REVISED DRAFT DROUGHT PLAN 2022

NORTHUMBRIAN WATER *living water*

EXCLUSIONS ON THE GROUNDS OF NATIONAL SECURITY

Northumbrian Water Limited has not excluded any information from this plan on the grounds that the information would be contrary to the interests of national security.

Under Section 37B(10)(b) of the Water Industry Act 1991, as amended by the Water Act 2003 (“the Act”), the Secretary of State can direct the company to exclude any information from the published Plan on the grounds that it appears to him that its publication would be contrary to the interests of national security.

DOCUMENT CONTROL SHEET

Report Title	Revised Draft Drought Plan 2022
Authors	NWG Water Resources Team
Previous Issues	Northumbrian Water Drought Plan (2018) Northumbrian Water Drought Plan (2013) Northumbrian Water Drought Plan (2011) Northumbrian Water Drought Plan (2007)
Distribution List	**Internal:** Applicable Management & Affected Depts **External:** As per Drought Planning Guideline **Web:** www.nwg.co.uk/droughtplan

DOCUMENT CHANGE RECORD

Release Date	Version	Report Status	Change Details
31/03/2021	1	Draft	N/A - first draft
08/10/2021	2	Revised Draft	Amendments made to Draft Drought Plan in response to consultation

DOCUMENT SIGNOFF

Nature of Signoff	Person	Date	Role
Reviewed by	William Robinson	12/10/21	Water Resources & Performance Manager
Approved by	Keith Haslett	12/10/21	Water Director

Northumbrian Water is a trading division of Northumbrian Water Limited which is a group company of Northumbrian Water Group

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NON-TECHNICAL SUMMARY

We have prepared a summary of this Draft Drought Plan which explains in non-technical language how we respond to a drought and summarises the main triggers and actions in our Draft Drought Plan. This can be found on our website:

www.nwg.co.uk/droughtplan

Additionally, Defra has prepared the following document which summarises how water companies plan for dry weather and drought to make sure they can supply water and protect the environment:

www.gov.uk/government/publications/drought-managing-water-supply

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1 INTRODUCTION

1.1 Purpose of this Drought Plan

This document is our Northumbrian Water (NW) Draft Drought Plan 2022. It has been updated following an eight-week public consultation which ended on 3 August 2021 and reflects our Consultation Statement of Response which we published on our website on 21 September 2021.

Drought plans are operational tactical manuals that detail the actions we will take during a drought. They identify how we intend to manage a future drought, what trigger levels can be used to identify when action is required, and what measures are available to support supplies when levels of service are compromised. They also outline how the effects of a drought and drought actions will be communicated to customers and take account of the need to undertake monitoring to assess the performance of drought actions.

This Draft Drought Plan builds on our previous Drought Plan 2018 and has been prepared following the Environment Agency's updated Drought Plan Guidance (2020).

1.2 What is Drought?

We live in a changing climate where droughts and hot weather are becoming increasingly likely. There are many definitions of drought. The Environment Agency (2008) defines drought as "...a period of low rainfall which creates a shortage of water for people, the environment, agriculture, or industry".

Beran (1985) defines drought as "A decrease of water availability in a particular period and over a particular area". This definition reflects the very unique nature of every drought in terms of intensity and duration but also spatial distribution.

The Environment Agency refers to both environmental droughts and water resources droughts. For the purposes of this Drought Plan, an environmental drought is where low river flows or waterbody levels have the potential to cause damage to the natural environment and local ecology. A water resources drought affects the amount of water available for abstraction from rivers, waterbodies and aquifers for public water supply.

1.3 Regulatory Framework

We are required to prepare a drought plan under Section 39B of the Water Industry Act 1991, as amended by the Water Act 2003. A full list of the guidance and legislation that we have followed in preparing this Draft Drought Plan is included in Appendix 9.

The drought planning process is effectively regulated by the Secretary of State and the Environment Agency.

Our drought planning is supported by our Water Resources Management Plan 2019 which forecasts water demand for the period April 2020 to March 2060 and documents how we plan to meet this demand. In contrast, this Draft Drought Plan considers what measures can be implemented in the short term to address temporary shortages of water resources during drought conditions.

1.4 Early Consultation

We recognise the value of early communication with the many stakeholders potentially affected by and involved in the drought management process. We have pre-consulted with key stakeholders including other water companies, the Environment Agency, Natural England, and our Customer Challenge Group, known as the Water Forum.

We wrote to our drought plan consultees on 22 October 2020 and asked for comments or feedback on our current Drought Plan. We received comments back from the Environment Agency, Natural England, NFU, Wave Utilities, Independent Water Networks Ltd and the Consumer Council for Water and have taken account of them in the preparation of this Draft Drought Plan.

1.5 Draft Drought Plan Consultation

The consultation on our draft Drought Plan took place over an eight-week period, which ended on 3 August 2021. The draft Drought Plan was available for review on our website www.nwg.co.uk\droughtplan.

The Statutory Consultees included:

- The Secretary of State, Defra
- Ofwat
- Environment Agency
- Consumer Council for Water
- Natural England

- Local Authorities within the company's supply area
- National Park Authority
- Historic England
- Navigation Authorities

Consultees were asked to send their written representations on our draft Drought Plan to the Secretary of State for Environment Food and Rural Affairs which were then forwarded on to us at the end of the consultation period.

We subsequently prepared a Consultation Statement of Response which details:

i. the consideration we have given to representations;
ii. any changes that have been made or will be made to the draft Drought Plan as a result of consideration of those representations and the reasons for doing so; and
iii. where no change has been made to the draft Drought Plan as a result of consideration of any representation, the reason for this.

If our responses to the consultation comments are accepted by Defra, they will be included in our final Drought Plan which should be published on our website www.nwg.co.uk\droughtplan during 2021/22.

