Drought Plan 2022 (revised draft)

Yorkshire Water

20/09/2021

YorkshireWater

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In accordance with Drought Plan guidance, this statement certifies that Yorkshire Water's Drought Plan has been reviewed by our security team. This 'public' version includes information that we have redacted or edited out in the for reasons of national security.

1 Introduction

Yorkshire Water provides clean and wastewater services to over five million people in Yorkshire. Planning for droughts is an essential part of ensuring that our services remain resilient during extreme weather events. As a water undertaker we have a duty to prepare and maintain a drought plan under Sections 39B and 39C of the Water Industry Act 1991, as amended by the Water Act 2003 and in accordance with the Drought Plan Direction 2020.

A drought is a naturally occurring prolonged period of drier than normal rainfall that reduces the volume of water available in rivers, reservoirs and below ground, leading to water supply problems and potentially harm to the environment. Hot temperatures can make a drought worse by evaporating moisture from the soil, increasing water use and reducing both water and oxygen in waterbodies to levels that are harmful to aquatic life. Droughts can last for a few weeks to several years and in certain circumstances can lead to water supply shortages for public water supply, the environment, agriculture, and any businesses that rely on water abstractions. The sensitivity to droughts is variable and can be dependent on when dry weather occurs. For instance, short periods of below average rainfall during the growing season can impact a farmer's crops. Whereas it would take a much longer dry period for a drought to affect water supply.

The most recent Environment Agency Water Company Drought Plan guideline (DPG2020) was published in December 2020. In April 2020 the Government stated its expectations for drought planning in a letter to the chief executive officers of water companies operating wholly or mainly in England. Our Drought Plan 2022 builds on our previous drought plans incorporating both learning from recent dry weather events and these latest guidelines and government expectations.

The Drought Plan Directions have also been revised and updated and now include the requirement for all water companies to submit a revised draft plan by a common submission date (1 April 2021). We have submitted this Drought Plan 2022 in draft to the Secretary of State for the Department of Food and Rural Affairs (Defra) in accordance with the latest Drought Plan Direction 2020 (see Appendix 1). We will review the plan following a period of public consultation and, on receipt of permission from Defra, we expect to publish a final version in 2022.

Alongside this Drought Plan we have published a non-technical summary, which can be found on the Yorkshire Water website.

1.1 An overview of our Drought Plan processes

This Drought Plan is based on the extensive drought planning experience that we gained during 1995-1996, 2003, 2010, 2011, 2018 and 2020, and formalises a process that has been successfully used in practice. The Plan is consistent with our Water Resources Management Plan (WRMP) 2019 and with Environment Agency and Defra requirements.

Every drought is different and can challenge us in new ways to the last. Each drought we experience tests our supply systems and processes, providing new learning that enables us to strengthen our resilience to future events. We use actual drought events to create scenarios in our water resource planning model to help us identify when drought actions are needed and produce triggers so that we react in a timely manner. We also develop scenarios to represent events worse than those we have experienced previously to ensure we are as resilient as possible to future, more extreme events.

The drought actions available to us include measures that can either increase available supplies or reduce the demand for water, which inevitably increases during dry weather. Most recently, the prolonged dry weather during 2018 and the dry weather period experienced in 2020 during the first Covid-19 lockdown period, provided some new challenges not experienced in past droughts. We were able to continue meeting customer demand throughout these recent events, although a number of our drought plan triggers were crossed, and drought actions implemented. Both events led to extremely high demands that reinforced the importance of demand reduction measures as drought actions.

At the start of a dry weather period, we will implement actions that have no or little material impact on customers or the environment. As a dry weather event escalates, the actions available to us include imposing restrictions on customers or taking more water from the environment. Some of these actions will require legal approvals through the granting of a drought permit or drought order. We prepare for these well in advance and have pre-written applications we can update if a drought develops.

In most years a drought will not develop, but by reacting at the onset of dry weather we are more resilient in the years that do progress into drought. Our initial drought actions will balance the need to conserve water supplies for continuing dry weather against the risk of taking more extreme actions too early, which could be an unnecessary risk to the environment.

1.2 How we plan our water resources

The Drought Plan is one of three water resource planning documents that water companies in England and Wales are required to produce or contribute towards. As well as producing a Drought Plan, we have a statutory requirement to produce a Water Resource Management Plan. The third plan is a regional water resource plan, which is not currently a statutory requirement.

Water Resources North

Yorkshire Water is part of the Water Resources North (WReN) regional group which has been assembled to oversee water resources planning at a regional scale for the North East of England and Yorkshire. The WReN regional group members include stakeholders with an interest in water resources in our region, such as non-public water supply abstractors (energy providers, agriculture and industry), water companies and representatives from key groups and trusts.

There are five regions in total and Yorkshire Water is producing the first WReN Regional Plan alongside Northumbrian Water, Hartlepool Water and the regional group members. Regional Water Resource Plans provide a process for water companies to plan for the long-term in collaboration with other abstractors in the same region. They aim to address the future water resource demands of both the water users and the environment. This includes improving resilience to drought and contributing to national resilience through bulk transfers if these prove to be best value solutions.

The first WReN Regional Plan is currently being drafted and will be available for consultation in January 2022. Please see https://www.waterresourcesnorth.org/ for details on progress to date. Further information on the Government's requirements of regional plans can

be found via the following link https://www.gov.uk/government/publications/meeting-our-future-water-needs-a-national-framework-for-water-resources.

For some of the regional groups there are clear benefits to co-ordinating drought actions and even going so far as to develop regional drought actions and triggers. The benefit of regional drought planning for the three WReN water companies is limited due to the geographical size of the companies and their risk profiles. The three companies have no water supply connections. Hartlepool Water is surrounded by the Northumbrian Water supply area but has its own groundwater supply. Yorkshire Water and Northumbrian Water share a border, but this is in a rural part of the region. Although Yorkshire Water has a drought option to create a link to transfer water from Northumbrian Water this would be an extreme drought action, and our drought plan triggers and actions are designed to avoid this need where possible.

The climatic variations are also a factor as is the resource position. The three companies experience different rainfall patterns, rely on different hydrological structures, and have different levels of service. Yorkshire Water and Hartlepool Water have potential to have restrictions on use more frequently than Northumbrian Water. Hartlepool Water relies solely on groundwater, whereas Yorkshire Water has a conjunctive use system that takes water from mostly surface resources although groundwater is still a vital resource providing around 25% of our supply. Groundwater tends to react much more slowly to dry weather than surface water. It is therefore unlikely the three companies would experience a drought of the same intensity at the same time, unless in very extreme and unprecedented circumstances. This limits the potential for regional drought planning as it is likely we would not be experiencing the same drought impacts at the same time.

The priority for Water Resources North is to therefore support regional water resources resilience through the Regional and Water Resources Management Planning processes, rather than through water company Drought Plans.

Water Resources Management Plan

Our Water Resource Management Plan (WRMP) is a long-term plan that forecasts supply and demand public water supply needs in Yorkshire over a minimum of 25 years. We use it to identify any future risks that could reduce

available supply (e.g. climate change) or increase demand (e.g. population growth). The forecasts are based on dry year scenarios as these will test our systems more than normal years.

If the supply-demand balance shows there is a risk of falling into deficit, we will invest in new supplies and / or demand reduction activity to ensure that supplies to our customers remain secure into the future. Our WRMP will also consider the impact our use of water resources has on the natural environment to help ensure that our abstractions remain sustainable into the future. We produced our WRMP in consultation with customers and stakeholders and we aim to take a balanced approach in deciding which actions to take.

All water companies have a legal requirement to produce WRMPs every five years. Our current plan is WRMP19 and covers the 25-year period from 2020 to 2045. The impact of climate change on supply poses a risk to our future supply demand balance if we do not take action. We intend to meet this risk by reducing leakage over the planning period.

The next WRMP will be WRMP24 and it is due to be published for consultation in the autumn of 2022. It will be developed in conjunction with the WReN Regional Plan and the regional needs will influence our company level plan.

Drought Plan

Our Drought Plan is an operational plan that identifies the actions we will take before, during and after a drought. It sets out how we will assess the effects of droughts, including the potential environmental impacts of any actions we might take and what we will do to monitor and prevent or mitigate the impacts.

Drought Plans ensure water companies are prepared for drought events that vary in severity. In our plan we set out the actions available to us to mitigate the impact of droughts. It's important that actions are implemented at the right time. To help us do this, we have defined triggers for the actions and for the activities leading up to implementing the actions, such as public consultations or environmental monitoring.

Water companies have levels of service for drought actions that restrict customer use or impact the environment. They are based on the likely frequency of the actions occurring. Our drought triggers are linked to our

levels of services to ensure we take appropriate action in a timely manner. Our current levels of service have been in place since April 2001 (see section 1.5). Through planning and investment for the long-term, our WRMP ensures we maintain this level of security of supply to customers.

1.3 Yorkshire Water's supply area

This Drought Plan explains the principles of managing resources in Yorkshire in both normal and drought periods. A flexible and timely approach is adopted to identify and respond to the various stages of a drought.

The area we supply is divided into two water resource zones – the Grid Surface Water Zone (SWZ) and the East SWZ – as shown in Figure 1.1. These zones are consistent with our WRMP.

Yorkshire was significantly impacted by drought during 1995 and 1996. During and immediately after this drought we made considerable investment in new pipelines and pumping stations. We laid major raw and treated water transmission pipelines and by the end of 1996 around 95 per cent of the population of Yorkshire were linked through a robust integrated grid network. At the same time, developments in computer modelling were implemented, which enabled the optimisation of water supplies together with centralised production planning, management and control.

Figure 1.1 Water resource zones

Since 1996 we have further extended our grid network, and 99 per cent of customers are now connected. The one per cent of customers not connected are in the East SWZ, which benefits from a considerable surplus of resources. Even in periods of drought, supply will be far greater than demand in this zone.

Figure 1.2 shows the current grid system. This provides customers with a robust supply system capable of maintaining our levels of service during severe, localised droughts. The interconnectivity enables the benefits of supply side actions, such as drought orders and permits, and demand management actions, such as water saving campaigns and targeted enhanced leakage control, to be spread throughout the Yorkshire region.

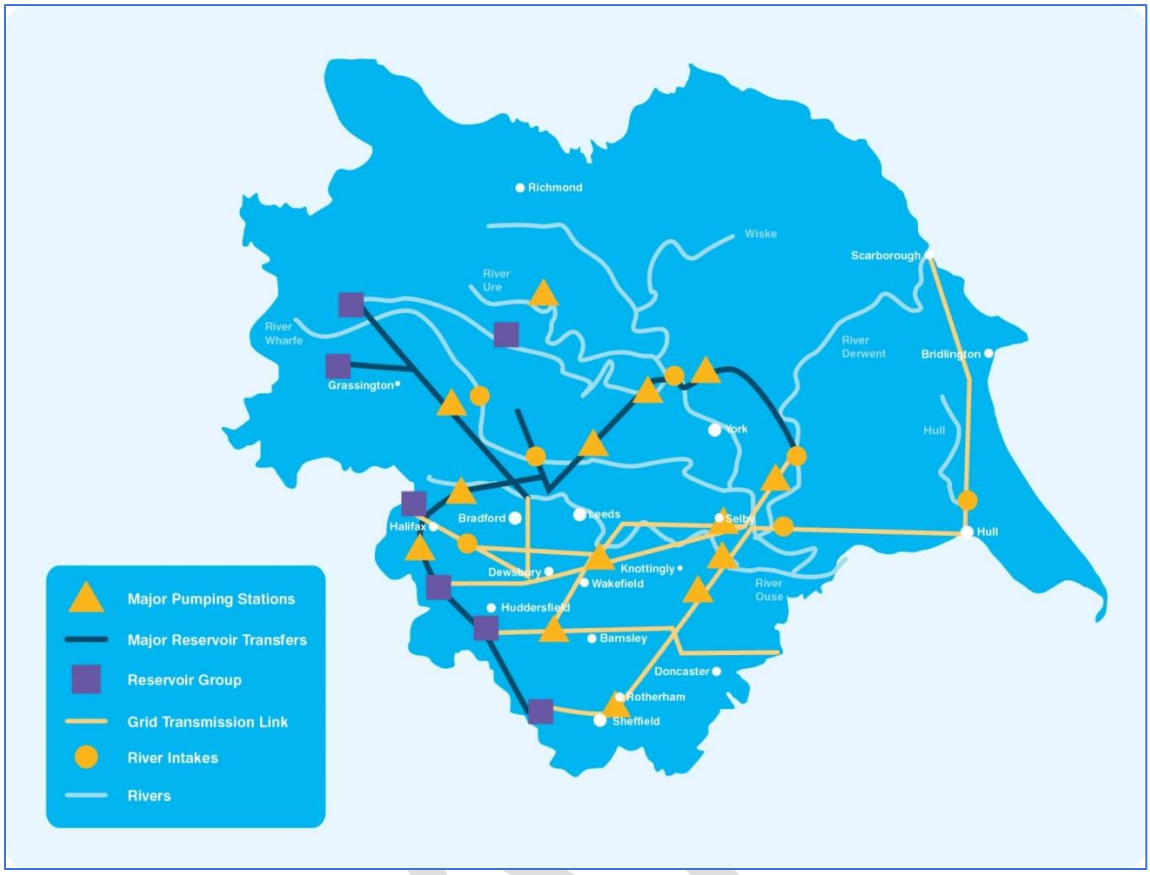


Figure 1.2 Yorkshire Water grid system

1.4 How we manage our water resources

We take a fully integrated, source to tap, approach to planning and managing water resources across Yorkshire. Our primary objective is to ensure that excellent quality water is reliably supplied at minimum cost to customers and the environment.

We estimate source yield as part of the WRMP process and refer to this as the deployable output of the available sources. We make adjustments to this figure to allow for outages, such as temporary plant failures or pollution events preventing abstractions. We also adjust for process losses, because some water will be discharged as waste during the treatment process. Once these adjustments are applied, we are able to provide an estimate of the total water we can provide to customers. This is referred to as Water Available For Use (WAFU). Our strategy is to ensure that, at all times, the WAFU is sufficient to meet expected demand, even in dry years, to ensure that we meet our levels of service (see section 1.5 below).

To help us maintain our levels of service, we have a weekly management process to determine key flow targets (for reservoirs, rivers, boreholes, water treatment works and pipelines) for the week ahead. The process uses our WRAP (Water Resource Allocation Plan) computer model to determine the best use of available resources to meet demand and maintain security of supply. Resources are selected to minimise costs, environmental impacts and carbon emissions.

The WRAP model takes account of expected demands, reservoir and groundwater operating rules, reservoir control curves and licensing constraints. Temporary constraints such as outages for maintenance work or water quality problems are considered. The WRAP model also takes account of our management of river resources in line with licence conditions. These conditions limit the volumes we can abstract, often restricting abstractions at times of low flow whilst allowing increased abstractions during higher flows, typically in the autumn and winter.

During dry periods customer demand increases and one of the first actions we take is to enhance our promotion of our water efficiency campaign. If we keep our customers aware of the situation and advise on how they can reduce their water use, this helps us to conserve resources and lowers the risk of needing to take more severe drought measures.

1.5 Our levels of service

We plan our resources to meet customer demands for water. The available yield of sources is expressed on the basis of a level of service to customers. The level of service relates to the frequency and type of drought actions used. Actions are categorised from level 1 to level 4 with the severity of the action increasing through the levels. The actions are summarised below and further details provided in section 3. We calculate our levels of service using historic weather patterns and previous worst-case scenarios to meet forecast demands.

Our current Levels of Service are shown in Figure 1.3. The frequency is an average over a long period of time, and therefore does not preclude a more frequent occurrence if there is a particular run of very dry years. We do not apply a frequency to level 1 as these early drought actions are delivered to some extent in most years as part of normal operations and practices. In dry

years we may need to enhance our water saving campaign, but we would communicate the benefits of water saving at all times.

Measure	Frequency
Level 1: Drought actions with minor environmental impacts and appeals for voluntary reductions in use	N/A
Level 2: Introduction of temporary use bans	No more than 1 in 25 years on average
Level 3: Supply-side drought permits / orders and non-essential use drought orders	No more than 1 in 80 years on average
Level 4: Emergency drought orders	1 in >500 years (This is an estimate of an exceptionally rare event)

Figure 1.3 Yorkshire Water levels of service

The National Framework for Water Resources places a requirement on all regions to be resilient to a 1 in 500-year drought for public water supply. Yorkshire Water is already at this level but will reassess for WRMP24 using updated climate change data and methodologies. We may, as in WRMP19, need to invest in interventions to ensure we remain resilient to future risks. Northumbrian Water and Hartlepool Water will also model their resilience to 1 in 500-year droughts and plan to achieve this level in their WRMP24 plans, ensuring regional resilience for public water supply in the WReN region.

Our level of service has improved since 2001 through leakage reduction, grid extension and additional abstraction licences. Customers place a high value on the reliability of water supply, and we have the same level of service for all of our customers.

Levels of service within the East SWZ are more difficult to simulate. For the Drought Plan we relate them to events where resource deployable output is insufficient to maintain demand within drought periods. For the East SWZ the level of service is based on an analysis of historic river flows and the ability to meet demand where output is constrained by abstraction licences.

The level of service provided in both water resource zones meets our minimum standard of temporary use bans i.e. not more frequently than 1 in 25 years on average. However, in the East SWZ, even in periods of drought,

supply is likely to exceed demand. Deployable output in the East SWZ is limited by the output of the East Zone water treatment works, which is 14Ml/d. In our WRMP 2019 we forecast dry year average demand in the zone is around 6Ml/d over the 25-year planning period. This provides a surplus of around 5Ml/d above headroom, which is 35 per cent of deployable output or 75 per cent of peak demand.

The regional demand in our deployable output model for WRMP 2019 is 1460Ml/d. Our levels of service for level 2 (temporary use bans) and level 3 (drought orders or permits) actions are the result of our WRAPSim model simulation and reflect the frequency of modelled restrictions. For level 4 (emergency drought order) we estimate a return period of greater than 500 years. We have estimated this by analysing modelled reservoir stocks and the use of extreme value analyses to suggest the frequency of stocks falling below 20% of regional reservoir stocks.

Extreme value analyses are not accurate for such large return periods with such relatively short time series (less than 100 year annual series to estimate a return period of 500 years), which is why we qualify this as an exceptionally rare event. Since it is based on annual minimum modelled reservoir stocks, it is really only applicable to single season events. Elsewhere in this Drought Plan we carry out statistical analyses on reservoir group inflows and rainfall to estimate the return periods of drought events. Again, these are relatively accurate for shorter return periods (up to twice the length of the time series, although different distributions return different estimates) but are not accurate for longer return periods. For WRMP24 and for our next Drought Plan we will use stochastic data series with thousands of years of record, which will give us a better idea of the frequency of extreme droughts and enable us to better define our 1 in 500 resilience.

1.6 Drought management actions that we may take

During a drought there are a number of actions that we can take to help maintain supply to our customers when available resources are low. The Environment Agency DPG2020 categorises water company drought plan actions into four levels, with the level of drought severity increasing as a company moves from level 1 upwards.

Drought Plans should only include actions up to level 3 but must also consider extreme drought management actions that could be delivered if there was

ever a risk of needing level 4 actions. Level 4 actions are part of water company emergency plans and would only be required in exceptional circumstances. The triggers and actions we take in the preceding levels are designed to avoid the need for any emergency drought actions that would significantly impact on customers. In accordance with the DPG2020 we have determined the likely triggers for drought plan actions including level 4 actions. These are discussed in section 2.

Our initial response to dry weather is to implement our level 1 actions. We will make operational changes, such as maximising our use of river sources, which allows us to use less reservoir supplies and conserve our stocks during the dry period. We will continually review our operations and adapt to the situation as it progresses. To help reduce the demand for water we will raise awareness of the situation and request voluntary reductions in use whilst enhancing our leakage activity.

We have an 'agile' approach for customer communications on the need for water conservation. The DPG2020 describes agile communications as a 'flexible and adaptive communications plan that promotes using varied and innovative communication channels to help customers reduce water use'. Our preference is to use agile communications that can be changed and adapted to reflect the risks and conditions. Messages to customers are linked to the severity of the situation, the risk of requiring more extreme drought measures later in the year and the short-term weather forecast.

If the situation escalates and our agile communications approach is not proving effective, we have the authority to impose temporary use bans. Temporary use bans are level 2 drought actions and (depending on the time of year) are a pre-requisite to drought permit or order applications, unless we can provide evidence that our agile communications reduced the demand for water.

In extreme droughts, we may implement level 3 actions which require authorisations through drought permits or orders which are granted by the Environment Agency and Defra respectively. Our level 3 actions can increase available water supplies by either temporarily altering abstraction permissions to allow us to take more water from rivers or by reducing the compensation flow we are required to release from reservoirs. We would usually apply to the Environment Agency for a drought permit to allow us to implement these actions. However, we can also apply to Defra for a drought

order. In some circumstances we may also implement level 3 actions that impose further restrictions on use, in addition to those prohibited by a temporary use ban. Level 3 restrictions are generally referred to as a non-essential use ban and can only be authorised if a drought order is granted by Defra.

Level 4 drought actions require an emergency drought order to be granted by Defra. Emergency drought orders permit severe restrictions on use to be imposed such as rota cuts, standpipes and phased pressure reduction. These actions could have severe social and economic impacts which are not considered acceptable, and most of the actions would be almost impossible to implement from a practical viewpoint. If we experienced a repeat of any of the droughts previously experienced in Yorkshire, we would not require level 4 restrictions. However, it is essential we have emergency plans for dealing with extreme events which includes extreme and unprecedented droughts.

We have modelled a trigger for emergency drought orders and our analyses show there is less than a 1 in 500 chance of this occurring. In the event it was a risk we have identified extreme drought actions to be implemented following level 3 actions to avoid reaching the level 4 trigger. Further details on all our drought actions are provided in Section 3 and Appendices 3 to 5.

1.7 Who have we already consulted?

In line with the DPG2020, statutory and non-statutory consultees were invited to comment prior to production of this draft Drought Plan.

Our statutory consultees are:

- The Environment Agency
- The Secretary of State for the Environment, Food and Rural Affairs (Defra)
- Ofwat
- Water supply licensees operating in our area.

We consult with inset appointees and licensed suppliers who supply premises in the Yorkshire Water supply area using the public water networks we operate in our area. Inset appointees are companies which provide a water

and/or sewerage service to customers in an area previously supplied by the incumbent water company (Yorkshire Water is an example of an incumbent). At the time of writing this Drought Plan there are three inset appointed water suppliers in our area. Two of these serve household customers with water and waste water services via our clean and waste water networks and the third provides wastewater services only.

Licensed suppliers are companies who can supply water to non-domestic customers and either hold a retail supply licence, which allows them to supply non-domestic premises, or a combined supply licence, which allows the holder to introduce water into the supply system for supplying its own customers. At the time of writing this Drought Plan there are 23 licensed suppliers operating in our region.

Our non-statutory consultees are those who have an interest in our Drought Plan or are likely to be affected by actions within our plan, including our neighbouring water companies. They include:

- Drinking Water Inspectorate
- Consumer Council for Water
- Natural England
- Historic England
- Local environmental groups, angling clubs, fish farms and river trusts
- Representatives bodies such as National Farmers Union (NFU), Internal Drainage Board (IDB) and Coal authority
- Anglian Water
- Northumbrian Water
- Severn Trent Water
- United Utilities
- The other regional water resource (WR) groups (WR West, WR East, WR South East and West Country WR)

- The Canal and River Trust (CRT).

Our pre-draft consultation on this Drought Plan was in the form of an email sent to all of the above consultees notifying them that we were revising our Drought Plan in accordance with regulatory requirements and providing them with the opportunity to respond in writing or meet with us to discuss the content of the Drought Plan prior to the public consultation.

1.8 Consultation with customers and the public

In accordance with statutory requirements this draft version of our Drought Plan 2022 is published on our website for consultation. If you would like to make a representation please write to:

Water.resources@defra.gov.uk

Or:

Defra
Water Company Drought Plan
3rd Floor, 2 Marsham Street
London
SW1P 4DF

2 Drought triggers

2.1 Groundwater and surface water triggers, and our data sources

We monitor our reservoir stocks continuously and compare them against control lines. We operate using marginal storage line (30 days supply), a Drought Control Line (DCL) and Normal Control Line (NCL).

