is outlined in our WRMP19. In order to achieve these reductions we have a programme of water efficiency projects which seek to deliver both messaging and physical interventions. The projects are targeted at an individual, community, regional or national level, dependent upon their nature. The projects include;

- Water audits - empowering customers to make a real difference to water usage. This might be through a DIY survey approach or physical presence in the property.
- Welsh Water's 'Cartref' initiative – providing targeted interventions, to improve water efficiency and product installation at a domestic level and targeting internal plumbing losses.
- Our award winning Schools Outreach Programme - the aim is for every student from age 5-11 to have some exposure to the water efficiency message.
- Product distribution – supplying our WRAS (Water Regulations Advisory Service) approved, water saving devices to targeted customers and at national events such as the Eisteddfod and Royal Welsh Show.

In addition, we have a programme of customer messaging each year to remind customers that using water wisely is the right thing to do as it helps us to maintain affordable customer bills and reduces our impact upon the environment.

We reinforce this work during a drought by enhancing our customer messaging and asking for voluntary restraint and supporting this through greater provision of water saving devices. This work is explained in greater detail in the section below on customer communication.

### 3.3.5. Temporary water use restrictions

The Water Use (Temporary Bans) Order 2010 provides water companies with powers to impose a range of temporary use bans of water by our domestic customers during a drought, without requiring a drought order (under section 76 of the Water Industry Act 1991). The Drought Direction 2011 sets out the range of non-domestic water uses that can be restricted under an Ordinary Drought Order (commonly known as a non-essential use ban (NEUB)).

### 3.3.6. Temporary Use Bans (TUBs)

During the initial phase of drought, our actions are intended to reduce demand by encouraging voluntary customer restraint on water use and enhanced leakage management. As we meet our 'Drought triggers' TUBs on water use may then be imposed following advertisement.

The results of our WRMP19 household customer research are presented in Figure 12 which shows our customers' willingness to pay to avoid these restrictions. This indicates which measures our customers are least happy to restrict relative to each other.

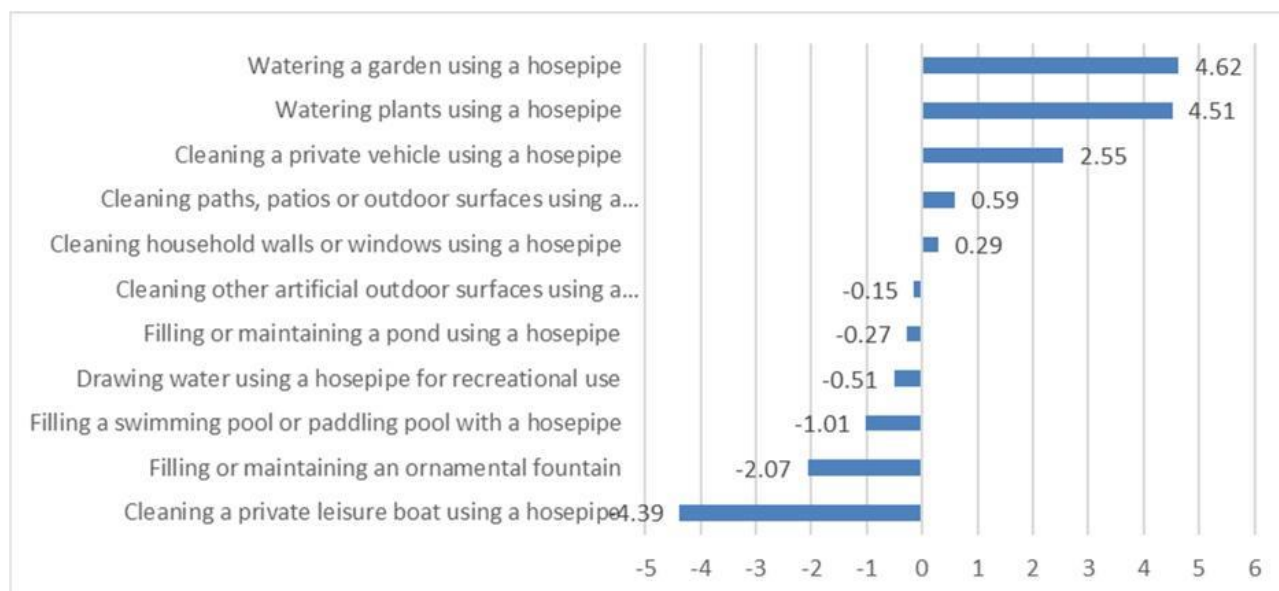


Figure 12 - WTP for water use types to be allowed during TUB -households

Our view has not changed that if restrictions are needed to be put in place then all of the allowable restrictions should be applied at the same time. This approach has the benefit of not discriminating between the uses our customers make of hosepipes and also avoids any confusion over the activities that are being restricted. This in turn will aid communication and provides the highest chance of managing customer water use which we believe is reasonable during very infrequent drought events.

Legislation sets out specific requirements for notifying the public prior to the introduction of the new TUB measures. Section 76B of the Water Industry Act 1991 (as amended) stipulates:

- Notice must be given to those affected (no time requirement is imposed)
- As a minimum, notice must be advertised in two newspapers circulating in the area to which the restrictions apply and advertised on our website

In regard to the phasing of Temporary Use Bans, we will look to retain maximum flexibility in terms of the activities we restrict and their timing and duration, together with the extent of implementation across our supply area. We need to ensure that any restrictions are effective and do not unnecessarily impact our customers for little or no benefit to our water supply.

We recognise that there is some merit in looking for consistency in imposition of TUBs between water companies, which is why we have signed up to the CoP covering these actions. However, all companies have also expressed the need for a flexible approach given that each drought is different and conditions across each company's supply area may be different.

The industry CoP identifies 3 types of exceptions whereby customers would not be restricted during the implementation of TUBs. These are:

- Statutory Exceptions that must be made to restrictions. These are specified through legislation and exempt restrictions for commercial uses of hosepipes, and on health and safety or environmental grounds.
- Discretionary Universal Exceptions agreed in line with the CoP to ensure a consistent approach to imposition of restrictions. These primarily relate to exemption of blue badge holders.

- Discretionary Concessional Exceptions which are granted by individual water companies. We will grant concessions on the grounds of protection of the environment and for those on our Vulnerable Customer list.

We have adopted a policy to maintain all exceptions once Drought Orders are in place to maintain clear and consistent messaging to our customers on water use restrictions, except in extreme drought circumstances where rescinding of certain concessions may be required.

In relation to cases of non-compliance with TUBs, any enforcement strategy or legal action would be subject to Welsh Water's Enforcement and Prosecution Policy, which takes a number of factors into consideration. When considering a matter for prosecution, Welsh Water complies with the Code of Crown Prosecutors. If customers wish to appeal in relation to the implementation of TUBs they are able to do so by application for Judicial Review of the order. Any customer wishing to pursue this route must take their own independent legal advice.

### 3.3.7. Non-essential Use Bans (NEUBs)

If the severity of the drought continues to increase following the implementation of TUBs, we may need to apply for an ordinary Drought Order to further restrict water use through the implementation of our non-domestic customers as allowed for under the Drought Direction 2011, commonly referred to as Non Essential Use Bans (NEUBs). The likelihood of needing these is set out in Chapter 4 but generally these restrictions would be imposed extremely infrequently with a 1 in 100 year drought return period or even rarer event being needed to trigger them.

The results of our WRMP19 household customer research are presented in Figure 13 which shows our customers' willingness to pay to avoid these restrictions. This indicates which measures our customers are least happy to restrict relative to each other.

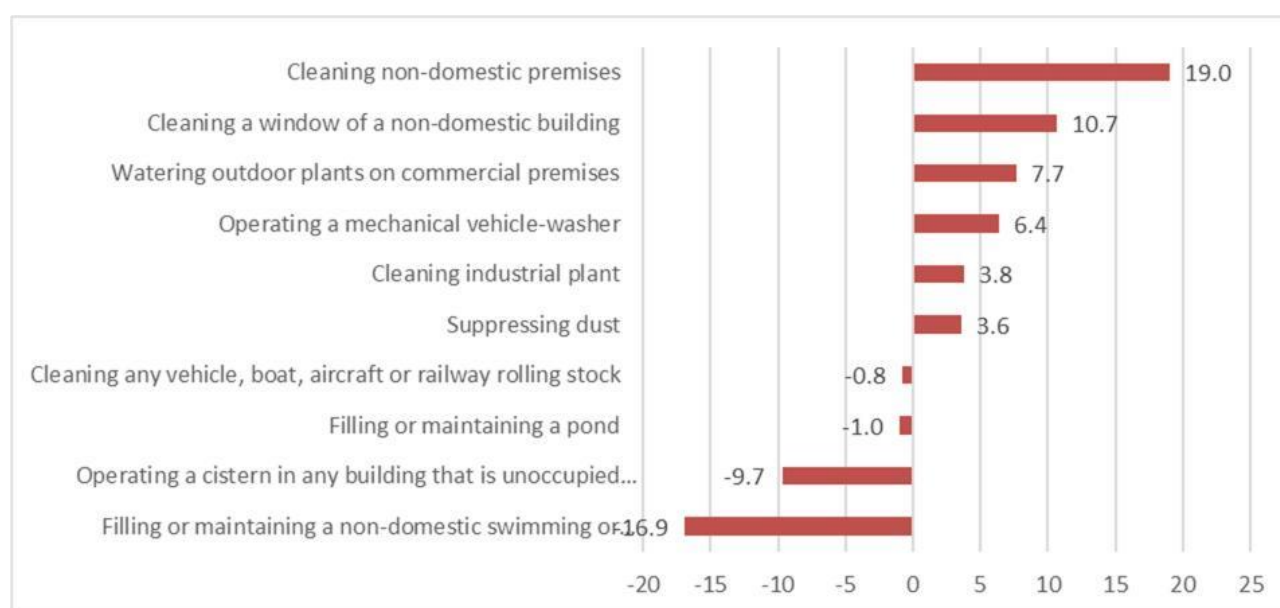


Figure 13 - WTP for water use types to be allowed during NEUB - non-households

Our view has not changed that if restrictions are needed to be put in place then all of the allowable restrictions should be applied at the same time. This approach has the benefit of not discriminating between the various non-essential uses of water, and also avoids any confusion over the activities that are being restricted. This in turn will aid communication and provides the highest chance of managing customer water use which we believe is reasonable during very infrequent drought events.



As per our approach to TUBs, we will look to retain maximum flexibility in terms of the activities we restrict and the timing and duration of these, together with the spatial implementation across our supply area. We will grant limited exceptions to Non-Essential Use Bans. The main concessions granted are:

- Concessions on the grounds of protection of the environment (relating specifically to the spread of non-native and/or invasive species)
- Concessions for those on the Welsh Water Vulnerable Customer list
- Concessions for small businesses which may be affected (on a case by case basis)

Discretionary concessional exceptions will require customers to write or make representation to us in order to obtain permission as set out later in this Chapter.

### 3.3.8. More extreme measures

Water rationing through the use of widespread enhanced pressure management or localised use of standpipes would only be employed in very exceptional circumstances under an emergency drought order and are viewed as an unacceptable practice for anything other than the most exceptional emergency circumstances. Within this Plan we have demonstrated that for the majority of our supply area it would take a drought event in excess of a 1:500 year return period to cause us to reach the point where we could run out of water to meet our customers' needs.

### 3.3.9. Potential demand savings

The savings in water use that we might make from demand management activities are difficult to estimate. In our 2015 Plan, we referred to a number of historic UKWIR reports. We have not had to employ drought measures in our supply area since 1990 and so we have little substantive data with which to quantify the impacts of these measures.

Although there is little data available from previous drought incidents within our area, best available information has been used to support our estimate of demand savings including guidance from Ofwat, Waterwise and UKWIR where possible. This reflects the requirements within guidance and legislation as best practicable.

Given this lack of additional information we continue to assume that TUB's aligned with customer messaging could reduce demand by the order of 5% with the addition of NEUB measures in place reducing this by a further 5% to 10%.

However, a national study has now been commissioned to examine the data from the 2018 drought across Wales and England and will report later in 2019. If this provides solid evidence that current assumptions are inaccurate, we will reflect this in our WRMP annual review work and if necessary look to amend our drought plan.

### 3.3.10. Compensation and Enforcement

The compensation payments that we make to customers for interruptions to their supplies are specified in our publications 'For You Not For Profit 2018-19' and 'For You Not For Profit – for metered customers 2018-9' available at [https://www.dwrcymru.com/en/Reading\\_Room\\_Library/Leaflets-and-Publications.aspx](https://www.dwrcymru.com/en/Reading_Room_Library/Leaflets-and-Publications.aspx) The documents outline compensation to household customers (whilst not including hosepipe restrictions) and business customers as below:

'We will compensate you if your water supply is interrupted due to drought. We will give household customers £10 per day or part day (up to the limit of last year's average household bill) and business customers £50 per day or part day (up to the limit of last year's water charges for the premises or up to £500 if you were not liable for last year's charges).'



Anyone who is affected by the taking of water under a Drought Order may make a claim, which must be made within six months of the date of expiry of the Order according to the rules which are set out in Schedule 9 to the Water Resources Act 1991.

We are not required to pay compensation to customers if the circumstances are so exceptional that, in Ofwat's view, it would be unreasonable to expect the interruption to supply to be avoided. Under the Water Resources Act 1991, customers are not entitled to compensation in respect of loss or damage sustained as a result of the implementation of Drought Permits/Drought Orders.

Further information on the guaranteed standards scheme (GSS) payments is available from the Ofwat website (<https://www.ofwat.gov.uk/wp-content/uploads/2017/03/The-guaranteed-standards-scheme-GSS-summary-of-standards-and-conditions.pdf>).

In June 2018 Ofwat issued their report "Out in the Cold" following an investigation into how water companies in England and Wales responded to the impact of the "Beast from the East". It stated that the current GSS scheme was not fair, fast or hassle free for customers and Ofwat subsequently put out a call for evidence to determine how to make things right. In late November 2018 Ofwat published recommendations to the UK and Welsh Governments regarding changes to the GSS scheme, suggesting a twin-track approach, with some changes being made now to address key issues and for Ofwat and Government to consider further potential changes in other areas over the longer term.

The immediate changes Ofwat has recommended are:

1. Increase the amounts of compensation customers receive for supply interruptions.
2. Reduce the time between additional compensation payments for longer supply interruptions
3. Remove the reference to supply interruption on 'strategic mains' which currently delays payments to customers
4. Make all GSS payments automatic
5. Review GSS payment amounts when cumulative inflation exceeds 10%

The proposed changes under points 1 - 3 above will result in an increase in payments of £30 to household customers for every 12 hours they are without water (currently this is £20 after 12 hours, or 48 hours if the problem is on a 'strategic main', and a further £10 for every additional 24 hours they do not have water). For non-household customers the payment should increase to £75 for every 12 hours they are without water.

Ofwat has stated that while the changes are being considered by both Governments, they expect all companies and retailers to reflect on the recommendations when setting their own compensation schemes. We are therefore making the changes to our GSS scheme from 1 April 2019, so the new amounts are being reflected in our annual billing publications printed in January 2019.

### 3.4. Communicating with our customers and stakeholders

Welsh Water's Drought Communications Plan (DCP) has been developed to ensure the effective flow of information to customers and stakeholders during the various stages of a drought. The strategy is designed to ramp up in response to the escalating stages of drought and trigger behavioural changes from customers to help conserve water supplies. While we have not had a hosepipe ban for many years, and have successfully reduced our leakage rates, as a company we fully appreciate how impacted we can be by events such as the hot summer experienced in 2018. Our updated DCP will ensure we are in a position to respond immediately in the event of similar conditions occurring in the future.

Key to the effective management of any drought situation will be engagement with customers and stakeholders. Their cooperation during such times is essential to help protect water resources. To achieve this we will need to ensure our communications are effective – particularly to generate understanding of the situation and actions we require them to take. We cannot however expect customers to play their part without also being explicit about all of the activities we undertake to keep them in supply: this forms an important part of our messaging.

