Drought Plan 2019

Yorkshire Water
May 2020

It's part of our Blueprint for Yorkshire





Contents

List of Figures

List of Tables

1 Introduction

In accordance with Drought Plan guidance, this statement certifies that Yorkshire Water's Drought Plan has been reviewed by our security team. Some information has been redacted or edited in this published version for reasons of national security.

1.1 Overview of process

This Drought Plan is based on the extensive drought planning experience gained during 1995-1996, 2003, 2010, 2011 and 2018, and formalises a process that has been successfully used in practice. It has been drawn up in accordance with the Defra and Environment Agency *Water company drought plan guideline*, published in December 2015 and the Drought Plan Direction 2016 (see Appendix 2). The Plan is consistent with our published revised Water Resources Management Plan (WRMP) 2019 and with Environment Agency and Defra requirements.

Each drought we experience differs from previous events and the recent period of prolonged dry weather during 2018 produced some new challenges not experienced in past droughts. We were able to meet customer demand throughout 2018 although a number of our drought plan triggers were crossed, and drought actions implemented. These actions included applications for two drought permits not included in our previous Drought Plan, the Yorkshire Water *revised draft Drought Plan 2018*, which was published on our website June 2018. This plan was due to be finalised once permission was received from Defra in accordance with the statutory process.

The permit applications that we made in late 2018 were to temporarily modify licence agreements we hold with the Environment Agency for abstracting water from two rivers in our region. The applications were to increase the total volume we could abstract over the year from 1 April 2018 to 31 March 2019. The two applications were granted by the Environment Agency, but we did not need to use them. The permits were required as a precautionary measure as we had used a larger than usual proportion of the licenced volumes in 2018 and there was a risk we could reach the annual limits if we experienced high winter demand in 2019. As the winter demand was not exceptional, we did not implement either permit.

As these temporary licence changes were not options in our revised Draft Drought Plan 2018, we consider that applying for, and having these permits granted, constitutes a 'material change' to our Drought Plan. In accordance with legislation and regulatory guidance we must prepare and publish a revised version of our Drought Plan within six months of the change. We were therefore required to update our Drought Plan and restart the statutory process for revising drought plans, thereby superseding the Drought Plan 2018.

The Drought Plan 2019 was submitted in draft to the Secretary of State for the Environment, Food and Rural Affairs (Defra) in June 2019 and published for consultation from 15 August to 26 September 2019. A Statement of Response to the

representations received was published November 2019, and this Drought Plan published as final following notification from Defra.

We have used the learning from 2018 to help make our Drought Plan more resilient to future dry weather events. Our Drought Plan 2019 incorporates the two permits granted in 2018/19 as drought options and makes further non-material changes to clarify details on drought actions and related triggers.

1.2 Water resource planning

We have made, and continue to make, significant investments to improve the security of supplies to all our customers whilst taking great care to protect the natural environment. This has been achieved through listening to our customers' needs and delivering a balanced WRMP. Our current Levels of Service have been in place since April 2001 and planning and investment through our 25-year WRMP ensures we maintain this level of security of supply to customers. This plan explains the principles of managing the resources network 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.

Our supply region includes 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 (2019).

Figure 1.1: Water resource zones

Considerable investment in new pipelines and pumping stations was made during and immediately after the 1995-1996 drought, which had impacted significantly in Yorkshire. Major raw and treated water transmission pipelines were laid 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.

Since 1996 the grid network has been extended further, and 99 per cent of customers are now connected. The one per cent of customers not connected are in the East SWZ and benefit from a considerable surplus of resources. Even in periods of drought, supply will exceed demand in this zone.

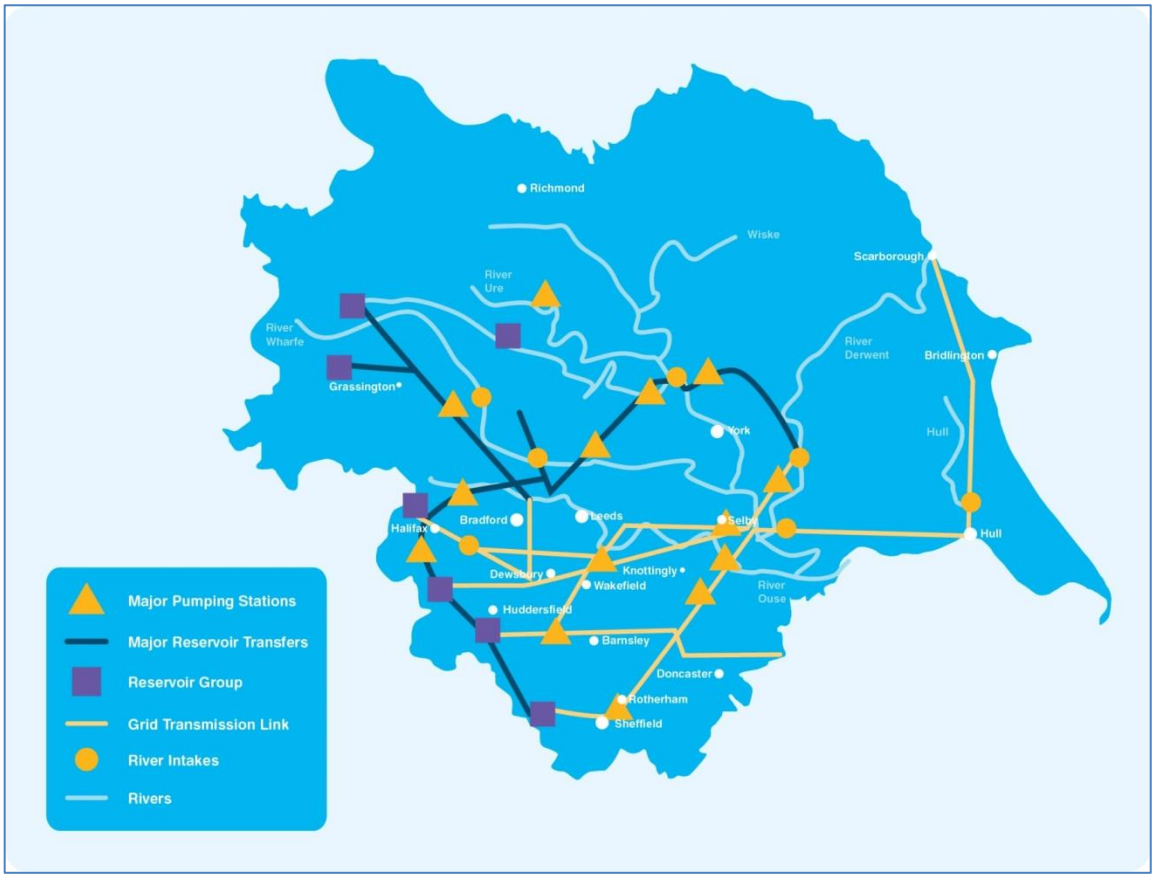


Figure 1.2: Yorkshire Water grid system

Figure 1.2 shows the current grid system, as of 2017. This provides customers with a robust supply system capable of maintaining Levels of Service during severe, localised droughts. It also enables the benefits of supply side action such as drought orders and permits, and demand management action such as conservation measures and targeted enhanced leakage control to be spread throughout the Yorkshire region.

1.3 Water resources management

Our process of planning and managing water resources in Yorkshire is part of a fully integrated approach to operational planning from source to tap across the whole region. The main 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 is referred to as the deployable output of the available sources. Adjustments are made to this figure to allow for outages, such as temporary plant failures or pollution events preventing abstractions. Once these adjustments are applied, we are able to provide an estimate of water available for use (WAFU).

Our strategy is to ensure that, at all times, the WAFU is sufficient to meet expected demand in a year with a prolonged dry period, to ensure that we meet agreed Levels of Service, which are described in Section 1.4 below.

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

The WRAP model takes account of expected demands, reservoir and groundwater operating rules, 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 which limit the volumes we can abstract, and often restrict abstractions at times of low flow and allow increased abstractions during higher flows, typically in the autumn and winter.

During dry periods customer demand increases and we will use demand side drought actions before we take actions to increase supply. One of the first actions we take is to enhance our promotion of water efficiency. If we keep our customers aware of the situation they can help us to conserve resources and reduce the need for more stringent drought measures. Depending on the severity of a drought, measures as listed in Appendix 5 may be used to temporarily increase the supplies as required.

1.4 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 of restrictions on use and temporary changes to water supply licence conditions. We calculate our Level of Service using historic weather patterns and previous worst-case scenarios to meet forecast demands.

The Level of Service currently adopted by Yorkshire Water is:

Introduction of temporary use bans:	no more than 1 in 25 years on average
Supply-side drought permits / orders and non-essential use drought orders:	no more than 1 in 80 years on average
Rota cuts / standpipes (emergency drought orders):	1 in >500* years

* This is an estimate of an exceptionally rare event

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.

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. The same Level of Service is adopted for all Yorkshire Water 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 Levels of Service are 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 the WRMP 2019 we forecast dry year average demand in the zone is around 6Ml/d over the 25-year planning period. This provided 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 the WRMP 2019 is 1460Ml/d. Our levels of service for temporary use bans and drought orders or permits are the result of our WRAPSim model simulation and reflect the frequency of modelled restrictions. For rota cuts/stand pipes we estimate a return period of greater than 500 years. This estimate has been obtained by analysis of modelled reservoir stocks, and the use of extreme value analyses to suggest the frequency of stocks falling below our emergency storage line (12.5% 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 (although different distributions return different estimates) for shorter return periods (up to twice the length of the time series) but are not accurate for longer return periods.

1.5 Drought management actions

During a drought there are a number of drought management actions we can implement to help maintain supply to our customers when available resources are low. Our initial response to dry weather is to make operational changes, such as maximising river sources to conserve reservoir stocks, to help conserve supplies. We will continually review our operations to adapt to the situation as it progresses. If the dry weather does continue, we will raise awareness of the situation and request voluntary reductions in use, followed by enhancing leakage activity.

If the situation escalates, we may impose temporary use bans (depending on the time of year) and / or implement actions requiring authorisations to be granted by the Environment Agency or Defra. Below is a summary of the types of drought management actions available to us in a drought and further details are provided in Section 3 and Appendix 3;

Demand-side measures include any drought actions that lead to a reduction in the volume of water we are required to put into supply.

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 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.

Our policy is to only implement temporary use bans between April and September when there is potential for them to help reduce demand. During winter months customers are not carrying out many of the activities restricted by a temporary use ban and savings are negligible. Therefore, to impose restrictions is confusing and instead we focus our external communications on more beneficial winter promotions such as advice on pipe lagging to prevent bursts.

Drought permits – relate to some of our supply-side actions, and are temporary authorisations granted by the Environment Agency to;

- authorise a water company to take (more) water from specified sources.
- 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.

The Environment Agency determines drought permit applications submitted by a water company. The National Permitting Service Manager or Area Manager will provide final approval. 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 will expect temporary use bans to be in place before a permit is implemented.

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.

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.

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.

For supply-side authorisations, in most circumstances we would apply to the Environment Agency for a drought permit. However, supply-side actions can also be granted by Defra under a drought order and we therefore refer to supply-side drought permits or orders throughout this plan.

Ordinary supply-side options refer to options that modify our existing abstraction permissions or reservoir compensation obligations. These options we would first implement, if required, in a short-term drought, typically up to two years. They do not require any additional assets or infrastructure to implement 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 also likely to be implemented in a longer-term drought, provided any necessary authorisations could be extended.

Long term drought options refer to 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.

Emergency drought order is 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. This 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 given by the Environment Agency.

1.6 Preliminary discussions

In accordance with the Environment Agency guideline, statutory and non-statutory consultees were invited to comment prior to production of our draft Drought Plan.

Our statutory consultees are listed below:

- Environment Agency
- Ofwat
- Defra

- Licensed water supplies operating in our area

We consult with inset appointees and licensed suppliers who operate 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. At the time of writing this Drought Plan there is only one inset appointed water supplier in our area, providing household customers with water supply via our supply system.

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 22 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
- 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
- Canal and River Trust

Our pre-draft consultation was in the form of an email or letter sent to all of the above consultees notifying them we were revising our Drought Plan as a result of the drought permits granted in 2018/19. We wrote to consultees again when we published the draft Drought Plan 2019 and opened a consultation period. Consultees were invited to send representations on the plan to Defra.

1.7 Public consultation

In accordance with statutory requirements a draft version of our Drought Plan 2019 was published on our website for consultation. A six-week consultation ran from 15 August to 26 September 2019 and all statutory and non-statutory consultees listed in Section 1.6 were notified.

We received representations on our draft Drought Plan from three parties and published a statement of response on our website. Some additional text was added to the Drought Plan in response to suggested improvements from the Environment Agency.

2 Drought triggers and scenarios

2.1 Groundwater and surface water triggers and data sources

We monitor our reservoir stocks continuously and compare them against control lines. The control lines are calculated using historical reservoir inflow sequences from 1920 (the start of our period of record) and are designed to minimise the risk of reservoir stocks falling below the marginal storage level. Marginal storage is 30 days supply at the reservoir or group yield, or 12.5 per cent of reservoir stocks, whichever is greater.

The control lines represent the value of reservoir storage that is required to guarantee a continuous rate of supply (equivalent to yield) such that the reservoir storage never falls below a critical storage line given the minimum historical inflows.

We calculate two sets of control lines:

- **Drought Control Line (DCL) -** the DCL is designed such that stocks will never fall below marginal storage.
- **Normal Control Line (NCL) - t**he NCL is designed such that stocks will never fall below the DCL.

Once we have calculated the NCL and DCL, we linearly interpolate between the 100% full level and the NCL, the NCL and DCL, and the DCL and emergency storage level, to obtain the ten control lines (CLs) used in our modelling and reservoir stocks monitoring. The NCL is control line (CL) 3, the DCL is CL7, and we use CL4 as the Environment Agency trigger line.

The control lines are updated on a regular basis and were last updated in 2012 based on minimum inflows from 1920-2011. In 2011 we experienced low rainfall and inflows in the south of the region resulting in very low reservoir levels in this area. A considerable amount of support was provided to compensation reservoirs by supply reservoirs, and this led to a change in the way the control lines are calculated.

For the DCLs, net inflows assume that if there is a downstream compensation reservoir, it supplies compensation flows at half the normal compensation, and this is fully supported by the supply reservoir. For the NCLs, full support to maintain the normal compensation release is assumed. The changes in control line derivation made in 2012 led to a decrease in yield for many reservoirs in the region, and/or an increase in the level of control lines. However, this yield decrease was not reflected in the regional deployable output. This was due to the conjunctive use operation of the grid system, whereby flows from multiple sources can be balanced across the grid.

We will review control lines using inflows calculated using data up to 2018 when available and provide any updates in annual reviews. Control lines have not been revised between 2013 and 2018 as, until 2018, there have been no significantly dry years since 2011. We have carried out analysis of minimum inflows for a selection of reservoirs, and no minima occur in the years 2012-2014. We are currently

updating our analysis of inflows to include the period 2015-2018 and this will be used in future WRMP and Drought Plan modelling / analyses.

The need for drought management action is determined by the DCL for groups of reservoirs in five areas of our supply region (East, North West, Central, South West and South). The North West, Central, South and South West groups all contain the region's surface water supply reservoirs. The East Group consists of the Hull Borehole Group (which is modelled 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. 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. The supporting information for drought order or permit applications in a particular reservoir group will be combined to include all reservoir operations, associated releases and maintained flows in the group.

Figure 2.1 shows the control lines of the five reservoir groups and measured reservoir group stocks for 2014 onwards, taken from our weekly Water Situation report in May 2017. This is discussed further in section 2.2.

Typically, when reservoir stocks are predicted by the Water Resources Planning Report (see section 2.4.3) to be within six weeks of crossing the DCL for a given resource group, we may introduce temporary use bans. The predicted stocks are illustrated in Figure 2.2. 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.

Prior to the introduction of temporary use bans we will have instigated publicity campaigns and other activities to reduce demand on resources. We will also be discussing the potential for non-essential use drought orders and for supply side drought permit or drought order plans with the Environment Agency. If we decide to progress with permits or orders including non-essential use drought orders we will start discussions with third parties with potential to be impacted, including retailers and the National Farmers' Union.

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 the WRMP assessment of deployable output. Any increase in trigger length would reduce 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.

The decision to impose or apply for authorisations to restrict water use or alter operations will rest with Yorkshire Water but would require justification. We would apply for drought orders or permits as necessary, working with the Environment Agency to establish an “exceptional shortage of rainfall”, and we would apply to Defra (drought order) or the Environment Agency (drought permit).

Examples of likely sequences of drought measures are shown in section 2.7. We use our Water Resource Allocation Plan Simulation (WRAPsim) model to model 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.

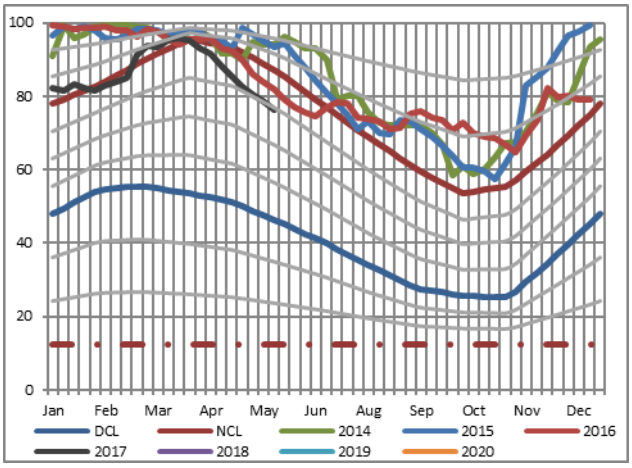
We have run a number of drought scenarios using examples of the timing and extent of drought measures under different storage conditions. We have used known low inflow years (e.g. 1929, 1995-1996) in order to trigger more extensive drought actions including the implementation of long-term drought options. The simulations have been at various demands and for some scenarios droughts have been “stitched” together to produce longer and more extreme droughts than we have in our historic record.

The reservoir stocks for the major reservoir groups for these scenarios are shown in Appendix 1 in the same format as our weekly Water Situation Report. These scenarios 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.