2 NORTHUMBRIAN WATER INFORMATION

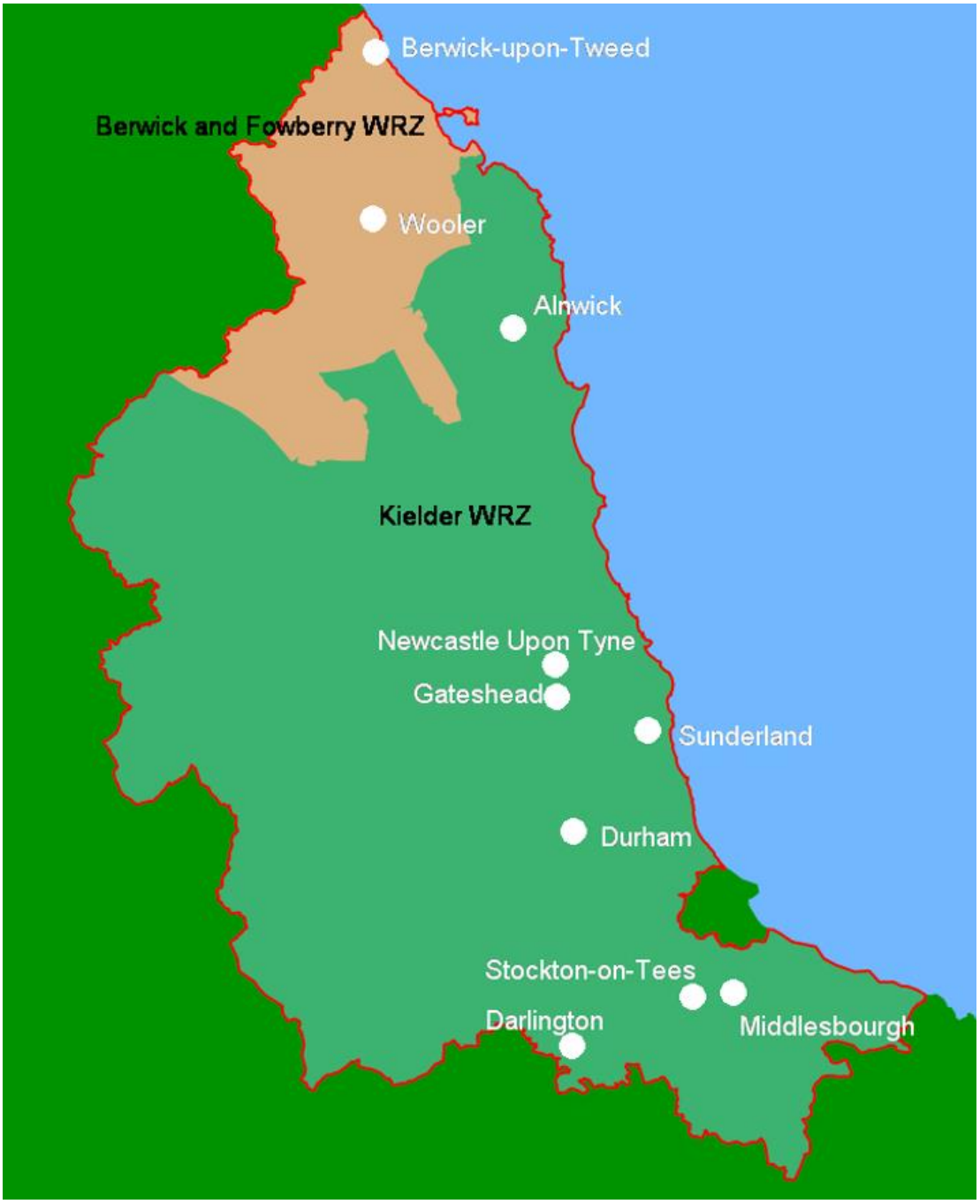
2.1 NW Supply System and Drought Management Areas

2.1.1 Overview

This section provides a high-level summary of our supply system and drought management areas.

We supply water to approximately 2.6 million customers in our supply area which extends from the Scottish border in the north to the Yorkshire border in the south and as far west as the Cumbrian border.

In accordance with our Northumbrian Water Resource Management Plan (WRMP), the supply area comprises of two Water Resource Zones (WRZ) known as the Kielder WRZ and the Berwick & Fowberry WRZ. A WRZ is defined as 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.



We will apply drought actions at a ~~Drought Management Area (DMA) which for the purposes of this Drought Plan, are the same as our~~ Water Resource Zone level.

The Kielder WRZ, which is extensive and covers most of our supply area (figure 1), has further been divided into six Operational Areas (OA). These OAs have been devised by considering the raw water network between various sources and the potable distribution network that allows water to be transferred between areas.

There are three main OAs within the Kielder WRZ, namely Tyne, Wear and Tees. They can all be supported by Kielder Reservoir via the Kielder Transfer Scheme. In addition, there are potable link mains between the Tyne and Wear OAs as well as between the Tees and Wear OAs. The other three OAs are small independent areas of supply that are reliant upon spring

sources. In the event of a drought, these three areas would be indirectly supported from Kielder reservoir via tankering potable water from Whittle Dene Water Treatment Works (WTW).

The Kielder WRZ also includes the Teesside Industrial supply which is a supply of screened but untreated water to a large industrial area of Teesside.

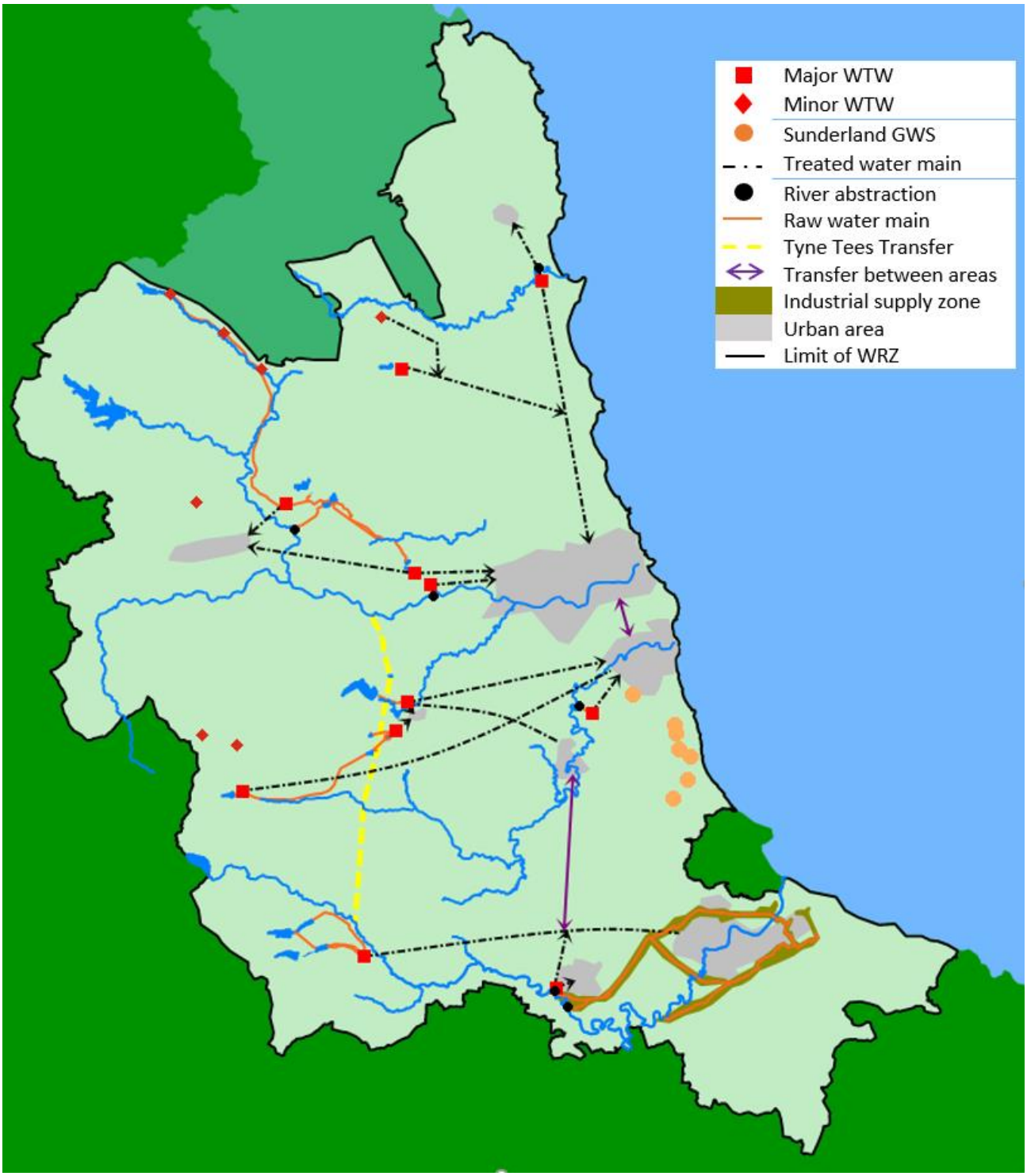


Figure 1: Kielder Water Resource Zone

A description of each Water Resource Zone is provided in the following sections.