Our communications strategy also has flexibility to adapt to varying drought situations by using appropriate communication techniques and messaging. Multiple communication channels are utilised to ensure the most appropriate is used for the targeted audiences. This also includes ensuring communication is fully bilingual to cater for our customers' language of choice. In developing our DCP we have considered the conclusions of the Consumer Council for Water's report 'Understanding drought and resilience'<sup>9</sup> and also the findings in the UKWIR report 'Drought and demand: potential for improving the management of future droughts'<sup>10</sup>. The company has also incorporated learning from the 2018 summer into the DCP.

### 3.4.1. Approach

Our overarching guiding principle in developing the DCP is to ensure that the water situation information we provide is timely and accurate. It is also essential that it offers advice and guidance explaining how the particular audience group we are targeting can play their role in helping us conserve water supplies to manage the situation. Our objectives are to:

- Nurture a culture of water efficiency and promote water efficiency messages to customers during normal weather conditions
- Encourage behavioural changes from customers to help conserve water supplies to minimise risk of restrictions during drought conditions
- Inform customers and stakeholders of the various stages of drought and associated impacts on their supplies
- Inform customers and stakeholders about the actions Welsh Water is taking to maintain supplies i.e. increased water treatment, increased leakage detection
- Align activity and messaging with regional or national initiatives to conserve water supplies i.e. Welsh Government's 'Water Strategy for Wales', Consumer Council for Water's water efficiency advice and also Waterwise activity.
- Provide information on how to prepare for, adapt to and mitigate water usage restrictions

While these objectives form the core of our strategy, tailored communications plans will be implemented to meet the requirements of an escalating drought situation. More information on this is detailed below.

The need for reliable and accurate information is essential during drought conditions – particularly as the heightened media interest can generate misinformation. This easily leads to undue concern amongst customers. Our approach to customer communication is therefore governed by the need to reassure customers by keeping them informed of the current situation and importantly what this means for them. For this reason we will ensure that the tactics and tone of messaging we use is appropriate to the situation we are in.

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<sup>9</sup> Consumer Council for Water Understanding drought and resilience. YouGov, prepared for Consumer Council for Water, March 2013.

<sup>10</sup> DROUGHT AND DEMAND: POTENTIAL FOR IMPROVING THE MANAGEMENT OF FUTURE DROUGHTS , UKWIR Report Ref. No. 07/WR/02/2

### 3.4.2. Background Campaign

One of the main challenges the company faces in managing customer expectations around drought risk is the perception that our supply area, particularly Wales, is awash with water. The truth is that water is equally as finite a resource in Wales as anywhere else.

As a responsible water supplier committed to preserving water and promoting water efficiency, the company runs its 'Love Dŵr' campaign throughout the year. The main thrust of the campaign is to encourage customers not to waste water with the strapline being – 'use as much water as you need but please don't waste it.' To achieve the objectives of the campaign, Welsh Water promotes messaging throughout the course of the year which includes:

- A dedicated area of our website with simple hints and tips on ways to save water around the home and garden
- Social media activity to promote water saving techniques for customers
- Films, infographics and animations which promote water efficiency and can be spread through social media and other digital platforms
- Working in partnership with Eco-Schools to promote sustainable water use in schools
- Delivery of water efficiency lessons at our Environment Education Centres across Wales and through lessons delivered by our peripatetic teacher at schools across our whole operating area
- Discounted water butt offers through website and social media competitions
- Use of regional and local media outlets to inform and remind customers about the campaign
- Offering water efficiency audits to identify where we can offer our free repair scheme for leaks on private supply pipes
- Promotion of water efficiency information at national and regional shows and also at local community events

### 3.4.3. The Communication Strategy

Before describing the means of communication and messaging that will be implemented at each drought stage, the following two points should be noted which are intended to assist in the successful implementation of the DCP.

#### *Regional Flexibility*

In developing the DCP, careful consideration has been given to ensuring it can be operated on three levels. On one level it will be possible to implement the DCP across our whole operating area to address a widespread drought. On another level, the DCP has the ability to respond to regional variations in drought conditions. On a third level, it will be flexible enough to operate for a single water resource zone. To achieve the flexibility required we propose that our operating area is split to mirror the geographic areas covered by the relevant regional media. It is proposed therefore that our operating area is split as follows and shown in Figure 14:

- Hereford
- South East Wales
- South West Wales
- North West Wales
- North East Wales
- Mid Wales

### Water company cooperation

Joint working will help ensure best practices, along with lessons learnt, are shared between companies which ultimately will assist with the effective management of drought situations. It will also ensure consistency of messaging for customers - conflicting messages could confuse customers at a time when we need them to fully understand the situation.

- Joint press releases
- Specific area on websites of each company dedicated to any joint working
- Joint press conferences
- Joint advertising campaigns
- Joint stakeholder briefings and newsletters.

### 3.4.4. Consultation on implementation of temporary use restrictions

Water companies now have extended powers which will allow them to introduce temporary water use restrictions without the need for a Drought Order. It should be noted that during the stages of a drought, customers and interested parties will be given the opportunity to make representations prior to any temporary use restrictions being implemented. While a 14 day consultation period will apply, the introduction of any temporary use restrictions is unlikely to come as a total surprise to customers. Our communications techniques will already have raised awareness amongst customers of the severity of the water resource situation.

The company will work to raise awareness amongst customers about its new powers at roadshows and other customer facing events it features in. With regard to the 14 day in-drought consultation period about temporary use restrictions, this opportunity to comment will be widely communicated to customers. This will be done through:

- Customer letter and associated information leaflet
- Notices in local newspapers and via local broadcast media
- Company website
- Company's social media channels

### 3.4.5. Representations

As discussed above and detailed within the CoP, customers may be granted exemption from TUBs and NEUBs. Customers who meet the criteria for statutory and discretionary universal exceptions can continue to use water without restriction and do not need to make a representation to us.

A clear deadline will be included for representations. Customers will have the option of either emailing or writing in with their representations. We will compile all representations received and present them to the Gold Centre for consideration. The introduction of any temporary use restrictions will be publicised before they are implemented.

With regard to discretionary concessional exceptions, customers will need to make a representation to enable them to continue to use water for the specific purposes laid out in Table 9. These will only be granted to individual users on a case by case basis and on their individual merit via our representation process. Our customers should contact us to seek more information on the imposition of demand restrictions, or request specific exceptions when we advertise that we intend to impose water use restrictions. We would also review whether it is appropriate for us to vary our exception policy in light of representations received. When representations are received we will:

- Log the receipt of the representation and acknowledgement to the customer;
- Review the representation against our policy based upon table 9 and 10 in line with the CoP;
- Representations that meet the criteria of our policy will normally be granted an exception from the restriction: this will be logged and the customer informed of this decision;
- More complex or higher water demand impact representations will be highlighted, logged as such and taken forward for consideration by a review panel; the customer will subsequently be informed of the review decision and reason for this.

Representations may be made in Welsh or English and should be made in writing to either:

**Water Use Restriction Exceptions**

**The Drought Co-Ordinator**

**Dwr Cymru Welsh**

**Ty Awen**

**Spooner Close**

**Celtic Springs Business Park**

**Newport**

**NP10 8FZ**

Or via email to [water.resources@dwrcymru.com](mailto:water.resources@dwrcymru.com) citing 'Water Use Restriction Exceptions' in the subject line.

### 3.4.6. Employee Information Programme

At every stage, all of our employees – both customer facing and those that do not usually deal directly with customers - will be fully briefed to ensure full awareness of any emerging drought situation. It is important that employees are fully briefed as most of them live in the communities which we serve. They can therefore be advocates for the company in these areas and help disseminate information - particularly linked to saving water techniques. Keeping staff informed will be done through a variety of techniques which will include:

- Colleague intranet
- Internal emails, newsletters
- Text messages to mobile phones
- PC Screen savers
- Welsh Water internal television system
- Chief Executive company-wide conference calls
- Social media

Communication Techniques Table 10 below clarifies who our target audiences are. Detail as to the timing and means of distribution of different messages and activities we would take as part of our DCP are contained in Annex 2. The level of activity and tone of messaging is intended to adapt to the different stages of drought and post-drought.

Audience	Constituents
<b>Customers</b>	<ul style="list-style-type: none"> <li>• Domestic</li> <li>• Business – i.e. caravan parks</li> <li>• Open Water customers (to communicated with via Wholesale Services)</li> </ul>
<b>Stakeholders</b>	<p>Statutory</p> <ul style="list-style-type: none"> <li>• Welsh Government Environment Minister</li> <li>• Welsh Government Drought Liaison Group</li> <li>• Natural Resources Wales</li> <li>• Defra</li> <li>• Environment Agency</li> <li>• Ofwat</li> <li>• Consumer Council for Water Wales</li> <li>• Drinking Water Inspectorate</li> <li>• Water UK</li> </ul> <p>Non-statutory</p> <ul style="list-style-type: none"> <li>• Political representatives e.g. MPs, AMs, MEPs, local councillors, community councils</li> <li>• Local Authorities</li> <li>• National Park Authorities</li> <li>• Fire Services</li> <li>• NFU Cymru / FAW</li> <li>• RSPCA</li> <li>• Neighbouring water companies</li> </ul> <p>Other</p> <ul style="list-style-type: none"> <li>• Press and Media</li> </ul>
<b>Other water users</b>	<ul style="list-style-type: none"> <li>• Day visitors to area</li> <li>• Holidaymakers</li> </ul>
<b>Staff</b>	<ul style="list-style-type: none"> <li>• Direct employees of Welsh Water</li> <li>• Contractors providing services to Welsh Water</li> </ul>

*Table 10 – Target audience for drought messaging*

A robust evaluation of the management of a drought situation can only be undertaken once drought conditions have subsided. The recovery or potential recovery from a drought will be monitored by the Communications, Water Resources and Water Demand teams. It is imperative that any lifting of drought actions is only taken when there is certainty that water resources have sufficiently recovered. The early lifting of drought actions before the resource situation has fully recovered and issues still persist could be counterproductive and result in reputational damage.

Our Drought Communications Plan has been updated in light of learning from the 2018 drought event. We will undertake a similar post drought review as we encounter future droughts, the high level objectives being to:

- Evaluate effectiveness of information being passed to the Communications team about emergence and development of a drought situation.
- Evaluate the communication tools that worked well / not so well during drought.
- Evaluate the effectiveness of reaching target audiences with key messages.
- Measure success of the DCP in reducing demand, and
- Obtain feedback from customers and stakeholders on the communications methods used and their effectiveness. Will also include measurement of clarity of messages

### 3.4.7. Lessons Learnt from the summer 2018

The summer of 2018 was the first year in which our DCP has been put into action. In reviewing the implementation of the DCP and its effectiveness, the following learnings were identified:

- For social media, subtitled video content proves particularly effective in reaching a large proportion of our customer base with water efficiency information.
- Producing regionalised film content and graphics increased the impact of social media activity, particularly when it was targeted to those areas.
- Producing simple infographics and animations helped put the situation into context for customers i.e. an animation to explain how reservoirs work and also an infographic on number of bursts we had identified and repaired, proved effective.
- Importance of adhering to agreed company messaging despite ever increasing media frenzy and also developments elsewhere in UK i.e. when a neighbouring water company announced its intention to introduce a temporary use ban.
- Importance of driving the news agenda and promoting the positive activities we are taking to manage the situation e.g. announcement of number of leaks being repaired, support we were offering to emergency services to tackle forest fires.
- Importance of continuing to promote water efficiency messages even when weather conditions change as likely will take time for reservoirs to recover.
- Need to be clearer on link between using less water and benefits this will have on the environment – both in terms of aquatic life in rivers and also reduced carbon emissions due to our need to treat less water.

## 3.5. Supply side options

The way in which we maximise our water resources is provided in Chapter 2 with the timing of these measures triggered as we moved from normal weather conditions in to drought.

Much was learnt during the summer 2018 about our ability to rezone our network through the operation of strategic valves and the use of new connections. These operations were managed through our Silver command centres to ensure that customers' supplies were not impacted as changes were made.

These operations have now been documented and where appropriate, have become part of our dry weather planning options. In addition, we successfully managed the operation of 40 road tankers in our North West supply area this year and this learning has been built into our existing tankering plans.

Annex 1 to this report provides additional detail on these activities within each of our 24 Water Resource Zones and the learning taken from the drought of 2018.



Our 2019 Water Resource Management Plan (WRMP19) sets out how we will ensure that our water supply capability is sufficient over the long term to meet customer demands and the needs of the environment, during the most severe historic droughts. However, as described in Chapter 4, we need to ensure that we are resilient to droughts more extreme than those we have historically experienced. Our analysis suggests there are a number of water resource zones where there is a water resource risk during the most extreme droughts scenarios.

In response, we have identified the options available to us that we would not consider using during everyday operation but may have to turn to in exceptional circumstances.

These schemes fall into two categories:

1. Water sources that we still retain for emergency use, which could be brought back into supply but with considerable effort to maintain good water quality.
2. Options that would need further legal provision to enable us to abstract water e.g. greater levels of abstraction than currently permitted or third party sources not currently used for public water supply for which we would need to obtain drought permits or drought orders from our regulators and/or Government during a drought

Our priority is always to maintain wholesome water supplies to customers, so we will need to take a flexible approach to the timing and use of any standby sources, given that their lack of recent use may affect the water quality they can provide at first. We will ensure that all of the sources that we might potentially use are sampled for water quality ahead of time to assess water quality risk through our Drinking Water Safety Planning process.

In terms of either taking greater quantities of water from our existing sources or retaining more water within our reservoirs by reducing the amount of water leaving them, as required under our abstraction licences, this can only be done through the application for Drought Orders or Drought Permits. The options for these and how we can mitigate any adverse impact on the environment is reported in Chapter 5.

In principle we would plan to use our permitted sources where practicable before turning to supply side options requiring drought permits or drought orders so that we minimise any negative environmental effects. Given the lead times for bringing some supply side options online, temporary use bans may be required in advance of these coming into supply.

Further detail on how we would manage our water supply systems during a drought is provided for each of our twenty four WRZs within Annex 1 to this main report. These describe how each WRZ operates during normal and drought conditions and sets out the options available to us to increase our supply capability.

Table 11 below provides a summary of our drought response actions against drought action zones.