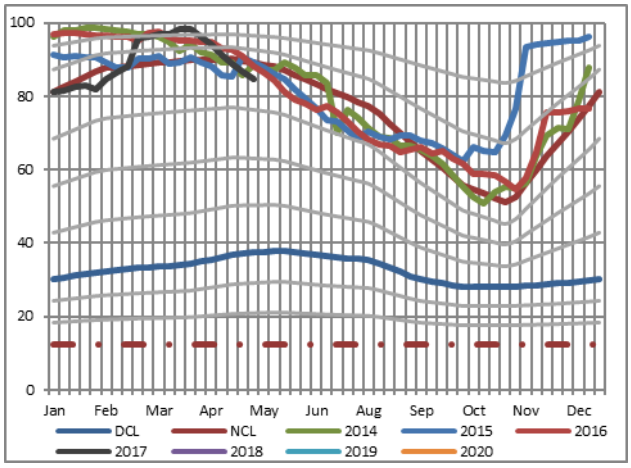
Following the prolonged dry weather in 2018 we applied for winter drought permits to aid reservoir recovery into 2019. Depending on prevailing conditions at the time, we may apply for winter drought permits if we believe they will promote reservoir recovery and have less impact on the environment than 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



NORTH RESERVOIR GROUP



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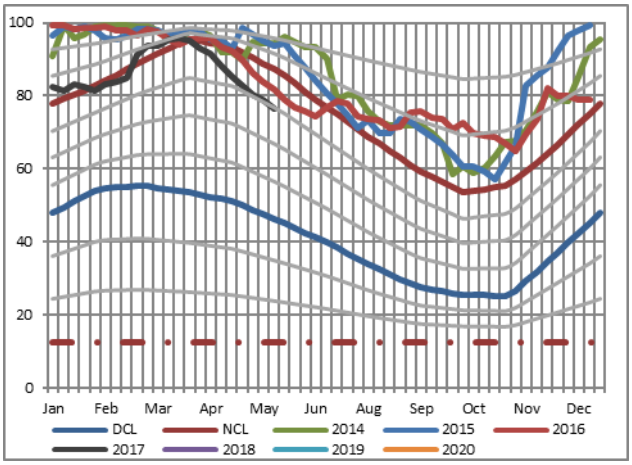
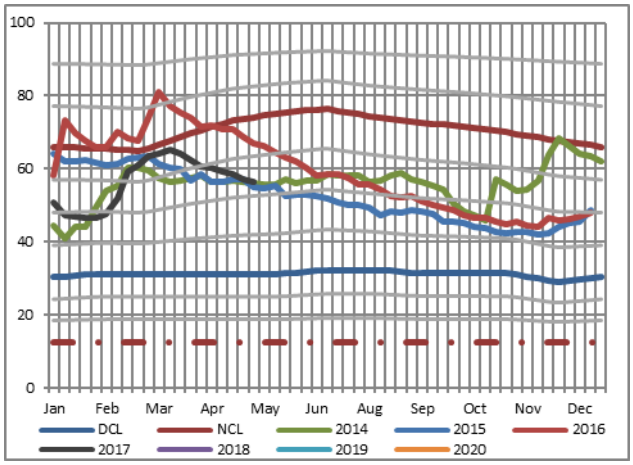


EAST RESERVOIR GROUP



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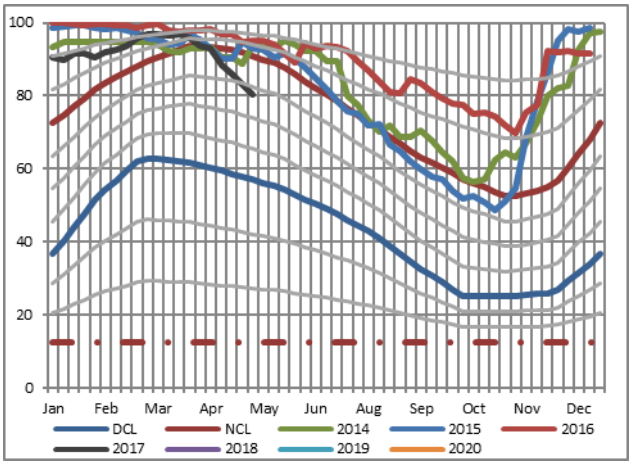

REGIONAL RESERVOIR

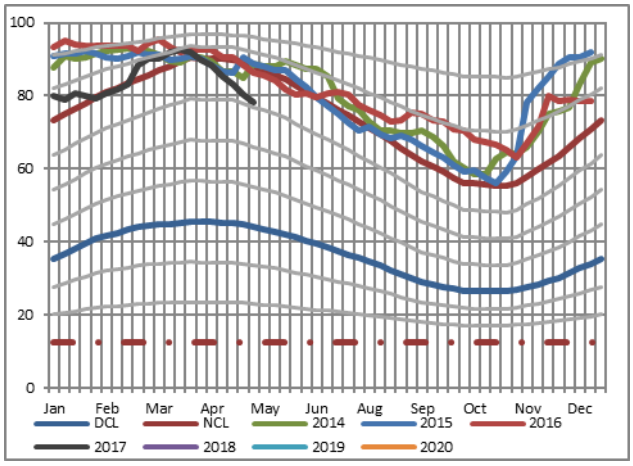

Figure 2.1: Area and Regional reservoir stocks- Drought monitoring in the weekly Water Situation Report

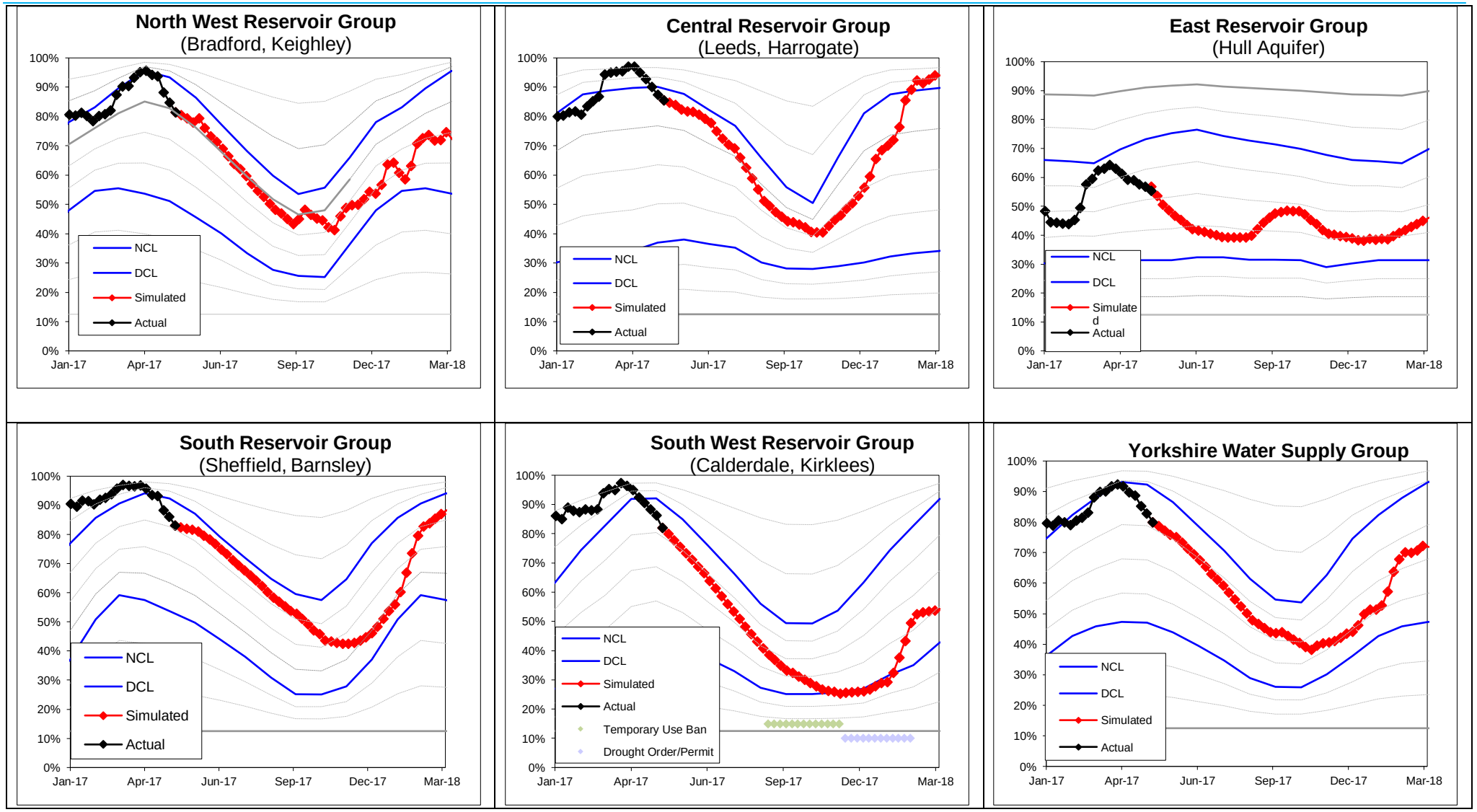

Figure 2.2: Regional reservoir group stocks and forecasts – Starting May 2017 with 1995 inflows

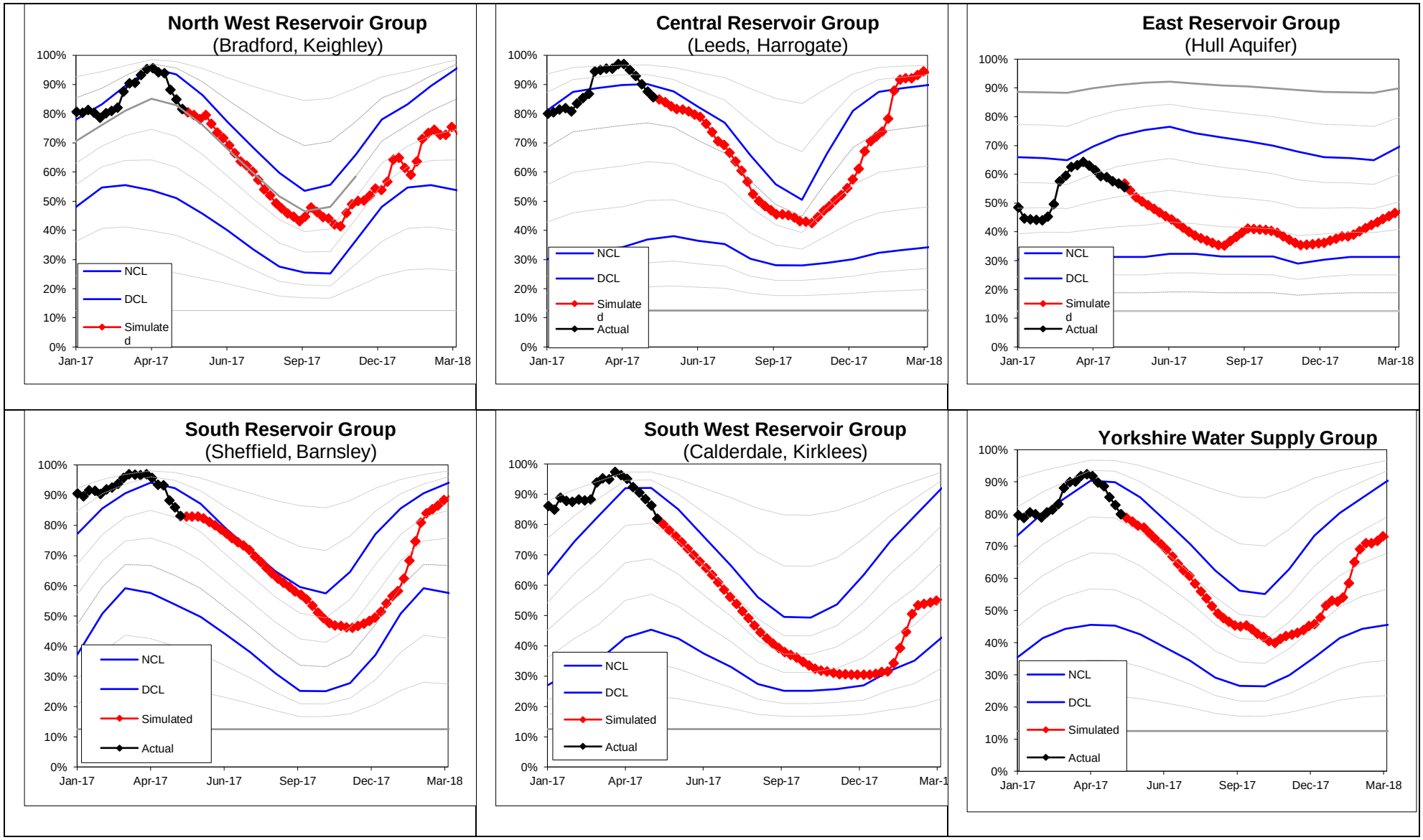

Figure 2.3: Regional reservoir group stocks and forecasts- Starting May 2017 with 1995 inflows and proactive management

2.2 Historic droughts

Our experience of historic droughts has helped develop 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.

The summer of 2003 was hot and dry late into the autumn, with no significant reservoir refill until November. In the summer of 2006 some very high temperatures led to extremely high peak demands. We have used this to reappraise our peak demand profile to reflect a worst-case scenario of high summer demands.

In 2010 and 2011 we experienced uncharacteristically dry springs, which have led to earlier than usual reservoir drawdowns. In both years, the spring was preceded by an unusually cold winter. At the end of 2011 we recalculated our control lines using the latest data, and changing the way we dealt with the issue of supporting compensation reservoirs from supply reservoirs when deriving control lines, making them more conservative.

During our most recent drought in 2018, a period of exceptionally dry weather led to an unprecedented and prolonged period of high demand across our region. In reaction to falling reservoir stocks we implemented parts of our Drought Plan and the Environment Agency classified the region as "in drought" from November 2018 to February 2019. To ensure we were resilient to the dry weather continuing into 2019, we started the process of applying to the Environment Agency for drought permits for the first time since 1996.

Significant rainfall in late 2018 meant our reservoirs recovered sufficiently enough for us to only progress with two drought permit applications. These permits were to temporarily modify licence agreements we hold with the Environment Agency for abstracting water from the River Wharfe and River Derwent. The applications were to increase the total volume we could abstract over the year from 1 April 2018 to 31 March 2019. The instantaneous and daily maximum abstractions were not changed, and neither were the rules that govern how much we abstract at different river flow rates. Both permits were granted by the Environment Agency.

The permits were required as a precautionary measure as we had used a larger than usual proportion of the licenced volumes in 2018 and there was a risk we could reach the annual limits if we experienced high winter demand in 2019. As the winter demand was not exceptional, we did not implement the permits.

2.3 Scenarios

The scenarios below describe droughts of different severities, and the actions we would take in these examples. It should be remembered that these are examples, and the actions described are indicative of how we would respond to these particular examples. The figures here and in appendices 1.2-1.6 show reservoir group stocks for our five area and regional reservoir groups, as reported in our drought contingency plan graphs in our weekly Water Situation Report. The area graphs are used for operational planning, and a temporary use ban or drought order / permit triggered in one area does not mean that such restrictions will be implemented. If temporary use bans or drought permits / orders are forecast in only one or two areas, we will manage resources to try to balance stocks across the region, and only implement regional restrictions once this had

been done. We will generally only implement temporary use bans or drought orders / permits if they are forecast in three or more of our five areas, or regionally.

2.3.1 May 2017 prolonged dry weather

In May 2017 regional reservoir stocks were close to the Environment Agency early warning trigger line, and the first Environment Agency liaison meeting was held in mid May. This followed a dry winter, and regional reservoir stocks were only 80 per cent at the start of the year. Some recovery occurred towards the end of February, but stocks remained relatively low, and recharge slow due to the extremely dry conditions. The area and regional reservoir stocks are shown in Figure 2.1.

We produced forecasts of reservoir stocks, which are shown in Figure 2.2. The forecast showed that we could expect a temporary use ban to be triggered the autumn of 2017 in the South West area if we had a repeat of the 1995-1996 inflows drought at 1300Ml/d demand. However, in practice we would not impose restrictions if a temporary use ban was forecast in only one area. In this scenario, a temporary use ban was triggered in only the South West area, and we did not apply for any demand restrictions, although we implemented our Company Risk Management Team and met with the Environment Agency in May once regional stocks crossed the Environment Agency trigger line.

Our normal water saving campaign promoting advice and free water saving devices was live as usual throughout the summer. As the weather warmed up we increased the level of promotion and instigated our media communications to heighten awareness of the dry weather. Our level of communications to customers, albeit heightened, did not cross into any more serious messages of do not use as regional stocks were only below the Environment Agency trigger line for a few weeks. The situation was monitored closely internally and communications were prepared and ready to be activated should the situation have escalated.

The 1995-1996 flow deficit is shown in Figure 2.5 on our Drought Response Surface (DRS). On this plot we can see that 1996 is our most severe 18 month drought by a considerable margin, falling just on the edge of the shaded area of the response surface where the DCL threshold is crossed.

Figure 2.3 shows the forecast assuming proactive management of the situation to avoid temporary use bans, by increasing the use of rivers and using reservoirs groups in areas with higher stocks.

Our WRAPsim model is calibrated so that in our WRMP Deployable Output scenario we meet our levels of service of no more than three temporary use bans and one drought order/permit triggered in each reservoir group in our period of record. When we are experiencing a particular drought event, we will optimise our operations in response to the conditions of that drought, balancing stocks across the region as far as possible. If stocks are falling quickly in one area, we will reduce the use of reservoirs in that area and increase support from other areas and from river abstractions.

2.3.2 Communication between Yorkshire Water and the Environment Agency

The Environment Agency receives our weekly Water Situation Report and is kept informed through regular discussions with relevant staff. When regional reservoir stocks fall below the Environment Agency early warning trigger line (see Figure 2.5) we instigate communication between Yorkshire Water and the Environment Agency's Regional Drought Co-ordinator. This trigger line is indicative of lower than usual reservoir stocks which could lead to supply issues related to dry weather. In this situation, we will establish 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 Regional 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 (Derwent, 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, for example fish kills
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 future need for restrictions or other measures is identified, the frequency of meetings will increase. The Environment Agency point of contact in severe droughts will be the Yorkshire Area Drought Co-ordinator. Consultation on the sequence of any demand restrictions, and the sequence and prioritisation of drought orders or permits, is covered in this liaison process. 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.