2.1.2 Kielder Water Resource Zone

The Kielder Transfer Scheme (figure 2) consists of:

- Kielder Dam and associated headworks including release valves and hydropower plant;
- Bakethin Dam;
- a weir and pumping station at Riding Mill on the River Tyne;
- a rising main from Riding Mill to Letch House;
- Airy Holm pond;
- a tunnel from Letch House to Frosterley on the River Wear and Eggleston on the River Tees (called the Tyne-Tees tunnel);
- a connection from the tunnel into the River Derwent and an abstraction into Mosswood WTW; and
- a licensed abstraction from the Tyne-Tees tunnel air shaft at Waskerley.

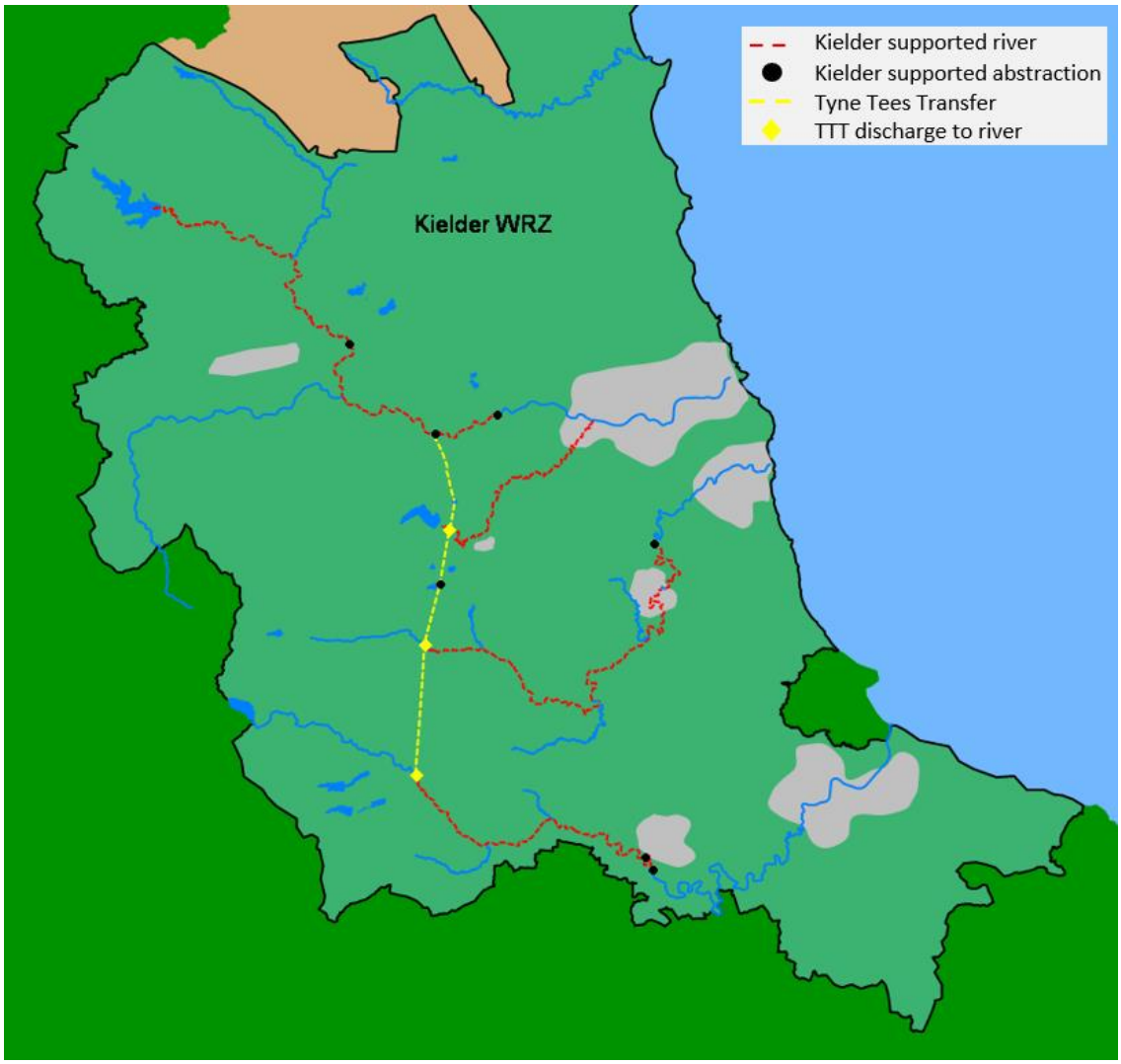


Figure 2: Kielder Transfer Scheme

The Kielder Transfer Scheme comprises of all the assets including and beyond the pumping station at Riding Mill in the River Tyne.

The North Supply Zone uses the Rivers North Tyne and Tyne by taking water at Barrasford and Ovingham intakes, whilst the Central and South Zones use the Kielder Transfer Scheme.

Riding Mill pumping station contains four pump units, each with a nominal fixed capacity of 90 Ml/day. A combination of up to three units can be used to supply 270 Ml/day which is around 50% of total raw water requirements for the Central and Southern areas. The rising main from Riding Mill to Letch House is 6.2km in length and 2 metres in diameter and the pumping head is approximately 205 metres. The gravity tunnel from Letch House to Eggleston on the River Tees is 34km long and 2.91 metres in diameter. The rising main and tunnel are designed to remain charged.

A dam forms a head pond on the tunnel system to correct any imbalance between rates of pumping and outlet discharge. It has a capacity of 450 Ml and inflow to and draw-off from the tunnel is by means of a 5m diameter shaft connected to the reservoir floor.

A cross connection linking the tunnel with Mosswood Water Treatment Works (WTW) can provide a substitution for the Derwent Reservoir resource and thus support water resources in mid-Durham.

The principal objective in the design of the Kielder Scheme was to augment the water resources of the Tees basin to meet the then rapidly increasing demand for water, primarily for industrial use. Although the forecast industrial demands have not materialised, there are clearly advantages of a strategic regional back up. Whilst the volume of transfer through the tunnel to the Tees has been limited to small amounts, the availability of support has enabled the cheaper local sources to be used more effectively, and to be drawn down further, without the necessity to place restrictions on water use.

The principal regulating reservoir in the Tees catchment is Cow Green which provides the full required support for prescribed flows and abstractions under normal conditions. During drought and future higher abstractions, releases may be made from the Lune/Balder reservoirs or the Kielder transfer scheme as required. The outlet portal for the Tyne-Tees tunnel to the River Tees is located at Eggleston.

Tyne Operational Area Resources

The northern part of this system is supplied from Warkworth WTW on the River Coquet, a reservoir and treatment works at Fontburn and from Tosson springs and treatment works. These are linked to the Tyne system with a potable water main and full flow from Warkworth can be replaced with potable water from the Tyne water treatment works.

For the remainder of the area water is supplied from six works, three very small works supplying Otterburn, Redesdale and Byrness with a slightly larger works at Gunnerton which supplies the area west of Hexham. Most of the water is treated at Horsley and Whittle Dene which jointly meets the majority of Tyneside and SE Northumberland demands. Raw water for this area is obtained by abstractions from the River North Tyne at Barrasford, which is

stored in a series of reservoirs, and the River Tyne at Ovingham. These are also supplemented by raw water from other impounding reservoirs.

There are also spring supplies at Carrshields and Allenheads.