Drought Action Zone	Supply Side Actions	Demand Side Actions	Communications Key Messages
<b>Normal</b>	<p>Weekly monitoring of rainfall, reservoir and river levels.</p> <p>Optimise sources to minimise the costs of operations whilst remaining within licence, operation and quality constraints</p>	<p>Daily and weekly monitoring of demand levels and review of supply/demand situation.</p>	<p><b>Use the water that you need but please don't waste it.</b></p> <p>General Water Efficiency Campaigns via:</p> <ul style="list-style-type: none"> <li>• <b>Company website water efficiency page</b></li> <li>• <b>Social media</b></li> <li>• <b>Press Releases</b></li> <li>• <b>Organised events</b></li> <li>• <b>Education Centres</b></li> </ul>
<b>Developing Drought</b>	<p>Targeted leakage management.</p> <p>Convene 'Gold incident' command centre.</p> <p>Implementation of dry weather operations to optimise water supply.</p> <p>Liaison in line with Management and Communication Plan</p>	<p>Continuous monitoring of demand levels and review of supply/demand situation.</p> <p>Implement demand side options:</p> <ul style="list-style-type: none"> <li>• 'Media Campaigns with Water Efficiency Device Offering'</li> <li>• 'Enhanced Leakage Management'</li> </ul>	<p><b>Weather has been drier than normal therefore reservoir levels aren't where we would expect them to be for time of year.</b></p> <p><b>Introducing temporary use restrictions is a last resort. We would like to avoid this so are asking customers to work with us to help conserve water resources.</b></p> <p><b>Continuation of Normal Activities plus:</b></p> <ul style="list-style-type: none"> <li>• <b>Website – dedicated web page ready to go live as soon as required</b></li> <li>• <b>Welsh Water spokesperson film clips</b></li> <li>• <b>Targeted social media</b></li> <li>• <b>Press releases - to be issued to relevant media.</b></li> <li>• <b>Paid for adverts - to appear in relevant media</b></li> <li>• <b>Letters to customers</b></li> <li>• <b>Roadshow / local exhibition</b></li> <li>• <b>Face to face meeting with stakeholders</b></li> </ul>

Drought Action Zone	Supply Side Actions	Demand Side Actions	Communications Key Messages
<b>Drought</b>	<p>Continue to optimise current dry weather operational activities to preserve resource.</p> <p>Review feasibility of bringing mothballed sources back in supply.</p> <p>If applicable: Preparation of supply side application for drought order from NRW. Commence baseline environmental monitoring</p>	<p>Continuation of preceding actions. Effectiveness of demand side measures estimated. Preplanning for the implementation of Temporary Use Bans.</p> <p>If applicable: Implement demand side options:</p> <ul style="list-style-type: none"> <li>• Temporary Use Bans (Saving of up to 5% of demand anticipated).</li> </ul>	<p><b>Weather has been drier than normal therefore reservoir levels aren't where we would expect them to be for time of year.</b></p> <p><b>Introducing temporary use restrictions is a last resort. We would like to avoid this so are asking customers to work with us to help conserve water resources.</b></p> <p><b>We may have to introduce a temporary hosepipe ban as a last resort to help conserve water supplies.</b></p> <p><b>Continuation of Developing Drought Activities with enhanced messaging plus:</b></p> <ul style="list-style-type: none"> <li>• Media interview with senior managers</li> <li>• Water efficiency lessons</li> <li>• Billing call centre recorded messages</li> </ul>
<b>Severe Drought</b>	<p>Continuation of preceding actions. Bring mothballed sources back in supply where feasible.</p> <p>If applicable: Implement supply side options.</p>	<p>Continuation of preceding actions. Implement demand side options:</p> <ul style="list-style-type: none"> <li>• Temporary Use Bans (Saving of up to 5% of demand anticipated).</li> </ul> <p>Preplanning for the implementation of Non Essential Use Bans. Preplanning for the implementation of Emergency Drought Order.</p>	<p><b>Weather has been drier than normal therefore reservoir levels are exceptionally low for the time of year.</b></p> <p><b>Temporary use restrictions are in place. We thank customers for observing these and protect water supplies.</b></p> <p><b>We may have to introduce non-essential use restrictions as a last resort to help conserve water supplies.</b></p> <p><b>We may have to implement alternative water supply options under drought permit/order.</b></p>

Drought Action Zone	Supply Side Actions	Demand Side Actions	Communications Key Messages
		<p>If applicable: Implement demand side options:</p> <ul style="list-style-type: none"> <li>• Non Essential Use Bans (Saving of up to 10% of demand anticipated).</li> <li>• Emergency Drought Order (Saving of up to 17.5% of demand anticipated)</li> </ul>	<p><b>Continuation of Drought Activities with enhanced messaging, details below:</b></p> <ul style="list-style-type: none"> <li>• Website – dedicated web page ready to go live as soon as required</li> <li>• Welsh Water spokesperson film clips</li> <li>• Targeted social media</li> <li>• Press releases - to be issued to relevant media.</li> <li>• Paid for adverts - to appear in relevant media</li> <li>• Letters to customers</li> <li>• Roadshow / local exhibition</li> <li>• Media interview with senior managers</li> <li>• Water efficiency lessons</li> <li>• Billing call centre recorded messages</li> <li>• Face to face meeting with stakeholders</li> </ul>

*Table 11 – Drought action sequence of events*

## 4. Understanding our Drought Risk

Chapter 2 has described how we will know when we are in a drought and how we assess the effects of this upon our water resource position. Chapter 3 then sets out the actions that we can and will take to ensure that we meet our customer's expectations in dealing with a drought period. Further to this we need to test our plan to confirm our level of drought risk and to ensure that the actions available are sufficient. This Chapter describes the overall process for understanding our drought risk and summarises at a high level the results of our drought scenario testing. Annex 1, to this report details the drought risk within each specific water resource zone and shows the results of plan testing.

### 4.1. Background

Within our Water Resources Management Plan we set out our long term plans for maintaining customer's supply during a drought event. Our previous plans have been tested against historic events whereby, we have demonstrated that our systems and responses are resilient to 'worst historic' droughts.

For Wales this is generally the 1976 drought where large parts of south east Wales saw severe disruption to their supplies via the implementation of rota cuts to ration the water available. We have now been able to estimate that the 1976 event has a return period of the order of a 1:100-1:150, that is to say that this event is only likely to occur at this frequency. This infers that our water supply systems can cope with droughts of at least this order of magnitude with drought management actions in place. For many zones we know that are resilient to worse droughts, we were unable to say how much more.

The view from Government is that our systems should be resilient to at least a 1:200 drought event before we take extreme measures are taken to manage demand. The National Infrastructure Commission for England's "*Preparing for a drier future: England's water infrastructure needs*" report<sup>11</sup> suggest that water company systems should be resilient to at least a 1:500 drought event, given the economic cost from significant disruption. Government needs to consider the findings of this report and whether further work specifically for Wales should be undertaken

It is clear however, that we should understand the level of drought severity that could impact our customers and the likelihood or frequency at which we might impose customer restrictions on their water use.

### 4.2. Drought Vulnerability Assessment

In order to answer the question on the level of drought resilience we can provide to our customers, we have undertaken drought vulnerability assessments for all of our WRZs, in accordance with the Drought Vulnerability Framework (DVF) guidance that was jointly published by Natural Resources Wales (NRW) and the Environment Agency (EA) in 2017.

This drought analysis work is relatively complex but the results are extremely useful and can be conveyed in reasonably simple terms. The concepts behind the DVF are fully described in the 2017 guidance report, but essentially it is an evaluation process that seeks to identify the level of drought risk that is faced by a WRZ across a range of drought scenarios of varying durations and severities. The DVF is a risk based approach with the initial phase of the assessment to screen out zones of low risk.

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<sup>11</sup> <https://www.nic.org.uk/publications/preparing-for-a-drier-future-englands-water-infrastructure-needs/>

### 4.2.1. WRZ Risk screening

As set out in our 2019 Water Resources Management Plan (WRMP19), the majority of WRZs are forecast to have a healthy supply/demand surplus throughout the planning period 2020 to 2050.

Alongside this, an initial assessment of drought resilience undertaken for the WRMP19 demonstrated that there are a number of WRZs where there is no risk of a failure of the emergency storage provision occurring under any statistically plausible drought events. The DVF manual contains some general guidance on identifying those WRZs where DRS analysis should be applied. We have discussed the reasons for not undertaking this work for some zones with NRW, and gained their agreement to adopt this 'risk based' approach.

Following this confirmation from NRW, an initial screening process has been applied to all our WRZs. The exclusions have been based on the following two criteria:

- For WRZs where the Deployable Output (DO) varies according to drought severity (i.e. they are hydrologically vulnerable), the amount of 'surplus' from the WRMP19 supply demand balance has been compared against the calculated value for Target Headroom. Target Headroom is a planning allowance that is used to account for uncertainties in the calculation of our supply demand balance forecasts. For those WRZs where the amount of 'surplus' in the zone is more than twice our Target Headroom allowance, then the WRMP19 resilience analysis was reviewed to determine the level of estimated resilience risk for that WRZ. If this was found to be high, i.e. beyond a 1:200 return period, then the WRZ was excluded from requiring a full DRS assessment, unless specific concerns warranted further investigation.
- For WRZs where the sources are not drought vulnerable then these were excluded provided there are no significant 'unknowns' or concerns about the nature of those resources. As an example, in our Llyswen WRZ we are licensed to abstract up to 5 MI/d from the River Wye, with demands generally around 4 MI/d. The nearest gauging station to our abstraction at Llyswen is the River Wye at Erwood. In 2018, data from NRW shows that lowest flows fell to at this station were 80 MI/d and so there are no realistic drought scenarios where we would see a shortage of rainfall that would cause this to fall below 5 MI/d. Hence the Llyswen WRZ has been screened out as low risk and so doesn't require a DRS assessment.

The results of the screening process are provided in Table 12 below. WRZs that were definitely screened out of the analysis have been colour coded in green, and WRZs where a detailed drought risk assessment was required are colour coded in red. WRZs where there is some risk and so a simpler drought risk assessment method was required are coloured in yellow.

WRZ	Outcome of Screening	Comments
NEYM	Full assessment required	Although the supply demand balance is in surplus there were concerns about the resilience of our mainland reservoirs.
Tywyn Aberdyfi	Full assessment required	Higher risk WRZ which is forecast in WRMP19 to have a supply demand shortfall.
Clwyd Coastal	Medium assessment required	Although the supply demand balance is in surplus, there are concerns about the drought risk at some of our reservoir sources.
Alwen Dee	Medium assessment required	The supply demand balance shows a relatively small surplus but the water resource position is considered to be robust.
Bala	No assessment required	The supply demand balance shows a relatively large surplus and so there is no risk of emergency storage breach under plausible drought scenarios.

WRZ	Outcome of Screening	Comments
Blaenau Ffestiniog	No assessment required	Drought resilience testing for WRMP19 indicates minimal risk and the WRZ has a relatively large supply demand surplus.
Barmouth	Full assessment required	Drought resilience testing for WRMP19 indicated some risk and there were some concerns raised during the 2018 drought.
Lleyn Harlech	Full assessment required	Although the supply demand balance shows a healthy surplus, some risk was indicated in the resilience testing for WRMP19, and there were some concerns raised during the 2018 drought.
Dyffryn Conwy	No assessment required	The supply demand balance shows a relatively large surplus and so there is no risk of emergency storage breach under plausible drought scenarios.
South Meirionnydd	No assessment required	WRMP19 drought resilience testing indicates there is no risk of emergency storage breach under plausible drought scenarios.
Elan Builth	No assessment required	Although drought can affect the Elan Valley system, this affects the main supply to Severn Trent, and there is no risk to our abstraction. For the Builth abstraction, there is no plausible drought scenario under which flows in the River Wye would fall below the abstraction licence.
Hereford CUS	No assessment required	No plausible drought scenario under which flows in the River Wye would fall below the abstraction licence.
Llyswen	No assessment required	No plausible drought scenario under which flows in the River Wye would fall below the abstraction licence.
Monmouth	No assessment required	No plausible drought scenario under which flows in the River Wye would fall below the abstraction licence.
Brecon Portis	No assessment required	No plausible drought scenario where Usk reservoir could not meet the required abstraction at Portis or provide enough regulation water to support our abstraction at Brecon.
Ross on Wye	No assessment required	The risk entirely depends on the Severn Trent bulk supply, which is from the River Wye and so not drought vulnerable.
Pilleth	No assessment required	Relatively large supply demand surplus and no evidence of drought risk in the WRZ.
Vowchurch	Full assessment required	The WRMP19 resilience testing indicated there are large uncertainties, primarily because the highest risk occurs during events such as 2003 when dry periods extend into September/October.
Whitbourne	No assessment required	No plausible drought scenario under which flows in the River Teme would fall below the abstraction licence.
SEWCUS	Full assessment required	Higher risk WRZ with a relatively small supply demand balance surplus.
Tywi CUS	Full assessment required	The risk is fairly marginal given the level of supply demand surplus in the WRZ, with possible failures at return periods > 1 in 500 when demand is equal to DO.
Mid & South Ceredigion	Medium assessment required	The WRMP19 resilience testing showed that, even where the demand is set to equal DO, it is unlikely that there would be any deficit unless extremely high drought return periods are tested.
North Ceredigion	No assessment required	Relatively large supply demand surplus so a simpler risk assessment method is appropriate.
Pembrokeshire	Full assessment required	Higher risk WRZ with a supply demand balance deficit identified in WRMP19.

Table 12 – Results of the DRS Screening Exercise

### 4.3.Drought scenario testing

For the zones that have not been identified as low risk we have used water supply system simulation models to look at the performance of the system under more severe drought events to those seen in our historic record. Our models reflect current operational constraints of our systems such as pumping and treatment capabilities, abstraction licence conditions, reservoir storage capacities, etc.

We have run simulations that use anticipated demand in a dry year with river flow and reservoir hydrology time series varied to simulate the operation of our current water supply systems if the historic weather patterns were experienced again.

We have used statistical techniques to produce hydrological records that still reflect the climatic conditions of the 20<sup>th</sup> Century, but include more extreme events than we have seen recently. Using sampling techniques, we have generated 'Drought Libraries' that contain numerous drought events of known duration and severity with which we can test the response of our supply systems through our models.

The model output has been assessed in two ways. We have initially run key drought years of known severity through our models to gain a detailed understanding of the response of resources within a zone to various types of drought, this is 'Scenario Testing'.

For zones where scenario testing has shown that there is a zonal risk to severe drought or worse then, we have analysed our systems response to the full drought library to provide a more complete picture of the types of drought that our systems are sensitive to. These are plotted as 'Drought Response Surfaces' (DRS) and are described in the next section of the report. The results of scenario testing and DRS analysis where undertaken are provided in Annex 1 for individual zones.

Figure 15 below, shows an example of our scenario testing for the Tywi Gower Water Resource Zone. We have plotted the estimated system response if the hydrology of 1975/76 and 1995/96 were to be repeated. This shows that we would expect our Tywi Gower zone to almost meet the developing drought trigger but we would not have to impose drought measures.

However, when tested against stochastically generated inflows, a 1:200 year drought (a drought with a 0.5% chance of occurring) may require Drought measures, whereas a 1:500 year type of drought certainly would with reservoir levels approaching Emergency Storage. This indicates that the zone maintains a good level of resilience up to around a 1:500 year event. This analysis is relatively new and some caution must be taken so that results are not oversimplified. This is a good indicative result which in this case adds confidence that the Tywi Gower zone is resilient to droughts certainly beyond 1:200 and possibly to events of the order of 1:500. Going forward we will continue to build on the work undertaken for this Plan.



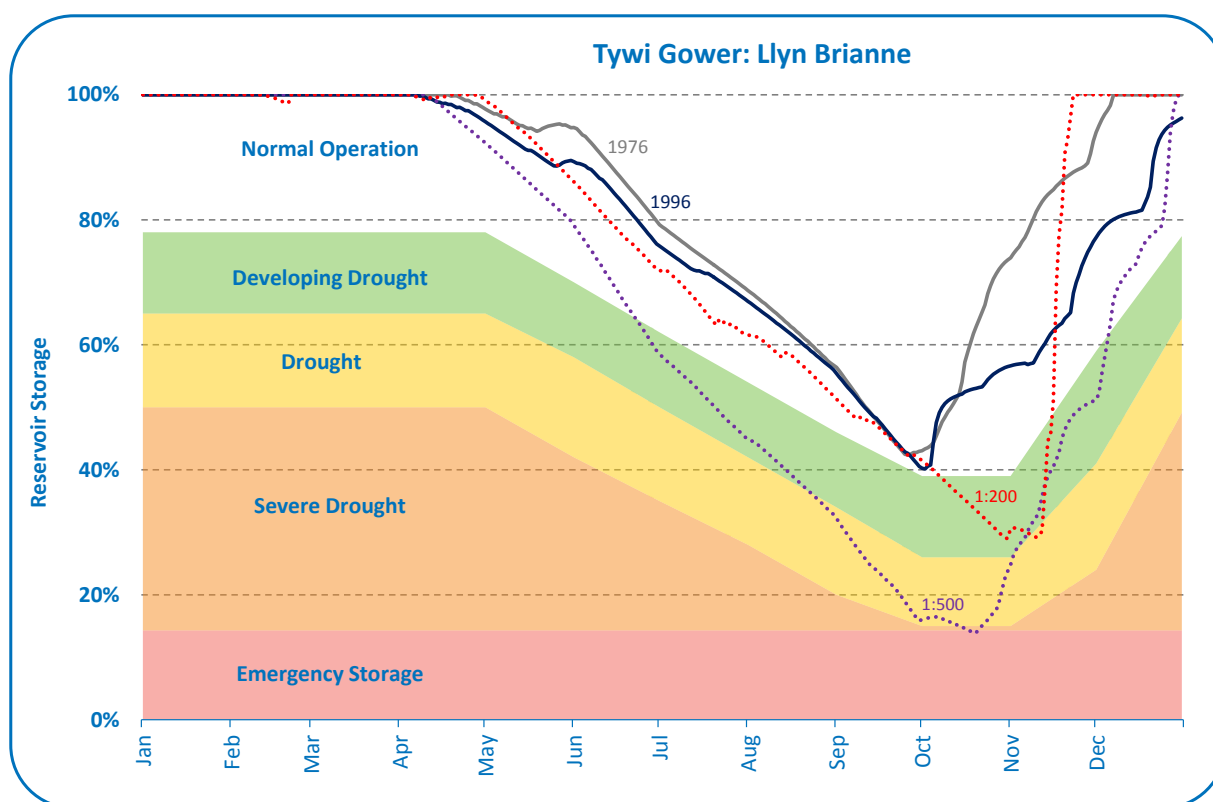


Figure 15 - Llyn Brianne Reservoir Drought Action Zones showing the results of scenario testing

#### 4.4.Drought Response Surfaces

Each scenario, as described above, is an estimate of our water supply system response to a specific combination of drought duration and level of rainfall compared to the long term average. Of particular importance to Government is our system's performance to the most extreme droughts and new targets have been set to ensure that water supplies are resilient to droughts that might be expected one in every 200 years or 0.5% likelihood. For zones where there is a risk of not achieving this we have undertaken further work to understand the types of drought that are cause for concern and the likelihood that our systems may fail to meet this target.