Measures which may be triggered in the event of drought conditions developing throughout Yorkshire include drought orders or permits to increase the water available for supply to the company, by varying abstraction conditions or reducing reservoir compensation discharges.

These would be granted by the Environment Agency (drought permits) or Defra (drought orders) following application. This process is described in Section 5.

2.3.3 1995-1996 inflows

The figure in Appendix 1.1 shows the predicted reservoir storage under a repeat of 1995-1996 inflows at an average annual demand of 1300Ml/d, with a dry year monthly demand profile. The simulation shows no temporary use bans as our service has improved since 1995-1996. In practice, during 1995-1996 we had drought orders throughout the region. The improved service, compared to the actual situation in 1995-1996, is due to the significant investment in leakage control and the grid network that we have made in the last 20 years. This scenario shows no temporary use bans as it is based on the entire 1995-1996 period, and the start of 1995 was relatively wet. The scenario shown in Figure 2.2, with forecasts for 1995-1996 inflows starting in May 2017 shows temporary use bans triggered in some areas because the start of 2017, was far drier than the start of 1995.

When January 1995-December 1996 inflows are repeated at a higher annual average demand of 1380Ml/d, temporary use bans are triggered. Since 2004 annual average demands have ranged from 1210Ml/d to 1317Ml/d, with an average of 1275Ml/d, so a 1380Mld annual average demand represents a high demand scenario. In 2018 we had a prolonged period of high demands, which was unprecedented in recent years. Average demand in 2018 was 1302Ml/d, with monthly demands of 1351Ml/d in May, 1350Ml/d in June and 1392 Ml/d in July. For much of this summer period the regional demand followed our high demand profile, which we used for forecasting in our scenario modelling.

The 1995-1996 event is the only two-year drought we have in our period of record. Rainfall totals for the 20 month period from March 1995 to October 1996 are just 67 per cent of the long-term average. This equates to a return period of about 1 in 500 to 1 in 1000 years (rainfall analysis using Tabony Tables). However, because the drought was preceded by and followed by relatively wet periods, if the entire two years 1995 and 1996 are analysed, the 80 per cent rainfall in this period has a return period of only 1 in 20 years. This highlights the problems associated with the use of return period statistics in drought situations.

2.3.4 Single season drought: 1929 inflows

The first figure in Appendix 1.2 shows the predicted reservoir storage under a repeat of 1929 inflows when demand is at 1460 Ml/d (Deployable Output). The DCL is not crossed in any reservoir group, although temporary use bans are triggered in all but the East (Hull Boreholes Group).

In this scenario the Environment Agency trigger for the regional reservoir group is crossed in April, and at this stage we would have started meetings with the Environment Agency and started our Company Risk Management Team (CRMT) as part of our water supply escalation plan. We would implement our annual summer water efficiency program starting in May with enhanced messages, requesting voluntary reductions in use. Temporary use bans are triggered in one area in July and in a further three areas in September. With the July threshold crossed, and further thresholds forecast to be crossed in late September, we would have begun preparation of our temporary use bans adverts in August, and advertised them in September. At the same time, we would have started to consult the Environment Agency and Natural England on supply side drought options, and begun preparation of our supply side drought permit applications and a drought order for a non-essential use ban. We would have considered imposing temporary use bans in late September, but when rainfall resulted in the recovery of reservoirs in October we would not have proceeded with our supply side drought permit applications and non-essential use bans.

The table and the second figure in Appendix 1.2 show a timeline of triggers and actions (plotted in relation to regional reservoir stocks), and also indicates the likelihood of this event using different return period analysis techniques.

When the same scenario is run at a more realistic, but high, average annual demand of 1380Ml/d, temporary use bans are triggered in the North West and Central areas (Appendix 1.3). When run at an average annual demand of 1300Ml/d, no temporary use bans are triggered.

We have carried out analyses on the minimum modelled reservoir stocks and on rainfall amounts for this event. Tabony Tables can be used to estimate the return period of rainfall events (*Tabony, 1977*), and indicate the regional rainfall (80 per cent of long-term average from February to September), has a return period of about 1 in 100 years. Extreme value analyses of the minimum modelled reservoir stocks from our WRAPsim model indicate that the minimum modelled reservoir stocks of 38 per cent have a return period of between 50 and 100 years.

The 1929 flow deficit is shown in Figure 2.5 on our Drought Response Surface (DRS). On this plot we can see that 1929 is our most severe six month drought ending in August, but it does not fall into the shaded area of the response surface where the DCL of our regional reservoir group is crossed.

2.3.5 Serious two-year drought

Appendix 1.4 shows the predicted reservoir storage in a serious two-year drought. This is based on the 1995-1996 drought, but run at a demand of 1460 Ml/d (deployable output) rather than the lower demand scenario shown in Appendix 1.1. In this scenario, temporary use bans are triggered in several areas, and stocks fall below the DCL in some areas, triggering drought orders.

When the Environment Agency trigger line is crossed in July of year 1 we would have started meeting the Environment Agency and convened our water supply escalation plan CRMT. We would also have requested voluntary reductions in demand, and escalated our summer efficiency campaign.

Our modelling shows temporary use bans are triggered in September in the central and south west reservoir groups, and in late October in our south reservoir group. However, we would be unlikely to implement temporary use bans at this time as they would have little effect due to the time of year. One of the main reductions in water use due to temporary use bans is garden watering, which is minimal even during a dry winter as it is outside the growing season. Instead we would carefully monitor the situation, and actively promote demand reduction and efficiency measures, and maximise leakage reduction. In line with our normal operating policy, with reservoirs below the NCL we would maximise river abstractions and minimise use of reservoirs wherever possible. In this situation we would operate to rebalance reservoir stocks as far as possible and minimise the use of reservoirs in the south and south west. In this situation we would consider applying for winter drought permits to increase annual abstraction limits on rivers if we were likely to exceed our annual limits if abstractions were maximised according to daily limits and relevant river flow thresholds. We may also have applied for winter permits to reduce compensation flows in areas where we were concerned about reservoir recovery and where we thought this would provide a benefit. Prior to applying for these permits we would have prepared environmental reports and liaised with Natural England and the Environment Agency.

If no winter permits had been applied for, over the winter period, if minimal winter refill had occurred, we would prepare our advertisements for temporary use bans and our applications for compensation reductions drought permits, including the preparation of environmental reports and liaison with Natural England and Environment Agency. Temporary use bans would be advertised

in March of year 2, and implemented by April, coinciding with the start of the growing season. With the slight recovery of reservoir stocks over the winter period, we would have continued to monitor the situation, and applied for a drought order for a non-essential use ban and supply side drought permits or orders in May of year 2, with a view to implementing them by the start of July. During this time, we would have been continuously reassessing the situation and would have been performing scenario modelling, and with a repeat of 1929 inflows from March 1996, regional reservoir stocks would have been forecast to fall below the DCL at the start of July 1996.

During the summer of year 2 when we were applying for supply side drought permits and a drought order for a non-essential use ban we would also be carrying out environmental assessments required for our long-term drought options, and assessing which options would be the most beneficial with respect to our current water resources position, as well as which were best in terms of the environment.

In this scenario non-essential use ban drought orders and supply side drought orders or permits are implemented even though regional reservoir stocks do not fall below the drought control line. Our modelling forecasts that stocks will fall below the DCL if we have a repeat of some of the worst years on record, and we implement the drought options in order to preserve reservoir stocks as much as possible in preparation for a second dry winter.

This scenario is based on our 1995/96 inflows, and its position on the DRS is shown as being on the border of having stocks below the DCL for the 18 month duration ending in August. In reality, the 1995/96 drought continued until October. It should also be noted that the DRS is for only the regional reservoir group, whereas the drought actions we have described relate to both regional and area groups. We manage our resources to balance stocks across the region as much as possible, so believe the regional DRS does offer an accurate reflection of our drought risk.

The same scenario is shown in Appendix 1.5, but run at an annual average demand of 1380Ml/d. In this scenario, temporary use bans are triggered in the summer of the second year in the South Area. The DCL is crossed in the winter of the first year in the South West Area, but no temporary use bans are triggered as this trigger would have been hit during the October to March period, when we do not implement temporary use bans. Had we had a repeat of the 1995-1996 inflows, we would have preserved stocks in the South West by reducing the use of these reservoirs and using alternative supplies, and would not have implemented temporary use bans, but would have increased our water efficiency and leakage activity.

2.3.6 Extreme three-year drought

A report commissioned by Yorkshire Water estimated the return period of a two-year drought to be 40-70 years in the south of the region. The return period is greater in the north (i.e. the event is rarer). This same report estimated that return periods for a three-year drought are greater than 400 years. However, the frequency of such long duration droughts may increase to as little as 1 in 100 years under extreme (10^{th} per centile) climate change scenarios. (*Duration Modelling - impact of multi - year drought events on resources and assets*, WRC 2012). This report analysed historical climate data (rainfall and temperature) and assessed the impact of future climate projections.

In the unlikely event that a drought was to extend into a third consecutive year, storage in each of the reservoir groups could be severely depleted, falling below and remaining below the DCL for several months (as demonstrated in Appendix 1.6). This is a scenario only; a three-year drought has never been experienced in the Yorkshire Water region since reliable records began, and there is a very low probability of such an event occurring.

Appendix 1.6 shows the predicted reservoir storage during an extreme three-year drought. This is based on the January 1995 to August 1996 inflows, followed by September 1995 to December 1996 inflows. This again represents a more extreme position than has been experienced in Yorkshire in our period of record.

In this example, we would have implemented our CRMT water supply escalation plan in July of year 1 when regional reservoir stocks crossed the Environment Agency trigger, at the same time as starting liaison with the Environment Agency. In July we would also have escalated our summer water saving campaign, and requested voluntary reductions. Over the summer we would have continually reviewed the situation, and we would have prepared our temporary use bans advertisements, although as in the 2 year drought in Appendix 1.5, we would be unlikely to have implemented temporary use bans when they were first triggered in September and October of the first year of the drought.

The drought control line was touched in the winter of year 1 in the South and South West reservoir groups, but in the period when we would not usually implement temporary use bans. During the winter we would have prepared our adverts for temporary use bans, and our applications for drought permits and orders to reduce compensation flows. In the spring of year 2, with some recovery, but with reservoir stocks still well below normal, we would have advertised and implemented temporary use bans. In the summer of year 2 we would apply for non-essential use bans and for ordinary supply-side drought permits to reduce compensation flows, and to increase river abstractions in low flow bands.

During the summer of year 2 when we were applying for ordinary supply-side drought permits and non-essential use bans we would also be carrying out environmental assessments required for our long-term drought options, and assessing which options would be the most beneficial with respect to our current water resources position, as well as which were best in terms of the environment. With the drought ongoing, we would decide which long term options to implement depending on resource and environmental investigations, and commence the process of construction of long-term drought options. Depending on the time taken to construct the long term option, the additional resource would be available sometime during year 3. The figure shows modelled reservoir stocks for the “ordinary” drought options of reduced compensation releases and decreased hands off flows (HOFs). In addition, this scenario includes options that would only be implemented during an extreme long-term drought, including use of the River Aire abstraction (up to 40Ml/d), and an additional abstraction of 40Ml/d from the River Ouse (this could either be the Tees transfer or the Ouse Raw Water Transfer). The decision to implement one of these options would be continually reviewed and in this scenario, would have been made during the second year of the drought with the option operational sometime during the third year.

There is some uncertainty as to when these long-term options could be implemented. Therefore, we have shown the effect of these options if implemented in January, April and July in the third year. This shows that a long-term option would aid recovery of reservoir stocks in the third year of an extreme drought; the earlier the option was available, the faster that recovery would be. This allows us to be certain that even if there were delays in construction of the long-term drought options, they would still improve our position with respect to reservoir stocks.

2.3.7 June 2018-March 2019

In 2018 we experienced exceptionally high demand and low rainfall, which led to our worst drought since 1995/96. During dry weather we aim to maximise use of river sources to conserve reservoir stocks for longer. We use our regional reservoir stocks graph to monitor the resource position and when pre-determined control lines are crossed it triggers drought actions. In the most recent dry years (2003, 2006 and 2011) prior to 2018 we crossed our Normal Control Line

and Environment Agency Early Warning Control Line but did not experience the same high demands as in 2018.

We received two drought permits in 2018/19 which were not options in our previous Drought Plan. These permit applications were identified in 2018 following the unprecedented high demands that required reservoir and river supplies to be used simultaneously for a substantial period. We identified them as being the best option to allow us to increase river abstractions and preserve reservoir stocks if dry conditions continued over the winter and we experienced exceptionally high winter demand, similar to 2018 winter demand.

At times last year, we had to maximise use of rivers and reservoirs simultaneously and during periods of low river flow we had to rely on reservoir supplies. We balance the drawdown of reservoirs across the region through use of our grid system. This makes our supply system more resilient to supply risks but following exceptional weather conditions during 2018, stocks in the reservoirs across our region were lower than average and we'd used more of our river abstraction allowance than we had in previous dry years. This led to the crossing of reservoir control lines, which triggered a number of our drought actions.

Figure 2.4 shows the 2018 reservoir stocks with key actions highlighted compared to the 1995 reservoir stocks.

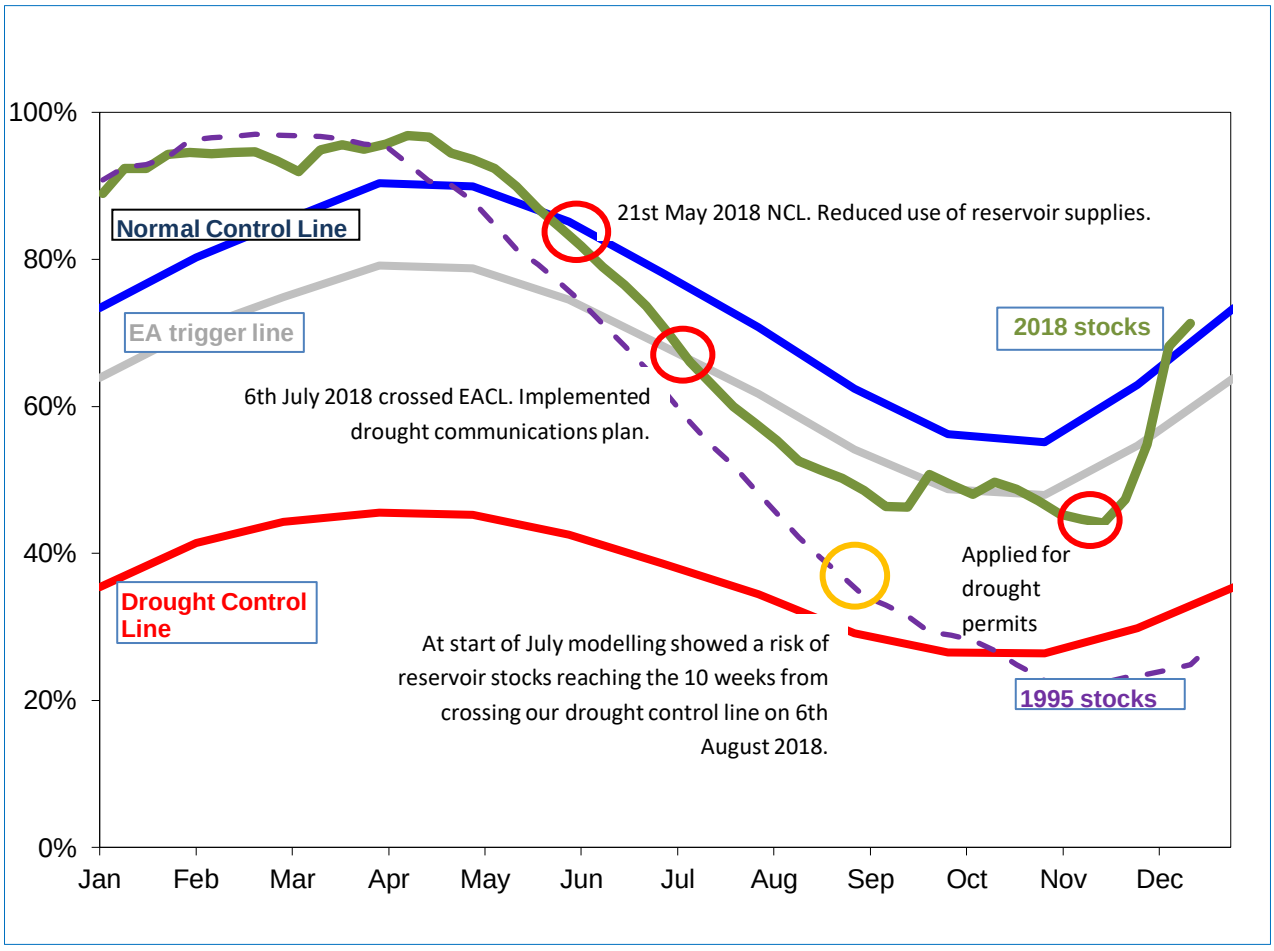

Figure 2.4: Regional reservoir stocks in 2018

In May 2018 our reservoirs stocks crossed our Normal Control Line, this triggers a change to operations to conserve reservoir supplies. At this stage we were implementing our summer

campaign for water saving. In June 2018 we started to model the potential for reservoir stocks to cross further control lines, which would trigger further drought actions. Reservoir stocks crossed the Environment Agency Early Warning Control Line on 6 July 2018. We continued to operate to maximise river sources where possible and enhanced our messages for encouraging customers to reduce their use voluntarily.

The demand experienced in June and July 2018 was unprecedented in our region and led to significant use of both reservoir and river resources simultaneously. Throughout the summer we continually modelled and monitored our water resources situation, including estimates of the likely dates that temporary use ban and drought permit triggers could have been crossed. Early in the summer, our forecasts indicated that in the worst-case scenario our temporary use ban trigger could have been reached during August and September in some areas. In reaction to this we enhanced our customer communications using more media channels to request water conservation. This included information for water retailers to ensure they were informed in case of any queries they may receive from their non-household customers. As the summer progressed, small amounts of rainfall meant we did not reach triggers linked to temporary use bans. In line with our Drought Plan temporary use bans would only be implemented in the summer months (in the current Drought Plan this is April-September inclusive).

In August 2018 we started preliminary work for permit applications, including onset of drought walkovers to gather information for environmental assessments. Our modelling indicated that in the majority of scenarios neither temporary use bans nor permits would be needed. However, in any drought, we plan for the worst-case scenario.