The development of these control lines is described in more detail in the supplementary report, Drought Plan 2022 Drought Triggers and Worked Examples of Drought Scenarios.

We determine the need for drought management action by the DCL for groups of reservoirs in five areas of our supply region (East, North West, Central/North), South West and South). The North West, Central/North, South and South West groups all contain the region's surface water supply reservoirs. The East Group consists of the Hull Borehole Group (which we model as a reservoir), and reservoirs which store water abstracted from the River Hull. We will apply for drought orders or permits for each of the five reservoir groups, as required.

Figure 2.1 shows the control lines of the five reservoir groups and measured reservoir group stocks for 2014 onwards, taken from one of the documents that we produce alongside our weekly Water Situation report. This is discussed further in section 2.5.

Typically, when reservoir stocks are predicted by our Water Resources Planning Report (see section 2) to be within six weeks of crossing the DCL for a given resource group, we may introduce temporary use bans, although the timing of the decision on whether to implement temporary use bans may vary depending on prevailing weather conditions, the time of year and known resource availability. We have included an example of a forward prediction of reservoir stocks in Figure 2.2.

Prior to the introduction of temporary use bans (our level 2 action) we will have instigated publicity campaigns and other activities to reduce demand on resources. We will also be discussing the potential for level 3 actions with the Environment Agency. These actions can temporarily alter abstraction and impoundment permissions through supply-side drought permits or drought orders or can impose a non-essential use ban through a drought order. If we

decide to progress level 2 and 3 actions, we will notify relevant stakeholders and third parties with potential to be impacted. These include inset appointees, retailers and the National Farmers' Union (NFU).

We will adopt the following process in the selection, prioritisation and implementation of supply-side drought orders and permits in consultation with the Environment Agency:

- Assessment of drought monitoring
- Assessment of risk (drought scenarios)
- Ranking of risks
- Drought order / drought permit design – assessment of yield benefit
- Drought order risk and benefit analysis (yield/environmental/ economic)
- Drought order prioritisation – programme development.

Our policy is that restrictions on use through a temporary use ban or non-essential use drought order would not generally be imposed during winter months. This would also include times when winter refill drought orders or permits were in place. Therefore, the standard we have adopted is that restrictions on use would normally only be imposed between the months of April and September inclusive. This policy will be reviewed in the event of droughts spanning two calendar years or more, or if exceptional conditions occur outside of our historic record.

A temporary use ban will be imposed to reduce demand and preserve stocks in preparation for drought order / permit applications, typically six weeks in advance of the planned implementation date for orders / permits. The six-week trigger time is consistent with our WRMP assessment of deployable output. Any increase in trigger length would reduce our Level of Service by resulting in temporary use bans being imposed more frequently than our customers are willing to accept.

The process of compiling drought permit / order applications and receiving determination from the Environment Agency / Defra means we must start to

prepare well in advance of the trigger. This will mean in many dry years we may need to start preparing applications but either may not actually submit the permits or we apply but do not need to implement.

Temporary use bans can be imposed by a water company without authorisation if it is experiencing, or may experience, a serious shortage of water for distribution. The decision to apply for drought permits or orders will rest with Yorkshire Water, but authorisation is required, and the success of an application is dependent on justification of need. During a drought we would apply to Defra for drought orders or the Environment Agency for drought permits as necessary. We would work with the Environment Agency to agree evidence of an "exceptional shortage of rainfall" prior to making any applications.

Examples of likely sequences of drought measures are shown in section 2.8. We use our Water Resource Allocation Plan Simulation (WRAPsim) model to simulate our water supply system. It is a behavioural model which incorporates system constraints and our reservoir operating rules. WRAPsim assumes that when reservoir stocks fall below the DCL for a given reservoir group, drought orders or permits will be implemented affecting demand zones, abstraction licences and compensation releases in the relevant area. However, in reality if we had low stocks in only one area, we would be unlikely to apply for such measures as we would use our grid system to manage resources across the region. We would apply for temporary use bans and drought permits or orders on a regional basis if triggers in a number of the areas were crossed.

The exact timing of consultation and implementation of drought measures will be subject to the particular circumstances prevailing at the time, but generally will be in line with the timing determined by the reservoir control lines. In a drought we will be monitoring all our reservoir levels and we will identify within each reservoir group which supply side actions are necessary. Although we operate to balance reservoir stocks as much as possible, localised rainfall and interconnectivity of reservoirs will mean some reservoirs stocks are lower than others and we will only apply for orders or permits that reduce reservoir compensation flows where a deficiency of supply exists or is threatened. Our preference would be to maintain the regulatory compensation flow if it does not pose a risk to supply.

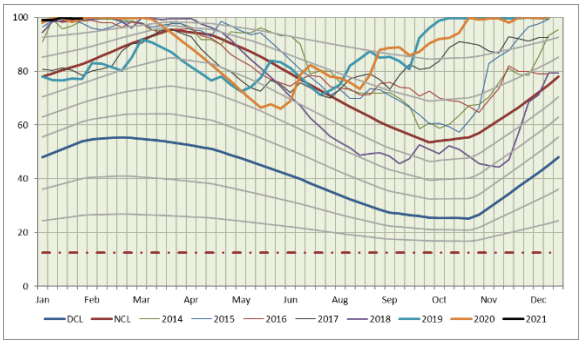
In our supplementary report, *Drought Plan 2022 Worked Examples of Drought Scenarios* we show a number of worked examples of potential droughts, which illustrate the timing and extent of drought measures under different storage conditions. We have used known low inflow years (e.g. 1929, 1995-1996) in order to trigger more extensive drought actions including the implementation of long-term drought options. The simulations have been at various demands and for some of our worked examples we have "stitched" together droughts to produce longer and more extreme droughts than we have in our historic record.

The reservoir stocks for the major reservoir groups for the worked examples shown in our supplementary report, *Drought Plan 2022 Worked Examples of Drought Scenarios* are in the same format as our weekly Water Situation Report. They have been run using the control lines in use now, which were developed using inflows from 1920-2011, and with varying levels of demand. The demand quoted is the annual average demand, with regional and seasonal profiles from recent years, so summer demands are typically higher than the average annual demand quoted.

Following the prolonged dry weather in 2018 we applied for winter drought permits to aid reservoir recovery into 2019. Depending on prevailing conditions at the time, we may apply for winter drought permits if we believe they will promote reservoir recovery and have less impact on the environment than waiting until the spring or summer months. The triggers we use are the same as for summer drought permits /orders.

The two new annual licence increase drought options, (which we received drought permits for in 2018/19) would only be implemented in winter as we would not reach the existing licence limit until later in the year.

NORTH WEST RESERVOIR GROUP



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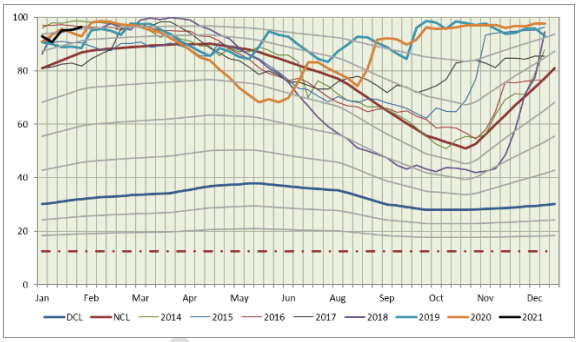

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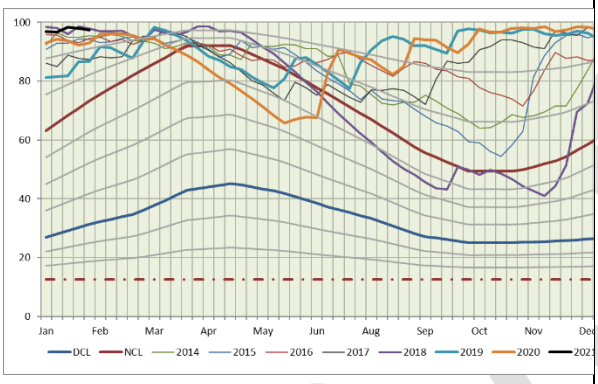

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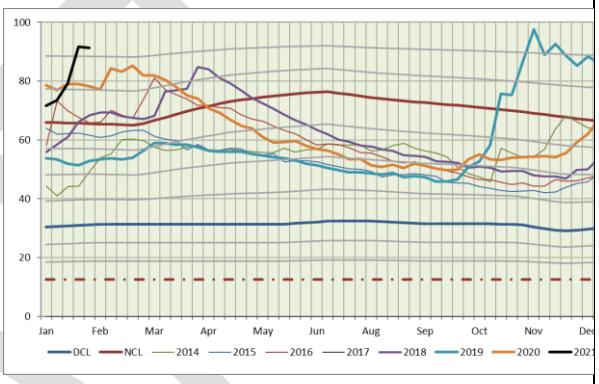

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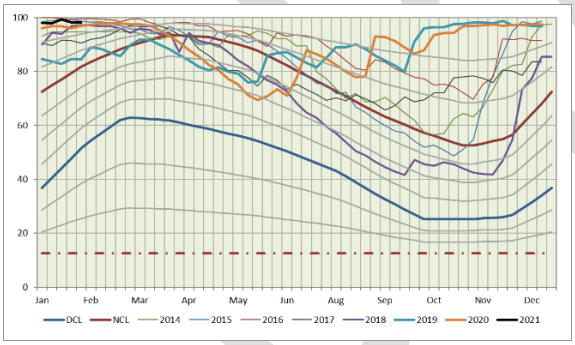

REGIONAL RESERVOIR

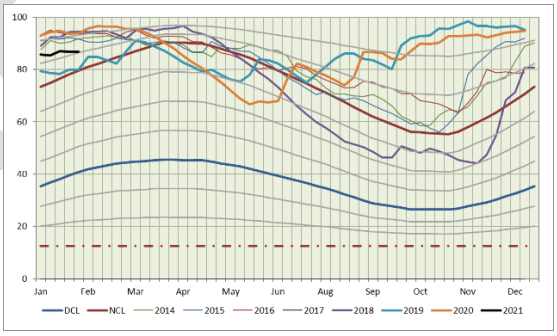

Figure 2.1 Area and Regional reservoir stocks- Drought monitoring in the weekly Water Situation Report

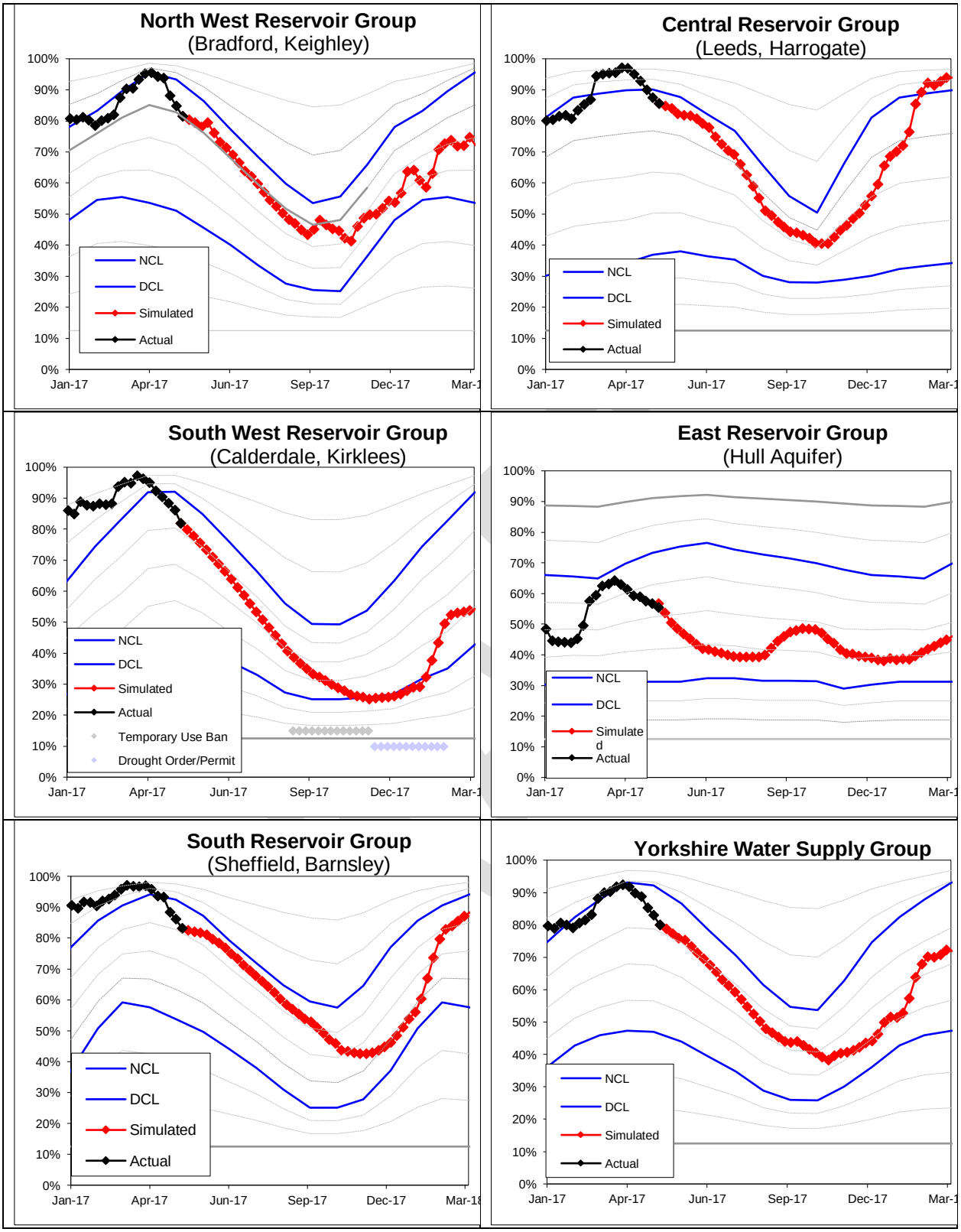

Figure 2.2 Regional reservoir group stocks and forecasts- Starting May 2017 with 1995 inflows

Environmental triggers

As well as taking actions to mitigate against the impacts of drought on water supply, we have a responsibility to mitigate the potential environmental effects of actions that we take during droughts. We help protect the environment through balancing our water abstractions and reservoir drawdowns. This helps conserve reservoir levels for the environment as well as water supply.

Our customer communications in the period leading up to and during a drought will advise customers on how they can reduce their water use and will inform them of the environmental benefits of such actions. Our 'traffic light' approach means water saving communications are used during non-drought conditions and escalated as required. We will enhance water conservation messaging in reaction to low rainfall or high demand and not just low stock levels (see Table 2.3). However, if an area of our region is showing higher than average demand during a dry weather period, we will target that area more than others to encourage water saving prior to stock levels approaching drought triggers. This helps conserve water for the environment, which will benefit from higher reservoir levels. For further information on our communications strategy see Section 5.

The majority of our level 3 supply-side drought actions are to reduce the compensation flow from reservoirs. Although we may need to do this to conserve supplies for customers these actions also conserve compensation flows for the downstream watercourse albeit at a lower volume than during normal conditions.

The triggers for compensation reductions are linked to reservoir stocks and the crossing of control lines as described above. If a reservoir control line triggered a need for a compensation reduction on a reservoir during circumstances where there was no risk to public water supply or if the action would not provide a public water supply benefit, we would still reduce the compensation in order to conserve supplies for the downstream watercourse.

Due to the connectivity in our Grid SWZ it is often the case that reservoirs can be supported by intra-zonal transfers when their stocks start to fall. We therefore use regional reservoir stocks to trigger most of our drought actions. We operate our conjunctive system to balance risks across our supply system and to maintain compensation flows for as long as possible during drought

conditions. If a reservoir cannot be supported by any other reservoirs it has a trigger for implementing the drought action that is linked to its own stocks rather than regional stocks. This ensures compensation reduction actions to maintain a downstream release to support the environment are made early enough to mitigate the risk of running out of compensation flows.

We also operate two compensation only reservoirs which have no direct link to water supply. These are monitored in the same way as public water supply reservoirs and drought actions will benefit the environment but there is no water supply benefit. Drought triggers and actions are linked to the individual reservoir stocks and control lines. See section 3.5.2 and Appendix 4 for further details on the actions.

2.2 Historic droughts

Our experience of historic droughts has helped us to develop and refine the processes and actions described in this Plan. Our modelling uses inflows which date back to 1920. This enables us to model our current system on significant droughts such as those that occurred in 1929, 1933-34 and 1959.

The concept of "grid management" followed on from the events of the 1975-1976 drought. The drought of 1995-1996 highlighted our reliability on the surface water reservoirs in the Pennines and led to investment to increase the resilience of our system by laying a major raw water transmission pipeline.

We describe a number of our recent historic droughts in the supplementary report, Drought Plan 2022 Drought Triggers and Worked Examples of Drought Scenarios.

2.3 Some worked examples of drought scenarios

The supplementary report, Drought Plan 2022 Drought Triggers and Worked Examples of Drought Scenarios, shows a number of drought scenarios of different durations, magnitudes and demands, and how we would expect to deal with them. The examples clearly show the development of droughts, the triggers for actions, and actions we would take for a range of droughts. These examples include droughts worse than those we have experienced historically, as well as historic droughts.

2.4 How we communicate with the Environment Agency

Each week, the Environment Agency receives our weekly Water Situation Report. In addition, as part of our 'Business as Usual' activity, we have regular discussions with the Environment Agency where matters related to water resources are discussed, including drought planning.

When regional reservoir stocks fall below the Environment Agency early warning trigger line (see Figure 2.3) we instigate additional communication between Yorkshire Water and the Environment Agency's Area Drought Co-ordinator. The trigger line that we use is indicative of lower than usual reservoir stocks which could lead to supply issues if dry weather was to continue. In this situation, we establish additional liaison meetings with the Environment Agency to keep them appraised of the water supply situation and the management measures that we have put in place.

Liaison will reduce when reservoir stocks have risen above the trigger line for a period of two weeks. The frequency of the liaison meetings will be established following the first contact with the Environment Agency Area Drought Co-ordinator.

The Environment Agency will provide information on its assessment of the severity of the drought. This is based on several statistics including rainfall and river flows and the Drought Severity Index (DSI) methodology. This information would be for each of the catchments in our supply region together with the Severn Trent catchments (the Derwent and the Idle and Torne).

We will agree with the Environment Agency when there has been an "exceptional shortage of rain" and identify triggers to initiate drought actions. Environment Agency drought classifications are described in Table 2.3.

Drought Stage	Indicators
Normal stage (green)	Small incidents during a short summer heat wave
Prolonged dry weather stage (yellow)	Established period of low indicators for the time of the year
Drought stage (amber)	Prolonged low and notably low indicators for the time of year
Severe drought stage (red)	Exceptionally low indicators over a long period of time
Recovering drought stage (amber)	Returning within low or normal ranges for time of year

Table 2.1 Environment Agency drought stages

If a potential need for level 2 restrictions or level 3 measures is identified, then we will meet the Environment Agency more frequently. The Environment Agency point of contact in severe droughts will be the Yorkshire Area Drought Co-ordinator, and through this liaison process we will consult on the sequence of any demand restrictions, and the sequence and prioritisation of drought orders or permits. The process will cover the following areas:

- Environmental assessment, mitigation and monitoring
- Data and information to be shared
- Relevant works in progress or works planned, including demand management measures.

2.5 How we manage and monitor water resources

Our conjunctive use system work on the principle of using available river resources in the winter and spring to preserve reservoir or groundwater storage until the summer, when releases from reservoir and groundwater storage can offset the lower availability of river resources.

We operate this way as the combined yield of resources used conjunctively is greater than the sum of the yields from the resources operated independently from each other. We have operated conjunctive use for many years, particularly in relation to the use of reservoirs and river sources.

We have a number of routine reports and management processes embedded into our operational production planning processes. These processes are used in the management of droughts, although the frequency of reporting and decision-making may be increased. The following sections describe the routine water resources monitoring, reporting and management processes which are in place.

2.5.1 Weekly Water Situation Reports

Weekly Water Situation Reports form part of the normal business as usual data gathering and presentation. The reports include the following information:

- Rainfall
- River flows
- Groundwater levels
- Reservoir stocks
- Demand
- Water treatment works outputs
- Flows in key grid pipelines

During "normal" conditions we produce a Water Situation Report ("WatSit Report") on a weekly basis. This report is available electronically to relevant Yorkshire Water colleagues and is also emailed to our Environment Agency regional water resources contacts. At the beginning of each month we upload a summary of the Water Situation Report to our website, and we also create an animated version of the report to help explain it to our customers1.

We increase the frequency of our reporting on critical hydrological features (such as rainfall and reservoir stocks) to twice per week when permission is sought level 3 actions (supply side drought permits/orders and non-essential use drought orders). The frequency will be increased to daily when permission is sought for level 4 (emergency) drought measures.

[1] https://www.yorkshirewater.com/open-data/watsit-report/

The report contains a drought monitoring section. This includes reservoir stocks within the key resource groups that are used to determine drought management actions (see Section 3). An example of this is shown in Figure 2.1.

Our Drought Plan incorporates reservoir control lines for each of the key reservoir groups in Yorkshire. These control lines are included in our weekly Water Situation Report and made available to the Environment Agency each week. The Environment Agency early warning trigger line is included to identify if or when we may reach a point where falling reservoir stocks will lead us to initiate discussions with the Environment Agency on the water supply situation.

When reservoir stocks fall below the Environment Agency early warning trigger line our Clean Water and Catchment Strategy Manager will contact the Environment Agency's Drought Co-ordinator for Yorkshire. We will then keep in regular contact until the situation recovers.

2.5.2 Weekly water production planning

A weekly management process, known as production planning, determines key flow target settings (reservoirs, rivers, boreholes, water treatment works and pipelines) for the week ahead. The process takes information from the Water Situation Report and then, using the Water Resource Allocation Plan (WRAP) computer model, determines the best use of available resources to meet demand and maintain security of supplies. It takes account of expected demand, reservoir and groundwater operating rules, control curves and licensing constraints. In addition, temporary constraints such as outages for maintenance work or water quality problems are considered.

The output from WRAP is made available electronically across the company. Field staff implement the required flow output settings. Any unforeseen events are handled by the Duty Manager in the Service Delivery Centre. As well as the weekly production planning meetings and management process, our Service Delivery Centre can make adjustments on a daily basis to reflect any changes in asset availability.

2.5.3 Monthly water resources planning report

Operation of our highly integrated network of resources is planned and tested (three to 18 months planning horizons are typical) using the WRAPsim model. These models can rapidly simulate the operation of the whole network against different inflow, demand and operating conditions.

We use WRAPsim to model scenarios starting at current reservoir stocks and operating constraints. We run the model for selected drought inflow sequences and predicted demands. The potential need for drought measures can be tested by comparing the stocks prognosis against control lines for each reservoir group. We also identify remedial actions to reduce and/or balance out the demand across any resource groups at risk.

The Water Resources Planning Report (WRPR) is produced from the output of WRAPsim model scenarios. The results identify regions and reservoirs impacted by dry years and we then carry out additional modelling to assess the need for mitigating activities (or remedial actions). Under normal conditions, we update the WRPR on a monthly basis; when we are in a period of dry weather and stocks are reducing, we update the WRPR more frequently (typically weekly) to ensure that we basing our decision making on up to date forecasts.

We use information from the WRPR to plan operational measures, such as decreasing minimum flows at water treatment works and using sources in areas with greater reservoir stocks, to reduce the longer-term risk of imposing restrictions on customers or seeking drought permits/orders for increased abstraction or modifications to river flow conditions. We monitor progress of the measures in the WRPR.

The WRPR is also used to scenario test operational measures that may reduce the long-term risk of restrictions or need for drought permits / orders, such as decreasing minimum flows at water treatment works and using sources in areas with greatest reservoir stocks.