Wear Operational Area Resources

The Wear Area Zone resources include an abstraction from the River Wear at Lumley WTW and two reservoirs, Derwent and Burnhope, which supply two water treatment works. Three smaller reservoirs, Smiddy Shaw, Hisehope and Waskerley supply Honey Hill Water Treatment Works. Additionally, there are several groundwater sources (boreholes abstractions mainly from the Magnesian limestone aquifer) which are situated to the east of the zone and two small spring sources to the west.

The groundwater supply system in the Sunderland area enables groundwater from one part of the groundwater abstraction network to be transferred to another area. Therefore, during a drought, if output at one borehole is reduced, groundwater abstraction from another borehole or from a surface water supplied WTW, may be increased to compensate for the shortfall.

Transfers from the Tyne-Tees tunnel can be made directly to Mosswood WTW or into the River Derwent in substitution for the prescribed compensation flow from Derwent Reservoir, thus reserving water in Derwent for future use. Discharges from the Tyne Tees tunnel can be made into the River Wear to maintain the flow in the river guaranteeing water is available for abstraction at Lumley. Water can also be abstracted from the Tyne-Tees tunnel to support Honey Hill WTW.

Tunstall reservoir is also located within the zone but no longer supplies a treatment works and is used exclusively for compensation and regulatory releases into the River Wear.

Tees Operational Area Resources

Water is pumped from the River Tees to supply Broken Scar WTW. Additional raw water abstractions are made from the River Tees to supply industrial Teesside.

Cow Green reservoir sits at the head of the River Tees and along with statutory compensation releases can be used for river regulation to support abstractions at Broken Scar WTW and the industrial demand.

The Lune and Balder reservoirs consist of Selset, Selset Weir and Grassholme on the River Lune, and Balderhead, Blackton, Hury Subsidiary and Hury on the River Balder. This group of reservoirs supply Lartington WTW and can also be used for regulation releases in support of the River Tees.

2.1.3 Berwick and Fowberry Water Resource Zone

In the Berwick & Fowberry WRZ all the water supplied is abstracted from the Fell Sandstone aquifer and there are groups of boreholes which supply two WTWs. To the west and southwest of Berwick five borehole sites supply water to Murton WTW which then provides water for Berwick and the surrounding area.

To the east of Wooler there are two borehole sites which provides water to Fowberry WTW which then supplies Wooler and the surrounding area with the treated water network stretching to Cornhill. The two WTWs areas are linked within the treated water distribution system (figure 3).

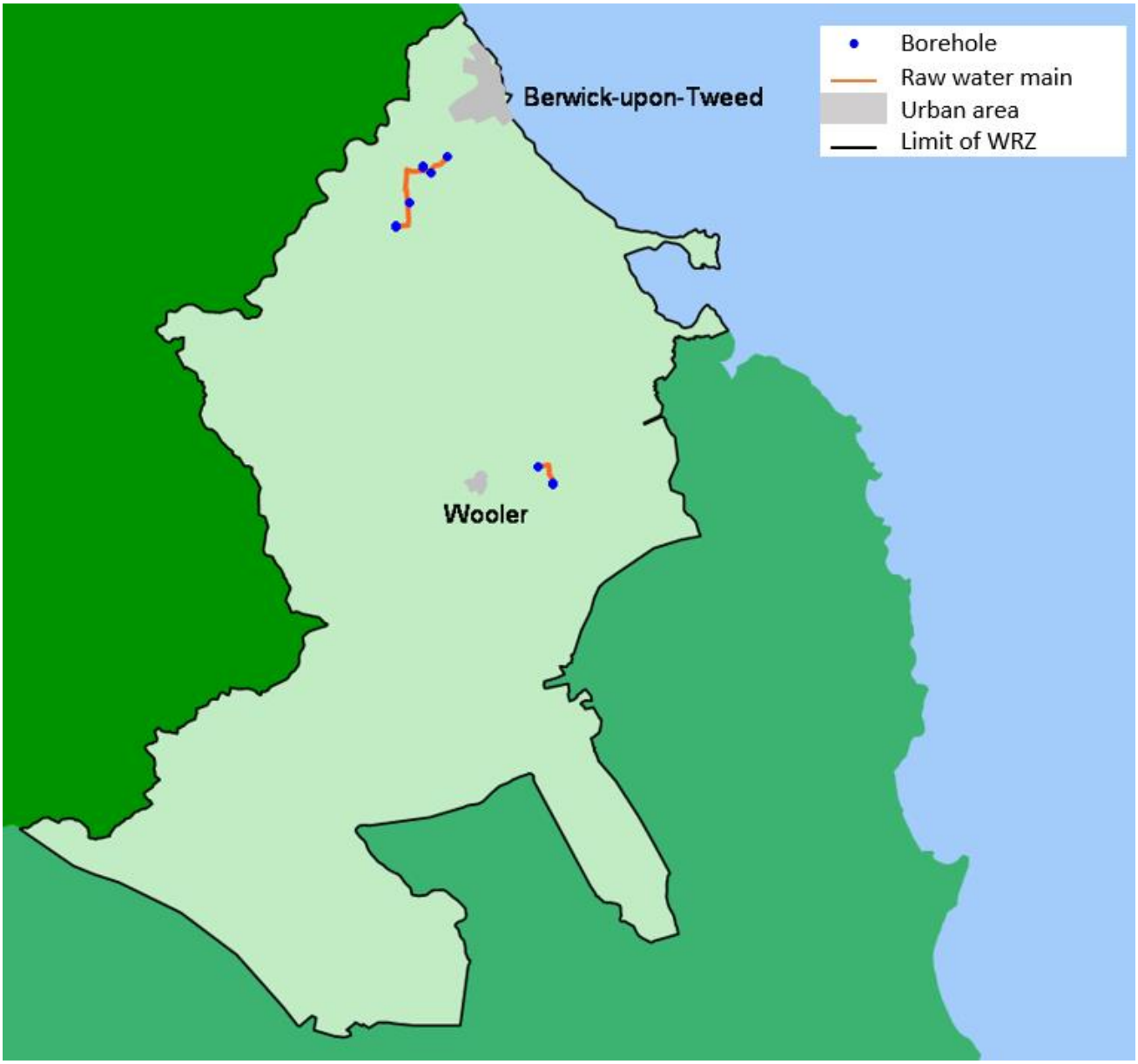


Figure 3: Berwick Water Resource Zone

2.2 Restrictions on water use and our Levels of Service

2.2.1 Overview

During long or very intense droughts we may need to place some restrictions on customer water use to ensure we are always able to maintain reliable supplies should the dry weather turn into an extreme drought. Without these levels of service, we would need to develop new water supply schemes, such as new winter storage reservoirs.

The frequency of these restrictions (our Levels of Service) have been previously agreed with our customers during the development of our previous Water Resources Management Plans, and will be reviewed again as part of the development of our next Water Resources Management Plan 2024.

Our current Levels of Service are summarised below:

Drought Action	Frequency (Return Period)	Frequency (Percentage)
Level 1: Appeal for restraint	1 in 20 years	0.05 (2%)
Level 2: Phase 1 Temporary Use Ban	1 in 150 years	0.0066 (0.66%)
Level 3: Phase 2 Drought Order Ban	1 in 200 years	0.005 (0.5%)
Level 4: Stand Pipes and Rota Cuts	1 in 500 years	0.002 (0.2%)

Our Levels of Service are presented as both a return period (e.g. 1 in 10 years) and as a percentage (e.g. 10%).