During August demand reduced closer to normal levels but rainfall was still below normal, and whilst we received average rainfall in September (largely due to a single storm event towards the end of the month), rainfall in October and the start of November was below average. Reservoirs stocks continued to decline through most of the autumn, at a time when we would usually see recovery.

At the beginning of November 2018 reservoir stocks were still below the Environment Agency Control Line and our water resource modelling (19 November 2018) indicated that, if we had a repeat of 1995/96 inflows over the winter and we experienced high winter demands, we could cross drought permit triggers (our Drought Control Line) in three of our five operating areas by January 2019. At this time our scenario modelling of below average rainfall from December 2018 to March 2019 with a repeat of high winter demands due to freeze-thaw over the winter of 2018/19 showed a risk our reservoirs would not refill in time for summer 2019.

In reaction to this risk we took the decision to submit drought permits applications in November 2018, before crossing the trigger for applications. This was to aid winter refill of reservoirs to ensure we were in the best position possible by spring 2019 if it remained dry. By implementing the permits during winter, we would have had less environmental impact than if we implemented them in the summer if reservoir stocks did not receive sufficient refill through rainfall alone. Furthermore, by maximising our prospects for winter recovery, we would have decreased the likelihood of requiring permits in the following year during the more environmentally sensitive spring and summer periods.

Throughout the process of producing the applications, starting in August 2018, we reviewed the need for the permits and the prioritisation based on the rate of reservoir drawdown and the volume of rainfall received. This led to some changes to the order for submitting the applications, for example we originally intended to submit the South West Area applications first, but this was later the lowest priority.

In November and December 2018, we applied for Drought Permits to reduce reservoir compensation releases in our South Area and to increase our annual abstraction limits for two river abstractions. We also submitted a "pre-application" for two reservoirs in our North Area and were intending to submit applications for a number of reservoirs in our North West and South West areas.

Significant rainfall in late November and early December 2018 led to a rapid increase in regional reservoir stocks from below the Environment Agency Control Line to above the normal control line. This was an unprecedented 26% increase in just three weeks. Drought permit applications for the River Wharfe and South Area had been submitted and the consultation period closed. As a result of the recovery in stocks we withdrew the South Area applications and did not submit any more reservoir permit applications.

However, we continued with the River Wharfe and River Derwent permit applications as a precautionary measure as, although our reservoirs had received significant recovery, there was a risk we would not have sufficient river resource available to meet a high winter demand. However, we operated to retain enough licence capacity to meet a three-week period of high winter demand, so we would have only needed to implement the permits if an extreme cold spell had occurred. Demand during the winter of 2019 was relatively stable and we did not implement either permit. The first half of 2019 has mostly been drier than normal, and with baseline river flows low due to the previous dry year, we are continuing to monitor the situation carefully.

2.4 Water resources management and monitoring

Conjunctive use schemes 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.

The combined yield of resources used conjunctively (i.e. by maximising river abstraction during high winter river flows) 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.

A number of routine reports and management processes are embedded into our routine 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.

2.4.1 Weekly Water Situation Reports

Weekly Water Situation Reports form part of the normal business of 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 a Water Situation Report is produced weekly and is available electronically to Yorkshire Water colleagues including the Kelda Management Team (KMT). The report is e-mailed each week to our Environment Agency regional water resources contacts. At the beginning of each month we upload a version of the water situation report to our website.

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

The report contains a drought monitoring section. This includes reservoir stocks within the key resource groups that are used to determine drought management action (see Section 5). 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 falling reservoir stocks and initiate discussions with the Environment Agency on the water supply situation.

When reservoir stocks fall below the Environment Agency early warning trigger line our Asset Strategy Manager will contact the Environment Agency’s Drought Co-ordinator at Lateral House, Leeds. We will then keep in regular contact until the situation recovers.

2.4.2 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.

2.4.3 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. Remedial actions are identified to reduce and/or balance out demand on 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 additional modelling is then carried out to assess the mitigating activities (or remedial actions).

Operational measures such as decreasing minimum flows at water treatment works, and using sources in areas with greater reservoir stocks, are planned 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. Progress of the measures is monitored monthly in the WRPR.

The WRPR is 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 WTWs and using sources in areas with greatest reservoir stocks.

In the event of drought measures becoming a reality, the frequency of planning reports would be increased to fortnightly or weekly.

2.5 Forecasting

Drought scenario planning is carried out 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 including all river and reservoir sources, boreholes, water treatment works, pipelines and demand centres. WRAPsim output provides 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.

The WRAPsim model can also be used to predict future water supply situations based on past weather patterns. This provides 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 Appendices 1.1 to 1.6, and Figure 2.2 and Figure 2.3.

2.6 Scenarios, triggers and actions

Examples of various drought scenarios with high level Yorkshire Water responses or actions are shown in Table 2.1. These examples are based on experience of one and two-year droughts in the Yorkshire region. An unprecedented third year of drought has been included to demonstrate additional action we could take if a three-year drought did occur.

Section 3 discusses a range of alternative supply-side options that we would consider in order to maintain essential water supplies in the event of a third consecutive year of a drought.

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 long-term drought options have long lead times. There is therefore 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.

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 infrastructure, for example, abstraction pumping stations, pipelines or water treatment work expansion.

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 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.

The trigger for considering the need for long-term drought options would be 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**
Grid SWZ 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	Calls for restraint and conservation campaign, enhance leakage control	Consider winter refill drought orders in consultation with the Environment Agency
Grid SWZ Serious drought in spring of year 2	Dry winter following dry year, with total reservoir stocks decreasing (typically below CL5)	Enhance conservation campaign and calls for water usage restraint, continue increased leakage control	Prepare for temporary use ban. Prepare drought permit / order applications for both increasing supply and restricting use.	Consult the Environment Agency on potential monitoring requirements for long-term drought options
Grid SWZ Severe drought in summer of year 2	Reservoir storage within 6 weeks of DCL	Impose temporary use ban	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. Consider long-term drought options
Grid SWZ Severe drought in autumn of year 2	Reservoir storage below DCL	Temporary use ban, drought orders and permits for increasing supply and a drought order for a non-essential use ban in place	Enhance conservation campaign and calls for water usage restraint, continue increased leakage control	Construct long-term drought options if required. Consider emergency drought orders
Grid SWZ Severe drought in spring of year 3	Reservoir storage still below DCL	Temporary use bans, drought orders and permits in place for increasing supply and drought orders for non-essential use bans in place	Enhance conservation campaign and calls for water usage restraint, continue increased leakage control	Long-term drought options in use

Table 2.2: Yorkshire Water drought scenarios and actions

The decision as to which long term drought options would be implemented would be made by the Yorkshire Water Risk Management Teams (see Section 5) and would be continually reviewed. The decision would be based 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.

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 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 demand reduction activities and had triggered or were close to triggering ordinary drought permits / orders. These options are only likely to be required if our modelling or analysis of supply and demand data is highlighting a risk demand reduction (including water use restrictions) and ordinary supply-side options 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 environmental assessment of long-term options would be completed in time to allow informed selection. Data collation and scoping would start early in year two, utilising data from previous environmental impact assessments (EIAs), e.g. Tees transfer feasibility and the WRMP Strategic Environmental Assessment (SEA). It is anticipated that EIA will take three to six months

depending on scheme complexity, which allows sufficient time for impacts to be identified and mitigated for implementation in year three.

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.

2.7 Links to actions/measures with timing information

Figure 2.5 represents regional stocks and provides an example timeline of the drought triggers and actions we would take leading up to implementation of a drought order for a non-essential use ban and supply side drought permits/orders, 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 2.5 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.

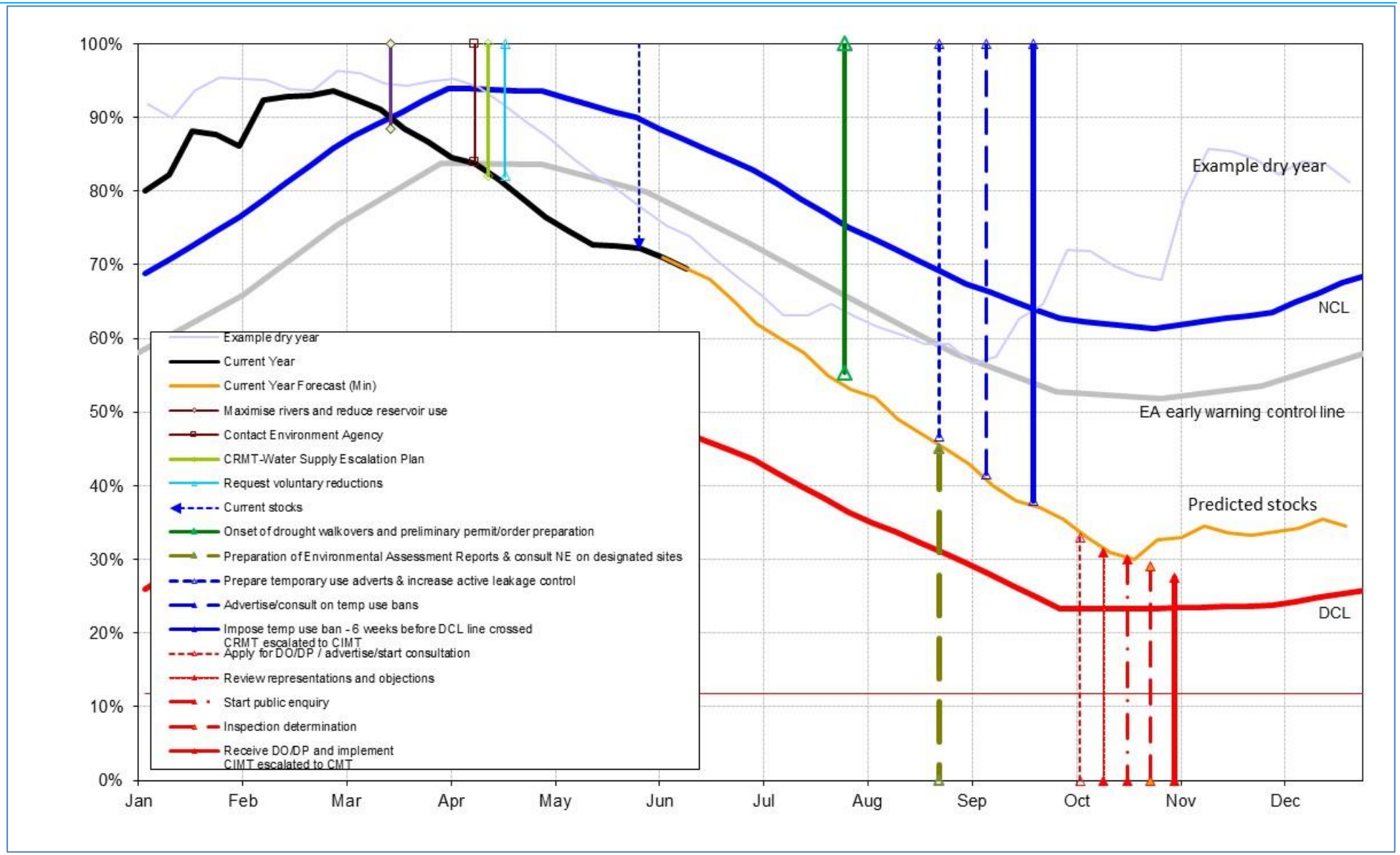

Figure 2.5: Regional reservoir group triggers

Table 2.3 lists each trigger and the associated drought action. This table shows the drought triggers included in Figure 2.5 and a trigger for long-term drought actions.

Trigger	Action
Regional reservoir stocks below NCL*	Reduce reservoir output
	Maximise all river abstractions
Regional reservoir stocks above the Environment Agency early warning trigger line and demand crosses the 75 percentile based on historic deamnd data	Enhance annual customer water saving messages to raise awareness of the dry weather conditions and an addiitonal need to conserve water. Communications will take into account the short term weather forecasts to ensure water saving messages are appropriate.
Regional reservoir stocks cross Environment Agency early warning trigger line	Start liaising with Environment Agency
	CRMT (Company Risk Management Team) meet to ensure that appropriate water supply escalation activity is implemented
	Enhance ongoing water conservation activity, requesting voluntary reductions
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. However, reservoirs with a local rather than regional trigger may require earlier implementation.
Regional reservoir stocks forecast to be 10 weeks away from DCL	CRMT escalated to CIMT (Company Incident Management Team)*
	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 Natural England on any potential supply side drought permits/orders that could damage sites designated under the Habitats Regulations 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.
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.
	CIMT escalated to CMT (Crisis Management Team)

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 recevied 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.
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 sepcific conditions efined in the authorisations are met.

* There are a number of other triggers that could initiate CRMT escalating to CIMT, as shown in Table 5.1, but not related to reservoir stocks.

Table 2.3: Drought plan triggers and associated 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 2.5). 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.

In a normal year we promote water saving to our customers through our website, social media, billing and offering free water saving devices. 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 a "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 or rainfall 50% below average, we will enhance our 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.

As discussed above, all our reservoir groups have an Environment Agency trigger line (as shown by the grey line in Figure 2.5). 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 set up a Company Risk Management Team (CRMT). CRMT will monitor the performance of our assets to ensure we are maximising our available resources, see Section 5.

The Environment Agency trigger line will also trigger increased 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.

This Drought Plan includes an additional trigger to previous plans for onset of drought walkovers of the river reaches that would potentially be impacted if we implemented 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.

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 Habitats Regulations or Wildlife and Countryside Act.

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 2.5 only two weeks are available as the diagram does not allow for any temporary refill of reservoirs.

Temporary use bans 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 2.5) between April and September.

Two weeks after imposing temporary, when reservoir stocks are forecast to be four weeks from crossing the DCL, use bans 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 2.3 shows the activities we will take in the four weeks between applying for 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 six weeks after temporary use bans are imposed.

There are 60 ordinary supply-side options we could implement at this stage, 51 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.

Droughts experienced in our region in the past have been one or two season droughts, however in the event of a longer-term drought we have identified a number of long-term options that would require additional infrastructure to be installed. The trigger for considering long-term drought

options is when reservoir stocks are six weeks away from crossing the DCL in a second year of drought. If this 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.

2.8 Yorkshire Water System Drought Response

We have carried out analyses based on the EA/UKWIR project *Drought Vulnerability Framework*. 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 2.6 is a drought response surface for the Yorkshire Water Regional Reservoir Group showing the number of weeks 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.

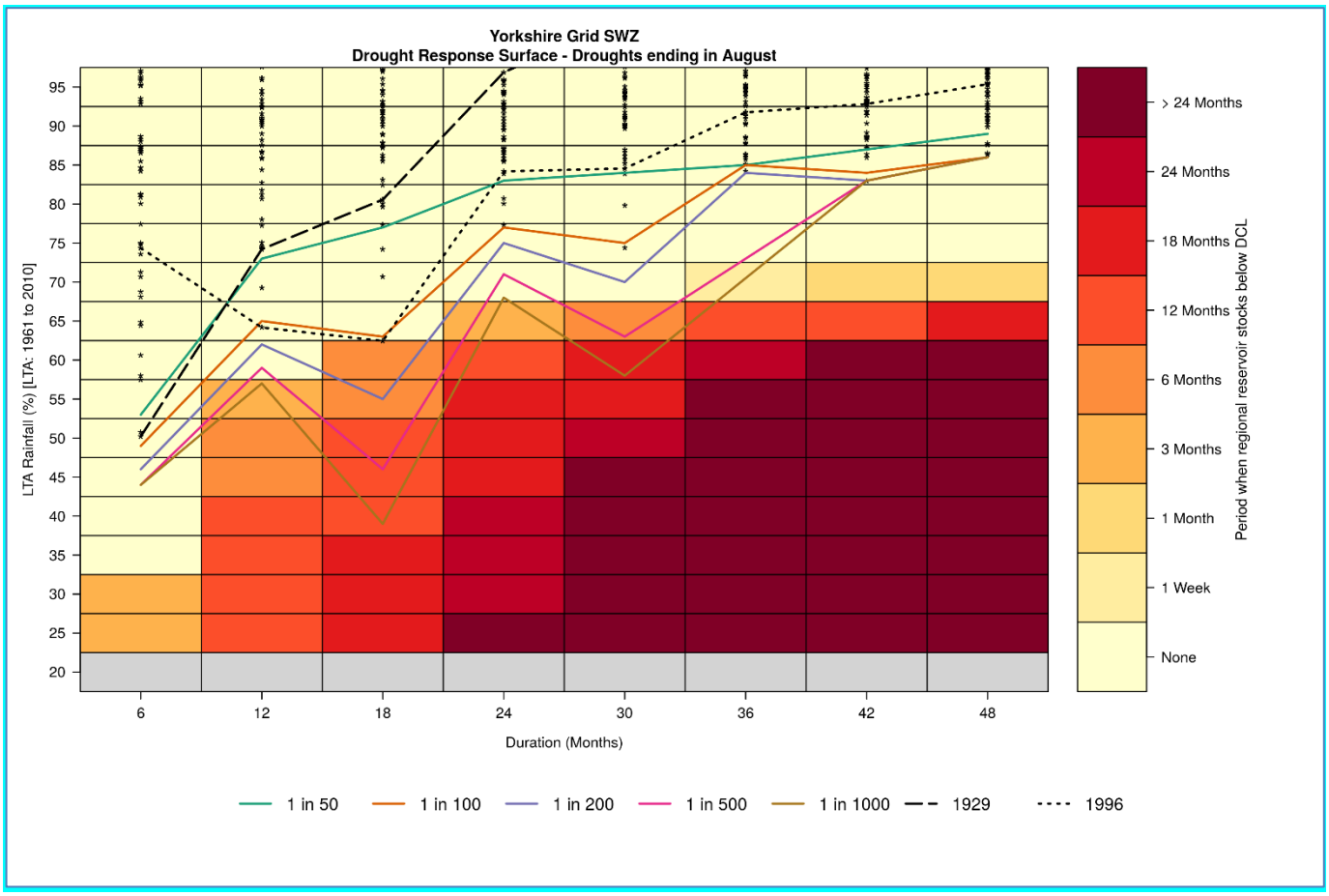

Figure 2.6: Regional reservoir group stocks and forecasts - Drought response surface for Yorkshire Water Regional reservoir group

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 drought orders. 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 1.7.

3 Drought management action

3.1 Introduction

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 consider all potential drought management actions available to us. These will be implemented as appropriate, depending on the severity and geographical extent of a particular drought.