We have defined a failure in our models as the point at which we can no longer meet the demands of our customers without the imposition of extreme demand management measures. This is the point on our reservoir drought control charts at which only 'Emergency Storage' is available to us, a position that we would never want to reach as this is an unacceptable risk to our customers. The extent of failure is how long we would remain in this position of relying on 'Emergency Storage'.

The water industry has developed a standard way to show this information called a Drought Response Surface (DRS) chart. This collates the output of the assessment and helps in communicating the findings.

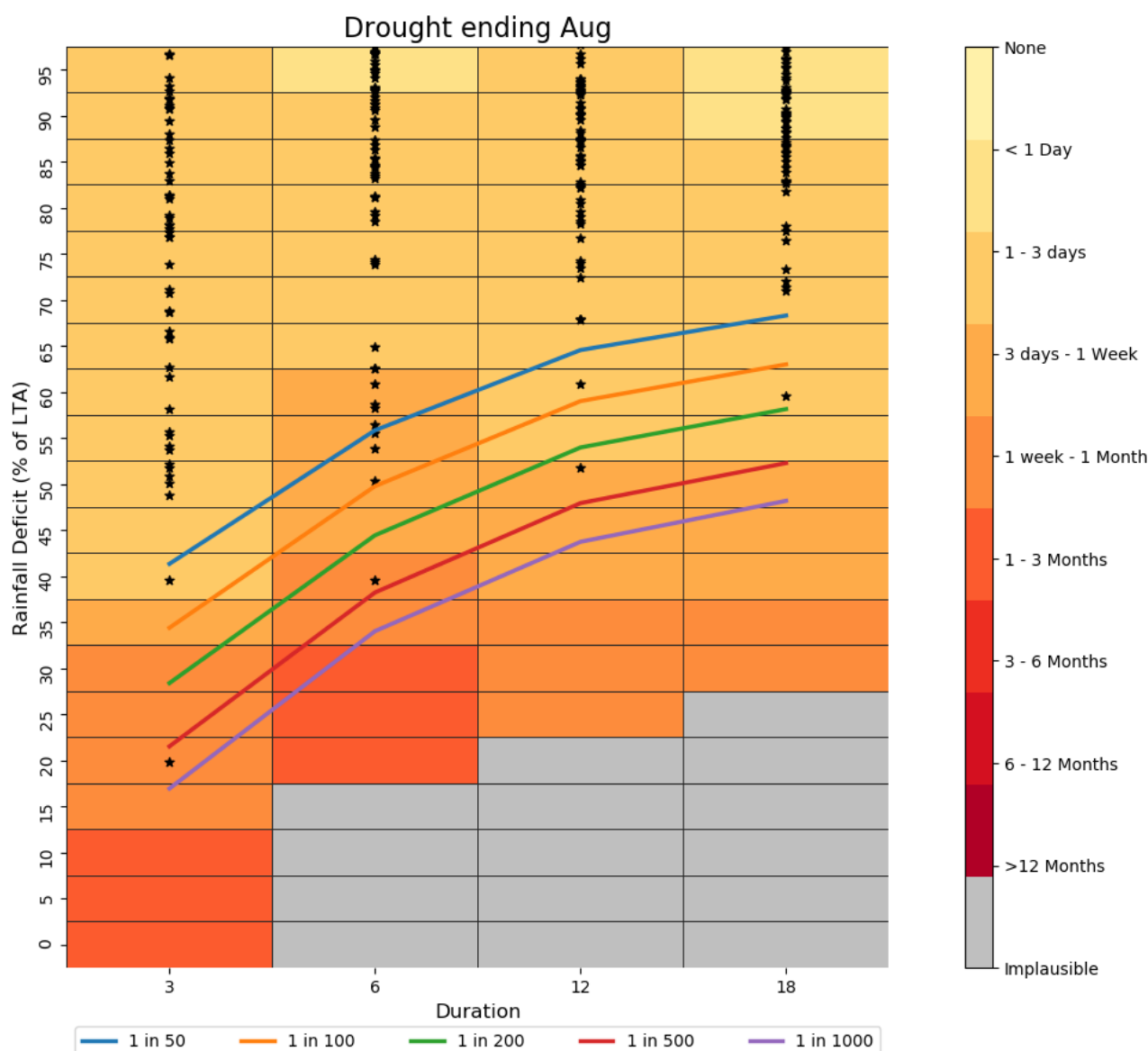


Figure 16 - Example Drought Response Surface chart for the Vowchurch WRZ

A drought response surface (Figure 16) is a visual presentation of the sensitivity of a Water Resource Zone to a range of droughts. Each drought is expressed in terms of rainfall deficit as a measure of drought severity (defined as the percentage of Long Term Average Rainfall, and shown on the y-axis, and the duration of the drought assessed in 6 monthly intervals on the x-axis of the chart. Two types of information are then overlaid:

- (1) The system response within each water resource zone for a given combination of rainfall deficit and drought duration. The system response is represented as a shaded cell, with the shading indicating the number of days that reservoir stocks are likely to be within the 'emergency storage' Drought Action Zone for each type of drought event. This metric is analogous to the number of days that widespread pressure management and local water rationing options are likely to be required, and hence conveys the risk of customer impact for a given event.
- (2) The likelihood of a drought for each combination of rainfall deficit and drought duration. The likelihood is visually represented as a series of stacked lines, each one showing a given return period of a type of drought event. As the deficit and duration increase, the likelihood of the event decreases; combinations of deficit and duration which are considered statistically implausible are greyed out and the system response to these sort of events hasn't been assessed.

Plotting this information then shows the system response to the drought return period which is the sensitivity of a Water Resource Zone to certain types of drought i.e. the drought intensity that the zone is more sensitive to, ranging from short (6 month, single season), intense droughts, to long (60 month, multi-year) droughts. Furthermore, for each type of drought, the DRS shows return period of that particular event hence enabling us to estimate the level of resilience that the zone has.

## 4.5.Results

Table 13 below provides a high level summary of the estimated risk for each WRZ of needing to implement customer water use restrictions. The return periods are not exact but are based on the results of our drought risk analysis, we have tried to interpret these into a 'simple' figure to present a high level view. Further detail on the zonal drought risk is provided in Annex 1.

WRZ	Temporary Use Ban	Non Essential use Ban	Extreme Measures
<b>North Eryri Ynys Mon</b>	Around 1:200	Around 1:200 to 1:500	>1:500
<b>Clwyd Coastal</b>	<1:200	Around 1:200 to 1:500	Around 1:500
<b>Alwen Dee</b>	Around 1:200	Around 1:500	>1:500
<b>Bala</b>	>1:500	>1:500	>1:500
<b>Tywyn Aberdyfi (without planned WRMP19 scheme)</b>	<1:20	<1:40	<1:50
<b>Tywyn Aberdyfi (with planned WRMP19 scheme)</b>	Around 1:200	Around 1:200 to 1:500	Around 1:500
<b>Blaenau Ffestiniog</b>	Around 1:200	Around 1:200 to 1:500	>1:500
<b>Barmouth (As now connected to Llyn Harlech)**</b>	<1:200	Around 1:200	Around 1:200 to 1:500
<b>Llyn Harlech (As now connected to Barmouth)**</b>	<1:200	Around 1:200	Around 1:200 to 1:500
<b>Dyffryn Conwy</b>	<1:200	Around 1:200 to 1:500	>1:500
<b>South Meirionydd</b>	Around 1:200	Around 1:200 to 1:500	>1:500
<b>Ross on Wye</b>	N/A*	N/A*	>1:500
<b>Elan Builth</b>	N/A*	N/A*	>1:500
<b>Hereford</b>	N/A*	N/A*	>1:500
<b>Llyswen</b>	N/A*	N/A*	>1:500
<b>Monmouth</b>	N/A*	N/A*	>1:500

WRZ	Temporary Use Ban	Non Essential use Ban	Extreme Measures
<b>Pilleth</b>	N/A*	N/A*	>1:200
<b>Brecon Portis</b>	N/A	N/A*	>1:500
<b>Vowchurch (without planned WRMP19 scheme)</b>	N/A*	N/A*	<1:100
<b>Vowchurch (with planned WRMP19 scheme)</b>	N/A*	N/A*	Around 1:500
<b>Whitbourne</b>	N/A*	N/A*	>1:200
<b>SEWCUS</b>	Around 1:200	Around 1:200 to 1:500	Around 1:500
<b>Tywi CUS</b>	Around 1:200	Around 1:200 to 1:500	Around 1:500
<b>Mid &amp; South Ceredigion</b>	Around 1:200	Around 1:200 to 1:500	Around 1:500
<b>North Ceredigion</b>	Around 1:200	Around 1:200 to 1:500	Around 1:500
<b>Pembrokeshire (without planned WRMP19 scheme)</b>	<1:100	<1:100	<1:100
<b>Pembrokeshire (with planned WRMP19 scheme)</b>	Around 1:200	Around 1:200 to 1:500	Around 1:500
<p>*The WRZ has sufficient water resource and the trigger for action is on levels of demand. We are only likely to impose TUBs and NEUBs in line with actions in the wider region, principally the SEWCUS zone.</p> <p>**This high level of resilience is based on the temporary schemes from the 2018 drought being made permanent and the two zones are joined together.</p>			

*Table 13 – Summary results of the Drought Vulnerability Assessment for all 24 WRZs*

Although these results indicate a high level of drought resilience, especially against the need for implementation of extreme supply side measures such as widespread pressure management or water rationing, we need to be mindful of the processes behind the generation of these results and the inherent uncertainties contained within them. These results provide a 'high level' view of a zones' resilience and we can use them to indicate where actions may need to be taken earlier in some zones when compared to others. The key areas of uncertainty to note within this process are:

1) Water resource models – We currently utilise the software package WRAPsim to simulate the performance of our water supply systems under a range of historical drought events. We are in the process of moving across to the AQUATOR modelling platform which will allow us to greatly improve the representation of our water resource zones and their behaviour during extreme droughts. Going forward we will use these new models to repeat the analysis undertaken for this Plan which will help us to refine the assessment of drought resilience.

2) The modelling undertaken for this Plan has assumed that a number of temporary schemes installed during the summer of 2018 to improve the connectivity within and between our zones, will be made permanent. In our PR19 submission to Ofwat we have requested £15 million to allow us to deliver these and so the levels of drought resilience presented here, particularly for the North Eryri Ynys Mon, Lleyr Harlech and Barmouth zones, will be much lower if these schemes are not completed.

3) We are using industry leading techniques in order to generate these more extreme drought events that we are testing our systems against. Whilst the science underpinning this approach is robust, it is still quite a leap to make in turning a 40 year data record into a 10,000 year data record. We therefore need to appreciate that the margin of error on these results is potentially quite large and that quoting resilience to a “1:500” year drought event could mean that in reality, we are resilient to between a 1:250 and 1:750 year drought event.

This uncertainty is highlighted in Figure 17 below which shows the simulated drawdown in our Llyn Aled/Aled Isaf reservoirs in the Clwyd Coastal zone, under a range of droughts that vary between a 1:100 and 1:5,000 year return period. It can be seen that the lowest simulated drawdown occurs under the 1:500 year scenario and not the 1:5,000 year scenario. The droughts simulated are of the same duration and timing i.e. they are 6 month events that begin in May and end in October, and the total rainfall deficit for the period corresponds to the return period for the total event, but it is the pattern of rainfall within those 6 month events that is very different and which has produced the variations in drawdown. This illustrates the caution that is needed when interpreting the results and assigning a ‘level of resilience’ to a particular zone.

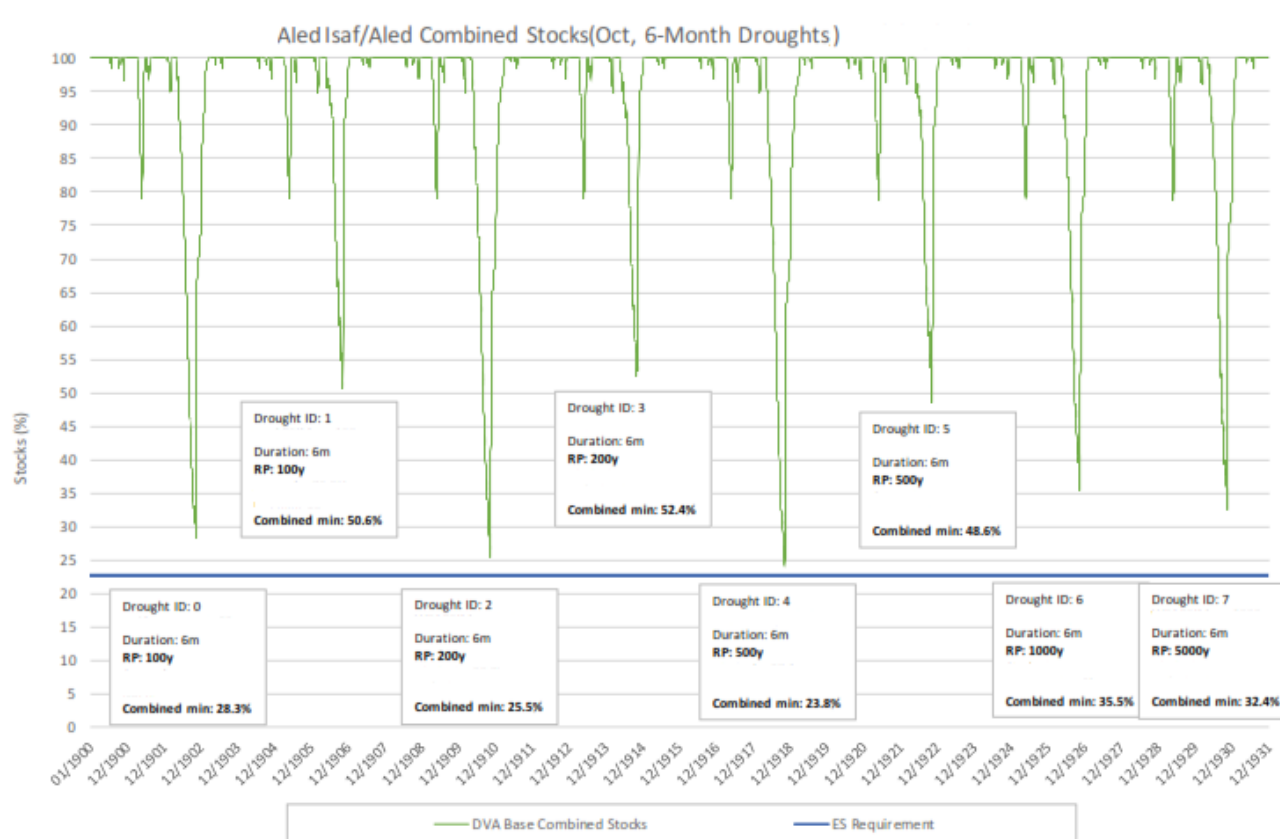


Figure 17 – Outputs of drought scenario testing

Overall then our current drought resilience is high with there being very little chance of us needing to implement standpipes and rota cuts to ration customer supplies. As shown in Figure 18 we have identified three zones (Pembrokeshire, Vowchurch, Tywyn Aberdyfi) where we would need to implement extreme supply side measures during drought events less severe than a 1:200 return period drought event. However, once our planned capital schemes are delivered in AMP7 then we will be resilient in these zones to drought return period events greater than a 1:500.