2.6 Forecasting

We carry out drought scenario planning using the WRAPsim model. The model simulates the conjunctive use of our sources since 1920 at a weekly time-step for given levels of demand. It contains over 1200 components, representing our conjunctive use grid and other relevant assets, and

including all river and reservoir sources, boreholes, water treatment works, pipelines and demand centres. WRAPsim output provides us with an accurate assessment of the future behaviour of each source, its ability to meet demand and the frequency of restrictions that would need to be imposed.

We can also use the WRAPsim model to predict future water supply situations based on past weather patterns. This provides us with predictions of when drought restrictions may be required and provides important support to drought planning. Typical output from WRAPsim for key resource groupings and scenario modelling are shown in Figure 2.2.

2.7 Scenarios, triggers and actions

Examples of various drought scenarios with high level Yorkshire Water responses or actions are presented in Table 2.2. These examples are based on experience of one and two-year droughts in the Yorkshire region. In all these examples we only required level 1 to 3 actions. An unprecedented third year of drought has been included to demonstrate additional action we could take if a three-year drought did occur. In this example we do not trigger level 4 actions but do require extreme drought actions.

Section 4 discusses extreme drought options that we would consider if level 1 to 3 actions were implemented and our existing resources were not recovering sufficiently. Our extreme drought options include several supply-side actions that require new assets and infrastructure. These options would only be considered in the event of a third consecutive year of a drought. We class these as long-term options and they would only be considered in a second year of drought when reservoir stocks were six weeks from the DCL.

Grid SWZ Drought Scenarios with potential high level decisions and actions (not based on any specific historical drought)				
Scenario	Trigger	Action 1	Action 2	Action 3
Serious drought in autumn of year 1	Prolonged dry summer with total reservoir stocks falling (typically below CL5)	Re-zone supplies to maximise grid and prepare drought pumping stations (level 1)	Enhance conservation campaign and appeal for voluntary reductions in use, enhance leakage control in reaction to breakouts (level 1)	Consider, in consultation with the Environment Agency, winter drought permits to aid reservoir winter refill
Serious drought in spring of year 2	Dry winter following dry year, with total reservoir stocks decreasing (typically below CL5)	Enhance conservation campaign with further calls for water usage restraint, continue increased leakage control (level 1)	Prepare for temporary use ban. Prepare drought permit / order applications for both increasing supply and restricting non-essential use.	Consult the Environment Agency on potential monitoring requirements for long-term drought options
Severe drought in summer of year 2	Reservoir storage within 6 weeks of DCL	Impose temporary use ban (level 2)	Enhance conservation campaign and calls for water usage restraint, continue increased leakage control	Apply for drought permit / orders for increasing supply and drought orders to impose a non-essential use ban (level 3) Consider long-term drought options
Severe drought in	Reservoir storage below DCL	Level 1 to 3 actions in place	Continue enhanced conservation campaign and	Construct long-term drought options if required.

autumn of year 2			increased leakage control and consider extreme drought actions	Prepare extreme drought actions. Consider emergency drought orders (level 4)
Severe drought in spring of year 3	Reservoir storage still below DCL	Level 1 to 3 and extreme drought actions in place	Continue enhance conservation campaign and increased leakage control	Long-term drought options in use

Table 2.2 Yorkshire Water drought scenarios and actions for the Grid SWZ

2.8 How we link triggers to actions and measures

Figure 2.3 represents regional stocks and provides an example timeline of the drought triggers and actions we would take leading up to implementation of level 3 actions, as stocks decline during a drought. More information on the drought actions is provided in Section 3. The timing of actions will vary depending on the rate of falling stocks.

In Figure 2.3 all triggers are crossed in one year, whereas in a real drought it is unlikely all triggers would be crossed in a single year and in some months reservoir stocks may increase before declining again. Table 2.2 lists each trigger and the associated drought action. This table shows the drought triggers included in Figure 2.3 and a trigger for extreme drought actions including long-term drought actions.

In a normal year, we would expect regional reservoir stocks to be above the NCL (as shown by the blue NCL line in Figure 2.3). When this trigger is crossed we will maximise our river abstractions and reduce reservoir output where possible, in order to preserve stocks for later in the year. This action will depend on the resources available, which will be less in a drought compared to a 'normal' year. Rivers will be maximised within licence conditions and reservoirs will only be reduced if sufficient resources are available from river sources.

We also promote water saving to our customers during a normal year. Iniatives include advice on how to reduce comsumption, free water saving self-fit packs available to order from our website or a home audit visit and fit service offered to customer groups or specified areas. Data reported in our weekly water situation reports provides a series of triggers for escalating our communications to customers when there is a heightened need to conserve water supplies. We use this data to operate an agile "traffic lights" campaign with green, amber and red status linked to customer demand, rainfall and reservoir stock levels.

If our data shows we are experiencing a period of hot, dry weather and demand is 75% of the long-term average (this is plotted on our weekly Water Situation Report demand plot) or rainfall 50% below average, we will enhance our agile customer communications to reflect the prevailing conditions. If demand increases further to 90% of the long-term average or rainfall is below average for several weeks we will heighten the messages further (see section 5).

During our weekly production planning process, we monitor reservoir stocks against the WRPR forecasts, and against control lines. If one reservoir or group of reservoirs is falling more than another, we operate to rebalance use to ensure that stocks in different areas fall through control lines at the same rate. This fits with our aim of ensuring supplies, and ensuring no area suffers at the expense of another, but it does make it difficult to prioritise areas where we would wish to implement drought permits or orders, as if we achieve our operating goals to balance reservoir stocks, all areas will fail at a similar time.

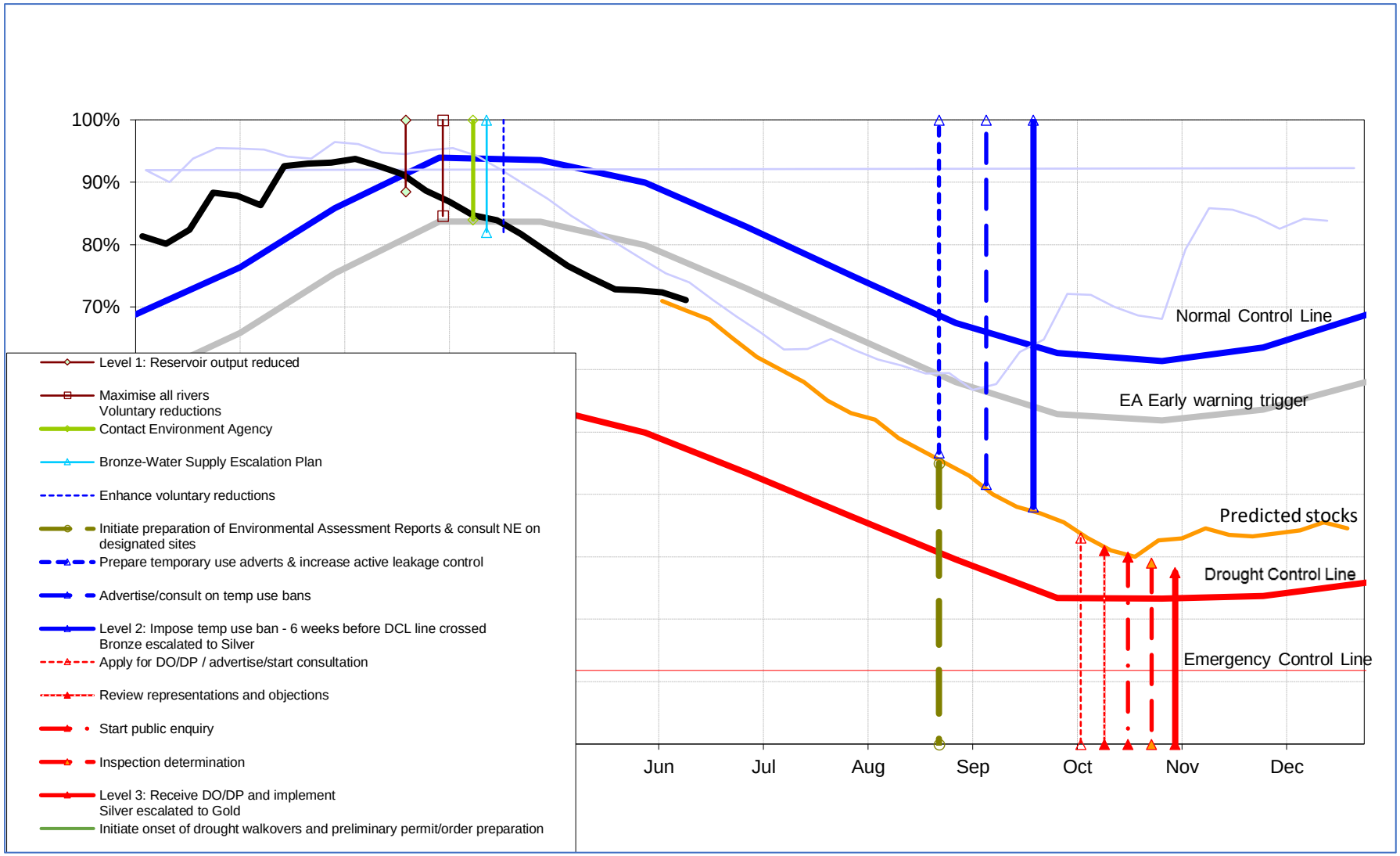

Figure 2.3 Regional reservoir group triggers

Trigger	Action
Level 1	
Regional reservoir stocks below NCL*	Reduce reservoir output
	Maximise all river abstractions
Regional reservoir stocks above the EA early warning trigger line, demand crosses the 75%ile based on historic demand data and / or pre-ceding month's rainfall is below 50% of average	Enhance customer water saving messages to raise awareness of the dry weather and need to conserve water. In line with our agile communication strategy to deliver apporpriate messages, communications will take into account the short term weather forecasts, which may over-ride the triggers if heavy rain is forecast.
Regional reservoir stocks cross EA early warning trigger line	Start liaising with EA
	Escalate to Bronze Risk (as defined in Company Incident Management Plan) and key YW teams meet to ensure that appropriate water supply escalation activity is implemented
	Further enhance ongoing water conservation activity, requesting voluntary reductions via a range of media.
	Start communications with key stakeholders e.g. inset appointees, retailers, NFU.
Regional reservoir stocks forecast to be 14 weeks away from DCL (8 weeks before TUB)	Consider on-set of drought walkovers and preliminary permit/order preparation (including in-river works permits if required). This will be a phased delivery, although the trigger is related to regional reservoir stocks, reservoir areas will be prioritised based on the risk of the group meeting its combined DCL. Reservoirs with a local rather than regional trigger may require earlier implementation.
Regional reservoir stocks forecast to be 11 weeks away from DCL	Start permit pre-consultation with key downstream abstractors and stakeholders (e.g. angling groups or local environment groups)
Regional reservoir stocks forecast to be 10 weeks away from DCL	Bronze Risk escalated to Silver (as defined in Company Incident Management Plan)
	Increase active leakage control
	Prepare adverts for a temporary use ban
	Initiate preparation of demand side drought orders to restrict non-essential use. Continue preparation of Environmental Assessment Reports and ordinary supply side drought order/permit applications as required.
	Contact NE on any potential supply side drought permits/orders that could damage sites designated under the Conservation of Habitats and Species Regulations 2017 as amended or Wildlife and Countryside Act

Regional reservoir stocks forecast to be 8 weeks away from DCL	If trigger reached April to September, advertise / consult on temporary use bans and continue preparation of drought permits/orders. If trigger reached, October to March continue preparation for permit applications as winter drought permits.
Level 2	
Regional reservoir stocks forecast to be 6 weeks away from DCL	Impose temporary use ban (April to September). Start pre-application process for drought permits.
	In the second year of a drought we would start to consider long-term drought options.
	Silver escalated to Gold (as defined in Company Incident Management Plan)
Regional reservoir stocks forecast to be 4 weeks away from DCL	Apply for ordinary supply side drought permits/orders to reduce compensation and modify existing abstractions and a demand side drought order to impose a non-essential use ban (if during April to September). Advertise/provide notice and start public consultation on drought orders/permits applications.
Regional reservoir stocks forecast to be 3 weeks away from DCL	Review any representations and objections received on drought orders/permits
Regional reservoir stocks forecast to be 2 weeks away from DCL	Start public inquiry/hearing process if applicable. If a public inquiry or hearing is required, then the assumed timescales for receiving authorisations could be delayed.
Regional reservoir stocks forecast to be 1 week away from DCL	Earliest potential inspection determination for drought order and permit applications where a hearing applicable. Start preparations for our extreme drought options.
Level 3	
Regional reservoir stocks forecast to be at DCL or close to crossing	Receive drought orders/permits. Time to receive will depend on the number of applications and associated enquiries/hearings.
	Implement drought orders/permits. We may start implementation sooner if granted before regional reservoir stocks reach the DCL. Implementation will be phased and may only be permitted if specific conditions defined in the authorisations are met.
	Determine which extreme drought actions will be appropriate for the situation.
Regional reservoir stocks forecast to fall below 20% within next 4 weeks	Implement extreme drought actions
	Prepare level 4 actions (this is emergency planning and not part of drought planning)

Table 2.3 Drought plan triggers and associated actions

*There are a number of other triggers, not related to reservoir stocks, that could initiate Bronze escalating to Silver, as shown in *Table 6.1*.

As discussed above, all our reservoir groups have an Environment Agency early warning trigger line (as shown by the grey line in Figure 2.3). If regional stocks fall below this line we will meet with the Environment Agency and continue regular liaison until stocks have been above the Environment Agency trigger line for a period of four weeks, and are not in imminent danger of going below the trigger again. We will also escalate to Bronze Risk, as defined in our Company Incident Management Plan. The Bronze Risk group will monitor the performance of our assets to ensure we are maximising our available resources, see Section 6.

The Environment Agency early warning trigger line is also used in our agile communications as a prompt to increase communications with the public and requests for our customers to reduce their water use to help preserve stocks. Although if we have experienced high demand or below average rainfall earlier in the year, we may already have escalated our water conservation messages. On crossing the Environment Agency trigger line, we will continue at an enhanced level of messaging until reservoir stocks recover.

We include a Drought Plan trigger for onset of drought walkovers of any river reaches with potential to be impacted if we implement supply-side drought options. If regional reservoir stocks are forecast to be 14 weeks from crossing the DCL we will initiate walkover discussions with the Environment Agency. However, we will take into account the weather forecast and likelihood of rain before starting the walkovers as any immediate rain could delay the trigger for applications and the timing of the surveys is important to ensure we capture the most accurate baseline data for each reach.

When stocks are 11 weeks from crossing the DCL we will start the process of contacting stakeholders who could be impacted by the applications. As with walkovers we may delay if sufficient rainfall is forecast for the applications to be delayed or not required. This trigger is to seek views of any groups/bodies with an interest in the affected area and notify any individuals such as downstream abstractors prior to the applications being made. We would always prefer to create awareness of applications in advance of the legal requirement to provide formal notices, however in some circumstances the situation may change quickly and limit the pre-notification time available.

If stocks are forecast to be 10 weeks away from the DCL we will increase our leakage control activity (see Section 3), prepare adverts for temporary use bans, start compiling Environmental Assessment Reports and other

supporting information for supply side drought permits/orders in case they are required later in the year. This will include a request to the Environment Agency for an updated list of downstream abstractors with potential to be impacted by drought permits. At this stage we will also start liaising with Natural England on any supply side drought order/permits that have potential to impact sites designated under the Conservation of Habitats and Species Regulations 2017 as amended or Wildlife and Countryside Act 1981 (as amended).

If stocks are forecast to be eight weeks away from the DCL between April to March, we will start preparing for temporary use bans. This will involve publishing adverts on the bans in time to allow customers to be consulted on the restrictions before they are imposed. The representation period will be a minimum of two weeks, but if time allows could be longer. In Figure 2.3 only two weeks are available as the diagram does not allow for any temporary refill of reservoirs.

Temporary use bans (level 2 actions) will be imposed if regional reservoir stocks, or stocks in a number of the area reservoir groups, are forecast to cross the DCL in six weeks (as shown by the red line in Figure 2.3) between April and September.

Two weeks after imposing temporary use bans, when reservoir stocks are forecast to be four weeks from crossing the DCL, we will submit and advertise drought order or permit applications for a non-essential use ban and supply side drought options. In winter the trigger will initiate winter drought permits. When applying for winter supply side drought permits, we would not apply for a non-essential use ban as a temporary use ban will not be in place and customer water use is generally lower in the winter months. However, in an extreme drought we would review this policy and the benefits of restrictions on use in the winter.

Table 2.2 shows the activities we will take in the four weeks prior to recieving and implementing drought orders / permits (if granted). It is possible that a temporary use ban and any rainfall will allow sufficient refill of the reservoirs to ensure drought permit / order applications are no longer needed. Assuming this does not occur, we will aim to implement drought orders / permits (level 3 actions) six weeks after temporary use bans are imposed.

There are 47[2] level 3 supply-side options we could implement at this stage, 44[3] of which require authorisation. Both the applications and implementation of the options will be phased taking into account prioritisation of need based on reservoir levels. We will be monitoring reservoir stock levels to identify the order of applications then implementation. The prioritisation would be constantly reviewed to take into account any rainfall or local demand increases that impact the drawdown of reservoirs.

If level 3 actions were in place, we would be considering the risk of level 4 drought actions. If our modelling indicated level 4 actions could be needed, we would consider which of our extreme drought actions would be most beneficial. If regional reservoir stocks were forecast to fall below 20% of the total capacity within four weeks, we would start to implement extreme drought actions in order to conserve supplies as much as possible to avoid the need for level 4 restrictions. If we were in a second year (or later) of drought and six weeks from crossing the control line we would consider our long-term actions. These long term actions are included in our extreme actions as they would be considered after level 3 actions.

If the long-term drought action trigger is crossed, we would make an assessment on the benefits of implementing long-term drought options. The crossing of this trigger would not lead to a long-term drought option being automatically implemented. The decision to implement long-term drought options would be based on reservoir stock predictions and the risk of them not recovering. At this stage, we would assess the feasibility of each long-term drought option and consider the criteria listed in Section 2.6.

2.9 Yorkshire Water System Drought Response

We have carried out analyses based on the EA/UKWIR project Drought Vulnerability Framework (DVF). We have used our WRAPsim model to show the effects on our supply system of droughts of different durations (from six months to four years ending in August) and severities (from 25 per cent to 95 per cent of average inflows). Figure 2.4 is a drought response surface for the Yorkshire Water Regional Reservoir Group showing the number of weeks

[2] Does not include two winter permit level 2 supply-side options

[3] 45 if we were abstracting from North West Area Reservoir 9 as a long-term extreme drought action. We also have one level 3 supply-side action that will require authorisation in the future once a flow trial is complete and the licence conditions revised.

regional reservoir stocks are below the DCL. The black stars show historically recorded droughts, the coloured lines show the estimated values of droughts of different return periods, and the black dashed lines show the 1929 and 1996 droughts.

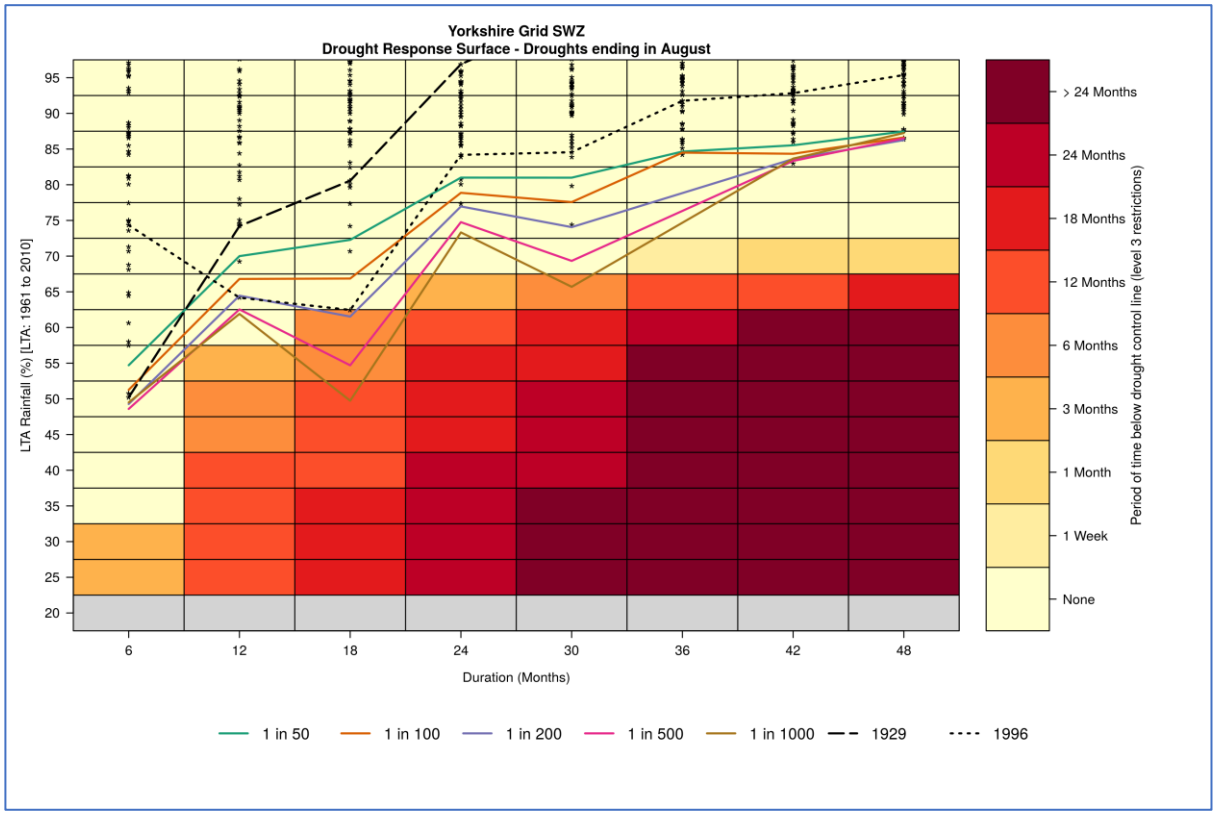

Figure 2.4 Drought response surface for Yorkshire Water Regional reservoir group

The results show that for the Yorkshire Water system when run at the deployable output demand of 1460Ml/d regionally, none of the historical droughts, with the single exception of the worst 18-month long period, resulted in level 3 drought actions. The worst historical droughts in all cases have an approximate return period of one in 100 years (to be expected with 95 years of record).

We believe this drought response surface illustrates the resilience of our supply system both to droughts we have experienced (black stars), and to droughts of up to 200-year return periods. Even a 1 in 200 return period drought of 18 months' duration would have only just over six months when stocks are below the DCL. Further, the analysis of longer duration droughts shows that they are unlikely to result in stocks below the DCL, due to the

extremely low probability of such low inflows for longer durations. We are still preparing for worse events than those in the historic record, as climate change may lead to a reduction in flows. It should be noted that the return period analyses have been carried out on the historic record of inflows for fixed drought durations, and the real drought events may be more or less extreme when analysed for different durations or using different metrics, such as rainfall. Extreme events such as long duration droughts are likely to become more common when the impacts of climate change are felt.

A fuller description of the analyses carried out to produce this response surface is given in Appendix 2 . This appendix also shows DRSs for regional reservoir stocks falling to 20%, a possible trigger for level 4 restrictions. In the past we have said we would use our emergency storage level of 12.5% stocks as a level 4 restrictions trigger, but 20% is the trigger we have chosen for this drought plan, after the experience of the dry weather in 2018 and 2020. We will review this trigger in our Water Resources Management Plan 2024 when we analyse long time series of stochastic data which will give us a far better understanding of the likelihood of such low stocks being reached, and we will evaluate the system response, rather than the response to individual events. Out latest analyses using 99 years of historic data suggest that the 20% stocks level will not be reached more frequently than 1 in 500 years, but such long return periods cannot be reliably estimated from relatively short data series.

The DVF demonstrates our resilience, but it has not been used to define our drought triggers. Our drought triggers have been defined by analysis of historical inflows (control lines) and historical demands (demand triggers).