We will liaise with the Environment Agency to agree arrangements for implementing specific drought management actions. A summary of these activities is provided in Table 3.1 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. Consultation with the Environment Agency and other relevant groups will normally be undertaken prior to the identification of the appropriate actions and to the applications being made.

Type of action	Measure	Legal measures required
Demand side - Customer Management	Promote water efficiency to domestic customers and non-household water users*	None
	Contribute to collaborative water conservation guidelines for non-household water users	None
	Temporary use bans	None – applicable 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	None
Supply-side Resource Management	Maximise available resources through use of alternative supplies / underutilised licensed resources e.g. mothballed or recently abandoned infrastructure/ water sources.	None unless require a change to an existing licence or new authroisation
	Raw water tankering where appropriate	None
	Reduce compensation flows. increase existing abstractions or utilise new abstractions	Can apply to the Environment Agency for a drought permit or to Defra for a drought order. Usually more apporpriate to apply for a drought order if a Habitat Directive site is likely to be affected.

* We will work with water retailers to promote non-household water conservation in our region and include retailers in any communications we send to non-household water users.

Table 3.1: Drought management 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 National Farmers' Union, the Canal and Rivers Trust, the Met Office, and representatives from environmental and angling groups, as well as Government (Defra, Welsh Assembly), regulators (EA, Ofwat, DWI and NRW) and customers (CCW).

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. Representatives from Yorkshire Water will contribute to the working of the NDG when it is running. However, as NDG is a national group, 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.

If a period of prolonged dry weather is affecting only a small part of the country and not Yorkshire, our involvement in NDG may be limited. However, during more significant dry weather and drought events – such as was experienced nationally during 2018 – we will ensure that we play a proactive role in contributing to the group to ensure that the water resources position in Yorkshire is clearly communicated into the meeting, and that any external communication messages are aligned with our own customer and stakeholder communications.

3.2 Drought permit and order application process

Drought actions that alter or suspend existing permissions related to the use of water for supply, require abstraction from a source not currently permitted or impose a non-essential use ban cannot be implemented without authorisation. 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 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 its likely we would apply to the Environment Agency for a drought permit.. We would discuss applications with the Environment Agency before submitting to determine if a drought permit or order application is appropriate. Drought order applications for non-essential use bans must be submitted to Defra.

In the event of applying for a drought permit or order we will follow the process set out in the *Defra Drought Permits and Drought Orders* November 2015 guidance. This process requires us to advertise the applications, hold a public consultation to raise awareness and allow interested parties to make representations and object. Where feasible, we will aim to resolve issues raised in objections through compensation or mitigation measures. If an agreement cannot be reached, it's possible a hearing or public enquiry could be required before the Environment Agency or Defra make a decision on granting the permit or order. Details on the drought permit / order application processes are provided in Appendix 3.2.

The timescales outlined in Table 2.3 for drought order / permit applications aim to comply with the Defra Drought Permits and Drought Orders November 2015 guidance. For a drought permit the guidance states that once an application has been received the Environment Agency will usually make a decision within:

- 12 calendar days of the date of the last notice, where no objections have been received or all objections have been resolved.
- 7 calendar days of the receipt of a hearing report (if a hearing takes place).

For a drought order the guidance given is that Defra will normally process within 28 days from the date of application.

Our triggers assume a decision on a drought order / permit application will take up to 28 days from submission of an application. However, if there are delays the timescales for implementing a drought order / permit will inevitably take longer than proposed in Table 2.3. The number of permit (or order) applications is also likely to impact on the time it takes for Yorkshire Water to apply and for the Environment Agency to determine the outcome. To help mitigate this, applications will be prioritised and phased based on the urgency for reducing compensations and / or the benefit to supply.

3.3 Demand-side options

Options to reduce demand include publicity campaigns, increased leakage control, temporary use bans and drought orders to restrict non-essential use. The implementation of these measures during a drought is phased as a drought progresses and linked to the triggers as set out in Table 2.3. At the on-set of a drought we will deliver publicity campaigns and increase leakage control. As a drought progresses through to more extreme phases we will 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. Further details on demand reduction options are provided in Appendix 3.

Every year we undertake activity to encourage our customers to be water efficient. This includes providing free water saving devices and water saving advice to our domestic customers. If demand reaches the 75 percentile based on recent historic demands or stocks fall below the Environment Agency early warning trigger line we will enhance this activity through media campaigns and our website (see Appendix 8 for more details).

If stocks are 10 weeks away from our DCL we will increase leakage ‘find and fix’ activity and resources as part of an enhanced leakage programme during a drought. At the time of writing this Drought Plan we are in the process of investing in new leakage techniques to reduce our leakage and remove the risk of a future supply demand deficit, which was identified in our WRMP 2019. This means we are already enhancing our leakage activity significantly. However, in a drought we will consider if any techniques can be brought forward to help reduce demand at peak times.

In addition to active leakage control there is potential to reduce leakage through pressure management. This would involve adjusting existing pressure reducing valves within our distribution system to operate at a lower pressure than standard. We currently operate to a pressure of 20m at the highest property supplied to ensure we meet Ofwat standards and minimise customer contacts. The standard pressure is 15m in the water main, but this does not always provide sufficient for taller buildings, properties with cold water header tanks and joint supply properties.

The lower pressure reduces the volume of water lost through existing leaks and reduces the risk of new bursts occurring. However, it may result in significant customer complaints due to problem with water using appliances at lower pressure and would have to be carefully managed.

The potential savings from additional leakage reduction are presented in Appendix 3.1. These savings are cumulative year on year as a drought progresses.

The volume of leakage we can reduce in a drought will vary depending on the specific conditions. In the summer of 2018, we experienced increased break out of leaks as during hot, dry weather, ground movement increases, causing our pipes to burst. In a normal year ground movement causes around half of our leaks, but the change in soil moisture in 2018 was unprecedented, and the number of burst mains increased by 60%. In any drought we will employ additional leakage reduction activities, but ground movement can mean leakage increases above normal levels during the summer months. If leakage levels do increase, we will aim to reduce to our annual target level during the remainder of the year.

If reservoir stock predictions are six weeks from crossing our DCL, we may impose temporary use bans on our domestic customers (see section 3.4). We will contact any inset appointees in our region to notify them of the restrictions and request they also impose on their own customers.

If temporary use bans were in place, we would also be promoting the need for reduced water use to non-household water users in our region. The Water Act 2014 introduced non-household water retail competition in England, 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 through our Market Services Team.

We will seek to work with retailers to promote water efficiency messages to their customers. If we need to communicate pro-actively with non-household water users e.g. to raise awareness of the situation or inform them of impending water use restrictions, we will ensure all retailers are made aware of these communications. 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.

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
- 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.

Two weeks after imposing temporary use bans, we may apply for a demand side drought order for a non-essential use ban at the same time as applying for supply side drought permits or orders. As with temporary use bans, we would be less likely to implement in the winter (April to September) 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, usually via a public inquiry.

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

- Prior to the use of temporary use bans we will implement our 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 will be imposed when reservoir stocks are at the DCL.
- No restrictions will be imposed between the months of October and March.
- We will also ensure that all available sources will be maximised, whilst ensuring that security of supply, drinking water quality and safety are not compromised.
- Prior to implementing water use restrictions we will hold a consultation.
- We will notify our customers when temporary restrictions 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. We will be required to demonstrate delivery of all our drought management activities prior to the use of non-essential use drought orders and supply-side drought orders or permits. Our analysis of previous droughts in the WRMP, and our scenario modelling in the Drought Plan, 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.

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 temporary use bans. The renewal of drought orders will require a similar benefit analysis and demonstration of demand management.

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. Assumed savings from temporary use bans are based on advice published in the report *Managing through drought: code of practice and guidance for water companies on water use restrictions - 2013*. (UKWIR, 2013).

Savings attributed to demand side drought actions are estimates only and actual savings can vary in each drought situation. Our deployable output calculation as described in our WRMP, includes demand reductions when temporary use bans, drought orders and drought permits are implemented. 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.

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.

3.4 Temporary use bans

Formal demand management options available to water companies were extended following the Flood and Water Management Act 2010 (FWMA 2010). Section 36 of the 2010 Act amended the Water Industry Act 1991 to allow companies to temporarily restrict defined customer water use activities during a drought without 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 (see Section 3.5).

We envisage 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 temporary use bans.

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 3.1 indicate the reduction in dry year demand that could be achieved should demand saving measures be implemented.

In accordance with the Flood and Water Management Act 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 the same channels of communication.

We will also ensure key stakeholders including retailers and the National Farmers Union are fully informed prior to notifications being published. We will provide retailers with information to help them answer any queries they may receive from their non-household customers.

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 to be banned under a temporary use ban

Consultation on temporary use bans

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 “qualificative 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 responsible and the reason for implementing a ban is a result of a serious shortage customers are more likely to accept a ban.

Further research, aimed at gathering consumer reaction and attitudes towards hosepipe bans, found that for 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 4.

3.5 Demand side drought order restrictions – 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 lists the water use activities that can be restricted by a drought order.

Water use activities that may be prohibited on succesful 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 un occupied and closed

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

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 3.2.

We will advertise a non-essential use drought order application in accordance with the code of practice and legislation set out in the Flood and Water Management Act 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 retailers during preparation of applications for non-essential use bans and ensure retailers are fully informed of the implications and potential impacts on non-household customers.

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 retailers.

3.6 Exemptions and concessions

Action 4 within the code of practice (CoP) requires all water companies to adopt a common approach to exceptions. 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.

3.7 Private supplies and vulnerable customers

Private supplies

In a drought, or period of prolonged dry weather, non-Yorkshire Water customers may contact us to request support in circumstances where their own private supplies (springs, boreholes etc.) may be running dry and resulting in a loss of their 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 power 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). These costs can be recovered from any relevant persons.

We will consider such requests for those who are considered most vulnerable via the local authority and only once contingency plans, procurement of temporary alternative supplies, a new supplies connection or metred standpipe have been exhausted. Support will depend on resources available and our ability to meet our own customer's demands.

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). Prioritisation will be given to maintaining water supply to these PSR customers during a drought or period of prolonged dry weather.

3.8 Supply-side actions

During normal operation, 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.

We manage a routine programme of borehole yield testing to establish the actual and potential deployable output. Where additional yield is identified, we will implement projects to achieve that yield within the abstraction licence. We would also review and implement projects to maximise our river abstraction licences. Assets which are temporarily out of service and are resulting in a loss of supply (outage) that is not required under normal operations, but is required during high demand, will be continuously assessed during dry weather. We will, where possible and safe, escalate maintenance and repairs to bring these 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 however, this is included as a long-term option as it requires additional permissions.

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. The requirements are specified in legal documents (Acts of Parliament or abstraction licence agreements) that permit the impoundment.

In a drought we may be required to apply for temporary authorisations to reduce the compensation releases in order to protect the remaining reservoir stocks so that we can maintain compensation at a lower rate until stocks recover. This authorisation would be through a drought order or permit. The releases required from some of our ‘compensation only’ reservoirs were originally specified in documents that allowed water from the reservoir to be used for supply to customers. However, there is now no supply benefit (due to changes in our supply system since the reservoirs were built) and the reservoirs are operated to support the downstream environment.

As a drought escalates, we are continually reviewing reservoir stock levels and the potential risks and which supply-side drought management actions outside of normal operations and licence permissions we should take. If our scenario modelling identifies a risk 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.

If reservoir storage is six weeks from the DCL, we would 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 notice to third parties. If this trigger is reached, 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 can provide additional resources temporarily to help us meet demand during droughts.

Appendix 5 gives a summary of each supply-side action 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.

We have the following actions available to increase supply during a drought:

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

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 (as stated in Appendix 5). 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. For this second reduction the local trigger for reservoirs that cannot be supported will also apply.

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 under risk of not meeting the 50% reduction, its individual stocks will trigger the reduction 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.

During a drought, we will also consider how our normal operations can be varied to provide alternative compensation to rivers or to reduce our bulk transfer from Severn Trent Water if required when they are experiencing a drought.

3.9 Supply side drought orders and permits

When we are in drought it will not always be possible to meet customer demand through our existing licenced sources of supply and demand management drought actions. Drought orders or permits will be needed in order for us to obtain additional supplies of water temporarily. We will choose the most appropriate water supply options in consultation with the Environment Agency, Drinking Water Inspectorate, Natural England and other groups as appropriate.

Our supply-side options for short-term droughts, typically lasting one or two years will increase supply through reducing compensation or increasing abstraction. We refer to these as "ordinary"

supply side drought options. This type of drought management action often requires authorisation through a drought permit or order. 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 have some additional supply side actions available to us, that we would only use in a drought lasting two or more years, once demand side options and ordinary supply side options had already been implemented. We refer to these as long-term drought actions or options. Details of all potential supply-side options are given in Appendix 5.

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.

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 and for providing 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.

As discussed in Section 2, the trigger for temporary use bans is when we forecast a reservoir group to be six weeks away from crossing the DCL. At this stage, we will be preparing an application for a drought order to impose a non-essential use ban and applications for supply side drought orders / permits and environmental assessment reports. 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. We would not implement water use restrictions during October to March as savings would be minimal.

To help us prepare a supply-side drought order or permit application in the time available, we have prepared draft documents for both compensation release and river abstraction drought permit applications (ordinary drought options). The draft documents include supporting information and environmental assessment reports that would require further details to be added prior to applying. The permit applications will also provide the basis for drought order applications if required. The templates will ensure that we provide the supporting documentation that regulators expect to be submitted with the applications.

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

- 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. 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. A summary of the environmental approach

taken is provided in Section 4, and potential impacts are summarised in Appendix 5.

- Details of environmental monitoring and mitigation requirements. A summary of the approach is provided in Section 4 and details are included in Appendix 5.

3.10 Ordinary supply side options

Ordinary supply side options are those we consider implementing if reservoir storage is six weeks from crossing the DCL. Many of these actions will require a drought permit or order to be approved. Actions that would be carried out within existing licence agreements or are not contravening the current legal requirements under an act of parliament or licence agreement do not require authorisation.

We have an ordinary supply-side option that reduces compensation releases but does not require authorisation as we currently operate above the flow we are legally required to release. Our current operations have been agreed with the Environment Agency and our licence agreements will, once the trial is complete, be altered to include the agreed releases.

We also 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 ordinary supply-side options would require authorisation to temporarily alter the legal compensation requirements in a drought. The details of which will be explained in the application.

A number of our ordinary supply-side options relate to compensation only reservoirs and there would be no supply benefit in reducing the compensation flow. However, if the action was not taken the reservoir would be at risk of running out of water for compensating the downstream watercourse. 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.

When we implement ordinary supply-side drought options we will have, where possible, maximised available resources within licenced conditions and enhanced our water efficiency promotions and leakage activity. During April to September a temporary use ban will be in place and we will be preparing a drought order application for a non-essential use ban. We would only start to consider long term drought options in a second or later year of drought and they would only be progressed if ordinary supply-side actions were in place, or soon to be implemented.

Two of our reservoir sites cannot be used in supply but we continue to operate compensation releases. The current licence authorisations do not authorise Yorkshire Water to abstract from these reservoirs for public water supply. If any drought actions were required to reduce the compensation releases the Environment Agency would need to apply to Defra for authorisation via a drought order. Although these will be drought orders, rather than permits, we have undertaken the environmental assessments (SEA, HRA and EARs) required for these reservoirs. We have also included the environmental assessments requirements in our SEA and HRA documents. We have included these reservoirs in Appendix 5 as Environment Agency drought order sites, but they are not Yorkshire Water supply-side actions.

Reducing compensation releases

Compensation releases are controlled flow releases from reservoirs that ensure the downstream river receives sufficient flow to meet environmental needs. Several of our reservoir groups provide compensation to rivers in our region. In the event of a drought, we would consider

reducing the compensation releases in order to save water for supply and / or maintaining the compensation flow for longer, at a reduced level. The majority of these drought actions would require authorisation through a drought permit or order (see above).

Details of these compensation reduction options are provided in Appendix 5. Information on the triggers for the options is in Section 0. The decisions on which orders or permits to apply for would be made in consultation with the Environment Agency and other interested parties. The environmental impacts of the options are discussed in Section 4 and Appendix 5.

Increasing existing abstraction licences

It may be possible to gain additional yield through increasing our existing abstractions. We have several ordinary supply-side options that would increase river abstractions to provide additional yield during a drought. We would require a drought order or permit to utilise our ordinary supply-side river abstraction options.

Details of these options and environmental impacts are provided in Appendix 5. The triggers for the options are discussed in Section 0. The decisions on which orders or permits to apply for would be made in consultation with the Environment Agency and other interested parties.

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 have identified one long-term groundwater option where we could benefit from increasing an existing abstraction.

We also have an option to relocate an existing licence that is currently unused due to bacteria contamination. It may be possible to reinstate the existing licence through borehole refurbishment and additional treatment processes. This will be considered when we look to maximise our existing abstraction permissions, as mentioned in Section 3.6. When considering long-term options, we will review this option and if there is a benefit of relocating the licence to an area where the risk of contamination is much lower.

Winter Drought Permits

In 2018 we applied for “winter drought permits” to reduce compensation releases and to increase annual abstractions in some rivers. Following significant rainfall late in 2018, we only progressed with the two river abstraction permits. In a drought, we apply for winter 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 a reduction in compensation releases could have greater environmental impact.

The two options to increase the annual permitted abstraction from two separate river sources, which require drought permits and were granted in 2018/19, are winter only options. The licensing year is from 1 April to 31 March, therefore we would only be requiring these permits in the winter months, depending on summer demands and if we had used up more of our permitted annual abstraction volumes than in a normal year. These two options, River Wharfe annual abstraction increase and River Derwent annual abstraction increase, are therefore winter only permits, whereas all other options requiring authorisation could be required at any time in the year.

3.11 Long-term drought options

In the event of a long-term drought lasting more than two years we have 10 (nine supply-side and one demand-side) additional options we would consider, and these are listed in Table 3.4. A

number of these options would require a drought order or permit and other permissions such as discharge consents for temporary use. Further details of the long-term supply side options are provided in Appendix 5. A number of our long-term options are feasible options within our WRMP and require new assets and / or infrastructure to be installed. 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.