We are mindful that the effects of climate change will lessen our drought resilience and this is borne out by the results of drought scenario testing shown in Figure 19 whereby an additional three zones (North Eryri Ynys Mon, Clwyd Coastal and Tywi Gower) may require extreme supply side measures under a 1:200 year drought event, once the effects of climate change are taken into account. This means that we will potentially need to invest in the future to maintain our current level of resilience, as the impacts of Climate Change develop.

The advanced statistical approaches we have used for this testing are very new to the industry and further analysis of the data we have undertaken outside of this Plan indicates there is some uncertainty that we should be mindful of.

For those WRZs that are showing a risk of very low reservoir levels/river flows as a result of testing against these more severe droughts, then we have retained a number of environmental supply side options to guard against the risk of interruption to customer supplies should our systems respond differently than we would currently expect.

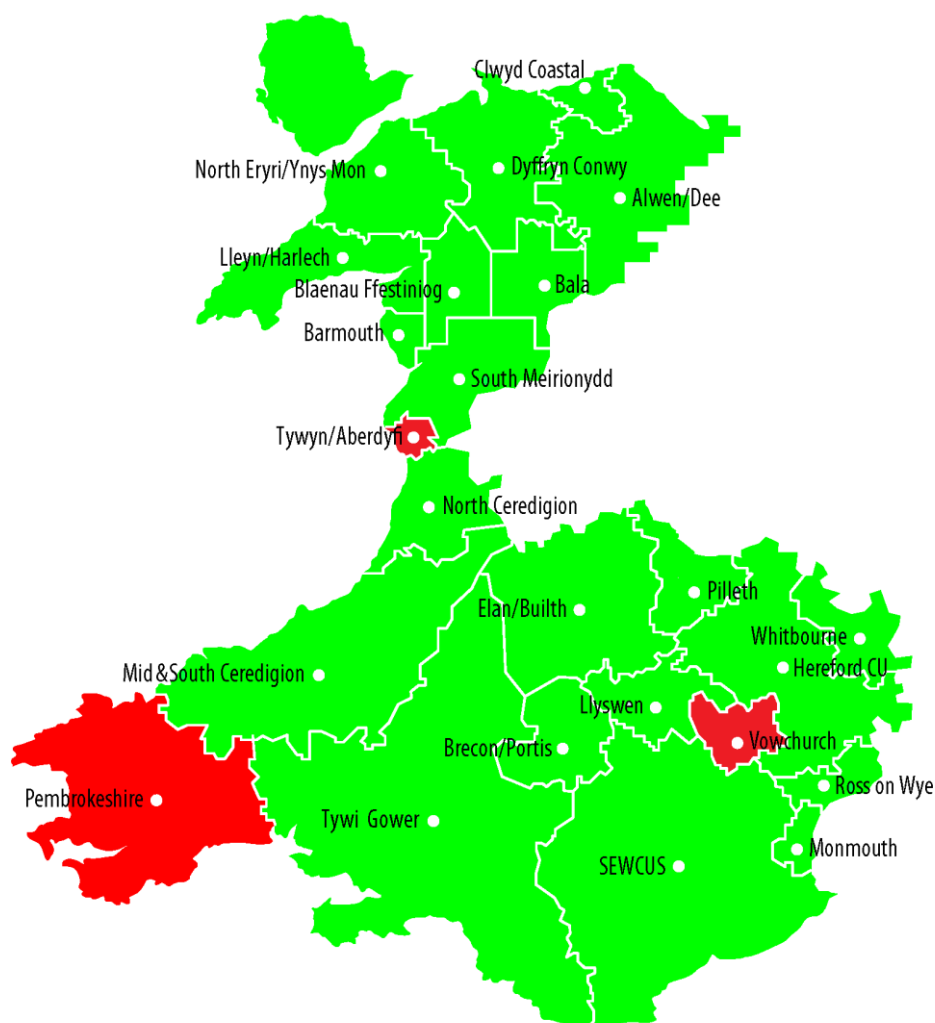


Figure 18 – Results of 1:200 drought scenario testing

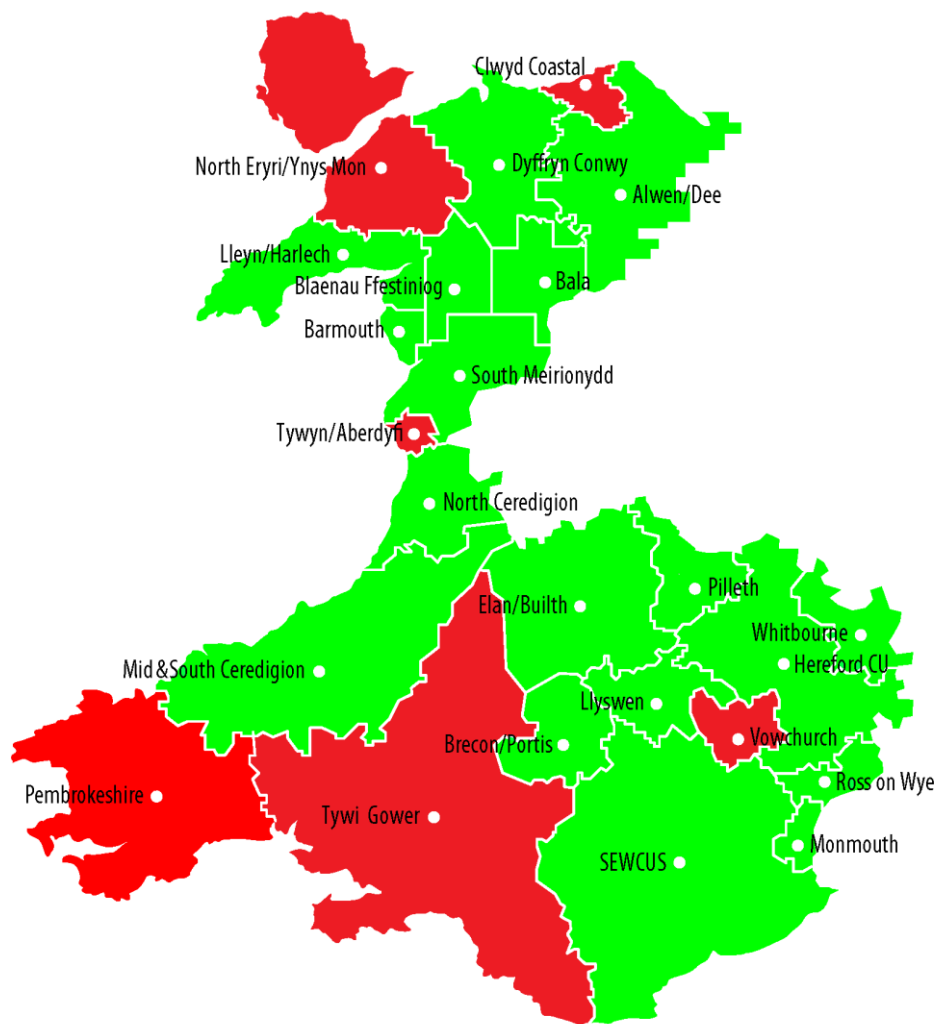


Figure 19 - Results of 1:200 drought scenario testing with climate change

## 5. Environmental monitoring and assessment

As described in Chapter 4, we have looked at options that we have available under severe drought conditions where we may have to take more water from the environment than we are normally permitted. Given the potential impact that this might have on the environment we would only do this once all the other Drought Plan options to both increase our existing supplies and to manage demand downwards have been exhausted.

For good reasons, the process by which we obtain this additional water is tightly controlled by legislation and enforced by our environmental regulators, Natural Resources Wales (NRW) and the Environment Agency (EA), with a formal process that we have to follow. Using the drought indicators defined in Chapter 2, we have to firstly confirm that our need for extra water is due to the effects of drought and not through any sub-optimal use of our existing supplies. Once this is confirmed, we will then submit either a Drought Permit application to NRW or the EA or a Drought Order application for the more ecologically sensitive sites, to Welsh Government or Defra.

This Chapter describes how we have generated options to take additional water from the environment during a drought. It also outlines the assessment work that we undertake to support our applications to our regulators and/or Government.

### 5.1. Legal Background

If our supply side options require us to operate outside of our standard abstraction licence conditions we will have to apply to NRW/EA and/or the Welsh Government/Defra for either a drought permit or drought order as appropriate.

In accordance with the requirements of Natural Resources Wales' 'Water Company Drought Plan Technical Guideline 2017' ('NRW DPG'), we have fully assessed the potential environmental impact of these options. The assessments take account of environmental legislation such as the Conservation of Habitats and Species Regulation 2017, Wildlife and Countryside Act 1981 & Countryside and Rights of Way Act 2000, Water Framework Directive, Habitats Directive and the Environmental Assessment of Plans and Programmes (Wales) Regulations 2004. In order to comply with these requirements we have produced the following environmental assessments to support our Drought Plan submission:

- Strategic Environmental Assessment of the Drought Plan
- Habitats Regulations Assessment of the Drought Plan
- Environmental Assessment Reports (incorporating Environmental Monitoring Plans)

### 5.2. Environmental Supply Side Options

#### 5.2.1. Updates since 2015 Drought Plan

Since publication of our 2015 Drought Plan, we have undertaken further work to better understand the level of drought risk across all our WRZs and confirm the potential need for any drought permits/drought orders. We have continued to work through and produce updated Environmental Assessment Reports (EARs) and have presented these to NRW and EA for review. The feedback on these EARs has helped to identify those options that could have the most ecological impact were they to be implemented during a drought. In this Plan we have therefore tried to remove the most damaging, particularly those that had the potential to affect internationally designated sites such as Special Areas of Conservation (SAC). There are some exceptions in those zones where our investigations have identified a significant drought risk and there are no feasible alternative options available.



Figure 20 shows the screening process undertaken to move from the list of environmental supply side options that were in the 2015 Drought Plan to those that are included in this Drought Plan.

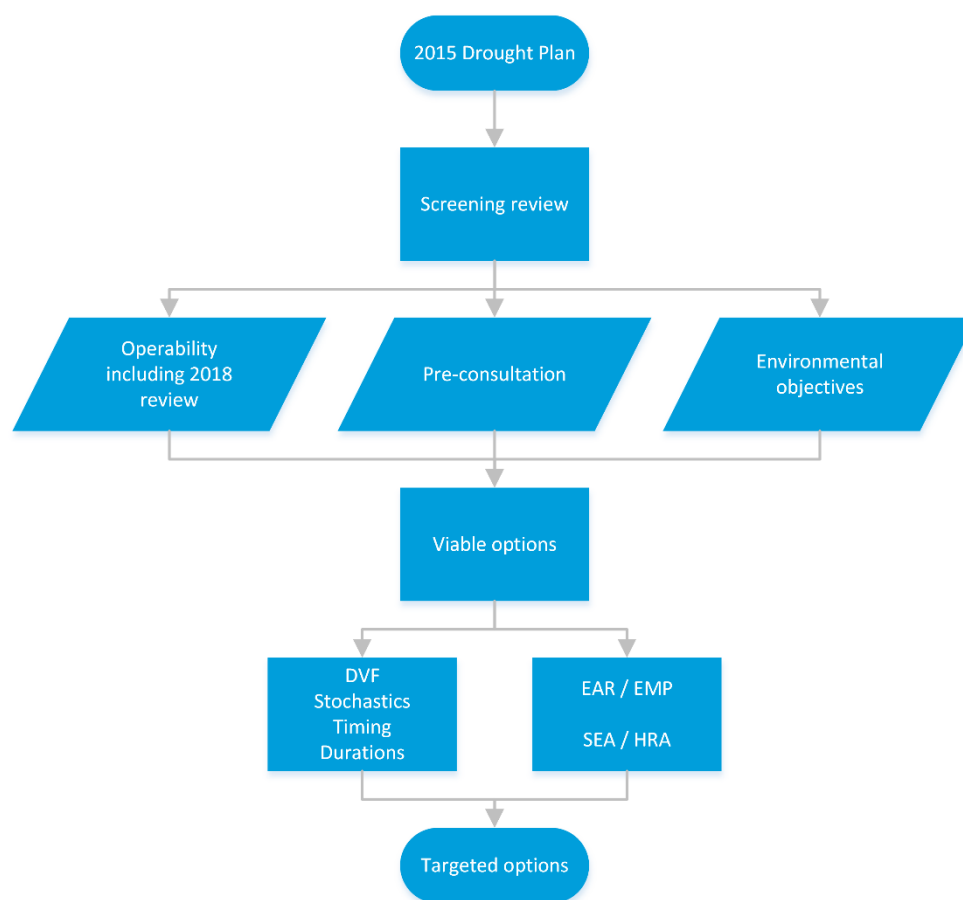


Figure 20 – Screening process to generate Drought Plan 2020 options

### 5.2.2. Results of Options Screening

Starting with our list of environmental supply side schemes that were in our 2015 Drought Plan, we have followed the screening process outlined in Figure 20. For those WRZs where the results of our scenario testing and drought risk assessment have indicated low risk, and we have high confidence in these results, we have generally removed all our drought permit/order options. We have also removed the majority of our options that would potentially impact an environmentally sensitive site, such as a SAC as we know our Drought Order applications for these options are unlikely to be granted without recourse to a public inquiry and likely need to demonstrate “Imperative Reasons of Overriding Public Interest”.

There are some exceptions such as our Pembrokeshire zone, where we know that until our WRMP19 scheme is delivered in AMP 7, we are running an unacceptably high drought risk and so we have retained a number of options to provide us with the reassurance that additional water is available if needed. However, we acknowledge these schemes would likely impact upon the designated environmental features of the Cleddau Rivers SAC and so we will work with NRW to understand the findings of our environmental assessments and identify any suitable mitigation and compensation measures that could be put in place.

Our experiences of managing our supplies through the drought of 2018 have provided valuable insight into the viability of a number of options that were included in our 2015 Plan. Long lead times and/or concerns over the water quality that we would be able to provide to our customers has meant that a number of options are no longer regarded as viable as a short term drought measure. Table 14 lists the options that have been removed from the Drought Permit/Drought Order process whilst Table 15 lists those that have been retained.