3 Our drought actions

3.1 Introduction

At the onset of a drought we will take operational action and increase our customer water saving messages. In most years, dry weather periods do not last long enough to be droughts, but we must not be complacent, and by taking early action we are better prepared if a drought does develop.

Severity of drought	Level	Action summary	Levels of service
Drought Plan	Level 1	Communications campaign	n/a
		Operational response (optimising sources, redistributing supplies, reducing outage).	n/a
		Increased leakage control	n/a
	Level 2	Temporary use bans	1 in 25 years
		Drought actions with minor environmental impacts (winter drought permits to increase annual abstractions).	1 in 25 years
	Level 3	Moderate environmental impact drought permit and ordinary drought orders.	1 in 80 years
		Non-essential use bans under a drought order	1 in 80 years
		All possible actions to avoid emergency drought orders including major environmental impact drought permits and orders	n/a
Emergency Planning	Level 4	Emergency drought orders (such as pressure reduction and standpipes)	1 in 500 years

Figure 3.1 Drought levels of severity and associated actions

We have a range of drought management actions available to us, which we implement as appropriate, depending on the severity and geographical extent of a particular drought. Higher level actions can mean restricting customer use or taking more water from the environment and we operate to avoid this where possible. Figure 3.1 provides a summary of the increasing levels of drought severity and the associated actions available to us. A number of the actions are linked to our levels of service (see section 1.5 also).

As the severity of a drought increases we will keep regulators and stakeholders up to date on the actions we are taking. This includes inset appointees and retailers, whose own customers could be impacted by the actions. Also other interested parties, such as the NFU and CRT, who may also be experiencing shortages of supply. We will regularly liaise with the Environment Agency to keep them up to date on the situation and resulting actions. Regulators and other stakeholders will be consulted if there is a need to agree arrangements for implementing specific drought management actions which require authorisation from specific bodies (e.g. Natural England, CRT).

Water companies, during times of prolonged dry weather and drought, will meet collectively as part of a cross-sectoral group including regulators (England and Wales) and other impacted bodies as a National Drought Group (NDG). We will proactivly contribute to the group to ensure that the water resources position in Yorkshire is clearly communicated at the national level, and that any collaborative communications are aligned with our own. The level of Yorkshire Water's involvement will depend on the overall national picture for water resources, the group's agenda and priorities, and the position in our own region at the time.

A summary of the drought measures we can use is provided in Table 3.1. Further details are provided below and in Appendices 3 to 5. Actions that are outside of our normal operating permissions or prohibit non-essential water use require authorisation from the Environment Agency or Defra through a drought permit or order. In the event of a severe drought, we are required to carry out measures to ensure we provide adequate supplies of wholesome water without the need for emergency drought orders. We have identified extreme drought actions that would be considered to help avoid the risk of requiring level 4 actions if level 3 actions were in place.

Type of action	Measure	Legal measures required
Demand side - Customer Management*	Promote water efficiency to domestic customers and non-household water users (agile communications strategy)	N/A
	Contribute to collaborative (regional and national) water conservation advice and campaigns for household and non-household water users. This includes WReN water companies and other stakeholders, neighbouring water companies, retailers and others if a national campaign is needed.	N/A
	Temporary use bans	N/A – can apply if experiencing, or may experience, a serious shortage of water for distribution
	Prohibit or limit non-essential uses of water (non-essential use ban)	Drought orders granted by Defra
Demand-side Distribution Management	Leakage reduction – increased find and fix activity, pressure management	Approvals required from Highways and Local Authorities
Supply-side Resource Management	Maximise available resources through use of alternative supplies / underutilised licensed resources e.g. mothballed or recently abandoned infrastructure/ water sources.	N/A provided permitted under existing licence or authroisation, if not a drougth permit or order is required.
	Raw water tankering where appropriate	N/A

Type of action	Measure	Legal measures required
	Reduce compensation flows.	Drought permit or drought order. In most cases a drought permit but usually more apporpriate to apply for a drought order if a Habitat Directive site is likely to be affected.
	Increase existing abstraction volumes or utilise new abstractions	N/A
	Install new assets or infrastructure to make use of existing licenced resources where current system constraints limit the use of the water	Planning permissions and DWI approvals.
	Install new assets or infrastructure to make use of new supllies	Drought permit or drought order, planning permissions and DWI approvals. .
	Overland pipes to make temporary network connections to any areas where local supplies are limited as a result of the shortage of rainfall	Planning permissions and DWI approvals.

Table 3.1 Drought Management actions

** We will work with inset appointees and water retailers to promote water conservation in our region and notify them in advance of any communications we send out that are outside of our annual water conservation campaign activity.*

3.2 The drought permit and order application process

The majority of our level 3[4] drought actions cannot be implemented without authorisation from either the Environment Agency or Defra. Requests for authorisation to alter existing abstraction permissions, reduce reservoir compensation releases or abstract from sources for which we currently do not hold any abstraction rights (supply-side actions) can be granted through a drought permit or order. Authorisation to restrict non-essential use can only be granted through a drought order. A drought permit application is submitted to the Environment Agency and a drought order application to Defra.

For supply side drought actions, we would discuss our intended applications with the Environment Agency well in advance of submitting applications. Supply-side actions in our drought plan requiring authorisation to implement would temporarily modify or suspend conditions on an abstraction or impoundment licence. Legally these permissions could be granted via a sucessful drought permit or order application. For all relevent options, we expect a drought permit application to be the preferred route and have therefore planned on this basis.

When submitting permit applications, we would follow the Defra *Drought Permits and Drought Orders* guidance. See Appendix 4 for further information on the application process. Our drought permit applications are grouped according to which of the five areas (East, North West, Central, South West and South) in our supply region they are located. In a drought the applications will be prioritised and phased based on the urgency for reducing compensations and / or the benefits to supply and the environment.

To implement level 4 drought actions, we would require an emergency drought order from Defra. Our drought plan worked examples and DRS show we would not require emergency drought actions in a repeat of any of our previous drought events and the risk of needing them is about 1 in

[4] We have three level 3 actions that are permitted under the existing terms of the authorisation to abstract or impound but are included a level 3 actions due to the potential environmental effects if implemented.

500 years. In accordance with Environment Agency guidelines, drought plans only include actions up to level 3, however, this includes extreme drought actions that could be implemented if there was a serious risk of emergency drought orders being required. See section 4 for further information.

3.3 Options to reduce demand

Options to reduce demand include publicity campaigns (agile communications) appealing for reductions in water use and increased leakage control (level 1), temporary use bans (level 2) and drought orders to restrict non-essential use (level 3). Further usage restrictions are possible via an emergency drought order (level 4) but would be classed as emergency planning and as such are not consider in detail in this Drought Plan.

The implementation of demand reduction measures during a drought is phased as a drought progresses and linked to the triggers as set out in Table 2.2. At the on-set of a drought we will deliver publicity campaigns and increase leakage control activity to countereact any breakouts that occur as a result of dry weather and ground movement.

During dry weather we implement an “agile communications campaign”. Agile communications is a term that refers to flexible and adaptive communications that are scaled up or down in reaction to changing weather conditions and water supply stocks. Information on the current supply and demand situation is promoted using varied and innovative communication channels to request customers reduce water use voluntarily. For a more detailed description on agile communications and leakage reduction see Appendix 3.

As a drought progresses through to more extreme phases we have the authority to impose temporary use bans to restrict domestic customer water use. Further restrictions on water use can be imposed under successful application of a demand side drought order, which we refer to as a non-essential use ban. Our demand reduction options are described below with further details provided in Appendix 3.

3.3.1 Inset appointees and retailers

We will seek to work with inset appointees and retailers to promote water efficiency messages to their customers. We will ensure all inset appointees and retailers are made aware of our communications to raise awareness of the situation or if necessary inform them of impending water use restrictions. We will also work in collaboration with regulators, the NDG, other water companies, WaterUK, the NFU and AHDB to ensure other water use sectors are kept informed.

We would notify inset appointees when we crossed our Environment Agency early warning trigger line and keep in regular contact until the siutation returned to normal. We would share our campaign messages so that they could promote the need to conserve water in line with their own drought plans. If any restrictions on use were required in Yorkshire, inset appointees would need to impose the same restrictions on their customers who are living in the area impacted. We would give them early warning if restrictions were being considered and we would update them in advance of the introduction, phasing in and lifting of the restrictions.

The Water Act 2014 introduced non-household water retail competition in England starting from April 2017. Since retail separation, Yorkshire Water is responsible for wholesale water supply and domestic retail in the Yorkshire region but not non-household retail services. Non-household billing and customer service provision is delivered by a number of retailers operating in the Yorkshire Water region. During a drought we will liaise with retailers operating in our supply region to keep them aware of the situation, particulaly if restrictions were being considered.

Potential support to non-household water uses in the event of a drought includes:

- Maintaining effective communications with non-household customers and trade bodies in conjunction with retailers
- Resources updates
- Operational issues
- Water quality changes that can occur if a supply is switched to another source as part of re-zoning supplies

- Ensuring the agricultural sector is aware of the situations and actions we are taking and is provided with timely notifications and relevant advice (e.g. https://ahdb.org.uk/water-supply-problems-a-guide-for-livestock-farms)
- Initialise contingency plans for efficient water use e.g. use of on-site storage
- Support customers with good practice guidance.

The Yorkshire Water Whosesale Market Services Team would be responsible for contacting inset appointees and retailers and keeping them informed until the situation recovered. A represtative of the Whosesale Market Services Team would attend the weekly Bronze Incident Management meetings to keep up to date on the siatuion as it developed and pass information on to inset appointees and retailers.

3.3.2 Restrictions on use during a drought

Our policy for restrictions that impact on domestic or non-household water use is:

- Prior to the use of temporary use bans (a level 2 action) we will implement our agile communications plan, enhance our water conservation campaign and undertake additional leakage control.
- Temporary use bans will be implemented when reservoir stocks within key areas are within six weeks of the DCL.
- Drought orders for restrictions of non-essential use (a level 3 action) will be imposed when reservoir stocks are at the DCL.
- No restrictions will be imposed between the months of October and March.
- We will ensure all available sources are maximised within licence constraints, whilst ensuring that security of supply, drinking water quality and safety are not compromised.
- Prior to implementing any water use restrictions we will hold a public consultation.

- We will notify our customers and stakeholders when restrictions via temporary use bans and drought orders are in place and when they have been lifted.

All these activities will be discussed with the Environment Agency as a part of an ongoing planning process, instigated initially by reservoirs stocks crossing the Environment Agency early warning trigger line. The timing of actions is understandably a contentious issue as restrictions have a social and economic impact on customers and businesses. The triggers for implementing balance the impacts of restrictions against the risk of needing to take more severe action if we do not receive sufficient rainfall for reservoir stocks to recover.

Our analysis of previous droughts in our WRMP and our Drought Plan worked examples shows that supply side drought orders and permits are likely to be phased in over a period of weeks. At this stage a demand side drought order could be in place depending on the time of year and receiving authorisation from Defra. We will be required to demonstrate delivery of level 1 and 2 demand management activities in our applications for non-essential use drought orders and supply-side drought orders or permits.

There is likely to be intense interest in the activities we have implemented, and the benefits achieved. The phasing will enable a continuous review of progress and an opportunity to modify future actions and drought orders. In addition, should the drought be prolonged for two years or more, we would review our policy on the benefits of restrictions during winter months. Any renewal of drought orders for restricting non-essential use will require a benefit analysis and demonstration of demand management to date.

A UK Water Industry Research (UKWIR) project has been carried out to provide a voluntary code of practice and guidance to water companies in England and Wales: *Managing Through Drought: Code of Practice and Guidance for Water Companies on Water use Restrictions – 2013 (incorporating lessons from the 2011–12 drought)*. This code sets good practice principles and actions to follow when evaluating when and how water use restrictions will be implemented to manage demand during times of drought. Details of the water use activities restricted in a temporary use ban and a non-essential use ban as defined in the code of practice are provided in Appendix 3.3.

Under the code of practice, we will act in accordance with four principles when considering whether and how we will implement water restrictions:

- Principle 1: Ensuring consistent and transparent approach
- Principle 2: Ensuring that water user restrictions are proportionate
- Principle 3: Communicate clearly with customers and the wider public/users
- Principle 4: Consider representations in a fair way.

We will also follow the agreed actions when evaluating how restrictions will be implemented:

- Action 1: Companies, regulators and government to work together
- Action 2: Coordinate communications
- Action 3: Adopt a common phased approach, considering socio-economic factors
- Action 4: Adopt a common approach to exceptions
- Action 5: Promote understanding and good practice.
- Our assumed savings from temporary use bans and non-essential use bans are based on advice published in the report.

Savings attributed to demand side drought actions are estimates only and actual savings can vary in each drought situation (see Appendix 3.2). Our deployable output calculation as described in our WRMP, includes demand reductions when restritions are in place. We have carried out sensitivity analyses and found that not including these reductions does not impact our deployable output (although it does result in slightly lower modelled reservoir stocks). We can therefore be confident that even if our estimated savings for temporary use bans and non-essential use bans are inaccurate, our deployable output would not be affected.

Temporary use bans

Section 36 of the Flood and Water Management Act 2010 (FWMA 2010) amended the Water Industry Act 1991 to allow companies to temporarily restrict defined customer water use activities during a drought without the need for a drought order. These are known as temporary use bans. Prior to the introduction of temporary use bans, domestic customer use restrictions not requiring a drought order were limited to hosepipe bans. The FWMA 2010 allows a greater range of water use activities to be restricted.

The Water Use (Temporary Bans) Order 2010 provides details on certain types of customer water use which can be restricted in relation to these new powers. In addition, the Drought Direction 2011 defined those uses which still require a drought order for them to be restricted. Although water companies have the power to impose temporary use bans without needing a drought order, they must be experiencing, or at risk of experiencing, a serious shortage of water for distribution.

If reservoir stock predictions are six weeks from crossing our DCL and our agile communications are not proving effective enough, we may impose temporary use bans. Our worked examples assume temporary use bans will be in place before we apply for a non-essential use drought order or a water supply drought permit/order, unless applying for winter permits. Table 3.2 shows temporary restrictions of water use to be in place two weeks before we submit drought order / permit applications. However, if reservoir stocks were to decline more rapidly than in previous drought scenarios, an application for a drought order or drought permit could be made at the same time as implementation of a temporary use ban.

Temporary use bans to be implemented in a drought:
Watering a garden using a hosepipe
Cleaning a private motor-vehicle using a hosepipe
Watering plants on domestic or other non-commercial premises using a hosepipe
Cleaning a private leisure boat using a hosepipe
Filling or maintaining a domestic swimming or paddling pool
Drawing water, using a hosepipe, for domestic recreational use
Filling or maintaining a domestic pond using a hosepipe
Filling or maintaining an ornamental fountain
Cleaning walls, or windows, of domestic premises using a hosepipe
Cleaning path or patios using a hosepipe
Cleaning other artificial outdoor surfaces using a hosepipe.

Table 3.2 Activities banned under a temporary use ban

We have considered guidance and incorporated the UKWIR Code of Practice in estimating the demand savings from imposing temporary use bans. The savings given in Appendix 3.2. indicate the reduction in dry year demand that could be achieved should demand saving measures be implemented.

In accordance with the FWMA 2010 and Water Industry Act 1991, before implementing a temporary use ban we will publish notifications on our website and in at least two newspapers circulating in the area it will be applied. In addition, we will publicise through other media channels such as television, social media, billboards and local radio. These notices will provide details on how customers can make representations on the proposed temporary use bans. They will state the date when the ban will commence and where it will be applied. We will provide notice of the lifting of a temporary use ban using similar channels of communication.

We will ensure key stakeholders including inset appointees, retailers, customer groups and the National Farmers Union are fully informed prior

to notifications being published. We will provide inset appointees and retailers with information to help them answer any queries they may receive from their own customers in the Yorkshire area who will be required to comply with the restrictions. Inset appointees have their own drought plans and will be required to impose any tempory use bans that Yorkshire Water imposes on any customers they serve in the areas impacted by the ban. Commercial customers will also need to comply with restrictions and we will ensure both retailers and inset appotintees are fully informed on the restrictions and the exemptions.

We have carried out customer surveys to assess attitudes to water use restrictions in our region. During preparation of our 2013 Drought Plan we consulted with customers and key interest groups on the concept of temporary use bans shortly after they were introduced by the FWMA 2010. We commissioned research to investigate customer awareness and understanding of the new powers and to seek views on the prioritisation and potential concessions for restrictions.

The results supported a non-phased approach to implementation of temporary bans on water use. Most of our customers felt that the maximum water saving would be made from temporarily banning the washing of cars and watering of gardens with a hosepipe during droughts. Temporarily banning other activities listed under the FWMA 2010 was perceived to be of little benefit to conserving water under drought conditions.

In 2018, Yorkshire Water commissioned research into temporary use bans (Future options for managing customer demand for water White paper prepared for Yorkshire Water by London Economics 2018) which concluded domestic consumers were confused by what a temporary use ban entailed and that non-domestic consumers perceived themselves to be greatly affected by a temporary use ban. There was also evidence to suggest consumers would rather accept water restrictions over an increase to their billing costs.

In 2018 we held “qualitative workshops” and conducted in-depth interviews with customers to gain an insight to consumer reactions to temporary use bans. This demonstrated that if the water company is perceived as having acted responsibly, and the reason for implementing a ban is a result of a serious shortage of water, then customers are more likely to accept a ban.

Further research, aimed at gathering consumer reaction and attitudes towards hosepipe bans, found that homeowners are worried that their garden, cars and social relationships will be damaged or diminished by a ban. Further details on the findings of both surveys are presented in Appendix 3.4.

Non-essential use bans

The range of restrictions imposed by temporary use bans can be extended through imposing a drought order for a non-essential use ban. The restrictions on non-essential use that can be implemented under a demand side drought order are provided in Sections 73 to 81 and Schedules 8 and 9 of the Water Resources Act 1991 and detailed in the Drought Direction 2011. Table 3.3 summarises the water use activities that can be restricted by a drought order.

Water use activities that may be prohibited on successful application of a drought order:
Watering outdoor plants on commercial premises using a hosepipe (does not include watering plants that are: grown or kept for sale or commercial use; or part of a National Plant Collection or temporary garden or flower display.)
Filling or maintaining a non-domestic swimming or paddling pool
Filling or maintaining a pond
Operating a mechanical vehicle-washer
Cleaning any vehicle, boat, aircraft or railway rolling stock
Cleaning non-domestic premises
Cleaning a window of a non-domestic building
Cleaning industrial plant
Suppressing dust
Operating cisterns in any building that is unoccupied and closed

Table 3.3 Water use restrictions imposed by a non-essential use ban

If reservoir stock predictions are four weeks from crossing our DCL and after imposing temporary use bans, we may apply to Defra for a drought order for a non-essential use ban. This could be at the same time as applying for drought permits or orders related to supply-side actions. As with temporary use bans, we would be less likely to implement in the winter (October to March) as the potential benefits are less.

A demand side drought order allows a water company to impose restrictions on a greater range of activities than a temporary use ban, these activities are considered to be "non-essential". The order can only be granted by the Secretary of State. A drought order for a non-essential use ban will require an application to be submitted to Defra and approved. It is usual for a hearing to take place except under exceptional circumstances. The process for drought order applications is outlined in Appendix 3.1.

We will advertise a non-essential use drought order application in accordance with the code of practice and legislation set out in the FWMA 2010 and Water Industry Act 1991. Notices of the application, detailing the prohibited uses of water and the exceptions, will be placed in newspapers and on our website. The application will also be publicised through other media channels. We will liaise with inset appointees and retailers during preparation of applications for non-essential use bans and ensure they are fully informed of the implications and potential impacts on their customers, who will need to comply with the restrictions.

Anyone impacted by the drought order will have the opportunity to object and details of where to send objections will be provided in the notices. Defra may hold a hearing or public enquiry to resolve objections. If a drought order is approved, we will advertise that it has been granted before implementation. Once a drought order to restrict non-essential use is lifted or extended, we will advertise this and inform relevant stakeholders including inset appointees and retailers.

3.3.3 Exemptions and concessions

Action 4 within the code of practice (CoP) requires all water companies to adopt a common approach to exceptions on any restrictions imposed during a drought. To allow this a number of exemption categories has been agreed:

- Statutory Exceptions: these are activities / water uses specified in the legislation which are exempt from restrictions imposed by temporary use bans and a demand side drought order and for which customers do not need to make representation to obtain permission;

- Discretionary Universal Exceptions: these are activities / water uses not covered by a statutory exception, but for which signatories to the Drought CoP have agreed to grant an exception for so that customers do not need to make representation to obtain permission; and

- Discretionary Concessional Exceptions: these are activities / water uses not covered by a statutory exception, but for which an individual water company offers an exception for which customers must first make representation to obtain permission.

When we impose temporary use bans and non-essential use drought orders, statutory exceptions, associated with individual purposes of use, will automatically be in place. Under the code of practice discretionary universal exceptions will also be permitted. The code of practice also suggests further discretionary concessional exceptions individual water companies may allow for. Statutory, discretionary and suggested discretionary concessional exceptions as presented in the code of practice are provided in Appendix 3.3.

Notifications we publish on temporary use bans and non-essential use drought orders as part of the public consultation will state the purposes of use that are restricted, and all exceptions related to each purpose. We will consider any representations received as a result of the public consultation. Representations are likely to include requests for further exemptions and concessions. Exemptions will include people who are disabled or otherwise physically impaired. Concessions could include businesses whose commercial activity would be unduly affected by the imposition of a drought order to restrict non-essential use. Before imposing temporary use bans and non-essential use drought orders we will review our discretionary exceptions, taking into account all representations. However, as a drought progressed these exemptions and concessions could be withdrawn to help reduce demand.

Yorkshire Water is part of the WReN Regional Group. During a drought we would be in contact with the other water companies in WReN and neighbouring companies not part of WReN to understand the extent of the dry weather impacts in their supply systems. Due to the geographical locations of the three companies and the hydrological and hydrogeological nature of each companies' water resources, it is unlikely the three WReN companies would be at the same stage of drought at the same time, unless in very extreme and unprecedented circumstances. In the event of restrictions on use being required for two or more of the WReN companies we would be in close communication and aim to align communications, restrictions, exemptions and concessions. However, restrictions will be subject to a public consultation and differences may arise if company's consultations result in variations.

3.4 Private supplies and vulnerable customers

3.4.1 Private supplies

Not everyone in Yorkshire is a Yorkshire Water customer. Some will have their own private supplies for either domestic or commercial use or both. Agriculture can be particularly vulnerable as their farming practices require increased water use during times of drought when their own private supplies may also be depleted. In a drought, or period of prolonged dry weather, anyone in our area with a private supply may contact us to request support in circumstances where their own supplies (springs, boreholes etc.) may be running dry and they are at risk of having no supply.

In accordance with DWI information (Managing insufficiency of private water supplies Appendix 1) and the Water Act 1991, anyone with a private supply in our region should establish their own contingency plans in case their supply is depleted by drought conditions. Where a contingency plan is not yet in place, they may seek advice from the local authority or Yorkshire Water as the incumbent water company. However, there is no obligation on either to provide an alternative supply of water (irrespective of the supply type and volume consumed), except where the local authority considers the circumstances to pose a danger to life or human health.

Where the local authority considers there to be a danger to human health, it has powers to require Yorkshire Water, if practicable, to supply water by

means other than pipes at reasonable cost for a specified period (e.g. a supply of bottled water, or water supplied in tanks or bowsers). The costs can be recovered from any relevant persons.

We will consider such requests for those who are considered most vulnerable via the local authority. Our ability to provide such support will depend on resources available and ensuring that we can continue to meet our own customers' demands.

3.4.2 Welfare for vulnerable customers

We will consider the needs of Yorkshire Water household customers in vulnerable circumstances, such as those on our Priority Services Register (PSR), when implementing supply restrictions. For example, these customers may have a medical or health condition which means that they need a constant supply of water. Consideration will also be given to the needs of sensitive non-household customers who are included in our PSR, once we have been notified by their retailer that they are defined as vulnerable for the purposes of the Security and Emergency Measures Direction (SEMD). We will give priority to maintaining water supply to these PSR customers during a drought or period of prolonged dry weather.