Two of our long-term drought options, North Yorkshire Groundwater increased abstraction and East Yorkshire Borehole 2 are scheduled to be brought into supply in 2022/23 and 2025/26 respectively. These schemes are part of our WRMP19 solution to provide additional resilience in our Grid SWZ, dependent on the outcome of environmental investigations and the abstraction licence applications. They remain as long-term drought options for the life of this Drought Plan but once the schemes are implemented they will no longer be included as long-term options. We will ensure our Drought Plan annual reviews and the next iteration of the Drought Plan reflect the status of these two schemes as they progress.

Historically there has not been a drought event in Yorkshire that has lasted more than two years. In 1995-1996 there was a two-year drought where, had the situation continued, we would have required resources in addition to those made available through first and second year drought options. In 1996 we started to construct a transfer from Northumbrian Water's abstraction from the River Tees. However, as the situation improved the transfer was not completed.

We will consider the long-term drought options included in Table 3.4 in a second year of a drought, if there was a risk regional reservoir stocks would reduce to six weeks away from crossing the DCL. For any long-term options, we consider could be beneficial, we will build on the preliminary Environmental Assessment Report (pEAR) / screening reports completed prior to finalisation of this Drought Plan. A full Environmental Assessment will be completed to consider any potential impacts and the monitoring and mitigation arrangements will be set out in detail. We would assess the environmental sensitivities to understood what mitigated measures would be required, as detailed in the completed Environmental Assessment.

Option	Time to implement (months)	Yield Ml/d	Comments	
Water efficiency in non-household properties	12	Up to 5	We will seek to work with retailers to deliver water efficiency devices and advice to non-household water users. The yield achieved would be dependent on retailers and non-household customers' participation.	
North West Reservoir 10	6-12	up to 3	Reservoir currently not used for supply. A drought order / permit would be needed to abstract up to 3 Ml/d, to be piped into the Bradford Aqueduct, when yield available. There is also an ordinary supply-side drought option to reduce the compensation release from North West Reservoir 10 (see Appendix 5).	
East Yorkshire Borehole 2	Up to 12 months	6	Relocate an existing unused borehole to a new location with improved water qaulity potential. A drought order or permit would be required to abstract from a new location.	
North Yorkshire Groundwater increased abstraction	12	2	Apply for a drought permit / order to increase abstracton from an existing borehole.	
Tees to Swale transfer	18	Up to 40	Import from Northumbrian Water Limited (NWL) via rivers transfer.	NWL's Drought Plan 2018 states up to 40Ml/d could be made available for transfer to Yorkshire Water in a drought. This would be dependent on specific drought conditions and Yorkshire Water agreeing terms with NWL.
Tees to Derwent pipeline	12-18	Up to 40	Import from NWL via a pipeline River Derwent Water Treatment Works 1.	
Abstraction from River Aire	12	up to 50Ml/d	Construct a new intake on the River Aire to be piped to a Bradford water treatment works. A drought permit / order would be required to abstract from the Aire.	
Increase Ouse pumping station capacity	6-9	10	Install additional pumping capacity to transfer increased flow, under the existing licence, from an abstraction on the Ouse to a water treatment works in Leeds.	
Ouse Water Treatment Works extension	12	22	Increase treatment works capacity to use water available under current licence.	
pipeline / Ouse Raw Water Transfer	12	60	Construct a pipeline at Ouse abstraction intake to transfer water using an existing licence to River Derwent Water Treatment Works 1.	

Table 3.4: Long-term drought options

Since 1996 we have improved our grid system and the ability to transfer resources around the region. These improvements mean a repeat of the 1995-1996 drought would not require us to consider a transfer from Northumbrian Water. However, to ensure we have options available in a severe drought, not previously experienced in Yorkshire, we include long-term drought options in our Drought Plan.

A three-year drought has never been experienced in the Yorkshire region since reliable records began, and there is a very low probability (greater than 1 in 400 years return period) of such an event occurring. Nevertheless, in accordance with national drought planning guidance, it is important for us to demonstrate that we have considered what actions could be implemented if such an unprecedented severe drought were to occur in the future.

We have a supply-side option that involves reinstating a previously discontinued resource at North West Area Reservoir 10. This would require reinstating assets to transfer the water to a treatment works. As with all our options, the water would only be put into supply if there are no environmental, safety or drinking water quality risks, in accordance with the Water Supply (Water Quality) Regulations. The assets will be assessed prior to implementation to determine the risk to water quality and the environment. If any risks are found that cannot be mitigated the source will not be used. We will consult the Environment Agency, Natural England and Drinking Water Inspectorate (DWI) during the assessment process.

Section 0 of this Drought Plan discusses an unprecedented scenario in which some long-term drought options would be implemented. In this scenario, the decision to implement long-term drought options is made in the second year of an extreme drought and an abstraction from the River Aire plus either the Ouse Raw Water Transfer or Tees transfer pipeline options are selected. Each drought event will be different, and the magnitude and duration cannot be predicted. The timing of implementation and the option(s) selected from Table 3.4 will be dependent on the drought situation as it develops.

When selecting which options to implement in a drought lasting more than two years, we would consider yield availability and where in our supply system the additional yield was required. Depending on which areas are most affected by a drought, the yield for some options may not be available and we would have to discount these. Our grid system allows us to transfer water around the region, but in a drought situation we would still need to consider where additional resource was most needed and select the most appropriate option for that area.

In Appendix 5 we have included the potential risks associated with implementing individual options and the risks to the environment that we would need to consider in a drought when determining the feasibility of each option.

The timescales for implementing each option will also determine the feasibility of a scheme. Appendix 5 gives an estimate of the time to implement each scheme. These timescales allow for planning and environmental assessment (see Section 4) as well as construction. In the scenario presented in Section 0 some of these options would not be completed in time to be available in a third year of drought. However, we may consider implementing schemes if there is a risk the drought could last longer than three years. Where resources allow, we may consider implementing more than one of these options.

We have identified appropriate planning requirements and Local Authority planning authorities who would give the required permits and approval for the long-term drought options. Details are provided in Appendix 5. This allows compliance with Drought Plan (England) Direction 2016 (Direction 3 (1) (c)). Before submitting drought order or permit applications we will review the permissions required.

We will discuss these schemes with the relevant planning authorities when we are moving into a long-term drought situation and the implementation of one or more of these schemes looks to be becoming more probable. We have strong relationships with the planning authorities in Yorkshire and discussion around permits and approvals could be quickly arranged when appropriate.

The trigger to contact the local planning authorities would be the second year of drought where reservoir stocks are forecast to reach six weeks from the DCL. We would contact the relevant planners to arrange a meeting to discuss our proposals and the required permits and approvals.

3.12 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 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. The agreement secures a maximum of 21,550Ml per year (59Ml/d annual average) until March 2084.

Severn Trent Water's draft WRMP19 included plans to reduce the volume of water available under this agreement in 2028 to mitigate the impact of sustainability reductions and climate change on available resources. Following publication of its draft plan Severn Trent Water has reviewed the situation and is no longer proposing a reduction in the water available to Yorkshire Water.

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 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. There is provision in the agreement to modify these rules and this was carried out in 1995-1996 and in 2003.

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 3.1 below. Severn Trent Water operates using several control lines, and the amount it takes depends on where reservoir stocks lie in relation to its "storage alert line". 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. This is to ensure we maintain our current levels of service as described in Section 1.4.

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.

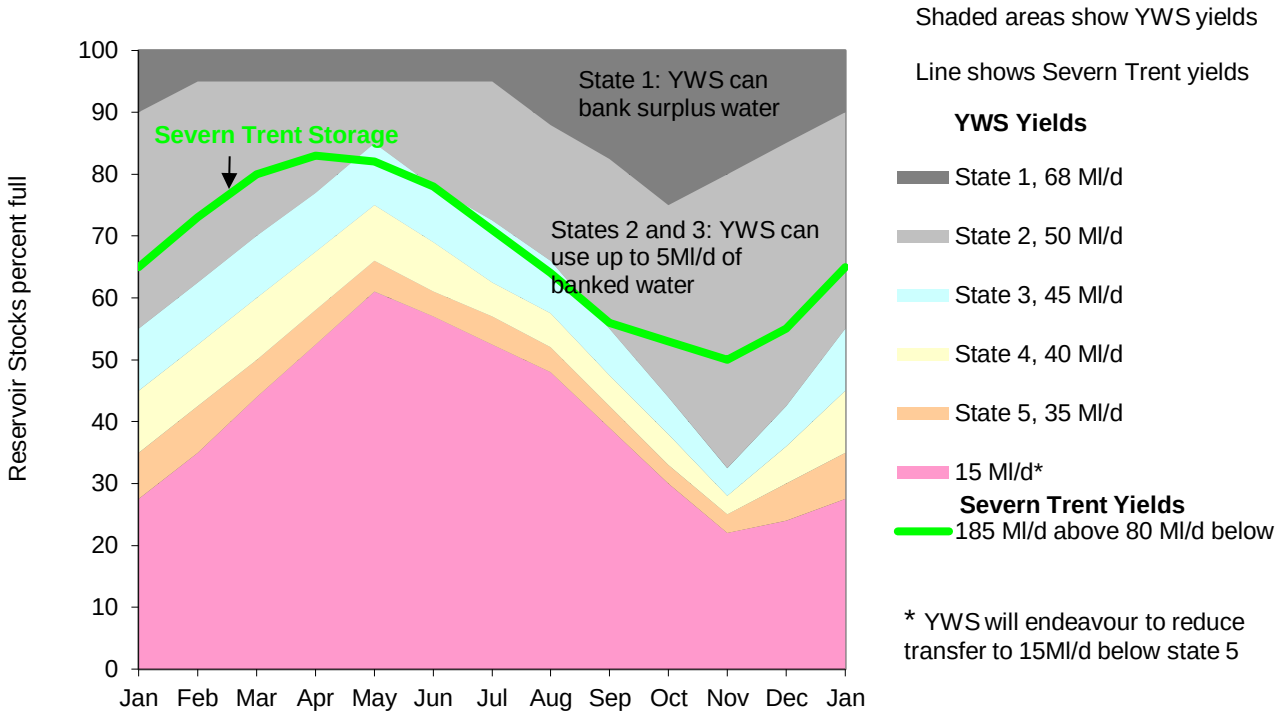

Figure 3.1 Severn Trent reservoir control lines and yields

3.13 Northumbrian Water transfer option

We have a long-term drought option to transfer water into our region from Northumbrian Water's abstraction on the River Tees. This option could only be implemented if Northumbrian Water was able to provide the water at the time it was needed. Northumbrian Water has stated in its Drought Plan that 40Ml/d is potentially available for transfer to our region in a historic drought scenario.

The Yorkshire Water Tees transfer drought option, including environmental impacts, are based on a transfer volume of 40Ml/d. However, the feasibility of a Tees Transfer option would need to be considered in a drought situation and is dependent on;

- Northumbrian Water's own customers' needs
- Any other bulk supply agreements Northumbrian Water may have in place during a drought
- Water availability in the River Tees and its supporting reservoirs
- Conditions specified in the Northumberland Reservoir 1 operating agreement held with the Environment Agency.

If resources were available, in the event of a drought, Yorkshire Water and Northumbrian Water would need to agree the transfer volume and terms and enter a bulk transfer agreement prior to

implementation of any scheme by Yorkshire Water to import from the River Tees. This would be done in consultation with the Environment Agency and Natural England.

In the event of a bulk supply agreement with Northumbrian Water being put in place, our Drought Plan will be updated to include the terms for using the import and to assess the impacts on our drought scenarios presented in Appendix 1.

There are two alternatives for transferring this resource to a treatment works near York. One option is to transfer it via the Rivers Swale and Ouse. The other is to transfer it via a pipeline. Implementation of the transfer options is likely to be more than 12 months, due to procurement, construction and planning timescales. When considering long-term options during a drought we will review the feasibility of implementing the pipeline or the river transfer option within the timescales available.

We will consider the inter-company bulk transfer and other long-term drought options included in Table 3.4 in a second year of a drought, if reservoir regional stocks are six weeks away from crossing the DCL. We will build on the preliminary Environmental Assessment Report (pEAR) for the Tees transfer options, completed prior to finalisation of this Drought Plan, and a full Environmental Assessment will be completed to consider any potential impacts and the monitoring and mitigation arrangements will be set out in detail.

Due to the planning timescales involved, a transfer from the River Tees is a potential option for providing additional water supplies to Yorkshire in an exceptional drought lasting three or more years. We would ensure environmental sensitivities were managed, assessed and understood as detailed in Section 4 and Appendices 5 and 6. The water would be made available under a bulk supply agreement with Northumbrian Water in consultation with the Environment Agency and the abstraction would be covered by the existing Northumbrian Water abstraction licence on the River Tees. Therefore, no drought order or permit would be required for this abstraction. However, the option to discharge to the River Swale would require a drought order to permit the discharge into the Swale.

3.14 Emergency drought orders

In the event of an exceptional 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 and, 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 include phased pressure reduction, introduction of rota cuts and supply of water by means of standpipes or water tanks.

Our level of service for emergency drought orders is 1 in 500 years and our Drought Plan aims to implement all feasible drought actions in a timely manner that would avoid the need for these measures. Therefore, the situation would only arise in exceptional drought conditions. Prior consultation and liaison with Local Authorities, the Consumer Council for Water, retailers, National Farmers Union and other stakeholders will be an important component of the planning.

3.15 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.

3.16 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 might 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 Environmental impacts

4.1 Introduction

The Environment Agency's Water company drought plan guideline requires that the Drought Plan is supported by a comprehensive level of environmental assessment. Much of this work is to be completed in advance of a drought, during the preparation of the Drought Plan, with a summary published within the plan.

The guideline 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.

According to the guideline, a water company is required to:

- Assess the potential environmental impacts of each supply-side drought management option, through undertaking a staged and risk-based environmental assessment. The environmental assessment will establish whether there are likely to be any environmental impacts from implementing the option, including whether there is a risk to the deterioration of the Water Framework Directive (WFD) status or potential of the waterbody. Further detail on the environmental assessment process is provided in section 4.2
- Prepare a monitoring plan for each supply-side drought option, providing details of any further surveys that are required to support completion of the environmental assessments, together with details of pre-drought, in-drought and post-drought monitoring requirements. Further detail is provided later in section 4.3.
- Set out the details for any data sharing and monitoring agreements. Further detail is provided in section 4.3.
- Detail the mitigation or compensation measures which may be required for each supply-side drought management option, should environmental impacts be predicted from the environmental assessments. Further detail is provided later in section 4.4.
- Determine whether any supply-side drought option, either alone or in combination, is likely to result in a significant effect on European sites, as designated under the Habitats Directive. This includes carrying out a Habitats Regulations Assessment (HRA) of the Plan, and if necessary, a Strategic Environmental Assessment. Further detail is provided later in sections 4.5, section 4.6, Appendix 6 (HRA) and the SEA.
- Provide a map showing the locations of potential drought permit or order sites together with important ecological sites that may be affected. Maps are provided in each Environmental Assessment Report.
- Provide a summary of the environmental assessment, together with potential mitigation measures for each supply-side drought management option. This is given in Appendix 5.

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 guideline. The guideline requires 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. The objective is to complete as much of the environmental work as is practical during the preparation of the Drought Plan.

We will work with the Environment Agency to agree the terms of any drought permit or drought order, to strike a balance between maintaining water supplies and protecting the environment. Selection of drought orders or drought permits, including the sequence of applications, considers a number of factors: the amount of water that the measure will make available; how effectively this water can be utilised within the grid; and the environmental impact of the measure.

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 0 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:

- Preparations of, and applications for, drought permits during the 2018 drought: Environmental Assessments together with on-set 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.

4.2 Environmental assessment

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. 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 updated drought plan guideline; specifically, Section 3 of the Environment Agency's "Drought plan guideline extra information: Environmental Assessment for Water Company Drought Plans". In addition, regular liaison with key specialists within the Environment Agency has been carried out throughout development of the plan, to ensure appropriate methodologies have been applied and all relevant potential impacts have been assessed.

As recommended by the guideline, a staged and risk-based approach to the environmental assessments has been followed, which means that the level of environmental assessment carried out for a particular option depends on the likelihood and severity of its impacts.

The suggested activities that we need to complete in order to assess the likely environmental impacts of our supply-side drought management options are presented in Figure 4.1: Environmental impacts activities flowchart below, which has been sourced from the Environment Agency's guideline.

The environmental assessment begins with an environmental impact screening exercise, which fulfils the guideline requirement to "assess how sensitive each feature is to the likely flow/level impacts caused by the supply-side drought management option". Screening involves two stages:

- Stage 1 - Hydrological impact assessment
- Stage 2 - Environmental sensitivity assessment

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 order or permit. 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.

Stage 1 determined the zone and extent of hydrological influence of each supply-side drought management option, both on an individual basis, and taking into account cumulative effects of simultaneous option deployment where options are located within the same catchment and across catchments.

Stage 1 also considered cumulative effects of other discharges and abstractions using abstraction licence and discharge consent information from the Environment Agency. Using the outputs from Stage 1, sites and features which could be impacted by the hydrological changes were identified, together with their sensitivity to those changes, based on the risk of them being impacted by the drought management option during the period of its operation (Stage 2).