WRZ	Option	Reason for removal
<b>North Eryri Ynys Mon</b>	Transfer of water from Marchlyn Mawr (the Dinorwig System) to Marchlyn Bach	Raw water quality concerns
<b>North Eryri Ynys Mon</b>	Abstraction from Llyn Cwellyn below the pump intake level	Option is environmentally impactful and not a viable scheme within a short timeframe.
<b>Clwyd Coastal</b>	Transfer water from Llyn Bran to Afon Aled	Raw water quality and cross catchment transfer concerns
<b>Clwyd Coastal</b>	Pump water from Llyn Aled 'dead' storage	Drought Permit not required.
<b>Alwen Dee</b>	Cutback in compensation release from Alwen Reservoir	Covered under Dee Regulations.
<b>Alwen Dee</b>	Utilisation of Llwyn Isaf with temporary WTW	Not viable scheme within a short timeframe.
<b>Alwen Dee</b>	Bretton Pumpback	Drought Permit not required.
<b>Alwen Dee</b>	Reinstate Llyn Bran with temporary WTW	Not viable scheme within a short timeframe.
<b>Bala</b>	Transfer of water from Llyn Conwy system (Dyffryn Conwy WRZ)	No drought risk
<b>Tywyn Aberdyfi</b>	Relaxation of annual licences on the Afon Fathew and the Nant Braich Y Rhiw	Concern is peak daily demands not annual licence volume.
<b>Llwyn Harlech</b>	Pumped abstraction of dead storage from Llyn Morwynion and increase annual abstraction licence to fully utilise Emergency Storage Volume	Option is environmentally impactful.
<b>Barmouth</b>	Pumped abstraction of dead storage from Llyn Bodlyn	Option is environmentally impactful.
<b>Llwyn Harlech</b>	Reduce compensation flow releases from Llyn Cwmystradllyn	An environmentally better alternative option is available.
<b>Llwyn Harlech</b>	Extension of the syphon arrangement to exploit the dead storage in Llyn Tecwyn	Drought permit not required.
<b>Dyffryn Conwy</b>	Increase the daily and/or annual abstraction licences from Llyn Cowlyd	Sufficient resource in Llyn Cowlyd within existing licence.
<b>South Meirionydd</b>	Increased abstraction from Llyn Cynwch Penycefn WTW to support tankering to outlying source areas	Enough capacity within existing licence to support tankering.
<b>Ross on Wye</b>	Exchange of spare Wye Regulation water to Severn Trent Water's Lydbrook abstraction point	WRZ not licence constrained during a drought.
<b>Hereford CUS</b>	Increase the abstraction at Broomy Hill by 3 MI/d	WRZ not licence constrained during a drought.
<b>Hereford CUS</b>	Increase the abstraction at Leintwardine by 0.1 MI/d	WRZ not licence constrained during a drought.
<b>Llyswen</b>	Increase the abstraction at Llyswen	WRZ not licence constrained during a drought.
<b>Pilleth</b>	Increase the authorised Pilleth abstraction	WRZ not licence constrained during a drought.
<b>Brecon Portis</b>	Maintain/implement a reduced Usk compensation discharge of 5.7MI/d and relax the requirement to ensure the average compensation discharge of 9MI/d for the year.	Option is environmentally impactful and WRZ has high drought resilience.
<b>Vowchurch</b>	Removal of flow condition on the River Dore	WRZ not licence constrained during a drought.

WRZ	Option	Reason for removal
<b>Whitbourne</b>	Removal of flow condition on the River Teme	WRZ not licence constrained during a drought.
<b>SEWCUS</b>	Further reduction in Talybont compensation water release and reduction of residual flow condition on Nant Clydach	Option is environmentally impactful and WRZ has high drought resilience
<b>SEWCUS</b>	Reduction in the Cwmtillery Reservoir compensation water release	Option provides insufficient yield during a drought and WRZ has high drought resilience.
<b>SEWCUS</b>	Unsupported abstractions from the River Usk at Prioress Mill	Option is environmentally impactful and WRZ has high drought resilience.
<b>SEWCUS</b>	Unsupported abstractions from the River Wye at Monmouth	Option is environmentally impactful and WRZ has high drought resilience.
<b>SEWCUS</b>	Use Grwyne Reservoir, as a regulating reservoir, to support abstraction at Prioress Mill or Llantrisant	Option is environmentally impactful and WRZ has high drought resilience.
<b>SEWCUS</b>	Reduce the compensation water releases from the Elan Reservoirs	Option is environmentally impactful and WRZ has high drought resilience.
<b>SEWCUS</b>	Utilise Grwyne Reservoir for direct supply	Scheme not viable within short duration of a drought.
<b>SEWCUS</b>	Compensation water reduction of 50% at Lower Carno Reservoir	Option provides insufficient yield during a drought and WRZ has high drought resilience.
<b>Tywi Gower</b>	Reduce Ystradfellte compensation flow by 50%	Option is environmentally impactful and WRZ has high drought resilience.
<b>Mid &amp; South Ceredigion</b>	Increase the Teifi Pools annual abstraction licence to fully utilise the Emergency Storage volume	If needed we would apply for a time limited licence variation at the time.
<b>North Ceredigion</b>	Increase the annual abstraction quantity from Llyn Llygad Rheidol	Licence change already in place.
<b>North Ceredigion</b>	Reduce the compensation release from Llyn Craig Y Pistyll by 50%	Option provides insufficient yield during a drought and WRZ has high drought resilience.
<b>Pembrokeshire</b>	Increase the direct abstraction from Llys-y-fran reservoir and remove the 59.1 Ml/d regulation requirement and the section 158 restrictions, if applicable	A permanent scheme to increase the abstraction is being delivered.
<b>Pembrokeshire</b>	Reduce the prescribed flow required at the Pont Hywel abstraction	Option is environmentally impactful and provides insufficient yield during a drought.
<b>Pembrokeshire</b>	Abstraction from the Afon Taf	Scheme not viable within short duration of a drought.

Table 14 – Options removed for this Drought Plan

This significant reduction in the number of Drought Permits/Orders will materially reduce the overall environmental effect of our draft Drought Plan across our supply area, including effects on various environmentally-sensitive river systems within international and/or nationally important conservation areas.

For the Drought Permits/ Orders included in our Plan, we closely examined the environmental effects, taking account of the different life-cycle stages of relevant aquatic plants and animals through the calendar year, to see whether we could reduce the duration and/or period of the year during which each Drought Permit/Order may be required. Where feasible, we then sought to avoid those months where the environmental effects of each Drought Permit/Order would be greatest. We also considered what mitigation measures would be needed to address the identified environmental effects for the remaining months when each Drought Permit/Order may be required. We adopted the same assessment approach for the new Drought Permits/Orders that are included in this Plan.

Following our updated assessment of drought resilience risks for each of our Water Resources Zones, we have also been able to reduce the risk of requiring the implementation of Drought Permits/Orders, helping to reduce the frequency of any temporary adverse effects on the environment.

By reducing the implementation frequency and duration of Drought Permits/Orders, and optimising the time of year for their implementation as far as possible, we have been able to reduce the overall environmental effects of the draft Drought Plan. Further details of the improvements made to our environmental assessments and the benefits these have for our Drought Permit/Drought Order options are provided in Annex 3.

WRZ	Scheme	Reason for retention
<b>Clwyd Coastal</b>	Reduction of the regulation release from Aled Isaf	Drought scenarios indicate we could cross into Severe Drought
<b>Clwyd Coastal</b>	Relaxation of the annual licences on Afon Aled and the Plas Uchaf and Dolwen Reservoirs	Drought scenarios indicate we could cross into Severe Drought
<b>Clwyd Coastal</b>	Relaxation of the Llannerch boreholes annual licence	Drought scenarios indicate we could cross into Severe Drought
<b>Clwyd Coastal</b>	Pumped (winter) refill from Aled Isaf to Llyn Aled	Drought scenarios indicate we could cross into Severe Drought
<b>Tywi CUS</b>	Reduce Crai compensation flow by 50%	Drought scenarios indicate we could cross into Severe Drought
<b>Tywi CUS</b>	Relax the maintained requirement below the Nantgaredig intake on the River Tywi.	Drought scenarios indicate close to crossing Severe Drought
<b>Tywi CUS</b>	Reduce Brianne compensation flow by 50% - Winter refill only	Drought scenarios indicate close to crossing Severe Drought
<b>Mid &amp; South Ceredigion</b>	Increase the Llechryd abstraction from 19 MI/d to 21 MI/d and obtain variation of annual licence amounts	Summer 2018 highlighted some drought risk so this option retained
<b>North Ceredigion</b>	Pumped abstraction from Nantymoch (a HEP reservoir operated by Statkraft) into the raw water main between Llyn Llygad Rheidol Reservoir and Bontgoch WTW	Summer 2018 highlighted some drought risk so this option retained
<b>NEYM</b>	Removal of Llyn Cwellyn 10 MI/d abstraction limit	Although low drought risk for the zone, some individual reservoir risk identified

WRZ	Scheme	Reason for retention
<b>NEYM</b>	Reduction of Alaw compensation water	Although low drought risk for the zone, some individual reservoir risk identified
<b>NEYM</b>	Reduction of Ffynnon Llugwy compensation water	Although low drought risk for the zone, some individual reservoir risk identified
<b>NEYM</b>	Reduction of Cefni reservoir compensation water	Although low drought risk for the zone, some individual reservoir risk identified
<b>Barmouth</b>	Reduce compensation water releases from Llyn Bodlyn	Summer 2018 highlighted some drought risk so this option retained
<b>Lleyn Harlech</b>	Reduce regulation releases from Llyn Cwmystradllyn	Drought scenarios indicate we could cross into Severe Drought
<b>Pembs</b>	Reduce the required prescribe flow below the Crowhill abstraction	DRS indicates significant drought risk until the WRMP19 scheme is delivered.
<b>Pembs</b>	Reduce the Compensation release from Preseli Reservoir by 50%	DRS indicates significant drought risk until the WRMP19 scheme is delivered.
<b>Pembs</b>	Canaston 50% reduction in “hands off flow”	DRS indicates significant drought risk until the WRMP19 scheme is delivered.
<b>Pembs</b>	Use of Llys y Fran freshet bank for public water supply	DRS indicates significant drought risk until the WRMP19 scheme is delivered.
<b>SEWCUS</b>	Emergency abstraction from the River Rhondda at Treherbert	Although low drought risk for the zone, some individual reservoir risk identified
<b>SEWCUS</b>	Utilise the dead storage in Talybont Reservoir	Although low drought risk for the zone, some individual reservoir risk identified
<b>SEWCUS</b>	Reduce compensation water releases from Llwynon Reservoir	Although low drought risk for the zone, some individual reservoir risk identified
<b>SEWCUS</b>	Emergency abstraction from the Afon Lwyd at New Inn	Although low drought risk for the zone, some individual reservoir risk identified
<b>SEWCUS</b>	Compensation water reduction of 50% at Pontsticill Reservoir	Although low drought risk for the zone, some individual reservoir risk identified
<b>Tywyn Aberdyfi</b>	Tankering raw water from Dysynni	DRS indicates significant drought risk until the WRMP19 scheme is delivered.

Table 15 – Options retained for this Drought Plan

## 5.3.Drought Options Environmental Assessment

### 5.3.1. Introduction

To minimise any potential impact upon the environment, for each option listed in Table 15 we produce an Environmental Assessment Report (EAR) which provides an independent and robust assessment of the potential environmental effects of implementation.

During a drought when river flows are low and temperatures are high, the environment will already be under some level of stress. Our assessment is designed to determine the environmental impacts of the drought permit/drought order over and above any effects arising from natural drought conditions. Our assessments also look at the potential to mitigate the effects of the drought permit or drought order.

### 5.3.2. Environmental Assessment Reports

To fully assess the potential effects of our options, each EAR includes assessment of the following:

- the likely changes in river flow / water level regime due to implementing the proposed Drought Permit/Order option
- identification of the environmental features that are sensitive to these changes and the likely impacts on these features
- how the option may affect the environment in combination with the effects of existing abstraction licences, environmental permits and other relevant activities and plans.
- identification of mitigation measures that may be required to prevent or reduce impacts on sensitive features
- recommendations for baseline, in-drought and post-Drought Permit/Order monitoring requirements

Consideration within the EAR is also given to the potential impacts of Drought Permit/Order implementation on the features of statutory sites designated for their nature conservation importance. They include Special Areas of Conservation, Special Protection Areas and Sites of Special Scientific Interest, as well as sites identified under the Ramsar Convention.

Given the sensitivity of the environment during a drought, the assessments are precautionary. Having said that, the EARs can only produce a prediction of likely impacts; any definitive impacts will only become known when we are actually in a drought and are implementing drought orders or permits.

The EARs utilise all available data and follow best practice assessment methodologies to produce a current view of the likely impact at the time of implementation. Where the EAR concludes that an option is likely to impact upon a feature, we identify or have already identified, effective mitigation measures so that they can be put in place as quickly as possible. Examples of mitigation measures might include temporary physical in-river works such as channel narrowing, or the provision of refuge areas to help species to survive. Where mitigation measures are not possible we will, in consultation with our regulators, provide compensatory measures for the environmental impact for example, re-stocking of fish in a river where the population has been affected by implementation of a Drought Permit/Order option.

The EARs are supported by Environmental Monitoring Plans (EMPs) which include details of the hydrology, water quality and ecological parameters required to be surveyed during the three stages of implementation of our drought permit/drought order options, namely:

- pre-Drought Permit/Order monitoring will assess the environmental conditions prior to implementation. This will inform the predicted impact from the option and any mitigation actions that may be required.
- in-Drought Permit/Order monitoring will assess the environmental conditions during the implementation of the drought option. Monitoring of sensitive habitats and features will provide early warnings of any unpredicted environmental impacts and ensure that mitigation actions are operating as designed.
- post-Drought Permit/Order monitoring will assess the recovery of any impacted environmental features following the cessation of our drought option. This will help identify whether any affected features have recovered to their pre-Drought Permit/Order option levels.

## 5.4.Improvements since Drought Plan 2015

We have continued to revise and update our EARs since the publication of our 2015 Drought Plan, taking on board the comments received from both NRW and the EA. To further improve the assessment of the options we have retained, we utilised the outputs of the Drought Vulnerability Framework to better understand the likely timing of scheme implementation given the seasonal life-cycle of the ecology present in our rivers and lakes. We have previously assumed that the option could be in operation at any time in the year. However, upon review of our water resource performance, as described for each zone in Annex 1, this is highly unlikely to be the case and so we have refined our assessment accordingly.

To illustrate the above, Figure 21 shows the simulated reservoir drawdown performance of Llyn Bodlyn against the various droughts generated in the ‘Drought Library’ stochastic time series for our Barmouth water resource zone. The orange line in the plot represents our ‘Severe Drought’ trigger line which is the point at which we would implement the option to reduce the Llyn Bodlyn compensation water release to the downstream Afon Ysgethin. It can be seen that there are a number of drought events in this record that cross the Severe Drought control line and so we have analysed the timing of these to understand when the reduced compensation flow is likely to occur. Figure 22 and Figure 23 provide two examples of these drought events in more detail which show exactly when reservoir storage crosses into the ‘Severe Drought’ action zone.

The timings from all the drought events in Figure 21 (three in total) that cross the Severe Drought line are presented in Table 16 alongside the features of interest that are present within the Afon Ysgethin. It can be seen for example, that the likely timing of implementation of the Drought Order to reduce the compensation water at Llyn Bodlyn would only affect the upstream Salmon and River Lamprey migration rather than downstream migration. This allows us to better target our monitoring and mitigation measures in order to understand any impacts and to mitigate against them at the time of implementation. The EARs produced for this Plan therefore presents a much more ‘targeted’ assessment than those in our 2015 Plan.