3.5 Options to increase supply

During normal weather conditions, it is not necessary to fully utilise our existing abstraction licences. In the early stages of a drought, we would review our operations and, where existing abstraction licence conditions allow, increase the yield taken from our available resources. This is carefully managed to ensure we balance the use of resoures and do not deplete any annual licence limits or reservoir levels too quickly.

If the situation does not recover, the resources we rely on under normal operating conditions may be depleted or constrained by licence restrictions at low flows (i.e. hands-off flow conditions stipulated on licence agreements). Supply-side options may then be needed to temporarily provide additional resources and help us meet demand. We have the following supply-side actions available in a drought:

- Rescheduling planned outage events and escalting actions to remove unplanned outages

- Re-commissioning of unused infrastructure/sources
- Reducing compensation releases
- Increasing existing abstraction licences
- Extreme drought supply-side actions, including alternative sources of supply and inter-company bulk transfers.

As well as maximising supply during a drought, we will consider how our normal operations can be altered to help protect the environment e.g. provide alternative compensation releases to rivers. We also consider if we can support our neighbouring water companies. Depending on our own resource situation, we will reduce our bulk transfer from Severn Trent Water if they are experiencing a drought and in need of the water.

We manage a routine programme of borehole yield testing to establish the actual and potential deployable output of our groundwater sources. Where additional yield is identified, we will implement schemes to achieve that yield within the abstraction licence. We would also review and implement projects to maximise our river abstraction licences.

At times our assets can be out of service either for scheduled maintenance and repairs or as a result of unplanned events such as pollution or asset failure. This can lead to a temporarily loss of supply known as outage. Due to the connectivity within our suply network under normal operations the supply may not be required. However, during extreme weather events, we may need to maximise available supplies in order to redistribute resoures and meet high demands. Outage events will be continuously assessed during dry weather to understand the impact on our system. We will, where there is a benefit and it is safe and feasible, reschedule planned events and escalate maintenance and repairs to bring assets back into supply.

We will review resources where spare licence capacity is available but current infrastructure limits use of licences. For example, we have a borehole licence at East Yorkshire Groundwater Option 2 that has not been used in recent years due to bacterial contamination. This borehole could be brought back into supply through refurbishing the existing borehole. Alternatively, we have an option to relocate the abstraction point. This is

included as an extreme option as it requires additional infrastructure and permissions.

If our scenario modelling is showing a risk to security of supply under existing operations, we will consider options for increasing existing resources or reducing reservoir compensation releases. These options are classed as level 3 options and the majority require authorisations to be granted as they can potentially harm the environment and mitigatory actions must be identified. They are therefore not part of our normal operating regime and we would not implement in the early stages of drought.

Appendix 4 includes a summary of individual supply-side level 2 and 3 options outside of normal operations that we would consider during a drought. At this stage, we would already be implementing demand side options and maximising the use of our existing available resources within normal operating conditions.

Our supply-side options for short-term droughts, typically lasting one or two years will provide additional resources by reducing compensation releases or increasing abstraction. We refer to these as "ordinary" supply side drought options. In addition to these we have options available to us, that we would only use in a drought lasting two or more years. We refer to these as "long-term drought options" and include as extreme drought actions, see section 4.

The majority of our ordinary supply-side options are to reduce the flow we release daily from our reservoirs to compensate the environment (compensation flow). This conserves resources for public water supply but also means we can provide a compensation flow for longer, albeit at a lower volume. The selection of ordinary supply side options we implement will take into account the need for conserving compensation flow for both supply and the environment.

Critical to the selection of the appropriate supply- side option will be the amount of water that would be made available, how effectively this water can be used and the environmental impact of the option. In the first stages of a developing drought, typically 20-75Ml/d of additional resources will be required. As the drought intensifies it may be necessary to increase this to

100-150Ml/d. Only in very exceptional circumstances would more than 150Ml/d be required.

3.5.1 Supply-side drought orders and permits

In total we have 49 ordinary supply-side actions. The majority require authorisation through a drought permit or order, except for three that are within existing permissions. One of these would require the CRT to be notified. We have nine long-term supply-side options, some of which may also require authorisation for a new / increased abstraction or discharge consent.

Supply-side drought order applications will be submitted to Defra. Drought permit applications will be submitted to the Environment Agency. In most circumstances we would apply for authorisation through a drought permit. We would select the most beneficial permit related actions in consultation with the Environment Agency and in advance of submitting we would consult Defra, the Drinking Water Inspectorate, Natural England and other groups as appropriate.

The Environment Agency's National Permitting Service Manager or Area Manager will determine a drought permit application based on the supporting evidence and taking into account any objections from third parties. Water companies must advertise a drought permit application and notify anyone who may be directly impacted by the porposed action. Further details on the application process are provided in Section 3.2 and Appendix 3.1.

As discussed in section 2, the trigger for drought permit applications is when reservoir stocks are four weeks away from crossing the DCL. However, we include triggers prior to this to ensure we have all the necessary information to suport the applications. As a drought escalates, we will be continually reviewing reservoir stock levels and the potential scenarios if the dry weather continues. In doing so we assess the risk that we may require supply-side drought actions that are outside of our normal operations.

If our scenario modelling identifies a risk that drought actions requiring a permit or order could be needed, we will start to prepare the applications well in advance of the decision to submit applications. Our trigger for this

preparation, including on-set of drought walkovers, is when reservoir stocks levels are 14 weeks from reaching the DCL.

The Environment Agency will only grant permits if a water company is able to prove there is a deficiency or risk of deficiency in supply and that it is due to exceptional shortage of rain. A water company also needs to demonstrate it has taken action to reduce demand and leakage. During the summer months the Environment Agency may expect temporary use bans to be in place before a permit is implemented, however evidence of agile communications could also be accepted if a similar volume of savings could be evidenced.

We shall need to inform local stakeholders and downstream abstractors who may be impacted by the drougnt actions. We shall send formal notification at the point an application is advertised. However, we recognise that earlier communication is needed and include a trigger that is 11 weeks before crossing the DCL for starting this communication process. We shall write to downstream abstractors and contact any local groups such as anglers or trusts who have an interest in the river offerign to meet with them to discuss the application. The trigger will not automatically initiate communication as this is likely to be phased as the applications themselves will be phased.

The trigger for a temporary use ban is when we forecast a reservoir group to be six weeks away from crossing the DCL. At this stage we may also start to submit "pre-applications" for drought permits to the Environment Agency, followed by actual applications two weeks later. The pre-applications allow the Environment Agency to assess if all relevant information is provided before we submit applications and give formal notice to third parties. We will liaise with third parties directly impacted by the actions in advance of submitting the applications.

We may also be preparing an application for a drought order to impose a non-essential use ban depending on the severity of the drought and the risks identified in our scenario analysis. We would not implement water use restrictions during October to March as savings would be minimal. We would start to consider long-term drought options if we were in a second year of drought and six weeks from crossing the DCL.

Drought ready applications

During a drought the situtation can change rapidly and it is important we can react effectively in the time available. Regulators have stipulated the information they expect to see in drought order or permit applications, and we have prepared draft drought permit application documents for our level 2 and 3 compensation release and river abstraction drought actions (ordinary drought options). These draft documents compile the information that is available in support of an application when we are not in drought. This speeds up the process if permit applications are needed and ensures we pre-agree the necessary environmental mitigation measures with the Environment Agency.

Drought orders or permits are issued for individual sites and relate to their specific authorisations granted through either an abstraction licence or an Act of Parliament. Due to the connective use of our reservoirs and the potential cumulative environmental impacts, we would usually intend to submit the applications for each reservoir area as a group. We will combine the supporting information for drought order or permit applications in a particular reservoir group to include all reservoir operations, associated releases and maintained flows in the group. The river applications will be applied for as individual applications.

The draft documents include supporting information and environmental assessment reports. Prior to applying, environmental monitoring would be carried out and the documents updated to include details specific to the drought situation. The permit applications also provide the basis for drought order applications if required.

The supply side drought order or permit application will provide information on the following:

- Existing authorisations for abstracting or impounding water.
- The location of the site(s) impacted and the area directly supplied by a river or reservoir resource.
- Details of the drought management actions we will have taken before applying for a drought order / permit. This will include the demand management actions taken, as discussed in section 3.3.

- Justification of the need for the drought permit / order including evidence of exceptional shortage of rainfall.
- An environmental assessment to show the likely impact the actions will have on the environment. A summary of the environmental approach taken is provided in Section 7, and potential impacts of individual actions, where applicable, are summarised in Appendix 4.
- Details of environmental monitoring and mitigation requirements. A summary of the approach is provided in Section 7 and details, where applicable, are included in Appendix 4.

3.5.2 Ordinary supply side options

Ordinary supply side options are level 2 or 3 drought actions that we consider implementing if reservoir storage is six weeks from crossing the DCL. The majority require authorisation through granting of a drought permit or order. Details of these options and the triggers are provided in Appendix 4

When we implement ordinary supply-side drought options we will have, where possible, maximised available resources within licenced conditions and enhanced our water efficiency communications and leakage activity. During April to September a temporary use ban will be in place, if there is no evidence of agile communications reducing demand, and we may be preparing a drought order application for a non-essential use ban.

The decision on which orders or permits to apply for would be made in consultation with the Environment Agency and other interested parties. It would depend on the severity of the drought and which areas of our region were most impacted.. The environmental impacts of the options are discussed in Section 7 and Appendix 4. Where possible we will prioritise actions where the environmental impact would be least damaging or, in the case of compensation related actions, where resources need to be conserved as there is a risk of running out of compensation flow.

Reducing compensation releases

We operate over 100 reservoirs in our region with around 80 of these used to supply water to customers. For many of our reservoirs, we are required to release flow to the downstream environment to compensate for the

reduction in flow due to the reservoir impounding the upstream source. These releases are referred to as compensation flows.

Compensation flow requirements are specified in legal documents (Acts of Parliament or abstraction licence agreements) that permit the impoundment. In a drought, we would consider applying for drought permits or orders to temporarily reduce compensation releases. By releasing less from the reservoirs we conserve supplies for customers. This also acts to maintain the compensation flow for longer, at a reduced level.

We operate several reservoirs to provide compensation flows that differ to the legal requirement but have been agreed with the Environment Agency to be better for the environment. These options would still require authorisation to temporarily alter the compensation requirements in a drought. The details of which would be explained in the application.

Actions to reduce compensation releases include a reduction to 50% of the normal operating release when either regional reservoir stocks reach the DCL or, for reservoirs with no support from other supplies, when the individual reservoir stocks reach its individual DCL (see Appendix 4). If reservoir levels continue to decline and the regional reservoir stocks are below the DCL for four or more consecutive weeks, we will implement a second compensation release reduction to one third of the normal operating release. The local trigger for reservoirs that cannot be supported will apply for this second reduction also.

Under drought conditions we balance supplies to try to ensure stocks in each area of our region are drawn down evenly. However, asset availability and uneven rainfall can lead to some reservoirs reaching critical levels earlier than others. In exceptional circumstances where a reservoir we can support from other sources is at risk of requiring more than the 50% reduction before that trigger is reached regionally, its individual stocks will trigger the reduction from 50% to one third of the normal compensation flow. This would be to preserve resources in the reservoir to provide a compensation flow for longer, albeit at a reduced level, until we received enough rainfall for stocks to recover.

Some of our reservoirs that are linked (either directly or indirectly) to our public water supply network but in a drought there may be no supply benefit to reducing the compensation release. These reservoirs may still

require drought actions to support the downstream environment. If the action was not taken the reservoir would be at risk of running out of water and no compensation flow would be available. We therefore include these as drought options with triggers relating to the individual reservoirs (local triggers), although we would still consider applying if regional reservoir stocks were approaching the DCL. The local trigger has been introduced to conserve stocks for the environment only.

We operate two reservoirs in our region that no longer have links (direct or indirect) to public water supply network. These reservoirs are referred to as 'compensation only' reservoirs. Yorkshire Water is the asset owner and is therefore responsible for the management and operation of the reservoirs, including making, recording and reporting accurate compensation flow releases. For compensation only reservoirs, it is the responsibility of the Environment Agency to apply to Defra for a drought order (using Section 73 of the WRA 1991) where it (EA) believes this is necessary to protect the environment.

Although the applications will not be made by Yorkshire Water, as the asset owner, we have undertaken the environmental assessments (SEA, HRA and EARs) required for these reservoirs and included the environmental assessment requirements in our SEA and HRA documents. We have also included these reservoirs in Appendix 4 as Environment Agency drought order sites, but they are not Yorkshire Water supply-side actions as there are no links to public water supply.

3.5.2.1Increasing existing abstraction licences

It may be possible to gain additional yield through increasing our existing abstractions. We have six level 3 ordinary supply-side options that would increase river abstractions to provide additional yield during a drought. We would require a drought order or permit before we could implement these actions.

Three of the ordinary supply-side actions would temporarily increase the daily permitted abstraction volume. Two would increase the total volume we are permitted to abstract in a year and are winter only options (see below). We also have a river related option to alter a prescribed flow release from a reservoir which conserves water to support the abstraction.

These level 3 actions are applied to existing sources of supply and do not require any additional permissions from the DWI or planning authorities.

Our experience in 1995-1996 and 2018 shows the potential for increasing groundwater supplies of potable water during a drought is limited by treatment capacity and mains infrastructure. We therefore have limited supply-side groundwater actions. It may be possible to reinstate a borehole that is out of service due to bacteria contamination through borehole refurbishment and additional treatment processes. This will be considered at level 1 when we look to maximise our existing abstraction permissions. The same borehole is also incuded as a long-term option to relocate the groundwater abstraction point to an area where the risk of contamination is much lower. We would only carry out one of these two options.

3.5.3 Winter Drought Permits

In a drought, we apply for winter supply-side drought permits if our modelling predicts they will help reservoir recovery and reduce the likelihood of drought permits being required in the spring or summer, when the environmental impacts are often greater. We have two options, River Wharfe annual abstraction increase and River Derwent annual abstraction increase, that are winter only drought actions and both require a drought permit. All other supply-side drought options requiring authorisation could be required at any time in the year. These can therefore be summer or winter permit applications.

The licensing year is from 1 April to 31 March and in most years we control the volume we take each day to ensure we do not reach the annual limit. The River Wharfe and Derwent drought actions increase the permitted total annual abstraction volume, so are only required in the winter months if there is a risk we will meet the licence limit before the end of March. However, the need would be linked to use in the summer months when high demands meant we used a higher porpotion of our permitted annual abstraction volumes than in a normal year. They are considered level 2 drought actions as the environmental impacts are minor.

3.5.4 Alternative source – Inter-company bulk transfer

The Yorkshire Water region is bordered by four water companies: Anglian Water, Severn Trent Water, United Utilities and Northumbrian Water. We

maintain a routine dialogue with each of these companies and in the event of drought would contact the relevant company water resource managers regarding their water supply situation and options for cross border support. The opportunities for support between Yorkshire Water, Anglian Water and United Utilities are currently minimal.

In 1989 we entered an agreement with Severn Trent Water for an import of untreated water from Severn Trent Water reservoirs to a Yorkshire Water reservoir in South Yorkshire. This agreement allowed for the continuation of a longstanding import arrangement dating back to the construction of the Derwent Valley reservoirs in the early 20th Century. The agreement secures a maximum of 21,550Ml per calendar year (59Ml/d annual average) until March 2084.

The agreement allows for either party to cease the transfer in 2035 provided noticed is provided no later than 2030. Severn Trent Water is considering reducing or stopping the transfer as an option in its WRMP24 and Yorkshire Water is reviewing potential alternatives. If any changes result from WRMP24 both companies will review the impacts on their drought plans.

The amount that can be taken by both Yorkshire Water and Severn Trent Water is set in operating guidelines based on the principal that we are entitled to 24.1 per cent of the available water (245Ml/d). In the event of serious drought in Severn Trent Water's region, we can assist by taking a reduced supply. The minimum supply rate set in the guidelines between Severn Trent Water and Yorkshire Water is 35Ml/d. The agreement allows either party to alther the amount taken with agreement of the other party. Variations such as this have occurred frequently over the years, including 1995-1996, 2003, 2018 and 2020.

In operating the Severn Trent bulk supply, we use five control lines, taking different amounts from the reservoirs depending on the time of year and the reservoir stocks. This is illustrated in Figure 3.2 below. Severn Trent Water operates using several control lines, and the amount it takes depends on where reservoir stocks lie in relation to these lines. These lines show the maximum that will be taken by either Severn Trent Water or Yorkshire Water at any time, including in a drought situation. We have agreed with Severn Trent Water that we will endeavour to reduce our minimum transfer to 15Ml/d in the lowest band (below State 5). However, in this event we would

not impose demand restrictions on our customers even if they were in force in Severn Trent if the rest of our region was not triggering drought actions. This is to ensure we maintain our current levels of service as described in Section 1.5.

The decision to implement restrictions in Yorkshire is triggered by our own resources. The scale, timing and duration of any reduction in supply will depend on the scale and extent of drought impacts in Severn Trent and Yorkshire. Any changes to the supply rules will be agreed by both companies prior to any change being made.

When we are in a drought situation we will consult with Severn Trent Water on short term bulk transfers. The availability of a transfer from Severn Trent would be dependent on its own water situation. If Severn Trent Water is also in a drought situation the yield is unlikely to be available. However, we would always discuss the possibility of increasing the import with Severn Trent Water. In 2020 Yorkshire Water and Severn Trent Water agreed operating rules around the use of additional abstractions for both companies, depending on reservoir states and demands.

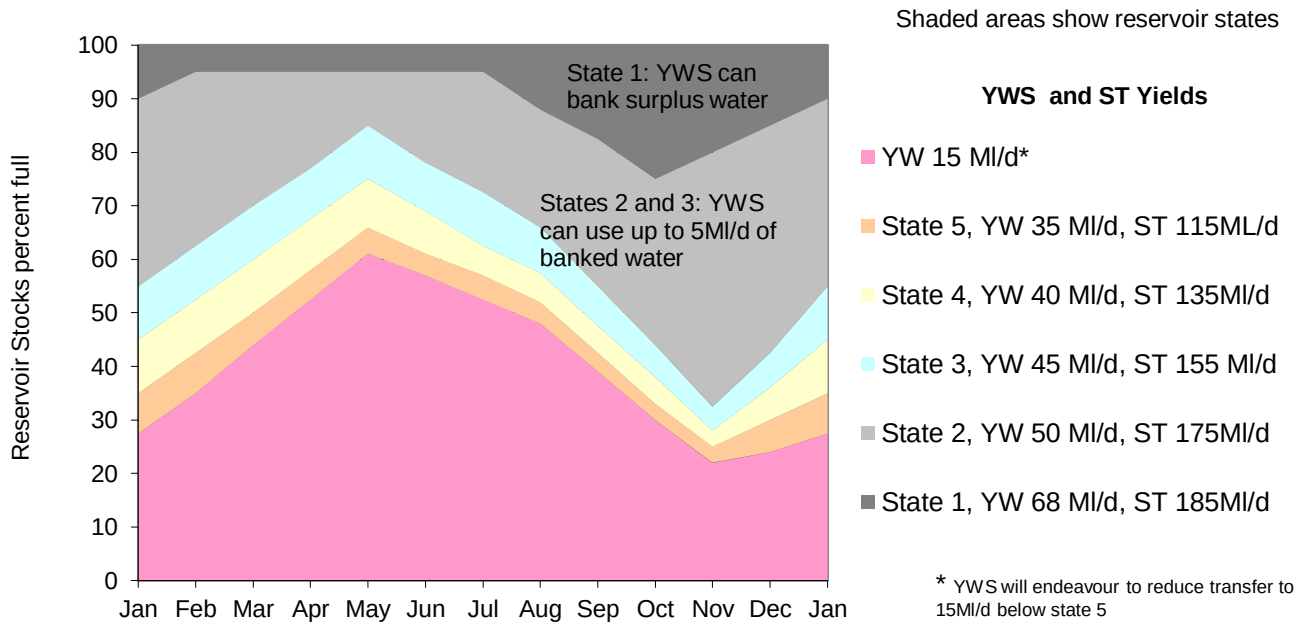

Figure 3.2 Severn Trent Reservoir control lines and yields

3.6 Compensation for water use restrictions

Water companies may be required to make payments (or give credits) to customers if their supply of water is interrupted or cut off under the authority of a drought order. If payable, the payments for each day (or part day) during which a supply is interrupted or cut off would be £10 for household customers to a maximum of our average domestic water charge in the previous year. For non-household customers, we will pay £50 per day to a maximum of the amount of water charges payable by the customer for the premises for the previous charging year. If the customer has not paid a full year's water charge, or a third party is responsible for the water charges, a maximum of £500 applies.

3.7 Compensation for adverse impacts from implementation of supply side drought actions

Under the Water Resources Act 1991, other abstractors adversely affected by a water company's drought management measures may make a claim for compensation. Under this act "a claim may be made at any time not later than six months after the end of the period for which the order authorises." Where a claim is "made during the continuance of the ordinary drought order, the Lands Tribunal may, if it thinks fit, award a sum representing the loss or damage which is likely to be sustained by the claimant" in respect of each day the claimant is affected.

When we advertise and consult on drought order / permit applications, to provide us with additional supply in a drought, we will reference the above to ensure abstractors potentially impacted by the drought measures are made aware that they may make a claim for compensation to the Lands Tribunal.

We have a record of abstractors downstream of drought permit sites that may be at risk of derogation due to drought orders / permits being implemented. We will check for any additional abstractors with the Environment Agency at the time of making a permit application. We will send notices of permit/order applications to all third parties we identified as potentially impacted.

4 Extreme drought management actions

In the event a very severe drought, water companies can consider emergency drought orders. An emergency drought order requires authorisation from Defra and allows a water company to limit the use of water to such purposes as it considers necessary. The legislation for emergency drought orders is provided in the Water Resources Act 1991. If granted, it provides a water company with powers to limit the use of water for further measures not permitted through ordinary drought orders.

These further measures include phased pressure reduction, introduction of rota cuts and supply of water by means of standpipes or water tanks. However, due to the practicalities of implementing such actions, presure management is considered the most feasible and would be limited to areas where priority customers (e.g. hospitals) were not at risk.

In accordance with Environment Agency DPG2020 level 4 actions are part of energency planning and not included in this Drought Plan. Our Drought Plan is devised to implement feasible drought actions in a timely manner to avoid the need for such extreme measures. Our level of service for emergency drought orders is no more than 1 in 500 years. This makes it highly unlikely we would require emergency drought orders in our region.

The trigger for level 4 actions in our supply area is when reservoir stocks are 20 percent of their total capacity. Our modelling shows a repeat of any droughts in our historic record would not reduce resevoirs to 20 per cent and level 4 restrictions would not be required. However, if experiencing level 3 drought actions, we would consider actions more extreme than level 3 to help reduce any risk level 4 restrictions would be required in an unprecedented drought event.

The extreme drought management actions we have identified are listed in Appendix 4.6. These include actions to further reduce water use but do not limit the water supplied to customers. They also include futher actions to increase supply, which require greater permissions (e.g. new supplies and infrastructure) than level 3 supply-side actions or only become necessary (e.g. tankering) once available supplies in some areas of the region have become severely depleted. We refer to these as long-term options.

The extreme actions would be implemented after level 3 actions were in place and, except for the long-term options, would be triggered if regional reservoir stocks were forecast to fall below 20% of the total capacity within four weeks. The long-term options are triggered in a second or later year of drought when reservoir stocks are six weeks away from the DCL.

The DPG2020 suggest extreme drought actions water companies should consider. In determining which actions would be beneficial to the Yorkshire Water region in an extreme drought, we have considered;

- Practicalities of implementation.
- Feasibility of technical delivery and acheiving a benefit under extreme drought circumstances.
- Environmetal impacts.