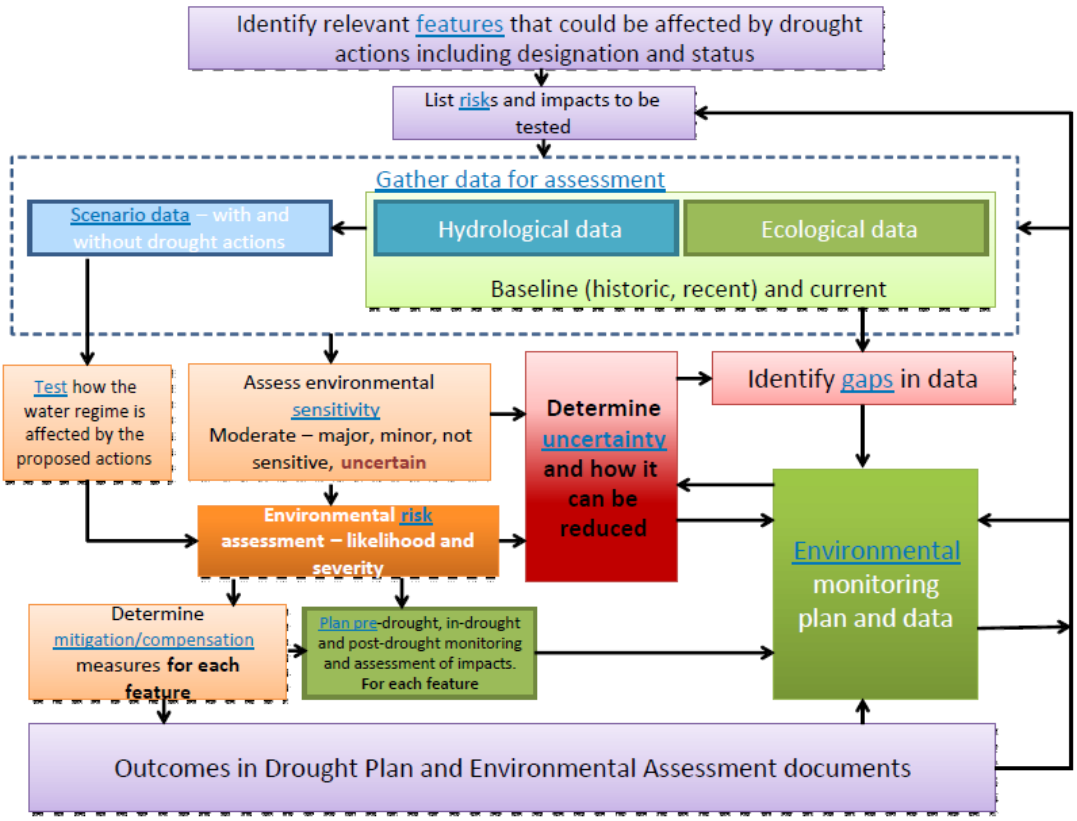

Figure 4.1: Environmental impacts activities flowchart

Sensitivity of receptors has been assessed considering the context that when drought options are actually implemented, the baseline conditions are likely to be characteristic of a severe drought. The basis for assessment therefore compares the impacts of drought option implementation against those that would occur naturally in an actual drought.

The environmental impact screening identifies the outcome for each listed feature, categorised in Figure 4.1 as either uncertain, moderate-major sensitivity, minor sensitivity or not sensitive, and identifies appropriate next steps.

In accordance with the guideline, results of the screening have also been used to inform the Habitats Regulations Assessment (HRA) and Strategic Environmental Assessment (SEA) which support our Drought Plan 2019, and are documented separately. See sections 4.5 and 4.6.

The screening process has considered relevant data types as specified in the Environment Agency's guideline. These include:

- Hydrometric data (various modelled and measured flow data)
- Designated site citation information (accessed from JNCC and MAGIC websites)
- Water Framework Directive (WFD) status information, including status classifications for fish and invertebrates
- NERC Act Section 41 species distribution
- invasive non-native species (INNS)
- information relating to scheduled ancient monuments, recreational resources and landscape features
- Environment Agency local knowledge.

The scope, methodologies and findings of the environmental impact screening were agreed with the Environment Agency and are presented in a series of Options Impacts Screening Reports (OISRs). The outcomes are also presented in summary form within Appendix 5 of this Drought Plan. The full OISRs, whilst not published with the Drought Plan 2019, can be made available on request.

The OISRs form the preliminary stages of the environmental assessment and inform which sensitive features are to be carried forward for further assessment. Where an option includes at least one feature identified as either: 1) uncertain; 2) moderate-major sensitivity; or 3) minor sensitivity in a designated site; in accordance with the Environment Agency's guideline, these features will be screened in for consideration during further environmental assessment, monitoring and mitigation.

Where an option includes at least one feature identified as either minor sensitivity (NERC species) or not sensitive, no further work is required. For such features, the information contained within the OISRs alone will form the supporting environmental information to accompany an application for a drought permit or order.

As identified in the screening process, environmental assessment in the EARs only investigates the potential impacts of the drought option for those sensitive features which have been screened in.

The further assessment work is presented in the EARs, which are prepared in accordance with Government regulations and good practice guidance. The scope of the EARs is set out in a separate Environmental Assessment Scoping Report, the principles and methodologies within which have been agreed with the Environment Agency.

It should be noted that further to this, in support of a previous version of this Drought Plan (2017), Yorkshire Water consulted the Environment Agency and Natural England on further aspects of the environmental assessment of the drought options. Specific consultation was focussed on identifying what further assessment was required to minimise uncertainty with regards to certain features including Sites of Special Scientific Interest (SSSI) and Local Wildlife Sites (LWS).

For SSSIs, screening identified those sites which could potentially be impacted by implementation of the drought plan and they were taken forward for further assessment. For three SSSIs, the assessment concluded that the hydrological impacts from some of our ordinary drought options (and subsequent impacts on designated features of the site) were uncertain. Subsequent, hydrogeological and hydrological investigations at these sites, carried out in discussion with Natural England, concluded that the impact from our ordinary drought options on these three SSSI's was deemed negligible

For LWS, the Environment Agency Drought Plan Guidance requires that these sites are considered as part of the environmental assessment of each drought option. In support of the previous Drought Plan, and through liaison with Local Record Centres in the Yorkshire Region, potentially impacted LWS were identified in support of hydrological screening. This exercise identified certain sites within proximity to drought options which could be impacted by drought plan implementation, but which may require further investigation. With regards to the latter, further work is currently being undertaken, following discussions held with the Environment Agency and Natural England, which will feed into the "application ready" EAR's for use during the preparation of future drought permits.

EARs will provide the results of the assessment of potential impacts arising from the drought measure, and inform monitoring and mitigation actions to protect rivers, ecology and industrial

and recreational users. The EARs are not published as part of this Drought Plan, but are to be 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 in the run up to a drought and then 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.

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

Compensation release reductions**:**

- North area reservoir drought options
- South area reservoir drought options
- Calder area reservoir drought options
- North West area reservoir drought options

River abstractions:

- River Ouse drought option
- River Ure drought option
- River Wharfe drought option
- River Hull 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, as outlined within the Cumulative OISR and each EAR, with the outputs summarised in Appendix 5.

We have also carried out assessments of the potential environmental effects of the nine long-term supply-side options in discussion with the Environment Agency and Natural England. In line with Environment Agency guidance, environmental impact screening reports have been completed for each of the nine options, categorising impacts as either uncertain, moderate to major sensitivity, minor sensitivity or not sensitive. The outcomes are summarised in Appendix 5.

The assessments provide the basis for setting out the further baseline information that is required to address uncertain impacts, as well as to define the likely environmental monitoring that would need to be put in place during a drought (as defined in the Environmental Monitoring Plan – see section 4.3).

As these options would be implemented after at least two years of a prolonged drought, the more detailed EARs would be developed and finalised as necessary, prior to triggering construction activities and making any applications for drought permits or orders where this is required.

4.3 Environmental data provision and monitoring plan

To monitor the effects of any implemented drought measure, the guideline requires that an Environmental Monitoring Plan (EMP) is developed. The EMP uses outputs from the EARs to

confirm the features for which further monitoring is required, and is designed to differentiate the impacts of the drought measure from those of natural drought. It would monitor the range of potential receptors in the reaches that would be affected by the drought measure, to identify effects and, where necessary, trigger the introduction of mitigation measures.

The EMP sets out in detail any additional baseline monitoring required to fill data or information gaps. It also identifies the locations at which monitoring will be undertaken, the frequency and the organisations responsible for carrying out the monitoring. The EMP has been produced as a separate document, which is not published with the Drought Plan. However, a summary of the approach is provided below and copies of the EMP can be made available on request.

The approach within the EMP is staged, so that the coverage and frequency of monitoring is progressively increased as the drought proceeds, low flows are experienced and the potential for impact from the drought measure increases. The triggers for increasing this targeted monitoring are based on flow and have regard to the most sensitive receptors. As flows recover, so monitoring intensity decreases, extending into a drought recovery period. The duration and content of the post-drought monitoring will depend on the severity of impacts detected 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 Regional Drought Co-ordinator and Fisheries and Environment Teams.

Baseline monitoring within each of the rivers potentially affected by a drought measure is an essential part of the EMP and the EARs. A large amount of baseline monitoring of the rivers in the Yorkshire region is routinely carried out by both the Environment Agency and Yorkshire Water. This includes biological monitoring in the form of macro-invertebrate, fish and River Habitat Surveys, chemical water quality monitoring and flow gauging.

It should be noted that further to recommendations made in the EARs as part of the previous Drought Plan process, we undertook baseline monitoring from 2015 to 2018. This will be supplemented with additional monitoring, as recommended in the 2017, 2018 and 2019 Drought Plan EARs, during the implementation of any drought permit.

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 ourselves is made available to the other organisation on a six-monthly basis against an agreed data schedule set out within the EMP. We will 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.

We will also meet with Natural England on an annual basis to discuss and agree any additional monitoring required for protected sites that is beyond Natural England's condition assessment monitoring programme.

4.4 Environmental mitigation measures

The Environment Agency's water company drought plan guideline 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 4.2) 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 5. The Environment Agency and other relevant parties will also be consulted further, prior to applying for an individual drought permit.

Details of potential mitigation measures and targeted monitoring are provided in Table 4.1. Please note that “potential mitigation option” is a separate list to “potential targeted monitoring” and the table is not intended to be read as discrete rows. The EMP provides further details on these mitigation measures, including any permissions or permits required. The mitigation measures, along with the drought monitoring, are based on experience from previous droughts in Yorkshire or other parts of the UK, providing assurance that they will be sufficient to protect the environment during drought.

Potential Mitigation Option		Inverts (WFD)	Fish (& WFD)	F-L pea mussel	Otter	Water vole	W-C crayfish	Potential targeted monitoring
Working with form and function	Creation of alternative refuges in deeper water						x	Walkover survey to identify and characterise pools at low flow prior to DP
	Provision of in-stream structures and flow baffles to create functional refuges to support flow sensitive taxa.	x	x					Ground-truthing of Lidar data of pools at low flow prior to DP
								Walkover surveys with fixed point photography
	Artificial channel narrowing to provide functional refuges to support species and enable swift re-colonisation.	x	x	x	x			Walkover survey to locate flow types (notably riffles) at low flow prior to DP
Structural modification	Modification to barriers and/or flows to improve passage		x					Walkover survey to identify and characterise in-channel barriers at low flow prior to DP
	Screening of intakes to reduce entrainment with regular inspection		x				x	Walkover survey to characterise barriers under DP conditions
								Visual inspection of screens
	Provision of freshets to ensure fish are capable of migrating		x					Installation of underwater cameras at barriers
Operations and maintenance	Gravel washing		x					Review of routine EA water quality monitoring data (WFD compliance) immediately following analysis
	Enhancement of WwTW treatment to improve quality of discharged effluent		x					Review of routine EA ecological monitoring data (WFD compliance) immediately following analysis
	Aeration of watercourse (note: limited benefits except for use in ponds. To discuss with EA prior to consideration)	x	x		x	x	x	Deployment of fine sediment traps with routine inspection programme
	Appropriate techniques to prevent transfer of invasive species					x	x	Programme of water quality monitoring (in situ analysis - DO, temperature, ammonia, turbidity, conductivity, pH)
	Appropriate vegetation control techniques	x						Programme of water quality monitoring (lab based analysis - BOD, ammonia, suspended solids)
	Piscivorous bird scarers		x					Fixed point photography of margins/in-channel vegetation
								Avian survey (piscivorous birds) during DP
Water management	Artificial freshets to provide temporary flow regimes		x	x	x	x	x	Walkover surveys to locate areas of flow sensitive habitat at low flow prior to DP
	Gradual phase-in of reduction in water volume/flows to avoid stranding of individuals						x	Walkover surveys to locate areas of flow sensitive habitat at low flow at the time of DP implementation
	Gradual phase in of compensation release increases to avoid stranding or displacement of individuals	x	x		x	x	x	Targeted visual inspection at the time of DP implementation at flow sensitive physical habitat
	Temporary reduction in volume of abstraction or increase in compensation release	x			x			Visual observation of spawning habitat
	Artificial freshet releases to provide temporary variation in the flow regime		x					Fixed point photography during walkovers

Potential Mitigation Option		Inverts (WFD)	Fish (& WFD)	F-L pea mussel	Otter	Water vole	W-C crayfish	Potential targeted monitoring
Ecological Interventions	Capture and relocate individuals across significant barriers, taking into account migratory periods		x			x		Fisheries surveys at low flow prior to DP implementation
	Rescue of individuals or groups, in consultation with the EA or NE as appropriate		x					Walkovers for monitoring of spawning and nursery habitats prior to DP implementation
	Restocking using juvenile lamprey ammocoetes within the catchment		x					Walkovers for monitoring of spawning and nursery habitats during DP implementation
	Restocking using offspring from broodstock from the catchment		x					Fisheries surveys at low flow after DP implementation
	Restocking of coarse fish from the catchment		x					
	Navigation controls in the channel to reduce disturbance damage upon vulnerable species and/or populations	x	x					

Table 4.1 Potential mitigation measures and targeted monitoring

4.5 Habitats Regulations Assessment Screening

As set out in the drought plan guideline, 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 no 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.

A copy of the HRA Screening report for this Drought Plan is provided in Appendix 6. Stage 1 HRA screening of the Drought Plan 2019 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. Similarly, the Stage 1 HRA screening also concluded that likely significant effects on the South Pennine Moors (Phase 2) SPA could not be ruled out as a result of the construction activities associated with the new pipeline for the Aire Abstraction long-term drought option. An Appropriate Assessment was undertaken for both options. The Appropriate Assessment concludes 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 Appropriate Assessment also concludes that, with the incorporation of suitable mitigation measures, the construction activities associated with the Aire Abstraction drought option will not have adverse effect on the qualifying features of the South Pennine Moors (Phase 2) SPA.

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.

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.

4.6 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.

The SEA Directive (2001/42/EC) requires a formal environmental assessment of certain categories of plans and programmes which are likely to have significant effects on the environment. The aim of the SEA Directive is “to provide for a high level of protection of the environment and to contribute to the integration of environmental considerations into the

preparation and adoption of plans and programmes, with a view to promoting sustainable development".

The Government's SEA Practical Guide was used to evaluate whether SEA should be undertaken on this Drought Plan, in accordance with the flow diagram shown in Figure 4.2. 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.

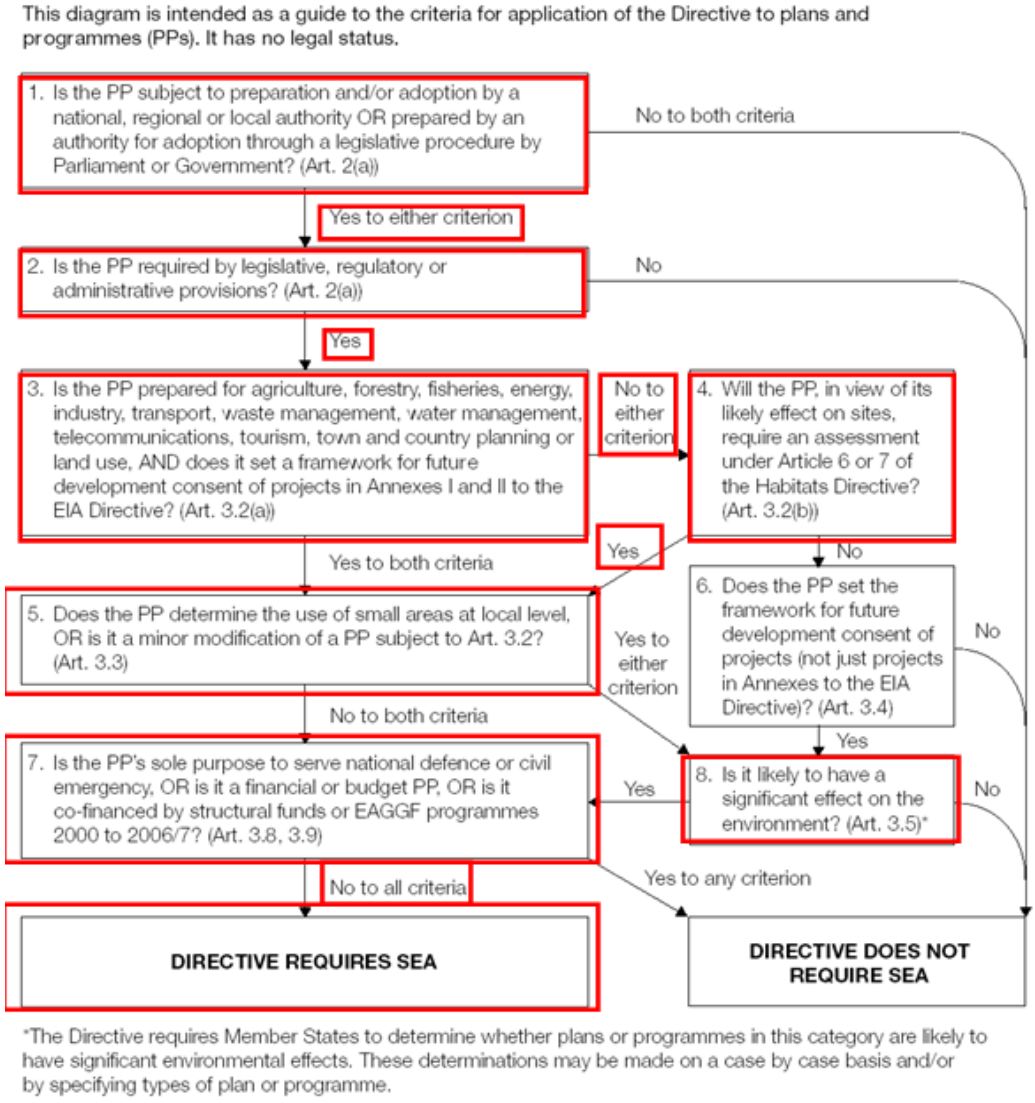

Figure 4.2: Application of SEA Directive to plans and programmes

4.7 Use of 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. As the SEA assessments

developed, we also discussed how the SEA findings, along with other evidence, influenced the drought planning process.

Using objective-based criteria, the SEA helped to consistently assess all of the demand-side and ordinary supply-side options in the Drought Plan, including the long-term supply-side options.

The SEA assessment of the demand-side option supports the ordering and sequencing of implementation of these options relative to supply-side options set out in the Drought Plan. The impacts of water use restrictions on customers and the local economy become more severe as the scale of water use restrictions widen. It is therefore appropriate that a drought order to prohibit non-essential water use is only implemented once reservoir storage falls below the DCL.