For example, our Level of Service for an Appeal for Restraint is 1 in 20 years on average, or a 5% chance. This does not mean that an Appeal for Restraint will be made with such regularity; for example, a 1 in 20 year drought event may occur 3 times in 20 years and then not again for another 40 years.

We are meeting all of our levels of service and have never needed to introduce Level 2, 3 or 4 restrictions.

2.2.2 Level 1 Appeal for Restraint

Some droughts, typically those of short duration, do not require us to place restrictions on the use of water. However, we would always ask our customers to use water wisely. However, as a period of prolonged dry weather develops, we may need to implement a Level 1 Appeal for Restraint. We would use all of our communication channels (e.g. social media and press releases) to ask our customers to Use Water Wisely.

2.2.3 Level 2 Temporary Use Ban (TUB)

As a drought develops, a Level 2 Temporary Use Ban (TUB) might be required (see Section 7.3.1 for more details). This would, for example, allow us to restrict the use of hosepipes for garden watering. Their use will still be rare and only when there is a real need.

2.2.4 Level 3 Non-Essential Use Ban

During severe droughts we may need to implement a Level 3 Non-Essential Use Ban (NEUB), sometimes referred to as a Drought Order Ban. This would allow us to place wider restrictions on the use of water including:

- Watering outdoor plants on commercial premises;
- 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; and
- Operating cisterns.

Restrictions would never be placed on the use of water for firefighting and our procedures for protecting vulnerable customers would come into force.

2.2.5 Level 4 Standpipes and Rota cuts

During an unprecedented drought, we might need to implement a Level 4 restriction to introduce rota cuts. This can only be done by applying for an emergency drought order. However, this is an emergency action and falls within the scope of our Emergency Plan and not this Draft Drought Plan.

2.3 Fire Service

Water companies have duties under Part 5 of the 2004 Fire and Rescue Services Act with regard to the provision of water for firefighting.

During minor and moderate droughts (i.e. those requiring Level 1, 2 or 3 drought actions to be implemented) we would never place restrictions on the use of water for firefighting. However, during unprecedented extreme droughts, the most severe of our Drought Plan actions is to reduce pressure within our network. This could affect the flow rate from hydrants used by the Fire Service for firefighting. Nevertheless, we would take all reasonable measures to provide adequate supplies of water for the Fire Service's use in firefighting. In the very unlikely event that network pressure reduction was required we would provide the Fire Service with as much warning as possible (a minimum of 7 days) and we would formally notify the relevant Emergency Planning Authorities.

2.4 Links to Other Plans

2.4.1 National Drought Framework for England and Environment Agency Area Drought Plans

The Environment Agency has prepared a document entitled, 'Drought response: our framework for England' which can be accessed here:

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/625006/LIT_10104.pdf.

The framework explains the Environment Agency's role and the roles of others in managing the effects of droughts on people, businesses and the environment.

The Environment Agency also has its own area drought plans which set out the metrics for determining drought status, the actions it will take during a drought and its communications plans.

We will always work closely with the Environment Agency during a drought and will continue to:

- share monitoring data;
- consider the various stages of drought with regard to our own Drought Plan;
- provide regular water resource updates;
- work closely with the Environment Agency's communications teams and where appropriate issue joint communications with the Environment Agency and other stakeholders.

2.4.2 Regional Water Resources Groups

Overview

Our local regional Water Resources Group is Water Resources North (WReN). We are a core member of WReN and are currently supporting the development of the first draft of the WReN Water Resources Plan, which will be submitted to Defra in August 2021. As things stand, WReN does not currently have any dry weather or drought actions that impact on our supply area. However, we will take account of any future actions that might be developed.

We have had pre-consultation discussions with neighbouring water companies including Hartlepool Water, Yorkshire Water and United Utilities.

We would consider any request to increase an export during drought on a first come first served basis and on a case by case basis, taking account of our own water resources position. We would not agree to increasing an export if it compromised our own levels of service or overall water supply resilience.

In an emergency situation, where customers of a neighbouring water company are at risk of a supply failure, we would look to support that company through the existing WaterUK mutual aid process where possible.

There might be occasions where we can operate our sources differently to benefit other water users during drought, while minimising the risk to supply. We will consider such requests on a case by case basis via waterresources@nwl.co.uk.

Regional Alignment

We will work collaboratively with other regional water companies, Water Resources North, the Environment Agency and other sectors to ensure that dry weather / drought communications are consistent and do not contradict each other. This will cover the environmental and water resources position, water efficiency messaging and the implementation of and communication around customer restrictions where there is a common water resources drought.

We will use language that is consistent across neighbouring water companies and seek to work collaboratively at a regional level, especially when imposing customer restrictions.

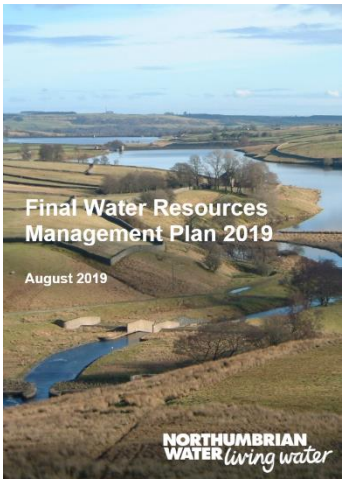
We have categorised our drought plan drought actions using the Level 1 to 4 definitions (see Section 6) and will be consistent in our language around Temporary Use Bans (TUBs) and possible exemptions. For TUBs (see Section 7.3.1 and Appendix 8) and Non-Essential Use Bans (NEUBs) (see Section 7.4.1) we have agreed common text in this Draft Drought Plan which covers, among other aspects, TUB and NEUB exemptions.

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

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

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

2.4.3 Water Resources Management Plan



We assess supply and demand in our Water Resources Management Plan (www.nwg.co.uk/wrmp) which sets out how we will provide a reliable and sustainable supply of water to our customers and is refreshed every 5 years.

Our latest plan called Water Resources Management Plan 2019 (WRMP19) covers the period from 2020 to 2060 and was prepared in line with the Water Resources Management Plan Regulations 2007 and Water Resources Management Plan Direction 2017.

WRMP19 forecasts how much water we will have available to supply our customers, taking account of future droughts, climate change and the need to protect the environment. It also forecasts how much water our customers will need taking account of future population growth. The forecasts are worst case in the sense that dry weather demands are measured against source yields defined by worse droughts on record (all of which had a return period of at least 1 in 200 years). By comparing our supply and demand forecasts in WRMP19 we confirmed that we will have reliable and sufficient supplies of water to meet customer demand over the forty year planning period.

We are currently preparing our new Water Resources Management Plan as part of a five year review known as PR24 (or Price Review 2024). We are testing our WRMP against historic droughts and also against plausible, synthetic droughts that are more impactful than historic droughts (in terms of severity and duration) with a return period of 1 in 500 years. Should the modelling of these more severe droughts cause a supply deficit we will look to address it by promoting new demand and supply schemes through our WRMP and Business Plans. The Environment Agency requires that by 2039 all water companies must be able to maintain supply during a 1 in 500 year drought (i.e. without needing to implement Level 4 drought actions).

By contrast, drought planning is essentially a prepared response to sustained dry weather (drought) conditions that have the potential to detrimentally affect public water supplies. This Draft Drought Plan is an operational tactical plan and sets out the actions we will take to manage water supplies in a drought and includes worked examples.

Drought conditions are usually manifested in the form of:

- reduced raw water availability (e.g. low river flows, low reservoir storage, low groundwater levels) and/or
- increased demand (e.g. due to increased drinking, garden watering, showering etc in dry weather).