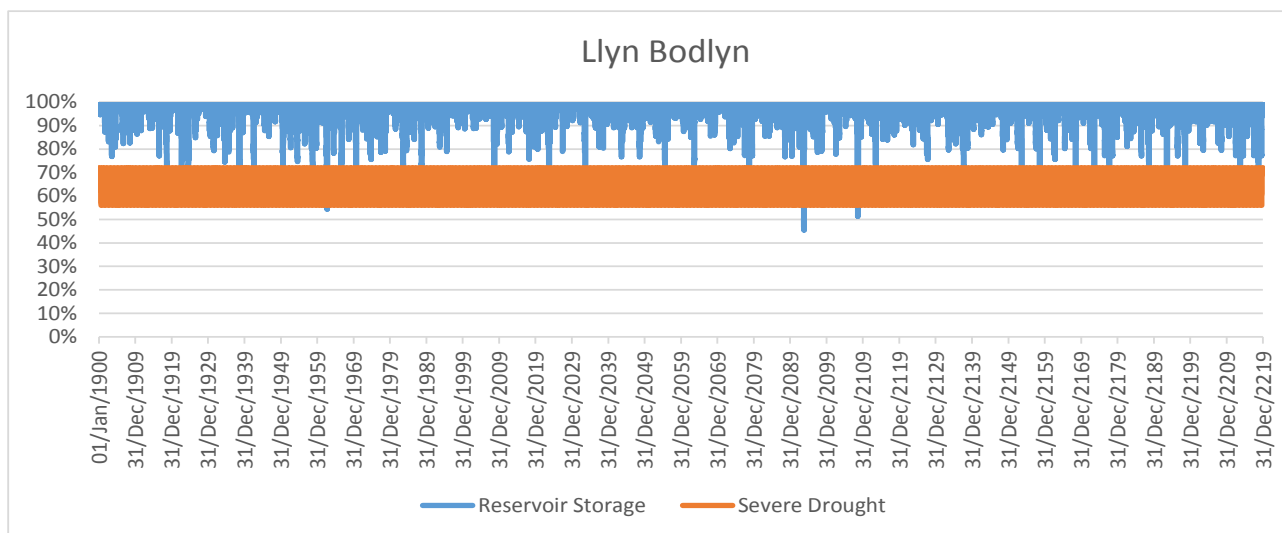


Figure 21 – Llyn Bodlyn simulated storage under the stochastic time series

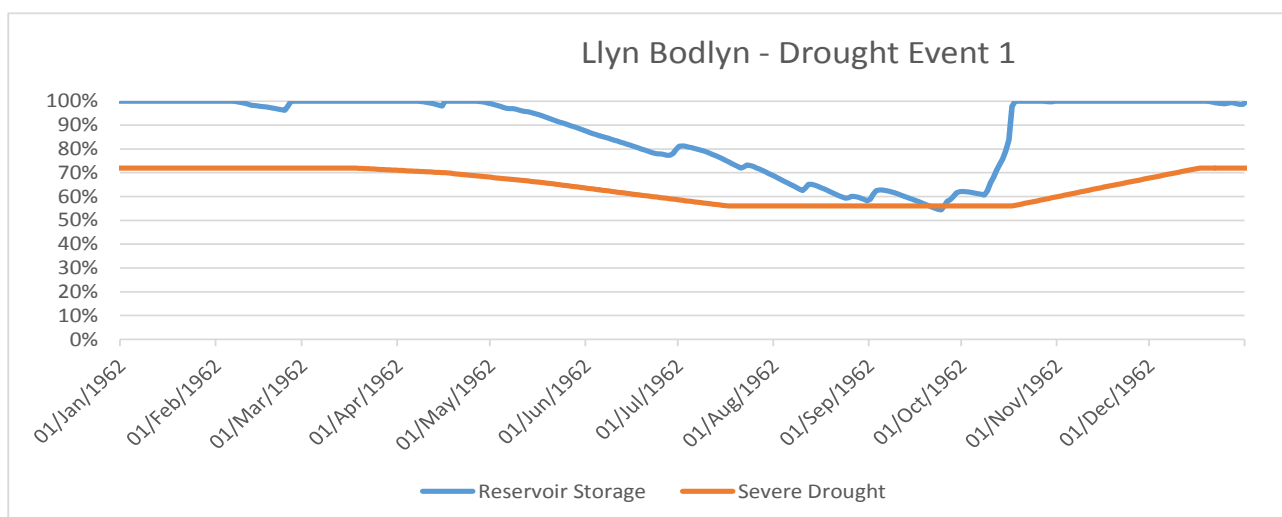


Figure 22 – Detailed view of Llyn Bodlyn Severe Drought failure 1

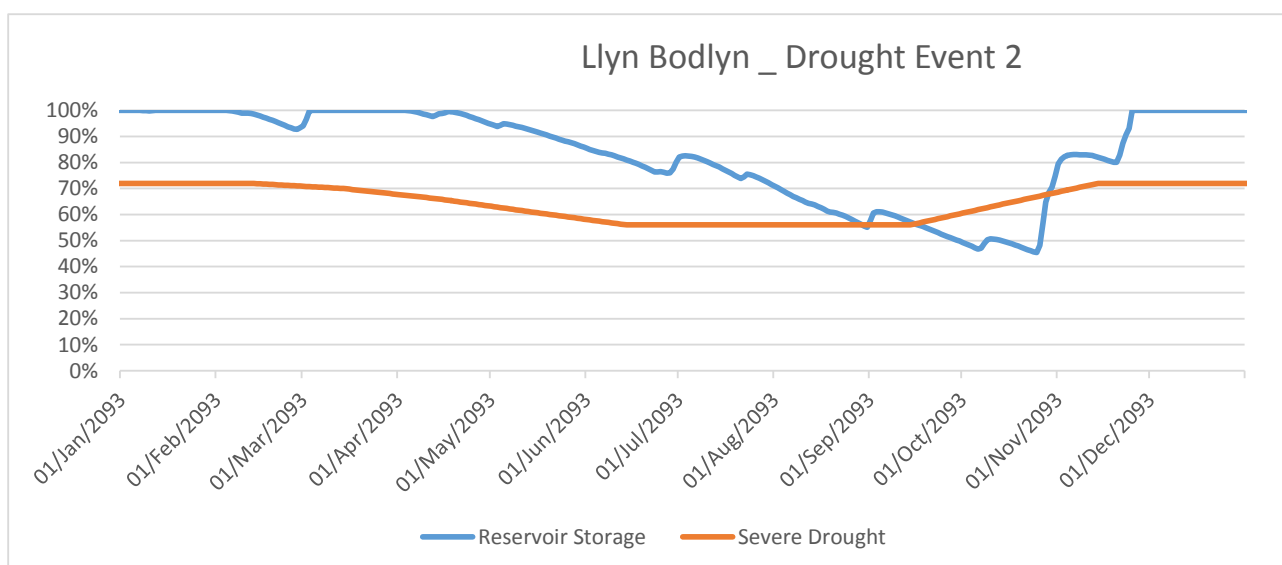


Figure 23 - Detailed view of Llyn Bodlyn Severe Drought failure 2



	EAR Risk	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Atlantic Salmon	Minor							Upstream migration					
Atlantic Salmon	Major	Downstream migration											
Atlantic salmon	Moderate	Year round juvenile habitat											
River lamprey	Minor				Downstream migration								
River/sea/brook lamprey	Major	Year round juvenile habitat											
Sea trout	Moderate				Upstream migration								
Sea trout	Moderate	Downstream migration											
Brown/Sea trout	Major	Year round juvenile habitat											
European Eel – other life stages	Negligible												
European Eel	Moderate						Downstream migration						
Phytobenthos	Minor	Communities											
Macroinvertebrates	Moderate												
Macrophytes	Moderate												
Bryophytes	Minor												
Drought Event 1							21/09 – 26/09						
Drought Event 2							16/09 – 29/10						
Drought Event 3						09/08 – 24/08							

Table 16 – Overlay of Severe Drought failures against environmentally sensitive features for the Afon Ysgethin

## 5.5. Timescales for our Drought Permit and Order Options

The outputs of the Environmental Assessment Reports indicate if an option is likely to impact upon the environment. Using this information and the available guidance<sup>12</sup> on applying for drought orders and drought permits, we have tried to estimate the time it may take for each of our applications to be determined, following the submission to either Natural Resources Wales/Environment Agency and/or Welsh Government/Defra. Understanding this timeline allows us to ensure that our drought triggers are set correctly to provide sufficient time to obtain the drought order/drought permit, before we cross in to the 'Severe Drought' action zone.

Figure 24 summarises our current understanding of the process and estimated associated timescales from the point at which we submit a drought permit/drought order application to the point at which it is determined. The flowchart essentially shows two key variables that influence the timescales:

- 1) Applying for a Drought Order involves a much longer timescale for a decision to be made.
- 2) If objections on an application are received, prompting the need for a public inquiry, this can add considerable delay to the process.

Table 17 shows that for the majority of our options, which either require a Drought Order or have been shown to have a 'Major' environmental impact and thus are likely to be objected to, the estimated timescales for the granting of these is at the longer end and could be around 35 days. The exact timings of a Public Inquiry are unknown but could conceivably mean the time taken to determine an application is longer than the assumed 35 days.

We will use the consultation process on this draft Drought Plan to work with NRW and EA to gain a better understanding of the timescales involved in determining a drought permit/drought order application and will revise our estimates accordingly. This potentially longer determination timescale means that in some zones we may have to revise our drought triggers so that applications are submitted as we are approaching the 'Drought' Action zone rather than when we are in it, as we currently assume.

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<sup>12</sup> <https://naturalresources.wales/permits-and-permissions/water-abstraction-and-impoundment/drought-permits-and-drought-orders/?lang=en>

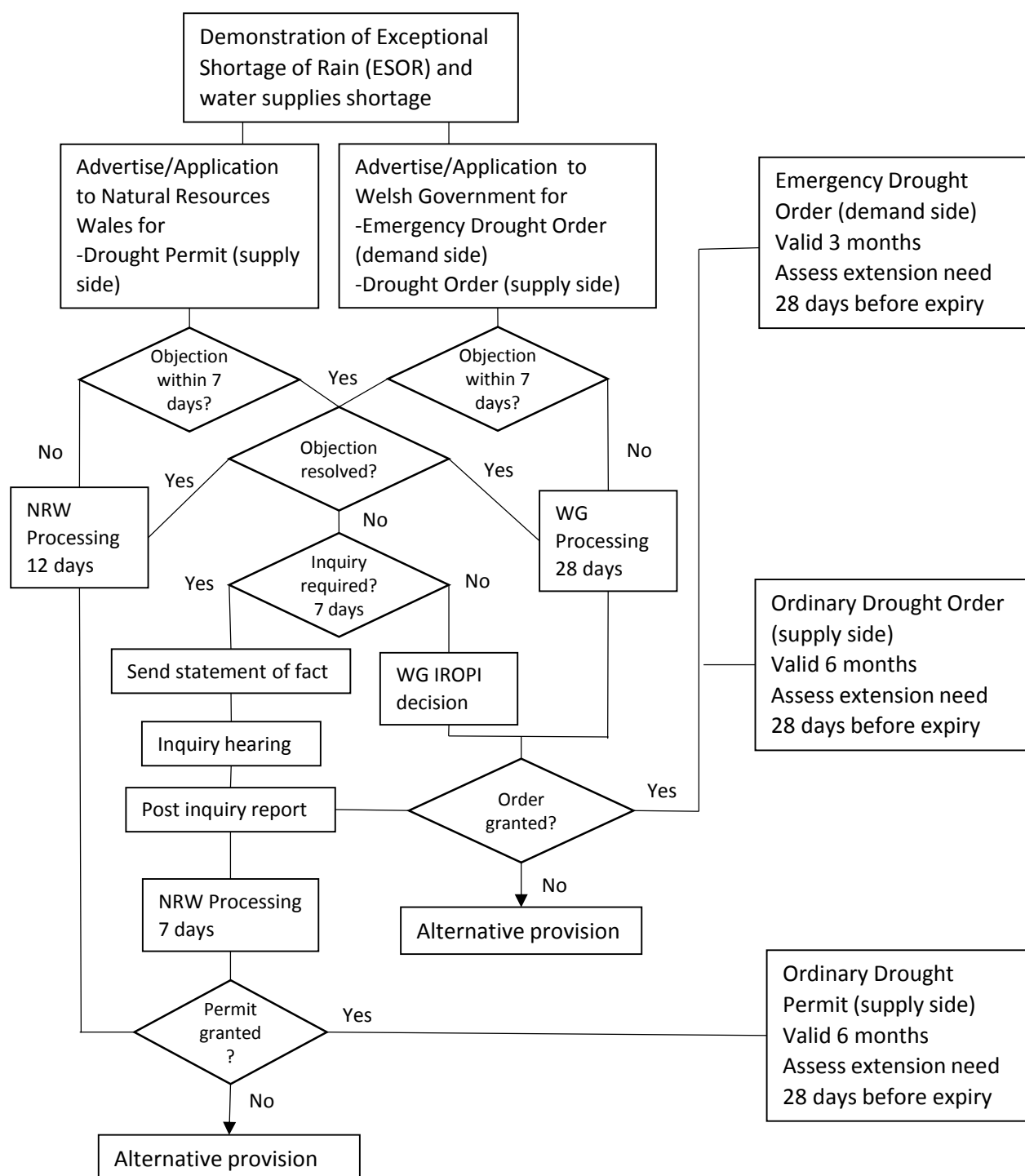


Figure 24 – Summary flowchart of the drought permit/drought order application process

WRZ	Drought Option	Hydrological Impact	Environmental Sensitivity	Permission Required	Indicative Timescale to implementation
North Eryri/Ynys Mon	8001-2 Removal of Llyn Cwellyn 10 MI/d abstraction limit	Negligible	n/a	Drought Order	35 days
	8001-3 Reduction of Alaw Compensation water	Major	Minor to Major	Drought Permit	19 days
	8001-4 Reduction of Ffynnon Llugwy Compensation water	Moderate to Major	Moderate to Major	Drought Permit	35 days
	8001-5 Reduction of Cefni reservoir Compensation water	Major	Moderate to Major	Drought Permit	35 days
Clwyd Coastal	8012-2 Reduction of the compensation release from Aled Isaf and modification of the Hands Off Flow value at Bryn Aled	Moderate	Minor	Drought Permit	19 days
	8012-4 Relaxation of the annual licences on Afon Aled and the Plas Uchaf and Dolwen Reservoirs	Minor to Major	Moderate	Drought Permit	19 days
	8012-5 Relaxation of the Llannerch boreholes annual licence	Negligible to Moderate	Minor to Moderate	Drought Permit	19 days
	8012-6 Pumped (winter) refill from Aled Isaf to Llyn Aled	Moderate to Minor	Minor to Moderate	Drought Permit	19 days
Tywyn/Aberdyfi	8021-1 New abstraction (tankering) from Afon Dysynni (to Pen Y Bont WTW)	Negligible	n/a	Drought Permit	19 days
Barmouth	8033-2 Reduce compensation water releases from Llyn Bodlyn	Major to Moderate	Major to Minor	Drought Order	35 days
Lleyn/Harlech	8034-1 Reduce regulation releases in Dwyfor	Negligible	n/a	Drought Permit	19 days
SEWCUS	8109-1 Reduce compensation flow from Llwynon	Major	Major to Minor	Drought Permit	19 days

WRZ	Drought Option	Hydrological Impact	Environmental Sensitivity	Permission Required	Indicative Timescale to implementation
	8109-4 Emergency river abstraction on the Afon Lwyd at New Inn	Major	Major	Drought Order	35 days
	8112-1 Emergency river abstraction on the Afon Rhondda Fawr at Treherbert	Major	Major	Drought Permit	35 days
	8116-3 Pump dead storage water from Talybont reservoir	Minor	Negligible	Drought Order	35 days
	8119-1 Reduction in compensation release from Pontsticill reservoir	Major	Major	Drought Permit	35 days
Tywi C.U. Area	8201-1 Reduce Crai compensation flow by 50%	Major	Major	Drought Order	35 days
	8201-3 Remove the maintained requirement below the Nantgaredig intake on the River Tywi	Negligible to Minor	Minor	Drought Order	35 days
	8201-4 Reduce Brianne compensation flow by 50%	Major	Major	Drought Order	35 days
Mid & South Ceredigion	8202-1 Increase the Llechryd abstraction from 19 MI/d to 21 MI/d and obtain variation of annual licence amounts	Negligible	n/a	Drought Order	35 days
North Ceredigion	8203-2 Pumped abstraction from Nantymoch (a HEP reservoir) into the raw water main between Llyn Llygad Rheidol Reservoir and Bontgoch WTW	Negligible	n/a	Drought Permit	19 days
Pembrokeshire	8206-1 Reduce the required prescribed flow below the Crowhill Abstraction	Moderate	Minor to Major	Drought Order	35 days
	8206-2 Reduce the Compensation release from Preseli Reservoir by 50%	Major	Major	Drought Order	35 days
	8206-7 Llys y Fran Reservoir freshet	Negligible	n/a	Drought Order	35 days
	8206-8 Relax Canaston Hands-off flow	Major to Moderate	Major	Drought Order	35 days

Table 17 – Summary of EAR outputs and estimation of application timeframe

## 5.6.Strategic Environmental Assessment

One of the key mechanisms we have to ensure that our Drought Plan does not unnecessarily impact upon the environment during its implementation, is to undertake a thorough and robust Strategic Environmental Assessment (SEA) to identify any risks ahead of time. SEA became a requirement following the adoption of the European Directive 2001/42/EC on the assessment of the effects of certain plans and programmes on the environment. The Directive has been brought into national law by the Environmental Assessment of Plans and Programmes (Wales) Regulations 2004 and The Environmental Assessment of Plans and Programmes Regulations 2004 in Wales and England respectively.