In summary our extreme drought actions include;

- Removing non-statutory exemptions on temporary use ban and non-essential use restrictions.
- A powerful drought communications campaign either at a regional or national level.
- A non-household water audit and retrofit programme.
- Wide scale tankering to those areas where local sources have depleted and infrastructure limits internal transfers to a level that does not meet demand (tankering may also be used at a much smaller scale earlier in a drought but this would be very localised and for short periods of time e.g. if outages occurred or there were some temperarory periods of very high demand).
- Network changes through installation over overland pipes to those areas where local sources have depleted and infrastructure limits internal transfers to a level that does not meet demand.
- Options to install new assets and infrastructure (would only be considered in a long term drought lasting two or more years).

- Consult commercial and agriculatural water users on any actions they would consider to help reduce water supply or find alternative sources e.g. reducing production output. This would be voluntary only.

The decision as to which long term drought options would be implemented would be made by the Yorkshire Water Risk Management Teams (see Section 6) and would remain under continual review until the situation recovered. Extreme drought actions would only be considered if we were in a severe and unprecedented drought situation. It is difficult to estimate the benefits of the actions in the absence of any real data. Where information is available we have provided the assumed benefit. For demand reduction opitons and non-location specific supply-side actions the benefits are largely unknown and could vary significantly depending on the drought conditions.

A preliminary prioritisation has been incuded in Appendix 4.6. The preferred order of implementation would be for demand reduction actions to be implemented first. In an actual extreme drought situation it is most likely we would assess the feasibility and benefits under the exact circumstances and implement several actions simulataneously. Recognising this, we have grouped actions into a prioritisation scale of 1 to 3.

4.1 Long-term drought actions

Our extreme actions include long-term drought options. These are derived from the options we consider in our WRMP options appraisal. We class these actions as extreme drought actions as they require additional permissions and new assets/infrastructure, which would not normally be considered outside of the WRMP process and they would only be implemented in a prolongued drought. We have created preliminary Environmental Assessment Reports (pEAR) / screening reports for the long-term supply-side actions, which would be updated as required.

Further information on the long-term options can be found in Appendices 4 and 5. We have not stipulated specific triggers for individual long-term drought actions, as the decision to implement these options would depend on conditions at the time. The timescales for implementing the majority of our long-term drought options are longer than those for options that we would consider implementing in a one or two-year drought. This is due to

the need to construct additional assests/infrastructure, for example, abstraction pumping stations, pipelines or water treatment work expansion. This creates a risk that any trigger specified would be crossed early in the second year of a drought, which could result in abortive activity planning for a long-term drought option that, more often than not, would not actually be required.

In view of these timescales, decisions on moving forward with implementation of one or more long-term supply-side options would be taken after implementation of all the appropriate one or two-year drought options (level 1 to 3 actions) set out in this Drought Plan. If the situation did not recover we would progress the planning and feasibility work to support decisions on implementing long-term drought options. This work would be accelerated as the drought continued and subject to continual review.

During the decision process we would consult the Environment Agency, Drinking Water Inspectorate (DWI) and Natural England as required to review the risks and benefits of implementing the long-term options. We will ensure full compliance with the requirements of Regulation 15 in the Water Supply (Water Quality) Regulations 2016 when considering introducing any new sources to be used ultimately for drinking water. Specifically, we will meet the arrangements stated in DWI Information Letter 06/2012, around providing; adequate information to the DWI / appropriate sampling and monitoring / reporting requirements / and following our Drinking Water Safety Planning risk assessment methodology and submission of Regulation 28 documentation as necessary.

By this stage we would already be meeting regularly with the Environment Agency. In the spring of a second year of drought we would start discussions on the instigation of environmental monitoring requirements associated with the relevant long-term options, in line with the Environmental Monitoring Plan. These discussions would start prior to taking the decision to implement long-term drought options to endeavour to provide a summer drought environmental baseline before a third summer of drought.

We would not progress long-term options until we had implemented level 1 and 2 activities and had triggered or were close to triggering level 3 actions. Depending on the severity of the drought in years 1 and 2 we may have implemented some of our other extreme actions which have shorter

time scales. The long term options are only likely to be required if our modelling or analysis of supply and demand data is highlighting a risk our level 1 to 3 actions are not sufficient to mitigate against drought conditions, or if we believe we will need to implement these options if drought conditions will continue into a second winter.

The majority of our long-term options will require a drought permit or order, in addition to other authorisation linked to construction and new supplies, including planning permissions and DWI approvals. They would require a detailed environmental assessment report to be produced to accompany any permit or order applications. These assessments would be produced in accordance with the DPG2020 and utilise all baseline data and information available at the time. It is anticipated that some of the schemes will require a full Environmental Impact Assessment, which could take three to six months to produce depending on scheme complexity. Where feasible the assessments will be carried out in parallel to other planning and approval applications.

By commencing work on these schemes as early as our modelling dictates it will allow sufficient time for the options to be implemented in year 3. There is a risk of abortive work or creating unused assets but this risk must be balanced with the social and economic risks created by level 4 emergency drought actions, which we would seek to avoid.

When deciding which long-term options to implement, a range of criteria would be considered, including the location of the option and drought, cost and supply benefit as well as the environmental impacts. The decision would not be based solely on environmental factors, although these would be fully considered throughout the process. We would base our decision on conditions at the time taking into account the following;

- The magnitude of the supply deficit to be addressed, taking into account the severity of rainfall forecasts.
- The areal extent of a drought to determine which options will have an impact where additional resources are most needed.
- The availability of the resource, for example, river sources may not be available if the river flows are impacted by the drought.

- Construction timescales taking account of measures to accelerate delivery, such as fast-track procurement approaches, seven day per week working, multiple construction teams and use of modular construction techniques.

- The likely environmental impact of individual options. Where possible we will select the least damaging options based on prevailing environmental conditions and the Strategic Environmental Assessment (see Section 4) if they can provide the required volume in the affected areas.

- Any other risks relating to option implementation (e.g. drinking water quality and engineering risks).

- The costs of implementing and operating long-term options will be considered alongside the above criteria in the selection of options.

The DPG2020 state extreme drought actions should be temporary and generally not result in permanent increases to deployable output i.e. usually distinct from WRMP options. We consider WRMP actions should be considered in an extreme drought as they have potential to provide larger benefits than other extreme drought actions. They may also be less environmentally impacting than temporary supply-side actions which allow abstraction at low flows or reduce compensation flows.

However, the infrastructure requirements may need to be considered differently to permanent WRMP options, and its possible overland pipes will be implemented or temporary assets that would not be utilised under normal circumstances. If they were implemented in a long-term drought we would review the potential for maintaining the assets in our post drought review and the next iteration of our WRMP. We would discuss the environmental impacts and licencing implications of this with the Environment Agency at the time of preparing for implementation of long-term options and during our post drought review.

The time to implement these actions (6-18 months) creates a risk the drought could be over before the benefit available. However, a drought of more than two years is unprecedented in our region and in these circumstances we would balance the risk of redundent investment against

the risk of a prolongued drought where reservoirs do not recover sufficiently to provide a secure supply of water.

5 Customer Communications

We promote water efficiency to customers throughout the year and we react to dry weather by increasing communications. This high level of communication will inform customers of the additional need to save water and appeal for voluntary reductions in water use. The communications are scaled up and down using a range of media including our website, customer events, billing, mailshots and social media.

Publicity starts before we would class ourselves as in drought to encourage water conservation and to inform customers and stakeholders early. Stakeholders will include in-set appointees and retailers as information will be relevant to their customers. Full details of our Drought Communication Plan are given in Appendix 6.

We operate an agile water saving communications strategy that aims to reduce both long-term demand for water and temporary peaks in use related to weather conditions. We always encourage our customers to use water wisely by providing advice through our website and offering free water saving devices all year round. During periods of hot, dry weather we communicate there is an increased need to save water. The severity of the developing situation would determine the level of messaging and it's important that customers understand when there is additional need to conserve water supplies.

During droughts it is usually the case that other water companies and sectors will be impacted at the same time. We shall collaborate communications on a national level through participation in any NDG initiatives.

Due to the hydrological differences and different water availability risks of the WReN companies (Northumbrian Water and Hartlepool Water), it is unlikely we would reach the same stage of drought actions (levels 1 to 3) at the same time. This limits the likelihood of regional drought actions, but there could be benefits of joint communications with WReN companies as well as with our neighbouring water companies (United Utilities, Severn Trent Water and Anglian Water). These are often carried out through participation in the NDG but we would also discuss outside of this group.

5.1 Red, amber and green messaging

To deliver our agile communications, we have developed our "traffic lights system". The red, amber and green status is linked to demand, resources and weather to help customers understand there is a need to conserve water at all times, but this need is escalated during certain conditions.

Our traffic lights system uses an intelligent data initiative that looks to tailor and target messages to audiences based on key water use influencing factors. Customers are not all motivated by the same types of messages and it is important that we reflect this with messages that are relevant to different customer groups. For instance, some customers respond more to understanding the benefits of water saving to the environment whereas others may associate water saving to hosepipe use only and think it not relevant if they do not have a garden themselves.

Our approach is in line with the Consumer Council for Water's report 'Understanding drought and resilience'. This report concludes customers would be more engaged if they had information from water companies on the need for water saving outside of extreme drought events, they were better informed on the actions the companies were taking to mitigate droughts and if the communications reflected their own needs. The research groups customers into the following four categories:

- Socially conscientious customers are looking for practical tips and advice on saving water during and outside of drought periods.
- Service motivated customers need to know what water companies are doing to resolve drought issues, both in the short-term and long-term.
- Disengaged urban customers could be more engaged through information on the wider environmental issues affecting drought, and some practical tips on saving water.
- Business customers are looking for more business specific communication to clarify the 'grey areas' and information to educate customers on business restrictions.

We use publicity as an early response to dry weather, whereby the communications are appropriate for the developing situation, and can be

scaled up or down as needed. The critical factor is the weather pattern, particularly rainfall and high temperatures. When demand increases in dry weather, we react to the conditions but must be flexible to changing weather patterns as a hot, dry summer can quickly change to heavy rainfall and risk of flooding.

During the majority of the year we will be in green status and demand will be close to average. While in green status we will use a base level of communication that promotes water saving messages to customers providing tips and free water saving devices. If we move into amber, then red status, we will enhance both the type of messages and the media channels we employ.

Our weekly water situation report provides a series of triggers for moving into amber and red status. When either demand reaches the 75th percentile based on historic data, rainfall is below 50% of average or reservoir stocks cross the Environment Agency early warning trigger line we enter amber status. If demand increases further and either reaches the 90th percentile using historic demand, rainfall has been below 50% for more than six weeks or reservoir stocks are ten weeks from crossing the DCL this triggers a greater level of messaging and media.

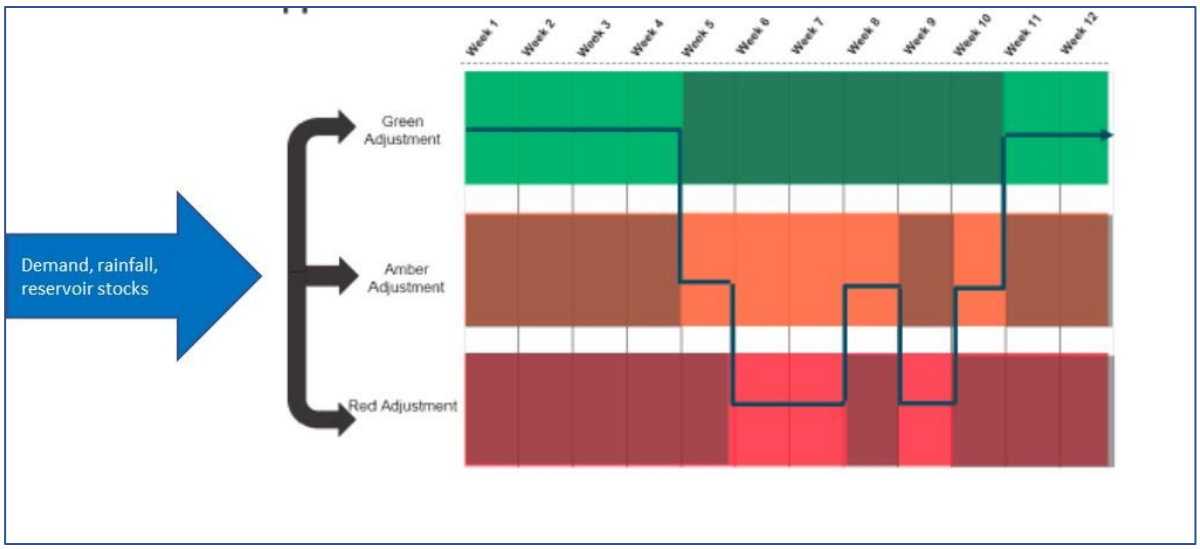

Figure 5.1 Agile communications traffic lights system

The messages will also use forecast weather conditions to tailor the messages to ensure they are relevant. We choose appropriate messaging based on weather forecasts and modelled scenarios, as well as reacting

to reservoir control lines. If stocks are below the normal control line and above our Environment Agency early warning control line this would not automatically trigger a need for increased communications. However, if we were experiencing dry weather and predictions suggested there was a risk of crossing the control line, we would increase our level of messaging. If conditions switched to rain, we would be able to reduce or alter the level and type of messages in a matter of days to ensure the communications were appropriate. Table 5.1 provides a high-level drought communications plan linking actions to the triggers included in Section 2.

Trigger	Action
Demand reaches the 75th percentile, rainfall is below 50% of average or reservoirs cross Environment Agency early warning trigger line	Review current water efficiency activities and opportunities to increase customer uptake of free devices Request voluntary reductions using key messages and communication channels. Consider joint messages with Environment Agency and other water companies.
Reservoir stocks forecast to be 10 weeks from away from DCL	Prepare adverts for temporary bans on water use. Below are examples of the type of adverts we would use.
Reservoir stocks forecast to be eight weeks from away from DCL	Advertise/consult on temporary bans on water use.
Reservoir stocks 6 weeks away from crossing DCL	Impose temporary bans on water use. Distribute adverts and use communication channels to notify customers
Two weeks after imposing temporary use bans	Advertise and start consultation on drought orders and permits. Notices will be published in one or more local newspapers circulating within the affected area and in the London Gazette.
Six weeks after imposing temporary use bans	Impose drought orders or permits. Use communication channels to notify interested parties.

Table 5.1: Drought communication plan

By reacting to triggers relating to weather and demand we can ensure customers are aware there is a need to reduce water use early, before we are in a drought and before we reach reservoir control lines for more severe actions. This helps conserve reservoir supplies, reduces pressure on the environment and reduces the likelihood drought measures that impose restrictions on use or take more water from the environment will be implemented. However, if demand returns to normal and/or rainfall is forecast we will adapt the messages or may even return to our normal "green" campaign level of communication.

To encourage water efficient behaviour, we use various communication channels to raise awareness to customers. This is likely to include the following:

- briefing updates on the water supply situation
- information about water supply improvement schemes including leakage control measures
- briefing on the weather for awareness of potential drought sequences
- water saving advice for household and non-household water users
- if applicable, water use restrictions and drought permit or order advertisements.

We will select the channels of communicate based on the severity of the situation, which include social media, the Yorkshire Water website, newspaper adverts, media press releases, press conferences and local meetings. To ensure customers are kept informed and receive appropriate advice we will liaise with local authorities, parish councils and other groups including retailers and the National Farmers Union.

5.2 Communications for water use restrictions and drought permits

When reservoir stocks are forecast to be within six weeks of crossing the DCL this triggers the implementation of temporary use bans in the summer

months. We will have started our agile communications in advance of this and be monitoring the impact on customers. If there was evidence our agile communication strategy was reducing demand, a temporary use ban may not provide any additional savings, and we would assess the potential impacts of such restrictions taking into account the specific circumstances at the time. However, we would continue to prepare for temporary use bans to ensure we were ready to implement if needed and if there was potential for summer drought permit applications, we would implement with sufficient time to have a measurable impact prior to applying for a summer drought permit.

If temporary use bans were needed, notifications would be published in advance (reservoir stocks forecast to be within eight weeks of crossing the DCL) offering customers the opportunity to make representations. These notices will explain the restrictions included under the Flood and Water Management Act 2010.

We will provide details of areas where restrictions are being considered to Environment Agency, Consumer Council for Water (CCWater), local authorities, health authorities and other interested parties using appropriate means. e.g. meetings, email, telephone media and press releases.

We will consider joint press releases and advertising campaigns with the Environment Agency, CCWater and other water companies affected by drought. This will help enhance the water saving messages and may be more cost effective.

Yorkshire Water is part of the WReN Regional Group. During a drought we would be in contact with the other water companies in WReN (Northumbrian Water and Hartlepool Water) to understand the extent of the dry weather impacts in their supply systems. Due to the geographical locations of the three companies and the hydrological and hydrogeological nature of each companies' water resources, it is unlikely the three companies would be at the same stage of drought at the same time, unless in very extreme and unprecedented circumstances.

In the event of restrictions on use being required for two or more of the WReN companies we would be in close communication and aim to align communications, restrictions, exemptions and concessions. However,

restrictions will be subject to a public consultation and differences may arise if company's consultations result in variations.

It is likely that the level of calls to the customer contact centre will increase during a period of drought, especially if any restrictions on use were imposed. Provision will be made to ensure that all staff in the contact centre are fully aware of the situation and are able to provide comprehensive information and advice to customers. Appropriate information will be provided to inset appointees and retailers to ensure they are equipped to answer any queries they receive from their non-household customers.

As the situation develops, we will provide regular updates to our customers and stakeholders. We will also provide notification of when stocks recover and the removal of any restrictions if required.

All drought communication activities will be monitored to assess which are most effective. This will include recording website hits, number of devices requested and number of phone calls. We will request feedback on our communications from customer focus groups and CCWater.

As a number of our drought options have a potential to impact on the environment, we will also consult Natural England regularly during a drought. If reservoir stocks are 10 weeks away from the DCL we will contact Natural England on any potential drought permits / orders that could impact on the Habitats Regulations or Wildlife and Countryside Act.

6 Our drought management structure

6.1 Management structure

We continuously monitor our stocks and operations during normal conditions to ensure that we are supplying customers from the most appropriate resource depending on the balance of stocks across the region and any operational considerations. Falling reservoir stocks trigger changes in source outputs and we review our operations to manage the situation and react to these changes. We will incrementally escalate our drought management processes in reaction to the developing situation to ensure timely decisions are made.

The first water supply escalation team to be convened is Bronze Risk, which can be escalated to Silver and Gold as defined in our Company Incident Management Plan. The Bronze Risk team will be formed no later than when regional reservoir stocks reach the Environment Agency early warning trigger line. The Bronze Risk Team will be chaired by the Clean Water and Catchment Strategy Manager and include representatives from teams responsible for managing resources, optimising supplies and managing our assets. Bronze will meet weekly until stocks recover.

Bronze will review available resources and asset performance to ensure we maximise our resources to meet increased demand and where possible preserve stocks that may be required if the situation continues. Drought scenario modelling will be reviewed by Bronze to aid decision making and ensure external communications are aligned with the projected potential risks. A representative from our External Communications team will provide an update on customer and media communications. A representative of our Wholesale Service Desk team will work with the External Communications team in respect of all retailer and inset appointee communications.

If the drought situation continues Bronze will be escalated to Silver, again as defined in our Company Incident Management Plan. Silver will be chaired by Yorkshire Water's Head of Service Delivery, Water Quality & Production and be held twice weekly. The structure of this team includes representatives from Bronze and additional input from customer services and legal services. Silver will be responsible for liaison with the Kelda

Management Team, managing staff resources and all communication with the Environment Agency, Drinking Water Inspectorate and other stakeholders and regulators.

Table 6.1 gives the criteria for moving from Bronze to Silver. The escalation of management groups will depend on the drought situation. If reservoir stocks continue to fall and are six weeks from crossing the DCL, Silver will be escalated to Gold. Gold will include all contacts included in Silver and will be headed by the Yorkshire Water Leadership Team (YWLT).

As not all droughts are the same, we have not defined a single trigger for moving from one management group to the next. If a single criterion or multi criteria in Table 6.1 is met, we will consider escalating to the next management team.

The structure of the teams responsible for drought management can be found in Appendix 7. The details of key contacts will be provided to the Environment Agency at the first drought trigger during the initial Environment Agency/Yorkshire Water liaison meetings. Further details will be provided as the drought escalates.

YW Trigger	Bronze	Silver	Gold
Reservoir Stocks	Environment Agency early warning trigger line	Predictions show summer restrictions are necessary	Reservoir stocks six weeks from crossing DCL
		Serious shortage likely in a supply area	
		Reservoir stocks are likely to cross DCL in 10 weeks	
Demand	Experiencing high demand (frequently above 75%ile)	Prolonged period of high demand	
Asset		Loss /failure of critical asset	

		leading to supply shortfall	
Water Companies		Restrictions imposed in neighbouring company (Severn Trent, Anglian, UU, NWL)	
Drought Measures		Planned/plan in progress	Implemented or planned
Environment Agency	Environment Agency early warning trigger line crossed	Environment Agency Drought Status "prolongued dry weather" or "in drought"	
Media		Heightened media campaign regarding local/national water supply situation	

Table 6.1 Criteria for Water Supply Escalation to Bronze, Silver and Gold

7 Environmental Impacts

7.1 Introduction

The DPG2020 sets out how a company should assess and mitigate the impacts of its supply-side drought management options on the environment, how it should monitor and measure these impacts, and outlines the requirement to consult relevant bodies where potential environmental impacts have been identified.

In preparing the environmental components of the Drought Plan, we have worked closely with the Environment Agency, following the recommended approach set out in the DPG2020. The guidelines require a comprehensive level of environmental assessment of each supply-side drought option, whilst weighting the level of detail against the risk posed by the potential drought action.

Drought planning is a continuous process. We continually review reservoir stocks, rainfall data, river flows and demand on a weekly basis. The drought line triggers referred to in Section 2 forecast on-set of drought walkovers, and the subsequent updating of the Environmental Assessment Reports (EARs), will commence 14 weeks prior to us crossing our DCL. In the summer months this will also be eight weeks before the possibility of a TUB. However, we will be aware in advance of this that there has been a rainfall deficit, and that these measures could be needed.

We have extensive experience of the monitoring and mitigation of drought and drought measures, and of assessing the environmental effects of river abstractions, river transfers and reservoir compensation releases. In considering the environmental requirements of the Drought Plan, we have drawn on this considerable experience including:

- On-set of drought walkovers, and preparation of in-river works permits during the extended period of dry weather in 2020
- Preparations of, and applications for, drought permits during the 2018 drought: Environmental Assessments together with onset of drought monitoring to support the preparation of a number of drought permit applications

- Applications for drought permits and orders during the 1995-1996 drought: Environmental Assessments together with extensive monitoring to support 36 drought order applications.
- Applications for time limited abstraction licences on the Rivers Ouse, Ure and Wharfe 1998, 2003 and 2017: Full environmental assessments and associated monitoring programme.
- Heavily Modified Water Bodies schemes and investigations: Modification of compensation flows at numerous reservoirs in AMP5/6 to meet WFD compliance. Included extensive ecological monitoring, flow model development and research, following an adaptive management approach.
- Tees Transfer feasibility study: Detailed environmental study (1997 to 2000) to provide an assessment of the construction and operational impacts of the pipeline and river transfer options.

7.2 How we assess the environmental impacts of a drought measure

In order to understand the effects of any proposed drought measure, we have carried out an environmental assessment for each supply-side drought management option. We have also carried out an assessment on two Environment Agency drought order compensation flow reduction actions. The environmental assessments consider the potential impacts of each proposed measure on a range of receptors. The overall scope of the environmental assessment is intended to meet the requirements of the DPG2020; specifically, Section 3 of the Environment Agency's "Environmental Assessment for Water Company Drought Planning Supplementary Guidance".

Two types of supply-side drought management options have been assessed: ordinary supply-side drought options and long-term supply-side options.

The ordinary supply-side drought options involve a reduction in compensation flow from a reservoir or an increase in abstraction from a river. These options result in a reduction in flow in the river downstream and

the majority will require a drought permit or order. The ordinary supply side options have been subject to a detailed environmental assessment.