There are direct linkages between longer term water resources planning and drought planning in terms of the calculation of all elements relating to the Supply Demand balance, which for the purposes of this document can be assumed to be consistent.

It should be recognised that the frequency of drought may increase in the future due to the impact of climate change.

Our levels of service for each of our Level 1, 2, 3 and 4 Drought Actions are the same for both our Water Resources Management Plan and this Draft Drought Plan.

2.4.4 NWL Business Plan

In our Price Review 2019 (PR19) Business Plan, which covers the period from 1 April 2020 to 31 March 2025 we included schemes covering:-

- Our metering, leakage and water efficiency strategies
- All schemes in our Water Industry National Environment Programme (WINEP).

Our baseline supply demand balance calculations have confirmed a supply surplus for both Water Resource Zones across all years of the planning horizon. Therefore, no further supply or demand management schemes were included in the Business Plan.

2.4.5 NWL Emergency Plan

Our Business Continuity Team is responsible for developing and maintaining our Emergency Plans and for ensuring that our obligations are met under the Security and Emergency Measures Direction (SEMD) 1998.

Our Business Continuity Team is represented on our Drought Management Group and would oversee implementation of Level 4 drought actions (standpipes and rota cuts) in the very unlikely event that they are needed.

2.4.6 River Basin Management Plan

River Basin Management Plans (RBMPs) set out how organisations, stakeholders and communities will work together to improve the water environment and include a series of objectives to support water bodies reaching good status.

We do not have any drought permit supply side drought actions in our Drought Plan and so believe it is consistent with supporting RBMP objectives.

2.4.7 Other Water Company Drought Plans

In our pre-consultation discussions, we met with our neighbouring water companies (Hartlepool Water, United Utilities, and Yorkshire Water) to ensure that our respective drought planning is consistent in terms of:

- assumptions regarding bulk raw water imports / exports;
- assumptions regarding potable water imports and exports; and
- communications.

2.5 Agreements and arrangements for bulk supplies and transfers

2.5.1 Potable Water

We have one potable water import and one export. The potable water import is a very small volume from United Utilities and we export a supply of on average around 1 megalitre/day to United Utilities from our Wear Valley Water Treatment Works. Neither of these transfers would be affected in a drought.

In addition to these transfers with our neighbouring water company we have 2 exports to New Appointments and Variations (NAVs) - limited companies that provide a water service to customers in an area which was previously provided by the incumbent monopoly provider.

2.5.2 Raw Water Bulk Supply

We have no raw water imports or exports.

3 DROUGHT MANAGEMENT STRATEGY AND PROCESS

3.1 Overview

This section of our Draft Drought Plan sets out our strategy and the process we will follow when responding to drought.

3.2 Drought Management Objectives

The overall objectives of our Drought Management Strategy are:

- To expedite the process of implementing a drought action;
- To identify potential drought measures that may be required in response to a range of drought conditions;
- To provide a comprehensive package of information and procedures that mean we can respond quickly to drought conditions, including collecting the information necessary for a drought permit or drought order application;
- To enable early discussion with regulators, customers and other stakeholders on our proposed response to a drought; and
- To ensure that senior leaders within our business will be provided with detailed, relevant and reliable information on which to make decisions.

3.3 Internal Management

Our Drought Management process begins with the formation of our Drought Management Group (DMG). The trigger for forming the DMG will be based on ambient supply and demand conditions and will be particularly influenced by when resource monitoring starts to indicate a potential worsening of hydrological conditions. Our key drought indicators are raw water reservoir storage and groundwater levels in the aquifers from which we abstract. These indicators, discussed further in Section 4.2, are reviewed and reported to all levels of management on a weekly basis outside of drought conditions by our Water Resources team.

The decision to form the DMG will be made by our Head of Water Strategy and Planning and our Water Director. We will use our weekly water resource trend forecasts to determine whether the DMG should be formed. For example, if we forecast that reservoir storage will fall below the Level 1 drought action trigger within the following 3 weeks, we will form the DMG. This will give us 3 weeks to prepare for making a formal appeal for restraint.

Our Head of Water Strategy and Planning will assume the role of Drought Manager and will chair the DMG. A DMG secretary will also be appointed and will be responsible for taking, circulating and tracking meeting actions.

The DMG will be formed from individuals representing both 'affected departments' and/or those able to provide the necessary expertise in relation to the various areas of drought management, as shown in table 1 below:

Area of Responsibility		Job Title
Overall Management	Leadership and Accountability	Water Director
Drought Manager (Chair)	Chair - responsible for timely implementation of drought actions in line with this Drought Plan	Head of Water Strategy and Planning
Environment Agency Liaison	To update the EA on latest supply/demand situation and to consult the EA on drought actions	Water Resources & Performance Manager
Resource and Environmental Monitoring	To ensure monitoring is undertaken and reported	Water Resources Team Manager; and Environmental Scientist
Hydrology & Modelling	To undertake water resources system modelling and to provide advice on surface water abstraction	Hydrologist
Hydrogeology	To undertake groundwater modelling and to provide advice on groundwater abstraction	Hydrogeologist
Water Production	To operate Water Treatment Works as directed by the DMG To inform DMG of any Water Supply constraints	Head of Water Supply
Distribution & Leakage	To operate the water network as directed by the DMG To inform DMG of any Water network constraints To ensure appropriate resources are available to undertake enhanced leakage find and fix	Head of Water Network (North)

Area of Responsibility		Job Title
Water quality issues	To advise the Water Directorate and the DMG on any water safety plan hazards (Catchment to Customer Tap) that may arise as a drought develops	Water Quality Manager (North)
Demand	Reporting of customer demand	Supply Demand Team Leader
Water Efficiency	To support dry weather messaging and Appeals for Restraint	Water Efficiency Manager
Customer Services Rep	To ensure customers are kept informed as and when Level 1 to 4 drought actions are implemented	Head of Customer Operations
Public Relations Lead	To ensure key stakeholders are informed of drought conditions and proposed drought actions	Corporate Communications Manager
Communication Lead	To ensure all dry weather messaging and Appeals for restraint are actioned to agreed deadlines	Head of External Communications
Maintenance	To continue with proactive maintenance As a drought deepens, to ensure reactive maintenance is fast tracked	Regional Maintenance Manager
Asset Delivery	To ensure the timely delivery of any new assets	Asset Investment Programme Manager
Emergency Planning	Co-ordination of Level 4 drought actions (Standpipes and rota cuts)	Emergency Planning Advisor

Table 1: Drought Management Group Configuration

All of the roles included in the above table will attend the Drought Management Group from the date it is formed with the exception of the Asset Investment Programme Manager and Emergency Planning Advisor who will only attend when Level 3 actions are being considered.

The DMG will meet as follows:

Level 1 Drought Action: Every two weeks
Level 2 Drought Actions: Weekly
Level 3 Drought Actions: Daily
Level 4 Drought Action: Continuous in Emergency Meeting Room

Drought actions will be identified and implemented before a major resource difficulty occurs. Such actions will be reviewed on a regular basis in response to daily reporting of the resource situation.

Our drought strategy is to reduce demand in the early stages of drought, initially through enhanced dry weather messaging through our respective media channels, followed by a formal appeal for restraint. This approach will reduce the likelihood of needing drought permit actions to address supply issues should the drought worsen.