The objective of the SEA Directive is:

*“to provide for a high level of protection of the environment and to contribute to the integration of environmental considerations into the preparation and adoption of plans and programmes with a view to promoting sustainable development...”*.

Throughout the course of the development of this Plan, the aim of the SEA has been to identify any potential impacts from the options we have proposed in terms of their environmental, economic and social effects. If any adverse effects are identified, these options can then either be rejected or modified to manage or mitigate adverse effects.

### 5.6.1. Applying SEA to Drought Plans

The SEA Directive requires “an environmental assessment ... of certain plans and programmes which are likely to have significant effects on the environment” (Article 1). Plans and programmes are defined as those:

- “which are subject to preparation and/or adoption by an authority at national, regional or local level or which are prepared by an authority for adoption, through a legislative procedure by Parliament or Government; and
- which are required by legislative, regulatory or administrative provisions” (Article 2(a)).

The Welsh Government guiding principles for a Drought Plan state that those responsible for preparing drought plans should carry out a SEA as part of the range of assessments required to inform their development.

Unlike plans such as transport or land use where there is the expectation that they will be implemented during their lifetime, the various measures put forward in a drought plan may never be actioned as there may not be drought conditions that would trigger the measures. As the timing, severity, duration, frequency and location of any drought that may occur during a plan’s lifetime is not known, we cannot predict with certainty the measures that may need to be deployed in practice and, in turn, their effects on the environment. However, it is possible to assess the likely significant effects of the use of such measures should they be required. It should also be noted that the assessment considers the effects of the measures themselves, not the natural effects of the drought, which forms the baseline environment for the purposes of the assessment.

The outputs from the SEA of this draft Drought Plan are:

- to ensure that the likely significant potential environmental effects associated with the draft Drought Plan are identified, characterised and assessed;
- to help identify appropriate measures to avoid, reduce or mitigate adverse effects and to enhance beneficial effects associated with the implementation of the draft Drought Plan wherever possible;
- to provide a framework for monitoring the potential significant effects arising from the implementation of the draft Drought Plan measures;
- to give the statutory consultees, stakeholders and the wider public the opportunity to review and comment upon the effects that the draft Drought Plan may have on them, their communities and their interests, and to encourage and support them to make responses and suggest improvements to the draft Drought Plan;
- to demonstrate that the draft Drought Plan has been developed in a manner consistent with the requirements of the SEA Regulations; and
- to help inform Welsh Water's decisions on the final form of the Drought Plan.

## 5.7. Habitats Regulations Assessment

To complement our SEA, the Conservation of Habitats and Species Regulations 2017 (the 'Habitats Regulations') requires that competent authorities assess the potential impacts of plans and programmes on the Natura 2000 network of European protected sites to determine whether there will be any 'likely significant effects' on any European site as a result of the plan's implementation (either on its own or 'in combination' with other plans or projects); and, if so, whether these effects will result in any adverse effects on the site's integrity. The process by which the impacts of a plan or programme are assessed against the conservation objectives of a European site is known as Habitats Regulations Assessment (HRA).

We are aware that the 2017 regulations will be amended in a number of respects in the event of the UK leaving the European Union, but the requirement to undertake a HRA will continue.

Welsh Government and NRW guidance states that those responsible for preparing the drought plan "must ensure that the drought plan meets the requirements of the Conservation of Habitats and Species Regulations 2017, and must undertake a HRA on the effects of your plan on European sites, alone or in combination with other plans or projects (e.g. the effects of drought management actions on European sites)".

For each potential drought management measure, the HRA has considered whether there are any likely significant effects arising from construction or implementation activities and/or operation of the measure on one or more designated sites, including Special Protection Areas, Special Areas of Conservation and Ramsar sites (designated under international law to protect birds and their habitats). The HRA of our draft Drought Plan essentially follows four stages:

- A screening process is undertaken to identify whether each drought management action in this Drought Plan (either alone or in combination with other plans or projects) is likely to have any significant effects on designated sites.
- Where a likely significant effect cannot be ruled out (noting the precautionary principle), an Appropriate Assessment has been undertaken of the drought management action to determine whether this would adversely affect the integrity of the designated site(s), either alone or in combination with other plans and projects, taking into account available specific mitigation measures.

- Where adverse effects could not be ruled out at the Appropriate Assessment stage, alternative options have been examined to identify whether it is possible to avoid any potential significant effects on the integrity of the designated site.
- An assessment of compensatory measures where, in the light of an assessment of Imperative Reasons of Overriding Public Interest, and consideration of compensation measures it has been concluded that the Welsh Ministers should be asked to decide whether the Plan should proceed. Where relevant to specific Drought Permit/Order options (see Section 5.9), we will be discussing this final stage of the HRA process with NRW as part of the consultation on our draft Drought Plan prior to developing the required assessments.

## 5.8. Scoping Consultation

To support the production of the SEA and HRA we issued two Scoping Reports to statutory consultees for a five week consultation period between 5th November and 7th December 2018.

Responses were received to the consultation from the following organisations:

- Natural Resources Wales
- Environment Agency
- Cadw

A meeting was held on 3rd December 2018 in support of the consultation, with all statutory consultees invited. It was attended by Natural Resources Wales and the Environment Agency. Feedback was received from NRW, Cadw and EA and their comments were integrated in the final Scoping reports issued in December 2018.

The SEA Environmental Report and the HRA Report are published for consultation in parallel with the draft Drought Plan to support its submission.

## 5.9. Results of the Environmental Assessments

HRA screening identified several drought order options included in this Plan as having a likely significant effect on European sites, so these options have been subject to an Appropriate Assessment. The provisional outcomes of the Appropriate Assessment determined that we are unable to conclude that there would be no adverse effects on site integrity of the following designated sites, taking account of provisional considerations of mitigation measures that might be feasible to avoid adverse effects on the following sites:

River Usk SAC

- 8201-1 Crai Reservoir (alone)

Cleddau Rivers SAC

- 8206-1 Crowhill (alone and in-combination with the Canaston option),
- 8206-8 Canaston (alone and in-combination with the Crowhill option),



Full details of the environmental assessments for these three options are provided in Appendices 21, 26 and 29 respectively. Following submission of this draft Drought Plan, we will work closely with NRW during the consultation process to both understand their views on the results of our option assessments and help determine the best way forward (including in relation to Stage 3 and Stage 4 of HRA) for us to be able to include these options within our Final Drought Plan.

#### 5.9.1. Habitats Directive Stage 3 Alternative Options and Stage 4 IROPI

In accordance with the Conservation of Habitats and Species Regulations 2017, competent authorities cannot consent to plans, projects or operations if the Appropriate Assessment concludes that the plan, project or operations may have an adverse effect on the integrity of a relevant site. The Welsh Government / Natural Resources Wales Drought Plan Guideline (DPG) also indicates that a drought plan will not normally be enacted or adopted unless it can be shown that it would not have a likely significant effect on or an adverse effect on the integrity of a relevant site. The DPG also states that in exceptional cases, a plan or project can be enacted or adopted despite having an adverse effect on the integrity of a relevant site if it can meet the three sequential tests listed below:

- There must be no feasible, reasonable alternative solutions to the plan or project which are less damaging to the affected relevant site(s).
- There must be “imperative reasons of overriding public interest” (IROPI) for the plan or project to proceed – this must involve a balancing of factors such that the harm (or risk of harm) to the relevant site must be outweighed, or overridden, by the reasons for agreeing to the plan or project
- All necessary compensatory measures must be secured to ensure that the overall coherence of the network of relevant sites is protected.

For the three Drought Order options where we cannot currently conclude “No Adverse Effect” on the integrity of a European site we will work with Natural Resources Wales during the consultation on our draft Drought Plan to agree the best way forward to ensure we produce a robust Plan that mitigates supply risks to our customers whilst minimising any potential impact upon the environment, including protected sites.

### 5.10. Compensation to other abstractors due to a Drought Order

When a drought order is granted to us, other abstractors affected by that action can approach Welsh Water under Section 79(2) and Schedule 9 of the Water Resources Act 1991, for compensation in particular circumstances for loss or damage sustained by reason of the taking of the water. Anyone wishing to claim compensation should refer to Schedule 9 of the Water Resources Act 1991 for details of eligibility. However, for clarity we outline some of the process below:

Those eligible to apply for compensation include owners and occupiers of the land affected by any drought order, owners of the source of water, all persons interested in the source of the water, owners of the place of discharge, all persons interested in the place of discharge.

A claim for compensation under Schedule 9 of the Water Resources Act 1991 can be made by serving upon the applicant (i.e. Welsh Water) a notice stating the grounds of the claim and the amount claimed. Claims for compensation must be made at any time not later than six months after the end of the period of which the order is effective.

Any claim for compensation would be reviewed by us on a case by case basis. Any question as to the right of a claimant to recover compensation, or as to the amount of compensation recoverable shall, in default of agreement, be referred to, and determined by, the Lands Tribunal.

## 6. Post-drought actions

### 6.1. Drought recovery

When wetter weather returns, this will reduce water demand but it can take a considerable amount of time for our reservoir stocks to recover to the position that we would normally expect them to be in. During this period, we will continue to undertake similar risk assessments as those made during the drought period but with greater attention to the longer term impact. We will look both at the prospect of the weather turning dry once again and the likelihood that our reservoirs will re-fill over the winter/spring period and not lead to further issues the following year. At this stage we will look at the need to apply for additional drought permits aimed at securing water supply for the following year. We have listed the sites where we might make such application in Chapter 5.

Our water resource zones have differing characteristics in terms of their resilience to varying types of drought, as discussed in Chapter 4, and more specifically to their ability to recover post drought.

Reservoirs such as Usk in the south east of our region can struggle to refill because the size of the catchment from which it receives its water is relatively small in comparison to the size of the reservoir and the volume of demand it has to meet. Other reservoirs such as Cwellyn in north-west Wales refill over the winter period as the opposite is the case.

For these reasons, the initial recovery out of the drought action zone would not typically be the point at which all measures would be lifted. A more likely point for declaring the end of a drought would be in the approach to the normal zone, when reservoirs are well stocked for the time of year and, in demand trigger zones, abstraction quantities fall below the developing drought trigger level.

There is a reputational risk if any drought actions put in place are lifted prematurely (i.e. in advance of imminent re-deterioration into drought conditions). Hence, caution will always be taken in deciding when, as conditions return to normal, any restrictions upon use can be lifted and appropriate communication issued to customers.

As with the onset of drought it is important that we take a flexible approach to the lifting of restrictions imposed on our customers or in taking additional water from the environment outside of our permitted volumes. We may also choose to lift restrictions on an area basis in a proportional manner. These decisions will be led by the Gold incident team and further discussed with government through the Wales Drought Liaison group and the National Drought Liaison Group. The factors that will be taken into account in making this decision will be:

- The results of risk forecasts for individual WRZs
- The time of year and anticipated savings from demand side measures
- Forecast weather conditions
- Natural Resources Wales and the Environment Agency environmental drought status

Throughout the post-drought stage as conditions recover, environmental monitoring will be undertaken as part of the suite of actions to ensure we have the fullest possible understanding of the impact that any supply side drought actions have had. This post-drought environmental monitoring also informs our decision making so that appropriate measures can be taken to support the recovery of the environment after a period of drought.

## 6.2. Post drought review

Once we are confident that conditions have recovered and we are able to ‘stand down’ our incident response teams, we will hold a number of internal meetings involving all the members of our Gold and Silver centres to review the drought event.

The extent of the review will be dependent upon the level of drought encountered. We will review the effectiveness of the drought management actions we took to understand any impacts to customers and the environment from their implementation. Separately we would also review how well our Drought Plan has performed, particularly in relation to:

- The appropriateness and efficacy of the hydrological triggers used to determine entry into drought, looking at where triggers gave early warnings, reliability of triggers, etc.
- An assessment, where possible, of the demand reductions resulting from the communications strategy.
- The effectiveness of demand management measures (e.g. leakage, active pressure management, etc.) in reducing demand, including variables impacting the savings achieved
- Outcomes of operational ‘mop-up’ sessions and workshops to identify unforeseen system constraints, etc.
- Capturing of operational learning from drought option delivery, including asset performance, operational restrictions, and procurement of service.
- Supply side measures, operational details around their implementation, including barriers to delivery, opportunities to streamline the process and where options should not be included in the future
- Review of the environmental monitoring of supply side drought options and the mitigation measures which were pursued
- The management and communications strategy adopted during the drought
- Cooperation during the drought between various key stakeholders, such as NRW, EA, other water companies, etc.

For more severe droughts where we have put TUBs in place, we will prepare a ‘lessons learnt’ report.

Once we have completed our internal review we will meet with Government and regulators to review how effective they felt our drought management was, how well we worked together across organisations and whether improvements could be made, particularly in terms of communication and support to other sectors.

These discussions will inform and promote improvements in practice, to reflect the greater understanding of activities in a drought. This review process is outlined in Figure 25.



Figure 25 – Drought event review process

## REFERENCES

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- <https://naturalresources.wales/permits-and-permissions/water-abstraction-and-impoundment/drought-permits-and-drought-orders/?lang=en>

## APPENDICES

- Appendix 1 – Drought Vulnerability Framework: Final Project Report
- Appendix 2 - Drought Vulnerability Framework: Hydrological Update
- Appendix 3 – Strategic Environmental Assessment (SEA) of the Draft Drought Plan 2020: Environmental Report
- Appendix 4 – Habitats Regulations Assessment (HRA) of the Draft Drought Plan 2020: Habitats Regulations Assessment Report
- Appendix 5 Environmental Assessment Report Llyn Cwellyn (Option no. 8001-2)
- Appendix 6 Environmental Assessment Report Llyn Alaw (Option no. 8001-3)
- Appendix 7 Environmental Assessment Report Llyn Fynnon Llugwy (Option no. 8001-4)
- Appendix 8 Environmental Assessment Report Llyn Cefni (Option no. 8001-5)
- Appendix 9 Environmental Assessment Report Llyn Aled Isaf (Option no. 8012-2)
- Appendix 10 Environmental Assessment Report Afon Aled (Option no. 8012-4)
- Appendix 11 - Environmental Assessment Report for Llanerch (Option no. 8012-5)
- Appendix 12 - Environmental Assessment Report for Llyn Aled (Option no. 8012-6)
- Appendix 13 - Environmental Assessment Report for Dysynni (Option no. 8021-1)
- Appendix 14 - Environmental Assessment Report for Bodlyn (Option no. 8033-2)
- Appendix 15 - Environmental Assessment Report for Dwyfor (Option no. 8034-1)
- Appendix 16 - Environmental Assessment Report for Llwynon (Option no. 8109-1)
- Appendix 17 - Environmental Assessment Report for Lwyd (Option no. 8109-4)
- Appendix 18 - Environmental Assessment Report for Rhondda (Option no. 8112-1)
- Appendix 19 - Environmental Assessment Report for Talybont (Option no. 8116-3)
- Appendix 20 - Environmental Assessment Report for Pontsticill (Option no. 8119-1)
- Appendix 21 - Environmental Assessment Report for Crai (Option no. 8201-1)
- Appendix 22 - Environmental Assessment Report for Tywi (Option no. 8201-3)
- Appendix 23 - Environmental Assessment Report for Brianne (Option no. 8201-4)
- Appendix 24 - Environmental Assessment Report for Llechryd (Option no. 8202-1)
- Appendix 25 - Environmental Assessment Report for Nantymoch (Option no. 8203-2)
- Appendix 26 - Environmental Assessment Report for Crowhill (Option no. 8206-1)
- Appendix 27 - Environmental Assessment Report for Preseli (Option no. 8206-2)
- Appendix 28 - Environmental Assessment Report for Llys y Fran (Option no. 8206-7)
- Appendix 29 - Environmental Assessment Report for Canaston (Option no. 8206-8)