For the purposes of reporting, the supply-side drought options considered for environmental assessment are grouped as follows:

Compensation release reductions:

- North area reservoir drought options
- South area reservoir drought options
- South West reservoir drought options (split into Upper Calder and Mid Calder)
- North West area reservoir drought options

River abstractions:

- River Ouse drought option
- River Ure drought option
- River Hull drought option
- River Wharfe drought option
- River Wharfe annual abstraction increase
- River Derwent drought option

Cumulative impacts of options both within groups and across groups have also been considered. A summary of the environmental impacts identified within each EAR can be found in Appendix 4.

Long-term supply-side options are those that could be implemented in a third year of drought and strengthen the resilience of measures available to the company should a very severe and prolonged drought event occur. Such options include increases to borehole, reservoir and river abstractions; increasing water treatment capacity; and river transfers. These options require additional construction elements, as well as changes to the operational regime of the water resource and in some cases a drought order or permit. Thus, a detailed environmental assessment report

has not been completed for each of the long-term strategic options at this stage. The DPG2020 indicates that efforts should be focussed on understanding, and where possible mitigating for, the environmental impacts of the supply side drought options which are most likely to be implemented. As such, the long-term supply options have been subject to an environmental screen, which provides sufficient information to inform the potential environmental risks and mitigation requirements for these options. The outcomes of the screening are summarised in Appendix 4.

We have developed an Environmental Assessment Methodology, in consultation with the Environment Agency, which provides a detailed approach to the specific requirements of the DPG2020 which are:

1. Setting out the likely changes to the hydrology (or hydrogeology) due to a proposed action.

2. Identifying the key features of the environment which are likely to be affected by these changes and assessing their sensitivity.

3. Assessing the likely impact on these features, allocating a level of confidence in the assessment and setting out the actions we will take to reduce uncertainty.

4. Mitigating against the potential impacts and where datasets are considered insufficient it is our responsibility to implement environmental monitoring to generate the information required.

The overall approach taken in completing the environmental assessment to demonstrate an understanding of the impact on the environment of implementing the proposed drought options is illustrated in Figure 7.1**.**

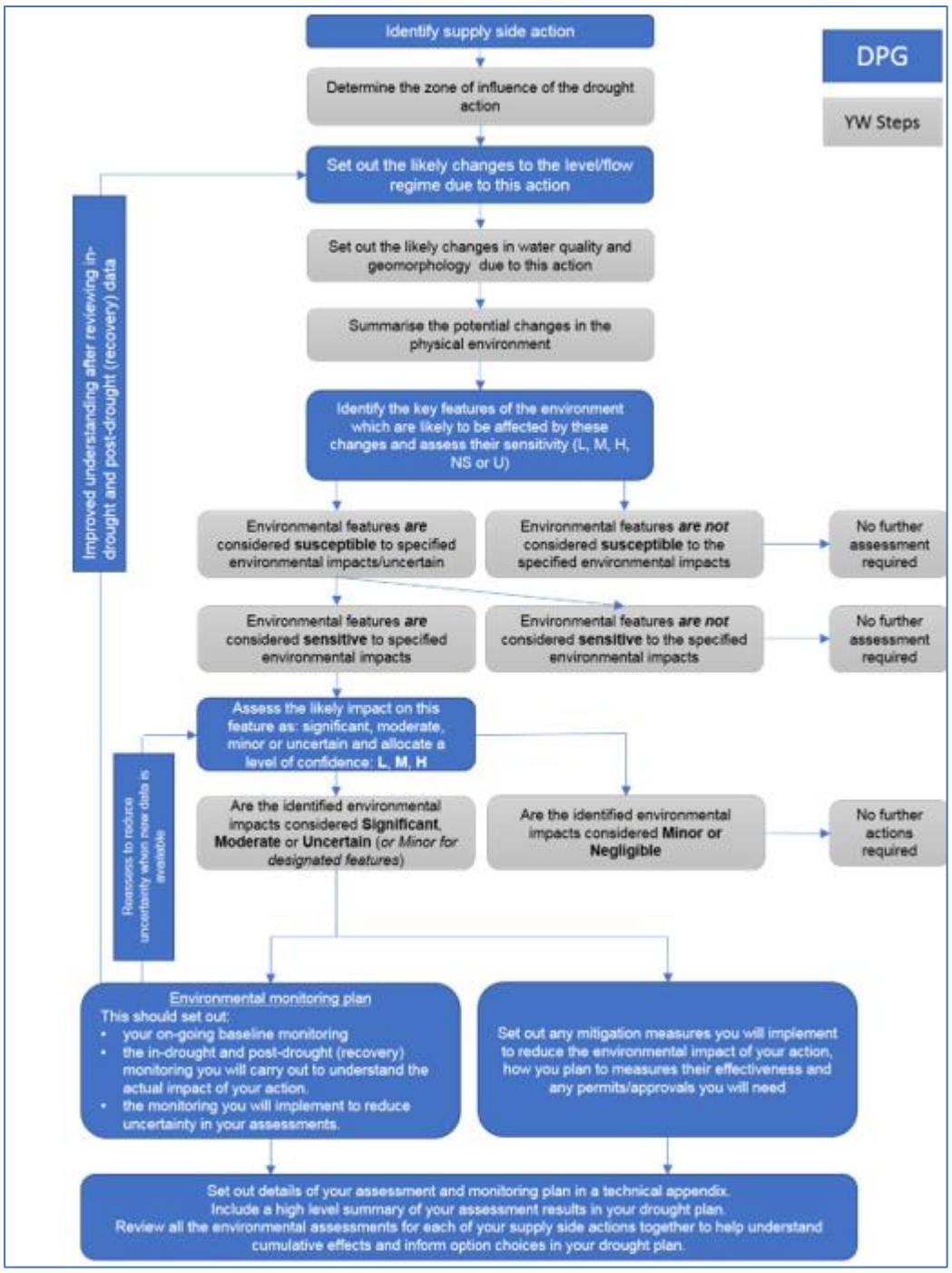

Figure 7.1 Approach to undertaking environmental assessments as identified in the DPG2020. Steps in blue are DPG2020 tasks. Tasks indicated in grey are Yorkshire Water tasks

7.2.1 Determining the zone of influence and timing of the drought option

The first stage of the environmental assessment for each supply side option is to determine the zone of influence, defined through hydrological effects, and the timings of the permit.

7.2.2 Physical environment: characterisation at a reach scale

The physical environment characterisation and the assessment of likely changes from the drought option are then set out for each reach within the zone of influence. The physical environment is described in terms of the reach setting, and for those aspects which may change as consequence of the drought action, the reference conditions without the drought option and the likely changes from the drought option.

The physical environment characterisation includes four key aspects:

1. Reach setting
2. River flow regime (reference conditions and sensitivity)
3. River habitats (reference conditions and likely sensitivity)
4. River water quality, including water quality pressure (reference conditions and sensitivity).

7.2.3 Identifying features likely to be affected and assessing sensitivity

With the zone of influence and considering the level of impact on the physical environment identified, potentially sensitive receptors (sites / features) are identified. This sensitivity assessment is used as a screening exercise to identify features that should be considered for detailed assessment.

The key features considered include:

- designated biodiversity sites (Special Area of Conservation (SAC), Special Protected Area (SPA), Ramsar, Site of Special Scientific Interest (SSSI), landscapes including World Heritage sites, Scheduled Monuments, European Landscape Convention, marine conservation zones (MCZs), national parks, areas of outstanding natural beauty (AONB), National Nature Reserve (NNR) and Local Nature Reserve (LNR) and NERC species which are located on or within 500m of the impacted reaches;
- local wildlife sites and NERC priority habitats which are located on or within 100m of the impacted reaches;

- ecological communities and, where identified, Water Framework Directive (WFD) status of designated waterbodies which contain the impacted reaches;
- sensitive ecological features as advised by the Environment Agency and Natural England;
- invasive non-native species (INNS); and
- wider features which should be taken into account in determining the potential impacts of drought action implementation – specifically other abstractors, landscape, navigation, recreation and heritage.

Where features are considered to have a medium or high sensitivity to drought options, these are considered for detailed assessment. The exception are sites and features that are considered to be of national or international importance. In such cases, these features will also be considered for detailed assessment where a low sensitivity has been identified

7.2.4 Assessing impacts

Where screening of the drought options has identified that a sensitive ecological feature is present within the zone of influence of the drought option and screening has indicated that it is sensitive to the impacts of the drought management action, the potential impact is investigated. The investigation considers the impacts of the changes in flows, water quality and geomorphology as a result of the drought management action, and the consequent impacts on the habitats and species.

The DPG2020 also requires us to consider the implications of drought actions on all water bodies affected and for all relevant classification elements. Where deterioration is likely to occur as a result of a drought option, we set out what this will be and how we will mitigate it.

7.2.5 Cumulative Assessment

In accordance with the DPG2020, the assessments also consider how our proposed drought actions may affect the environment in combination with the effects of existing licences, consents and plans. For example:

1. Existing abstraction licences that operate within the hydrological zone of influence of the drought options, as well as other abstraction and discharge consents;

2. Assessment of the most likely cumulative impacts of the drought permit with other supply side and drought permit / order options within the hydrological zone of influence (including both intra- and inter- zone options);

3. Potential cumulative impacts with other third parties' drought schemes.

The EARs are not published as part of this Drought Plan but are completed as far as is reasonably practicable in advance of a drought, in parallel with the preparation of this Drought Plan. The EARs are finalised during the onset of a drought and submitted alongside an application for a drought permit or drought order.

This approach ensures that much of the environmental information is collated in advance of a drought, whilst ensuring that the environmental assessment is based on the specific environmental and hydrological conditions occurring at the time, which cannot be predicted in advance. This enables the Environment Agency to make a swifter determination of drought orders or permits and ensures that any issues may be dealt with early.

7.3 Environmental Monitoring Plan (EMP) and Data Provision

7.3.1 Monitoring

In line with the DPG2020 we have prepared an EMP that sets out the following information:

- On-going baseline monitoring to inform sensitivity and impact assessments:
  The baseline monitoring programme (BMP) ensures that sufficient baseline data is available for the environmental features associated with each hydrological reach to inform the sensitivity and impact assessment and to define the need for further monitoring to reduce uncertainty. The BMP has also considered the Environment Agency's monitoring programme, third-party monitoring programmes and

any monitoring programmes required by Yorkshire Water to fulfil the commitments of the Water Industry National Environmental Programme (NEP).

- the monitoring that we will implement to reduce uncertainty identified in the assessment of either the sensitivity of the environment or impacts on features considered in the detailed assessment; and
- the in-drought and post-drought (recovery) monitoring that will be carried out to understand the actual impact of a drought option.

  The plan has been designed to differentiate the impacts of the drought measure from those of natural drought. This is achieved using a Before-After-Control-Impact (BACI) approach. Paired control and impact sites monitored under baseline, in-drought and post-drought (recovery) stages assist with understanding the differences between the impacts of natural droughts and drought options.

A data exchange process has been agreed with the Environment Agency, through which baseline monitoring data from work carried out by either the Environment Agency or Yorkshire Water is made available to the other organisation on a regular basis. We collate this baseline data to ensure the data set remains up to date.

We meet the Environment Agency at least annually to discuss their routine monitoring programme, the data exchange process and to review our baseline monitoring programme, to ensure their effectiveness. This baseline data schedule in the EMP is also reviewed annually to ensure it remains up to date.

7.4 Mitigation

The DPG2020 specifies that any serious impacts on the environment that are predicted to occur through the implementation of any drought management actions are mitigated against. The environmental assessments undertaken (described in section 7.2) identify the sensitive features for which mitigation may be required and also specify associated monitoring requirements.

Discussions were held with the Environment Agency to identify serious impacts and to agree appropriate mitigation measures that are both available and practicable. Details of these are documented in the EARs and EMP and summarised in Appendix 4. The Environment Agency and other relevant parties will also be consulted further, prior to applying for an individual drought permit.

A suite of potential mitigation measures, from which specific measures would be selected subject to the nature and timing of a particular drought permit, are outlined in the EMP.

7.5 Habitats Regulations Assessment Screening

As set out in the DPG2020, each water company is required to ensure that its Drought Plan meets the requirements of the Habitats Regulations (Conservation of Habitats and Species Regulations 2017) through undertaking a Habitats Regulations Assessment (HRA).

The purpose of the HRA is to determine whether implementing the plan will have an adverse effect on the integrity of European sites which are designated under the Habitats Directive. Such sites include:

- Special Protection Areas (SPA)
- Candidate Special Protection Areas (cSPA)
- Special Areas of Conservation (SAC)
- Candidate Special Areas of Conservation (cSAC)
- Ramsar Sites
- Candidate Ramsar sites.

The HRA Screening report is a separate document which is published alongside our Drought Plan for consultation on our website. Stage 1 HRA screening has indicated that likely significant effects on the North Pennine Dales Meadows SAC could not be ruled out as a result of the implementation of the North Yorkshire Groundwater increased abstraction drought option. An Appropriate Assessment was undertaken and concluded that abstraction from the proposed North Yorkshire

Groundwater increased abstraction drought option will not have an adverse effect on the qualifying features of the North Pennine Dales Meadows SAC.

The HRA screening concludes there are no likely significant effects on the Humber Estuary European Marine site (EMS) or other European Designated Sites within the drought option areas. Accordingly, it is concluded that there are no other requirements for Appropriate Assessment.

No cumulative or in-combination impacts of operating the drought options at the same time, or with other relevant plans and projects, on European Sites have been identified.

The HRA screening assessments will be reviewed as part of updating the EARs at the time of triggering the need for any particular drought option, recognising that the environment is not static and changes could take place that influence the assessment.

7.6 Strategic Environmental Assessment (SEA)

The Strategic Environmental Assessment (SEA) Environmental Report is a separate document which is published alongside our Drought Plan for consultation on our website.

SEA is a statutory requirement, under the Environmental Assessment of Plans and Programmes Regulations 2004 (referred to as the SEA Regulations), for plans or programmes which could have significant environmental implications and helps to identify where there are potential impacts and how any negative impacts might be mitigated. The objective of the SEA 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".

The Office of the Deputy Prime Minister (2005) A Practical Guide to the Strategic Environmental Assessment was used to evaluate whether SEA should be undertaken on this Drought Plan, in accordance with the flow diagram shown in Figure 7.2. It was determined that SEA should be undertaken on a precautionary basis as the plan may have significant adverse effects on the environment. The SEA Environmental Report

presents the findings of the assessment. The SEA was informed by the HRA Screening Report, the Environmental Assessment Reports (EARs), environmental screening reports, the Environmental Monitoring Plan and consultation feedback on the SEA Scoping Report.

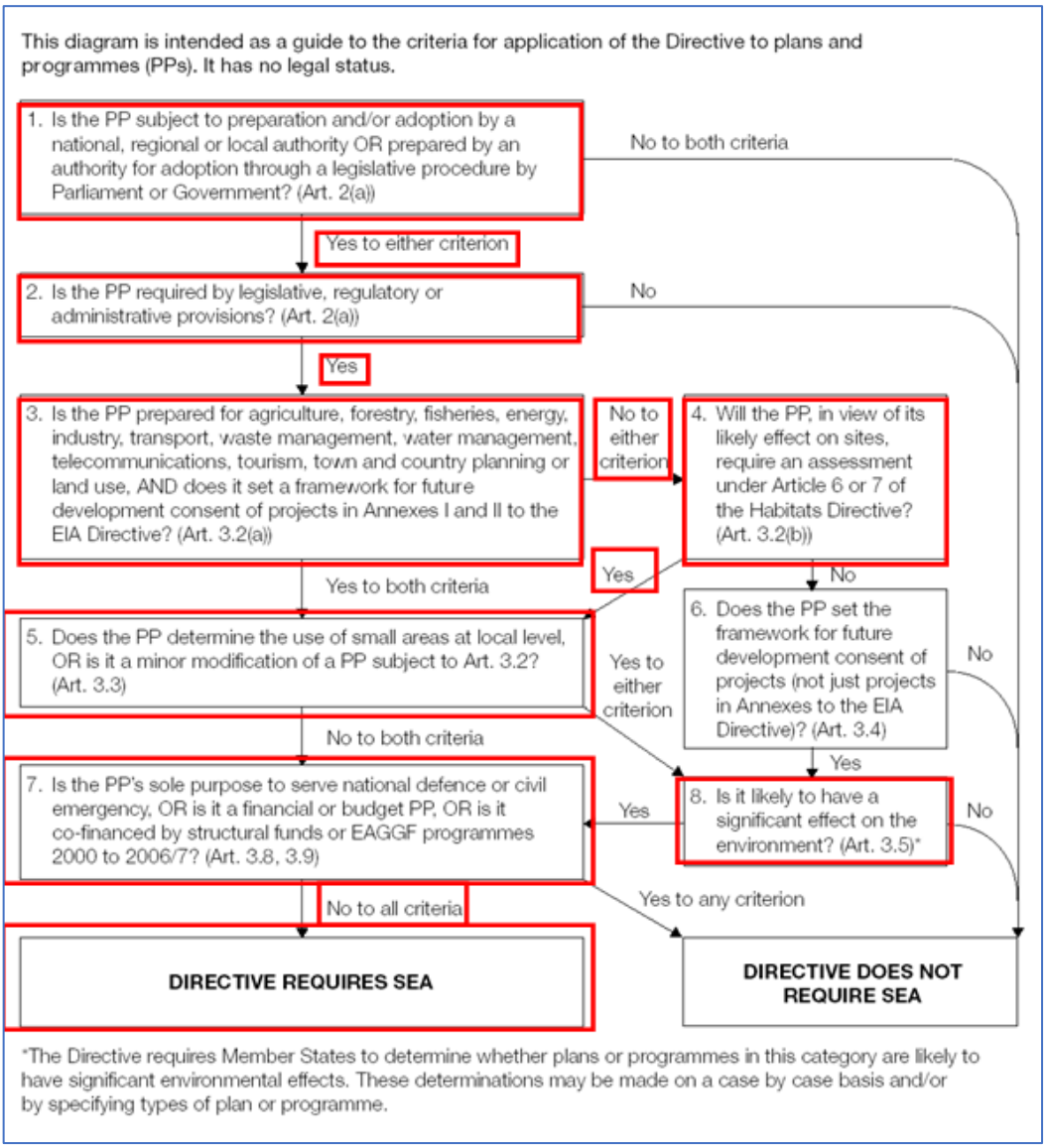

Figure 7.2 Application of SEA Directive to plans and programmes

7.7 How we used SEA in developing this Drought Plan

We actively consulted with the SEA statutory consultees during the SEA Scoping phase and subsequent development of the SEA Environmental Report.

Using objective-based criteria, the SEA assessment of each of the demand and supply-side drought options and their cumulative impacts provides a

consistent and relative assessment of the impact of each option to inform the consideration of the appropriate sequencing of option implementation, alongside other factors such as practicability, risks to drinking water quality and security risks. It is noted that some drought options may have different environmental effects depending on the season of implementation (for example, a summer drought compared to a winter drought). As drought measures can theoretically be required and implemented at any time of year, overall impacts are assessed on a worst-case basis in the SEA.

7.8 SEA findings

7.8.1 Ordinary supply-side drought options

The assessment of ordinary supply-side drought permit/order options found that the majority of options would have a major adverse effect on surface water flows and levels in the receiving watercourses; with the exception of South West Area Reservoir 1, South Area Reservoir 4, South West Area Reservoir 14 and the river abstraction options. Impacts would be restricted to the low flow regimes of the watercourses and would be short-term and temporary. Associated impacts on water quality vary from negligible to major; with the Wharfe increase in annual abstraction and Derwent annual abstraction increase performing best on this SEA objective. The North Area Reservoir 2 and North West Area Reservoir 6 options would only have minor adverse effects on biodiversity, flora and fauna and the Derwent annual abstraction increase, Wharfe Annual Abstraction and South West Reservoir 17 would have negligible effects while all the other options would be associated with moderate adverse effects. Adverse effects on recreation and landscape associated with lower water levels in the impacted watercourses would be minimal, ranging from none to minor across all of the options.

All the drought permit/order options would deliver minor to major beneficial effects on human health and economic activity through maintaining water supply during drought conditions. The options require no construction activities, so there would be minor beneficial effects associated with use of existing infrastructure. The options would also be associated with minor beneficial effects associated with the appropriate and sustainable management of water supplies and bolstering resilience to climate change.

The Ouse increased abstraction, Wharfe reduced regulated flow and Hull increased abstraction options have the greatest beneficial effects, as they would deliver large volumes of water during drought events. These options provide major beneficial effects with respect to SEA objectives regarding protecting and enhancing human health and well-being, enabling access to essential services and providing a resilient water supply for customers and the economy.

7.8.2 Long-term supply-side drought options

The long-term supply-side options cannot be implemented without prior construction and planning activity and so are not considered appropriate for implementation in the first two years of a drought (and there are sufficient alternative options that do not require any construction activity to ensure essential supplies can be maintained to customers). As such, the long-term options are not directly comparable with the ordinary drought permit/order options. The SEA process has been used to carry out strategic environmental impact comparison of the nine long-term options that might be required if a drought extended to a third consecutive year. The assessments have taken account of the HRA assessments where appropriate, along with findings from environmental reports.

The construction activities required for most of the long-term options have adverse effects relating to the consumption of resources, air quality and impacts on terrestrial species and habitats. North West Area Reservoir 9 and North Yorkshire Groundwater increased abstraction options perform best across these objectives as they do not require large scale construction activities and make use of existing infrastructure. The North West Area Reservoir 9 and North Yorkshire Groundwater increased abstraction options would also be associated with the lowest adverse effects on biodiversity, flora and fauna.

The environmental implications of the Tees – Swale transfer and Aire abstraction are greater than for the other options. In these cases, the impact assessments indicate potentially major adverse impacts on biodiversity, flora and fauna. However, these options also have major beneficial effects, as they would deliver large volumes of water during drought events. These options provide major beneficial effects associated with protecting and enhancing human health and well-being, enabling

access to essential services and providing a resilient water supply for customers and the economy.

These conclusions will need to be weighed against other factors, such as practicability, spatial distribution of drought intensity, supply-demand needs and potential risks to drinking water quality (including Drinking Water Safety Plan risk assessment regulations) in determining which option would be implemented first. None of the options are of sufficient environmental impact to exclude them from our Drought Plan as options for a third year of drought.

7.8.3 Cumulative Assessment

In accordance with the DPG2020, a cumulative, or in-combination, assessment has also been undertaken which involved examining the likely significant effects of each of the drought options in combination with each other and in combination with the implementation of other relevant plans and programmes.

The potential of Yorkshire Water's drought plan to interact with other plans, programmes or large projects was reviewed and it was determined that no cumulative effects will occur. However, there is potential for a number of Yorkshire Water's supply side options to produce cumulative effects. Detailed assessments are provided in the SEA Environmental report.

7.8.4 Summary

The purpose of SEA is to provide high level and strategic protection of the environment by incorporating environmental considerations into the preparation of plans and policy. In the context of drought planning, SEA assists in the identification of the likely significant environmental effects of Yorkshire Water's drought management options and how any adverse impacts might be mitigated.

The assessment showed that a distinction can be made between options that would be considered more sustainable than others and this can be used to inform the order in which they would be implemented. Sequencing of implementation will, however, be dependent on the spatial distribution of drought, prevailing supply-demand conditions and the available infrastructure to move water to areas of greatest need within the integrated grid system.

7 End of a Drought

Table 7.1 shows triggers for moving out of a drought and associated actions. A return to 'normal' conditions can be difficult to determine and it is possible to confuse with a short, wet period in a prolonged drought. We use a range of triggers to determine if we are in drought, and we will monitor our situation with respect to these triggers throughout the drought to help inform all decisions. The end of a drought is when there is no risk to security of supply and the risk of drought to the environment is no greater than during a normal year. As this is dependent on the risk of drought conditions going forward, we do not use a definitive end of drought trigger. As reservoir stock levels increase above drought trigger levels, we use the same levels to help determine when we start to consider ceasing drought actions in view of the modelled scenarios and likelihood of the situation worsening again.