As a drought develops the DMG will continue to review our supply demand situation and will implement drought actions as prioritised in Section 6. We will liaise with the Environment Agency before deciding on any particular course of action that may impact the environment.

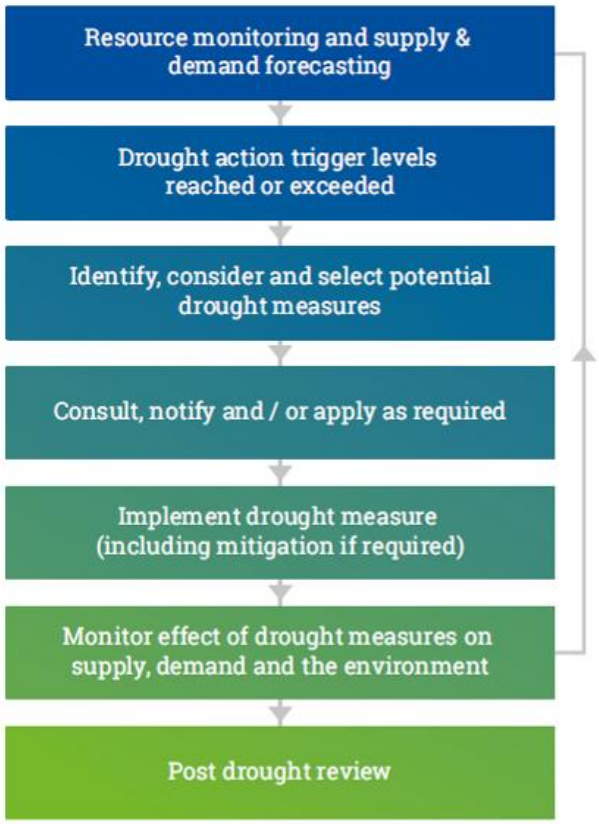
Communication with the Environment Agency is covered in Section 10 of this document (Communications Plan).

3.4 Drought Management Process

3.4.1 Overview

The DMG will make decisions on the potential implementation of drought actions following the process summarised in figure 4.

Figure 4: Drought Management Process



The arrows in figure 4 above denote lines of communication both internally and externally which are covered in Section 10.

The key elements of the above process are represented in the various chapters in this drought Plan.

3.4.2 Stage 1: Resource Monitoring and supply & demand forecasting

During this stage we undertake our business as usual water resource monitoring (e.g. rainfall, reservoir levels and groundwater levels) as well as water supply and customer demand forecasting which confirms whether we are entering a period of prolonged dry weather or not.

3.4.3 Stage 2: Drought Action Trigger levels reached or exceeded

The monitoring data from Stage 1 will tell us when the trigger level has been reached for implementing a drought action. The very first trigger is the formation of the DMG. As a drought intensifies, the DMG will brief our Executive Leadership Team and Board with increased frequency. The final decision for selecting and implementing a drought action lies with our Executive Leadership Team and Board.

3.4.4 Stage 3: Identify, Consider and Select Potential Drought Actions

This is when the DMG will review the drought measures in our Drought Plan and decide which ones to implement. Section 6.1 summarises the types of drought actions and the order in which they will be implemented. We will always implement those actions to reduce demand before applying for Level 3 Drought Permit actions.

3.4.5 Stage 4: Consult, Notify and Apply for Selected Drought Actions

For all of our drought actions, we will need to engage with a range of stakeholders (see Section 10 Communications Plan) including but not limited to neighbouring water companies, retailers and NAVs, Water Resources North, the Environment Agency, Natural England, the National Farmers Union (NFU) and CLA. This will ensure that:

- we are sharing our water resources position early; and
- that we can agree consistant messaging where other stakeholders are also ramping up their drought communications.

For Level 2 Temporary Use Bans (see Section 7.3) which restrict certain water use we are required to consult our customers and regulators.

3.4.6 Stage 5: Implement Drought Actions

Following completion of Stage 4, we will then impliment the drought action.

3.4.7 Stage 6: Monitor Effect of Drought Actions on Supply, Demand and the Environment

Once a drought action has been implimented, we will monitor its performance (i.e. the effect it has on customer demand and water supply.

3.4.8 Stage 7: Post Drought Review

Once our monitoring data has confirmed a drought is over and drought actions have been withdrawn, we will then undertake a post drought review (see Section 12) to identify lessons learnt and to review and improve our drought plan process.

3.5 External Stakeholders

Understanding the context of drought outside of our own supply area is essential. Experience of the drought in the south of England in 2012 confirmed the importance of water companies, regulators and Defra working in a collaborative, fully informed manner. Following the formation of our DMG, our intention will be to work closely with Defra, the Environment Agency, Water Resources North, other water companies, other sectors such as agriculture and the National Drought Communications Group to ensure our messages are aligned. Coordination of the timing and content of messages to our customers helps considerably in removing confusion about what is happening, and what we want our customers to do.

3.6 Decisions & Consultation in a Drought

The final decision for selecting and implementing a drought action lies with our Executive Leadership Team (ELT) and Board. As a drought intensifies, the DMG will brief our ELT and Board with increased frequency. When a trigger level is reached, the ELT and Board will already be fully briefed and aware of its implications. They will therefore be able to grant immediate approval.

Once an action has been selected we will consult with the Environment Agency and other consultees including the Consumer Council for Water before notice of the application is made. We will also engage when required with affected areas of the Fire Service in order to ensure that any implications for operational fire-fighting have been adequately considered. This will be particularly important in the context of restrictions on water use.

4 RESOURCE MONITORING & DROUGHT INDICATORS

4.1 Overview

An important requirement of our Drought Plan is to regularly monitor the status of key drought indicators including rainfall, soil moisture deficit, reservoir levels and groundwater levels. This monitoring informs:

- our water resources position in terms of whether normal condition prevail or whether we are entering or in a period prolonged dry weather or drought;
- when to form our Drought Management Group (see Section 3); and
- when drought action triggers are reached and when to implement drought actions (see Section 5).

Section 4.2 below provides a summary of each drought indicator and where appropriate confirms the type and length of the monitoring record. A description of how monitoring data can be analysed and used in support of a drought application is outlined in Section 4.2.8.

4.2 Drought Indicators and Monitoring

We have grouped our drought indicators into two categories:

- Hydrological and meteorological indicators that measure the direct effect on the hydrological cycle. These include rainfall (total and effective), soil moisture deficit,

temperature, weather patterns, groundwater (levels and recharge / drawdown trends), river flow, reservoir inflows, reservoir storage and abstractable quantities; and
- Customer demand and consumption

4.2.1 Rainfall

Rainfall is a primary indicator of drought severity. It has a direct effect on many hydrological parameters (soil moisture deficit, river flows and groundwater recharge) and can therefore directly impact on the quantities of water available for abstraction. Consequently, we will use rainfall to inform our drought status and to justify any restrictions on customers use of water.

Rainfall is measured at rain gauges throughout the north east, and is independently recorded by Northumbrian Water at the following reservoir sites:

Site	Period Data Covers
Kielder Reservoir	1969 to date
Catcleugh Reservoir	1969 to date
Fontburn Reservoir	1980 to date
Colt Crag Reservoir	1949 to date
Hallington Reservoir	1927 to date
Derwent Reservoir	1967 to date
Waskerley Reservoir	1900 to date
Burnhope Reservoir	1923 to date
Cow Green Reservoir	1969 to date
Balderhead Reservoir	1969 to date

Monthly HadUK rainfall data, dating back to 1891, is also provided by the Environment Agency for various catchments and is held by our Water Resources team. Under normal (non-drought) conditions rainfall data is analysed by the Water Resource team at the end of each month. In a drought, daily rainfall figures can be obtained directly as required.