An emergency drought order to restrict supplies to customers through rota cuts or standpipes has significant risks of adverse impacts on public health, social welfare and the regional economy. It would therefore only be considered as an option in an exceptionally severe drought, one that would far exceed the severity of any recorded historic droughts in Yorkshire. All other appropriate supply-side options, including the long-term supply-side options, would need to be implemented before implementing an emergency drought order.

The SEA assessment of the supply-side options indicated the relative impacts of each option. This information has informed the development of this Drought Plan and will equally help in making decisions during a drought as to the sequencing of implementing supply-side options.

The SEA indicated those supply-side options with a lower level of environmental impact that should be considered for implementation in the first stages of a developing drought. Options with a greater environmental impact would be implemented if the drought intensifies. If the drought extends into an unprecedented third year, the long-term supply-side options set out in this Drought Plan would need to be considered taking account of the SEA assessments, as well as wider factors such as the spatial distribution of drought impact, the prevailing environmental conditions and the time of year. Other factors, such as drinking water quality risks (which are already considered when applying for a standard drought permit / order option), will also need to be taken into account.

4.8 SEA findings

Ordinary supply-side drought options

The assessment of ordinary supply-side drought 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 North West Area Reservoir 12, Calder Area Reservoir 1, South Area Reservoir 4 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 moderate; with North Area Reservoir 2, Huddersfield Canal and the River Ouse abstraction options performing best on this SEA objective. The North Area Reservoir 2 and North West Area Reservoir 7 options would only have minor adverse effects on biodiversity, flora and fauna, while all the other options would be associated with at least 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, Wharfe and Hull River 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.

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 10, the East Yorkshire Groundwater Option 2 and North Yorkshire Groundwater increased abstraction options perform best across these objectives as they do not require large scale Tees – Derwent Pipeline and Ouse options, would also be associated with the lowest adverse effects on biodiversity, flora and fauna.

The environmental implications of the Tees-Swale (river 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.

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 SEA provides information on the relative environmental performance of alternatives, and is intended to make the decision-making process more transparent. The SEA can, therefore, be used to support the timing and implementation of drought options within the Drought Plan.

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.

5 Management and communications strategy

5.1 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 the Company Risk Management Team (CRMT). This team will be formed no later than when regional reservoir stocks reach the Environment Agency early warning trigger line. The CRMT will be chaired by the Asset Strategy Manager and include representatives from teams responsible for managing resources, optimising supplies and managing our assets. CRMT will meet weekly until stocks recover.

CRMT 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 CRMT 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 communications.

If the drought situation continues CRMT will be escalated, and a Company Incident Management Team (CIMT) will be instigated. The CIMT 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 CRMT and additional input from customer services and legal services. CIMT 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 5.1 gives the criteria for moving from CRMT to CIMT. 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, CIMT will be escalated to CMT (Crisis Management Team). The CMT will include all contacts included in CIMT and be headed by the Kelda Management Team (KMT).

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 5.1 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 . 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	CRMT	CIMT	CMT
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 5.1: Criteria for Water Supply Escalation CRMT, CIMT and CMT

5.2 Communication plan

We promote water efficiency to customers throughout the year through our website, customer events, billing, mailshots and social media. In the event of a drought developing we will increase communications with our customers regarding the water supply situation and the need to reduce demand. These communications will include retailers and information relevant to non-household customers.

Publicity would start well before a drought develops to encourage water conservation and keep customers and stakeholders informed. Full details of our Drought Communication Plan are given in Appendix 8.

The nature of forward contingency planning is that publicity is considered early. The critical factor is the weather pattern, particularly rainfall and high temperatures, and it’s important we choose appropriate messaging based on the developing situation.

We encourage our customers to use water wisely at all times by providing free water saving devices and advice through our website and other media. During periods of hot, dry weather its important that we communicate there is an increased need to save water. In 2019 we are

introducing a new water saving campaign strategy that aims at reducing both long-term demand for water and temporary peaks in use related to weather conditions.

When demand increases in dry weather it's important we react to the conditions early and that we can be flexible to changing weather patterns. To do this, we have developed our "traffic lights system", an intelligent data initiative that looks to tailor and target messages at audiences based on key water use influencing factors, such as demand, resources and weather.

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. The messages will also use forecast weather conditions to tailor the messages to ensure they are relevant.

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.

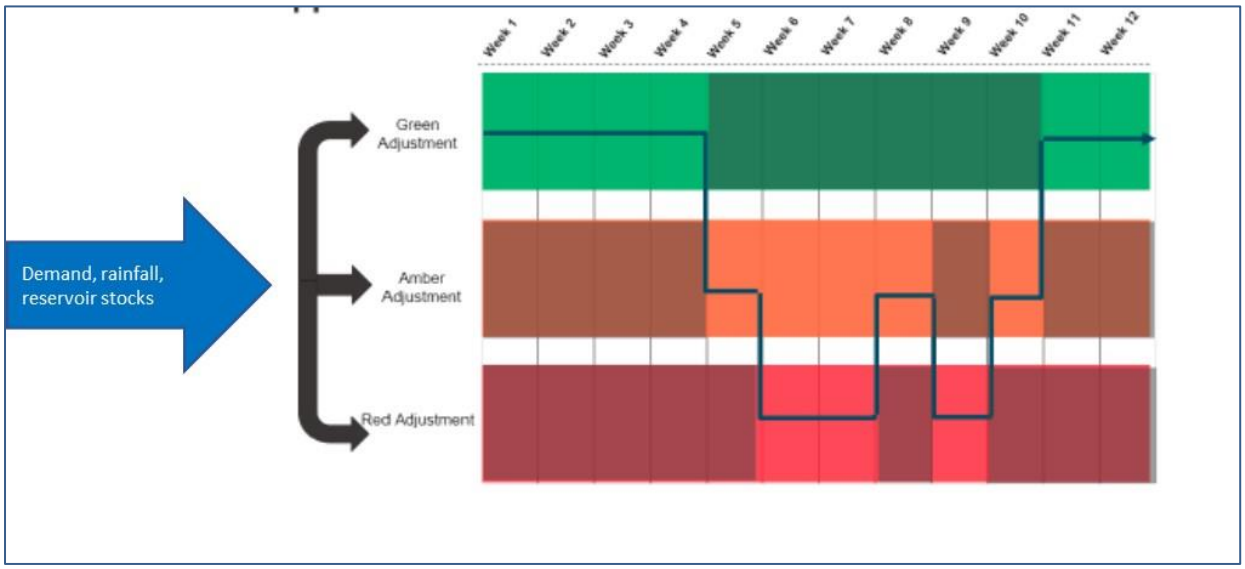

Figure 5.1 Communications traffic lights system

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 reach reservoir control lines and before we are in a drought. 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 return to our normal "green" campaign level of communication.

To increase water efficiency, we will 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.

When reservoir stocks are forecast to be within six weeks of crossing the DCL we will initiate the implementation of temporary use bans in the summer months. Notifications will 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.

It is likely that the level of calls to the customer contact centre will increase during a period of drought. 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 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 Post-drought 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. When reservoir stocks initially increase above our normal control line, 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.

Discussions and regular meetings with our local Environment Agency contacts will be ongoing throughout the drought. We will 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.

Where necessary we will model a range of rainfall scenarios to assess the risk of continued 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 actions and decisions. These triggers will be used to determine when we think the end of a drought has been reached.

De-escalation timetables for lifting demand restrictions and drought orders / permits would be discussed with the Environment Agency at regular intervals. 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. If reservoir stocks recover following submission of drought permit/order applications, we may withdraw the applications and will publish notices and notify interested parties of this.

Any restrictions on use would be lifted when the risk of seeking further drought measures passed. Customers will be informed when restrictions on use are lifted through local meetings, press releases and our website.

If drought permit/order actions have been implemented we will carry out post drought monitoring of the sites impacted as outlined in our EMP (see Section 4 for more information on our monitoring commitments). 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 Regional Drought Co-ordinator and Fisheries and Environment Teams.

7 Reviewing drought plan performance

Our Drought Plan incorporates experience gained during the 1995-1996 drought, periods of dry weather during 2003, 2010 and 2012, and most recently the 2018 drought. During 1995-1996 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. However, in 2018 we did apply for two drought permits, that were granted but not used.

In the winter of 2018 a severe cold spell (the “Beast from the East”) resulted in high winter demands as clean water distribution pipes froze, which led to bursts during thawing. In 2018 we experienced exceptionally high summer demand and prolonged dry weather. During dry weather we aim to maximise river abstractions in order to conserve reservoir stocks for later in the year. During June and July 2018, we were required to draw heavily on reservoirs and rivers simultaneous in order to meet the prolonged high demand. This depleted both our reservoir stocks and our permitted annual abstraction volumes, which are limited by licence agreements

Between October and December 2018, we submitted winter drought permit applications to reduce compensation releases from reservoirs in our South Area group and to increase the annual abstraction from two river abstractions in our region. The applications were to aid reservoir refill over the winter and to provide additional resources if we experienced exceptionally high winter demands caused by “freeze-thaw”. In late November and December, we received sufficient rainfall recovery that we withdrew the South Area reservoir applications. We continued with the river permit applications to ensure we were resilient to the risk of high winter demand, however, following a mild winter they were not implemented.

Dry periods experienced in more recent years have helped test our drought planning and management activity and we have incorporated these events into our WRAPsim modelling to provide drought scenarios as discussed in Section 2. Data recorded in 2010 and 2011 was used to recalculate reservoir control lines. When we have updated our demands, inflows and control lines using data up to 2018, we will incorporate this into subsequent drought plans and WRMPs.

We have incorporated lessons learnt by other water companies during the drought in the south of England in 2005/06 and United Utilities in 2010. Our demand-side options incorporate demand savings from the UKWIR report *Managing through drought: code of practice and guidance for water companies on water use restrictions – 2013,* which is based on experience gained by other water companies in droughts.

Each year we will review our Drought Plan, environmental assessment reports and monitoring plan, regardless of whether or not a drought has occurred.

Each drought we experience is different to previous droughts and can often create new challenges and lead to further learning. Following the 2018 drought we have reviewed the circumstances during the drought and the implementation of our Drought Plan and identified measures we can take to make our plan more resilient to future dry weather events.

We have provided the Environment Agency with a "lessons identified" report, as required in the *Environment Agency water company drought planning guideline,* 2015. The key measures identified and addressed in this Drought Plan are listed below

- The rapid decline of reservoirs stocks as a result of unprecedented prolonged high demand in 2018 meant drought actions were required earlier than our scenarios based on previous droughts. We have added additional triggers to address the following;
    - ensure enhanced customer communications are triggered by high demand as well as falling reservoir stocks - see Table 2.3
    - allow more time for the preparation of drought permit applications by commencing on-set of drought walkovers trigger earlier – see Table 2.3.
    - Link reservoirs that cannot be supported by other reservoirs to a local trigger in addition to the regional trigger to ensure timely application of permits – see Appendix 5
- We applied for two drought permits in 2018 that were not included in our Drought Plan. These have been added to this Drought Plan as ordinary supply-side options.
- Further information or clarity was required on some aspects of the supply-side options, such as winter drought permits, reservoir options related to minimum maintained flows or statutory control lines. The details in Appendix 5 have been updated to reference these issues.
- The Yorkshire Water drought management structure has been revised.
- Updated environmental components of the Drought Plan to include the two new options and to ensure consistent with all of the above, where applicable.
- Reduced the period in which we will impose temporary use bans from April to October to April to September. This has been done as the activities that are restricted under a temporary use ban, such as garden watering and use of paddling pools are unlikely to occur this late in the year. Our demand data shows summer demand increases are between the months of May and August. Other factors that lead to increased demand such as sunlight and temperature will also be low in October. Demands do not typically increase markedly in April, but we have kept the start of the temporary use ban season in April as there is likely to be some garden watering at the start of the growing season in a dry spring.
- We have clarified a non-essential use ban would only be imposed in the summer months for similar reasons to the above and also, in line with the Code of Practice, we apply a phased approach to restrictions on use and would implement a temporary use ban prior to a non-essential use ban.
- Two long term options have been removed. An option to reinstate a treatment work has been removed due to the condition of the remaining infrastructure being in disrepair and

the desalination option has been removed due to insufficient time to assess the requirement for disposing of waste and to carry out an appropriate assessment.

As mentioned above, in 2018 we applied for two drought permits, which were granted by the Environment Agency but were not options in the previous iteration of our Drought Plan. The permits allowed a temporary increase to the annual abstraction limits specified in licences we hold on the rivers Wharfe and Derwent. As neither option was included in our previous Drought Plan this constituted a material change and therefore a formal resubmission within six months of the change, in accordance with the Water Industry Act 1991, the Drought Plan Direction 2016 and Environment Agency and Defra Drought Plan Guidelines 2015. This Drought Plan has been produced within six months of 19 December 2018 when the first permit was granted by the Environment Agency.

We will continue to build on our learning from 2018 and will report progress through annual reviews. If further changes are required, we will update the plan when it is next revised as part of the statutory processes. Further learning includes;

- Identifying and developing new actions to support compensation reservoirs and therefore delay the need to reduce compensation flows through a drought permit.
- Removing uncertainty over a number of our supply-side actions to reduce reservoir compensation releases and the authorisation required. 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. We have added additional details to the relevant options in Appendix 5 based on our learning in 2018 and continue to work with the Environment Agency to clarify the drought action requirements.
- Reviewing our customer communications in a drought to incorporate learning from 2018 and our new customer engagement campaign, which was under development at the time of writing this drought plan.
- Reviewing our drought scenarios using data and learning from 2018.
- 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.
- Completing “application ready” permit applications (for ordinary supply side options requiring authorisation) to be finalised if required in a future drought.
- Ensuring our EARs are as application ready as possible, in line with discussions with the Environment Agency. These updates have been submitted to the Environment Agency for review during autumn 2019. Further amendments in line with the Environment Agency review will be made for the next iteration of the Drought Plan.
- Reviewing the drought permit consultation process and communications with consultees.
- Reviewing the integrity of the Yorkshire Water grid system under new scenarios based on the 2018 drought, to understand if we could benefit from further investment to strengthen our resilience to droughts. This would be considered in our next WRMP and Business Plan. Although this is to be completed for WRMP24, we have prioritised modelling to ensure there are no local areas at risk and have carried out works at a water treatment works in South Yorkshire to allow lower flows to be treated, and added operational

triggers for the use of North West Reservoir 12 for supply in order to protect the compensation release. We are also reviewing the compensation trial arrangements (and formalisation) for South West Area Reservoir 3.

7.1 Drought plan performance during a drought

During a drought situation we will continually monitor the effectiveness of our drought plan triggers and actions. As described in section 5.1 we have a drought management structure that will ensure teams are in place to monitor and react to the drought situation as it develops.

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 8.

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.

During a drought 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 also 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.

During a drought the “water supply escalation” CRMT 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. It would also accelerate any repairs required for assets that could help to maximise abstractions where required.

7.2 Drought plan performance directly after a drought

In the event of a drought occurring, which leads to implementation of our drought actions we will carry out some or all of the following activities, depending on the severity of the drought;

- 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 and produce new control lines where minimum inflows had occurred in the drought.

- If the drought resulted in a temporary use ban 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.

- The environmental impacts of the 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. This will include customer uptake of free water saving devices.

- 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, 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.

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's Water company drought plan guideline 2015.

We will review our Drought Plan 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 the Secretary of State, we will republish a revised plan within six months of the change.

The further actions identified following the 2018 drought and listed in Section 7 will be carried out in consultation with the Environment Agency and other interested parties as required. We will provide progress updates as part of our annual reviews and if applicable incorporate changes into the next iteration of our plan.

Our annual review will include a review of the supporting environmental assessments and monitoring plan. Specifically, we will consider whether there are any new designated sites or additional records for BAP species, over and above those already considered. Discussions will be held with the Environment Agency and Natural England, should any drought orders or permits have the potential to impact on designated sites.

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 the annual review.

In accordance with current legislation, we will revise and republish our Drought Plan no later than five years after the date our final Drought Plan is published or earlier if required through new legislation or a material change to the plan. In the event of a drought, this version of our Drought Plan supersedes all previous versions.

9 References

Water company drought plan guideline, Defra and Environment Agency, July 2015.

Drought orders and permits, Defra, Welsh Government and Environment Agency, 2011

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

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

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

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

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

Water Resources Management Plan, Yorkshire Water, 2014.

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

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

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.
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	An authorisation granted by the Secretary of State (England) or Welsh Ministers (Wales) under drought conditions which imposes restrictions upon the use of water and/or allows for abstraction/impoundment outside the schedule of existing licences on a temporary basis.
Drought permit	An authorisation granted by the Environment Agency (England) or Natural Resources Wales (for sites in Wales) under drought conditions which allows for abstraction/impoundment outside the schedule of existing licences on a temporary basis.
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.

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 guideline 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.
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.
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.
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 a site's integrity. A HRA will identify whether or not your actions will have an adverse effect on a site's integrity.
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

The following appendices are available in a separate document

Appendix 1 Example control curves plus scenario lines

Appendix 1.1: Drought Planning in Weekly Water Situation Report: 1995-1996 baseline scenario 1300Ml/d demand

Appendix 1.2: Drought Planning in Weekly Water Situation Report: 1929 1 season drought scenario at 1460Ml/d demand

Appendix 1.3: Drought Planning in Weekly Water Situation Report: 1929 1 season drought scenario at 1380 Ml/d demand

Appendix 1.4: Drought planning in Weekly Water Situation Report: 2 year drought at 1460Ml/d demand

Appendix 1.5: Drought planning in Weekly Water Situation Report: 2 year drought at 1380Ml/d demand

Appendix 1.6: Drought planning in Weekly Water Situation Report: Three-year drought at 1460Ml/d demand (1995-1996-1996)

Appendix 1.7: Drought response surfaces

Appendix 2 The Drought Direction 2016

Appendix 3 Drought management actions

Appendix 3.1: Demand-side drought management actions

Appendix 3.2: Drought permit and order application process

Appendix 3.3: Water use restrictions in a drought

Appendix 4 Temporary use bans consultation

Appendix 5 Supply-side drought management actions (spreadsheet)

Appendix 6 Habitats Regulations Assessment and SSSI Screening

Appendix 7 Company drought management structure

Appendix 8 Communications plan

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