Trigger	Action
Reservoir stocks increase above the Environment Agency early warning control line	Model a range of rainfall scenarios to assess the risk of continued drought. De-escalation timetables for lifting demand restrictions and drought orders / permits would be discussed with the Environment Agency. We would generally retain a drought order or permit for its duration although we may not be required to implement it; however, it may expire due to pre-determined de-escalation triggers within the authorisation. Review customer communications and promote the continued need to conserve water although it may be raining. Restrictions on use will remain in place unless modelling is showing actions such as compensation flow reductions will not be required – see below.
Reservoir stocks recover to a level where modelling is no longer showing a likely need for drought permit related actions or non-essential use bans. Depending on the time of year this may be when stock cross the Environment Agency early warning control line or not until stocks cross the normal control line	Withdraw any submitted permit / order applications and remove restrictions on use. Publish notices and notify interested parties. Customers and stakeholders will be informed when drought actions are no longer in place through press releases, our website and direct communications as appropriate. We will continue to promote water saving messages for voluntary water reductions.
Reservoir stocks increase above the normal control line	Model a range of rainfall scenarios to assess the risk of continued drought. Use this information to assess the

	situation and if it is appropriate to declare the drought has ended. Initially when reservoir levels recover, river levels can continue to be low and limit the volume of water we can abstract for supply to customers. This has potential to lead to a more rapid decline in reservoir stocks in the following year, particularly if rainfall is below average. Formally agree the end of the drought and a return to 'normal' conditions with the Environment Agency Drought Co-ordinator before releasing any external communications. Customer communications returned to 'green' level messages.
Drought permit actions have been implemented and operations have reverted to operating conditions as stated in the relevant abstraction permissions and legal agreements.	Carry out post drought monitoring of the sites impacted as outlined in our Environmental Monitoring Programme (see section 7 for more information). The duration and content of the post-drought monitoring will depend on the severity of impacts detected during the implementation of drought measures, the characteristics of the drought itself, and the recovery time for the various receptors. This flexibility is essential during a drought as no two droughts are the same and environmental conditions change over time, necessitating a robust and flexible approach. All additional monitoring and mitigation measures would be agreed through liaison with the Environment Agency Area Drought Co-ordinator and Fisheries and Environment Teams.

Table 7.1: End of drought triggers and action

7.1 Reviewing Drought Plan performance during a drought

During a drought situation we will continually monitor the effectiveness of our drought plan triggers and actions through the following activities:

- Teams will be in place to monitor and react to the drought situation as it develops. (See section 6 on management structure.)
- We will continually review available resources and asset performance to ensure we maximise our resources to meet increased demand and where possible preserve stocks that may be required if the situation continues.

- We would continually review outages and prioritise and accelerate any repairs required for assets that could help maximise use of resources.

- Daily demand data is recorded at a local level (production management zones) and reported in our weekly Water Situation Report. This data will be used to monitor demand and assess the effectiveness of the demand side actions when in place.

- A media communication schedule would be agreed in the event of a drought and would be revised as the situation progressed or recovered. As the drought develops, we will obtain feedback on which messages and communication channels customers prefer. This will include analysis of our website hits, orders for water saving devices, social media comments, customer and stakeholder engagement and survey responses. More information is provided in Appendix 6.

- Leakage is assessed daily during normal operations and this data will be used during a drought to identify areas where enhanced leakage control is likely to be most effective. The effectiveness of additional leakage reduction activity will be evident in our daily leakage analysis.

- We continually monitor reservoir stocks and river flows and would maximise river abstractions whenever river flows increased above abstraction thresholds following rainfall.

- We would run the Water Resources Planning Report more frequently as a drought progressed, looking at scenarios of the worst historic years and predicting when control and trigger lines were likely to be crossed. We would also balance abstractions between reservoir groups to ensure that one group did not fall at a faster rate than others, even if it was far drier in one area.

- We would ensure that the effects of any implemented drought options on the environment were assessed and understood, by reviewing our drought monitoring and triggering mitigation measures, where relevant. See section 4 for more detail on monitoring.

7.2 Reviewing Drought Plan performance after a drought

In the event of a drought occurring, which leads to implementation of our drought actions, we will review the plan's performance after the drought has ended. The extent of the review will depend on the severity of the drought and which parts of the plan had been tested. We will carry out some or all of the below activities:

- Review the effectiveness and cost efficiency of supply side drought management actions by analysis of hydrological data and scenario modelling.
- Review our reservoir control lines and recalculate our minimum inflows analyses. If applicable, we would produce new control lines if the minimum inflows during the drought were lower than previous droughts.
- If the drought resulted in restrictions on use or drought permit/order applications being triggered in any of our reservoir areas, we would review our levels of service and determine if the drought led to any changes in deployable output.
- Review drought triggers and if they provide enough time for implementation of drought actions.
- The environmental impacts of the level 3 supply-side actions will be assessed and understood, together with the effectiveness of any mitigation measures, through undertaking environmental monitoring. As river flows recover after a drought, the intensity of the associated environmental monitoring will reduce, extending into the drought recovery period. The duration of this post-drought monitoring will depend on the severity of the impacts and the recovery time for the various receptors. All additional monitoring and mitigation would be agreed with the Environment Agency, and any monitoring associated with the impacts and recovery of designated sites would be agreed with Natural England.

- Analyse demand data for customer water use and leakage to assess the actual reductions and cost efficiency of demand side actions and compare with current estimates of reductions.
- Review the effectiveness of our communications strategy through customer surveys, stakeholder feedback, social media engagement, attendance at "drop ins", drought permit/order consultation responses and direct customer contact during a drought.
- Review if any options or solutions that are not currently identified in the plan were identified during the incident and if they should be added to the plan.
- Review if any long-term options required temporarily in a drought could become permanent solutions. The costs and benefits, including environmental impacts, to convert the assets to permanent resources would be considered in the next iteration of our WRMP. The options would be considered alongside other feasible options as part of the WRMP process.

The drought actions will be discussed internally and externally to identify where improvements can be made. This will include discussions with external stakeholders such as the Consumer Council for Water, the Environment Agency and Natural England. Feedback will be sought from stakeholders in those areas most affected by drought actions, such as where supply side drought permits/orders have been in place.

We will provide the Environment Agency with a "lessons identified" report, including recommendations for drought planning improvements, within three to six months of conditions returning to normal. We will provide evidence recommendations have been acted on in annual reviews of the Drought Plan. In accordance with legislation, we will produce a revised Drought Plan if material changes are required as a result of the drought, as was the case following the 2018 drought.

We may alter our triggers and actions based on modelling and analysis of our most recent drought experience. Our drought scenarios will be revised to take into account any changes to the timing and effectiveness of drought actions.

If material changes are not identified the outputs of the lessons identified report will be incorporated into the next iteration of our Drought Plan, which will be produced within timescales specified by legislation. Progress will be provided in annual reviews of the Drought Plan.

Updates to our Drought Plan and actions we take in a drought situation may impact on our WRMP. When producing our next WRMP we will consider the impact of the drought on our resource availability, supply and demand forecasting, planning scenarios, water efficiency activities, asset health and future investment.

We will also consider if there are any impacts that should be taken into account in our next Business Plan and other related plans and programmes, such as our leakage strategy. Also, any investments made as a result of the drought could potentially affect other plans or programmes such as the River Basin Management Plan objectives or the Water Industry National Environment Programme. It is unlikely any of our drought actions would impact on these currently, but we will review as the plans and programmes may change in the future.

7.3 Lessons identified following droughts in our region

Our Drought Plan incorporates experience gained during previous droughts and periods of dry weather that test our plans but would not be considered drought events. The 1995-1996 drought is considered our worst drought on record and there was extensive use of drought orders and permits to manage supply and demand in our region. Following this drought, we invested to enhance our grid system.

We have not experienced any events since 1995-1996 that have required restrictions on use or implementation of drought orders or permits (level 2 and 3 actions). The most recent drought in our region was in 2018. Although we did not need to implement level 2 or 3 actions, we did submit winter drought permits. Due to the investment following the 1995-1996 drought, we were much more resilient to the 2018 drought event but concerned a harsh winter, similar to 'the beast from the east' in early 2018, could put additional stress on our system if we experienced exceptionally high winter demands caused by "freeze-thaw". We applied for two winter drought permits to increase permitted annual abstraction volumes on two river licences. The permits were granted but were not used.

We experienced periods of dry weather during 2003, 2010 and 2012, and most recently 2020. These dry periods are not considered drought events, but they do test our drought planning and management activity. We have incorporated these events into our WRAPsim modelling to provide worked examples as discussed in Section 2 and our supplementary report, Drought Plan 2022 Worked Examples. Data recorded in 2010 and 2011 was used to recalculate reservoir control lines. Inflows were updated up to the end of 2018, but because analyses showed that the inclusion of these additional years did not result in new minimum inflows, the control lines were not updated. When we have carried out analyses of the stochastic inflows being used for WRMP24, we will investigate the effects on control lines and incorporate this into subsequent drought plans and WRMPs. Further information on historic droughts can be found in section 2.2.

We review our drought plan following each drought and provide the Environment Agency with a "lessons identified" report. This is a review of the events leading up to the drought and any actions we took. This helps us identify where improvements can be made to our drought plan.

As a result of 2018, we made the following changes to the Drought Plan:

- We added new drought actions, which were the permits we applied for to increase two river abstraction licences. As these permits were not in our previous Drought Plan, this instigated a formal review of the plan in line with the drought planning regulatory process. Our Drought Plan 2019 was published as a result.

- A review of triggers for reservoir compensation flow reductions where the reservoirs are not connected to any other reservoirs and therefore cannot be supported. Reservoir specific triggers were applied to these sites, which are in addition to the regional reservoir control line triggers.

- Confirmation of the authorisation linked to supply-side actions to reduce reservoir compensation releases. This relates to reservoirs that are no longer used for supply and/or where our current operations meet terms agreed with the Environment Agency as "enforcement actions" or "flow trial" agreements but differ to requirements originally specified in acts of parliament.

- Identification of Yorkshire Water operated sites that are not used for supply and therefore in a drought the Environment Agency has the responsibility for applying for a drought order if any changes to the legal obligations are required.
- Reviewed our customer communications in a drought to incorporate learning from 2018 and our agile customer engagement campaign.
- Reviewed our drought scenarios using data and learning from 2018.
- Completed "application ready" permit applications (for our ordinary supply side options requiring authorisation) to be finalised if required in a future drought. Including ensuring our EARs are as application ready as possible.
- Reviewed the drought permit consultation process and communications with consultees.

Two actions resulting from the 2018 drought are still ongoing as they require further investigations and will be addressed through other processes. These include:

- Working with the Environment Agency to assess if current compensation releases are sustainable at low flows and where changes can be made to help conserve supplies and benefit the environment. The results will be incorporated into future drought plans.
- Reviewing the integrity of the Yorkshire Water grid system to understand if we could benefit from further investment to strengthen our resilience to droughts. This will be considered in our next WRMP and Business Plan.

The most recent dry period experienced in our region was in the spring of 2020. This was exacerbated by the impact of the COVID-19 pandemic and unprecedented high demands were experienced in May as more people were at home during the day. The early drought triggers were crossed, instigating enhanced communications to raise awareness of the situation and the need to conserve water, operational changes to conserve supplies

and preparation of environmental monitoring in case drought permit applications would be required later in the year.

During the summer months we experienced sufficient rainfall to return to normal levels and the dry weather did not lead to a drought situation or any material changes to our drought plan. However, as with all droughts there was learning from the experience, which is summarised below:

- The impact of the pandemic and more people being at home during the day had a significant impact on demand which is still being experienced. Although the peak was during May, demand throughout the year has been impacted by more domestic use and less commercial use. Further assessment of the COVID impact will be considered in WRMP24 scenarios in line with DPG2020.

- Both 2018 and 2020 highlighted the risk of reservoir drawdowns during dry weather periods. Reservoir drawdowns are required for essential repairs and inspections as part of our legal duties. If they coincide with dry weather events, this can mean that trigger levels for level 3 compensation flow reduction actions are reached sooner than they would be when not drawn down. The Environment Agency has informed us that drought permits to reduce the required compensation release would only be granted if exceptional shortage of rain was identified as the majority factor. This creates a risk to the environment if the reservoir cannot be supported from elsewhere and could lead to a risk to security of supply if the reservoir was essential for meeting customer demand. As a result of this we have reviewed our reservoir dry weather action plans and will discuss future risks with the Environment Agency in advance of drawdowns. This may allow actions to be agreed outside of drought that could be implemented as required if risks materialised during dry weather.

- It was identified that in-river permits, required for mitigation measures should a drought action be implemented, should be applied for and would be valid for five years. This would remove the need to apply during a drought and improve our drought readiness. At the time of writing, Yorkshire Water has submitted a

number of in-river permit applications and is awaiting a response from the Environment Agency.

- Evidence was available to demonstrate customer awareness of water conservation messages in the form of website clicks, survey responses and media reach. However, evidence to show messages were leading to a reduction in use is harder to demonstrate, especially during the period of dry demand as data cannot be fully assessed until conditions have returned to normal. We shall review data from 2018 and 2020 to try to better understand the evidence.

- An additional trigger for starting drought permit pre-consultation with key downstream abstractors has been added to this plan, which is five weeks before a drought permit pre-application is made (11 weeks before regional reservoir stocks reach the DCL).

8 Conclusion

This Drought Plan sets out how we would manage resources, mitigate impacts and communicate with our customers during a drought. It is based on previous experience of droughts and has been collated in accordance with the Environment Agency DPG2020.

We will revise and republish our Drought Plan in accordance with current legislation or earlier if required due to a material change to the plan. Plans are revised every five years; however, Defra may direct companies to review earlier. This Drought Plan has been produced as Defra has directed all companies to produce a drought plan by a common submission date.

We will review our Drought Plan following a drought event and, in any case, annually to determine if it is still fit for purpose and if any events in the preceding year result in a change to the plan. If there is a material change in circumstances that affects our plan or if directed to do so by Defra, we will republish a revised plan within six months of the change. If changes are non-material, we will provide an annual review document to the Secretary of State.

Our compensation releases are currently being reviewed under the Water Framework Directive. We will consider the impacts of any changes to releases on the supply side options and update accordingly in future iterations of the plan.

9 References

Drought orders and permits, Defra, Welsh Government and Environment Agency, 2020 (draft)

Duration Modelling - impact of multi - year drought events on resources and assets, WRC 2012

Estimating the water savings for baseline water efficiency activities, UKWIR 2009 (09/WR/25/4).

Future options for managing customer demand for water White paper prepared for Yorkshire Water by London Economics, 2018

Joint Nature Conservation Committee http://jncc.defra.gov.uk

MAGIC http://magic.defra.gov.uk

Managing through droughts: code of practice and guidance for water companies on water use restrictions, UKWIR 2013 (14/WR/33/6).

The variability of long duration rainfall over Great Britain. Met. Office Scientific Paper No. 37, Tabony, R.C. 1977.

Understanding drought and resilience, Consumer Council for Water, 2020.

Understanding the performance of water supply systems during mild to extreme droughts, Environment Agency, 2015.

Water company drought plan guideline, Defra and Environment Agency, 2020.

Water Resources Management Plan, Yorkshire Water, 2019.

10 Glossary of drought plan terminology

Abstraction	The removal of water from any source, either permanently or temporarily.
Abstraction licence	The authorisation granted by the Environment Agency (England) or Natural Resources Wales (for sites in Wales) to allow the removal of water from a source.
Baseline	Information on the environment that details conditions prior to implementation of a drought action.
Bulk transfers	A legal agreement for exporting and importing water between a donor and recipient operator.
Control curves	A diagram or graph presenting drought triggers levels.
Demand management	The implementation of policies or measures which serve to manage control or influence the consumption or waste of water.
Demand-side measures	Include any drought actions that lead to a reduction in the volume of water we are required to put into supply.
Drought management zones	The area (within a resource zone) that a particular drought management action will apply to as specified.
Deployable output	The output of a commissioned source or group of sources or of bulk supply as constrained by: environment licence, if applicable pumping plant and/or well or aquifer properties raw water mains and/or aquifers transfer and/or output main treatment water quality
Drought order (level 3 action)	An authorisation granted by the Secretary of State (England) or Welsh Ministers (Wales) under drought conditions. Drought orders can go further than drought permits and temporarily authorise a water company to: ▪ take water from a source specified in the order.

	▪ prohibit or limit the use of water for any non-essential purposes as set out in the Drought Direction 2011. ▪ discharge water to a place specified in the order. ▪ prohibit or limit the taking by the Environment Agency of water from a source specified in the order. ▪ Modify or suspend restrictions or obligations to taking, discharging supply or filtering/treating of water held by others (including Environment Agency). ▪ suspend or modify restrictions or obligations to which the water undertaker or any sewerage undertaker or anyone else is subject with regard to taking, discharging, supplying or filtering/treating water.
Drought permit (level 3 action)	Drought permits (or orders) are a requirement for some of our supply-side actions to be implemented. They are temporary authorisations granted by the Environment Agency (England) or Natural Resources Wales (for sites in Wales) to: ▪ authorise a water company to take (more) water from specified sources; and / or, ▪ modify or suspend any restrictions or obligations to which a water company is subject that relate to the (existing) taking of water from any source, for example reducing compensation releases.
Environment Agency drought orders	The Environment Agency may also apply to Defra for a drought order to: ▪ prohibit or limit the taking of water from a source specified in the order. ▪ suspend, vary or attach conditions to any consent for the discharge of effluent by anyone.
Environmental assessment	An assessment of environmental sensitivity and likely impacts from implementing drought management actions.

Environmental monitoring plan	The plan of how the company will address: gaps in the environmental assessment of the supply-side drought management action baseline monitoring (including pre drought monitoring) in- drought monitoring post drought monitoring
Environmental report	The report that accompanies an application for a drought order or drought permit. It should be based on the information from within the environmental assessment and updated with any additional information.
Emergency drought order	An authorisation granted under drought conditions to allow a water company to limit the use of water for further measures not permitted under a non-essential use drought order. These further measures are level 4 actions and includes the imposition of rota cuts, phased pressure reduction and/or supply through standpipes or water tanks. The Secretary of State for the Environment (Defra) determines and grants drought order and emergency drought order applications from water companies, using advice provided by the Environment Agency.
Extreme drought actions	Actions we would consider if we have carried out level 1 to 3 actions and the severity of the drought meant that there was a risk that we may require level 4 actions if no further measures are implemented. They are sometimes referred to as 'more before 4' actions. Our long-term drought options are also considered extreme actions and would be consider alongside the other extreme actions.
Feature	A way of describing an ecological, chemical, habitat or morphological element to be assessed. For example a species of plant or animal, habitat type or sub-habitat type.
Government	In this document Government refers to central Government (Defra) and the Welsh Government.
Habitats Regulations	The Conservation of Habitats and Species Regulations 2010. The domestic legislation which transposes the EU Habitats and Wild Birds Directives

	into UK law and replaces the Conservation (natural habitats &c) Regulations 1994.
In-drought monitoring	Monitoring that is undertake during the implementation of a drought management action.
Levels of service	The standard of service that water company customers can expect to receive from their water company, commonly setting out the frequency of restrictions that a company expects to apply to its customers.
Long term drought options (level 3)	Options we would consider in a second year of drought. These would require additional assets / infrastructure, and in some cases a drought permit or order, but would only be implemented in extreme circumstances that are unprecedented in our region. They are also classed as extreme drought actions and although level 3 would be only used if there was a risk of needing level 4 actions.
The National Drought Group	The National Drought Group (NDG) is a national (England and Wales) cross-sectoral group that meets during times of prolonged dry weather and drought. It is chaired by the Environment Agency and membership includes sectors with an interest in water resources and drought, including water companies, the NFU, CRT, the Met Office, and representatives from environmental and angling groups, as well as Government (Defra, Welsh Assembly), regulators (Environment Agency, Ofwat, Drinking Water inspector and National Resources Wales) and customers representative groups (Consumer Council for Water). The purpose of the group is to share information regarding dry weather and drought risks, and to ensure that all members have a common understanding of the water resources position nationally and any known or emerging risks.
NNR	National Nature Reserve - designation to protect the most important areas of wildlife habitat and geological formations in Britain, and as places for scientific research.
Non-essential use ban (NEUB)	In this Drought Plan we refer to a drought order that prohibits or limits the use of water for any non-essential purposes as a "non-essential use ban". This

	is different to a temporary use ban in that it imposes further restrictions, which a water company can only impose through a drought order granted by the Secretary of State. Section 3 and Appendix 3 include details of the water use activities restricted or prohibited by a drought order for a non-essential use ban.
Ordinary supply-side options	This is a Yorkshire Water term applied to options that modify our existing abstraction permissions or reservoir compensation obligations. These are options we would implement, if required, in a short-term drought, typically up to two years. They do not require any additional assets or infrastructure but may require authorisation through a drought permit or order, depending on whether or not the action would contravene statutory requirements or constraints. Ordinary supply-side options are likely to continue to be in place during a longer-term drought, provided any necessary authorisations could be extended.
Ramsar site	Internationally important wetland site.
Resource zone	The largest possible zone in which all resources, including external transfers, can be shared and hence the zone in which all customers experience the same risk of supply failure from a resource shortfall.
SAC	Special Area of Conservation - Designated under the European Habitats Directive (1991)
SPA	Special Protection Area - Classified under the European Birds Directive (1979)
SSSI	Site of Special Scientific Interest - A site given a statutory designation by English Nature or Natural Resources Wales because it is particularly important, on account of its nature conservation value.
Strategic Environmental Assessment (SEA) Directive	The Strategic Environmental Assessment Directive ensures significant environmental effects arising from proposed plans and programmes are identified, assessed, subjected to public participation, taken into account by decision-makers and monitored.
Supply-side measures	Include any drought actions that increase the volume of water available to put into supply or

	modify existing operations related to the taking of water for supply to customers.
Temporary use bans (TUBs)	Classed as level 2 actions and restrict or ban certain types of water use. They can be imposed by water companies on customers without the need for any special permissions provided there is evidence a serious deficiency of water supplies exists or is threatened. Details on the water use activities restricted or prohibited by a temporary use ban are provided in Section 3.
Water resource management plan (WRMP)	A water company long-term strategic plan for water supply and demand over 25 years.
Resilience options	Additional options to deal with plausible droughts worse than those in the recorded record. A case should be made for these in the drought plan but they should be included and funded through your next WRMP.
Habitats regulation assessment (HRA)	A HRA will identify whether or not your actions will have an adverse effect on the integrity of European sites which are designated under the Habitats Directive.
RBMPs	River basin district (RBD) plans aim to protect and improve the water environment for the benefit of people and wildlife. The plans set out how organisations, stakeholders and communities will work together to achieve an improved water environment for each RBD.
Civil emergency	Civil emergency is defined in the water industry act section 208 (point 7). The Environment Agency or Natural Resources Wales is not responsible for emergency plans. You don't need to include what you would do to maintain supply during a civil emergency in your drought plan as this will be covered by your emergency plan.
Designated sites of conservation importance	Nature sites and areas of countryside can be 'designated', which means they have special status as protected areas because of their natural and cultural importance. You can search for designated sites here: https://www.gov.uk/check-your-business-protected-area

Business plans	The business plan sets out a water company's business strategy and how they will provide value-for-money water and if applicable wastewater services to their customers.
Water resource zones	The largest possible zone in which all resources, including external transfers, can be shared and hence the zone in which all customers experience the same risk of supply.

11 Appendices and supplementary reports

The following are available in separate documents

Appendix 1 The Drought Direction 2020

Appendix 2 Drought response surfaces

Appendix 3: Drought management actions

Appendix 3.1: Drought permit and order application process

Appendix 3.2: Demand-side drought management actions

Appendix 3.3: Water use restrictions in a drought

Appendix 3.4 Temporary use bans consultation

Appendix 4 Supply-side drought management actions and extreme drought actions (separate spreadsheet)

Appendix 5 Extreme drought actions

Appendix 6 Communications plan

Appendix 7 Company drought management structure

Habitats Regulations Assessment Screening Report

Strategic Environmental Assessment

Supplementary Report: Drought Plan 2020 Worked Examples of drought scenarios

Thank you

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