All rainfall analysis carried out during a drought (cumulative variations, return period calculations etc) will be based on the HadUK data, rather than individual rain gauge readings.

4.2.2 Soil Moisture Deficit

Soil Moisture Deficit (SMD) is the amount of water required to raise a soil to field capacity. As a soil approaches field capacity, infiltration and ultimately aquifer recharge can potentially occur. The largest SMDs are found in the summer when rainfall is low and ambient air temperatures and evapo-transpiration rates are high. Aquifer recharge usually starts around late September/October when SMDs reach a critical threshold.

Similarly, to rainfall, monthly SMD figures are quoted in the Environment Agency's monthly bulletins and summaries on an area basis.

4.2.3 Groundwater Levels

The monitoring of groundwater levels is of greatest importance in our Berwick & Fowberry supply area, as well as the groundwater stations supplying Sunderland.
Groundwater levels in our pumped boreholes are automatically recorded every 15 minutes. Manual groundwater level measurements using a dip meter are regularly taken by our Water Supply team and sent to our Water Resources team for validation. Additionally, we can obtain groundwater levels in a number of monitoring boreholes as required under various abstraction licence conditions.

Although extremely unlikely at our borehole sites, groundwater level data can also potentially be used to optimise and adjust the position of borehole pump intakes as appropriate.

4.2.4 River Flows

We receive 15 minute flow data from the Environment Agency for all regulated rivers to ensure compliance with the requirement to maintain flows in those rivers. Additionally, the Environment Agency provides monthly river flow data on request.

Longer records for key gauging stations are already held in electronic format and are used for water resources system modelling and statistical analysis.

4.2.5 Reservoir Levels

Reservoir levels in all our impounding reservoirs are either available by telemetry or are recorded three times a week during operator checks of the dam structures. During a drought, reservoir levels are a critical element of monitoring the overall resource situation and therefore the frequency of these manual readings would be increased to daily. The reservoir levels would be monitored and compared to the control rule curves set out in the Kielder Operating Agreement and actions to alter abstractions would be made in accordance to those stipulations. Reservoir storage levels are widely circulated both internally and to external organisations such as the Environment Agency.

Reservoir levels are graphed to compare current levels with historic minimum, mean and maximum levels and reported weekly in a Reservoir Stock Report which is circulated to management and operational teams.

4.2.6 Weather Forecast

We have access to Met Office weather forecasts and will review short, medium and long term weather forecasts more regularly as we enter a period of prolonged dry weather and / or drought.

4.2.7 Operational Reporting

Daily water availability and supply figures for all Operating Areas are provided in daily supply reports for internal purposes. These reports also consider daily demand and weather predictions.

Daily abstraction, transfer (raw water), reservoir levels and treated water volumes are regularly updated and used to optimise the use of the raw water system in accordance with the various reservoir rule curves. We use an internally developed model on a weekly basis to undertake this optimisation process. In the event of a drought, this model would be run more frequently.

4.2.8 Reporting & Analysis of Drought Conditions

Every drought in the UK has a unique spatial and temporal signature. Droughts are also unique in their duration and severity, as well as their individual hydrological and consequential characteristics. It is important therefore to ensure that reporting and analysis of a drought situation takes account of the wide range of factors that potentially define it. Historical data can be used to demonstrate:

- a period of prolonged dry weather;
- an exceptional shortage of rainfall;
- whether a shortage of rain is affecting key surface and groundwater sources; and
- how our drought and resource position compares with neighbouring water companies and at a national level.

Our Water Resources Team maintains data on the indicators described in Section 4 and is responsible for its validation, analysis and reporting during a drought.

The majority of our water resources reports are circulated weekly outside of drought. Even during drought, this frequency of reporting should be sufficient to ensure our Drought Management Group is kept updated on ambient drought conditions and so that drought action decisions can be made in a timely manner. Drought reporting includes but is not limited to:

- Comparison of recent rainfall data with long term mean and minima for different sites representative of either supply or catchment area (point and area rainfall);
- Comparison of rainfall trends, groundwater levels and river flows to assess the impact of low rainfall on sources (surface and groundwater);
- Assessment of trends in soil moisture deficit and groundwater levels and their impact on river base flows and prospects for recharge;
- Assessment of refill for of impounding reservoirs; and
- Comparison of relevant hydrometric data against applicable drought measure trigger levels.
-

4.2.9 Experience of Recent Prolonged Dry Weather.

As discussed in Appendix 3 the most recent prolonged dry period was in 2018/19 when rainfall varied from 43% of the Long Term Average (LTA) in May to 134% of the LTA in March and again in 2020 when we had a very dry April and May. Clearly these events had an effect

on reservoir levels but we were able to utilise available resources to ensure that there was no issue with maintaining supply.

In the main rivers in our area (North Tyne, Tyne, Wear and Tees) under all conditions we are required to maintain a certain flow (Minimum Maintained Flow or MMF) which we do by adjusting releases from the relevant reservoir. In these dry spells flows from river catchments are greatly reduced and river levels fall. We are however able to make additional releases above those required to achieve MMF for environmental reasons. These releases improve conditions in rivers, particularly the North Tyne and Tyne, where the extra flows discharged encourages and aids fish migration upstream. The releases can also improve river quality in dry spells by increasing dilution and improving the oxygen levels in the water.

In agreement with the Environment Agency we make such releases in most years however the extended dry spell increased their duration and frequency.

5 DROUGHT TRIGGERS

5.1 Section Overview

An important tool in assisting our Drought Management Group (DMG) in deciding whether to implement potential drought actions is the use of trigger levels, defined for key surface and groundwater sources. This section of our Draft Drought Plan presents the drought trigger levels and drought actions for each of our Water Resource Zones.

Drought trigger levels essentially split a resource, either reservoir storage or groundwater level, into sections, each section dictates what, if any, drought management actions are required. The drought trigger levels have been developed using modelling techniques and have been fully tested against historic and stochastic droughts.

The same drought trigger levels used to implement drought actions are also used for the end of a drought event, i.e. drought actions are withdrawn once reservoir storage or groundwater levels rise above the trigger level. Worked examples are provided in Appendix 2. They demonstrate the implementation of these trigger levels against droughts used in our baseline planning assumptions for WRMP19, against plausible more extreme droughts using the results of our Drought Vulnerability Framework Assessment, as well as stochastic modelling. These examples show how we will introduce drought actions in a timely manner, allowing an appropriate lead-in time, for example when introducing water restrictions or applying for a drought permit or drought order.

5.2 Kielder Water Resources Zone

5.2.1 Surface water – reservoirs

All our reservoirs have control curves associated with them, these curves were designed using historical reservoir inflow sequences from 1926 to 2014 and are intended to minimise the risk of reservoir stocks falling below the emergency storage levels. Reservoirs are placed into various zones depending on the stock level relative to the control curves and can be categorised as follows:

Surplus Zone	Stock levels are healthy and can maximised to meet demand.
Conservation Zone	Stock levels are becoming stressed, abstractions from the reservoir are reduced and abstractions from less stressed sources are increased to meet demand.
Drought Zone	Stock levels are highly stressed and there is a risk of crossing into the Emergency Storage zone. Abstractions are restricted to their minimum, typically the local demand that cannot be supported from other sources.
Emergency Storage	A volume of water that is reserved for use during a drought of greater intensity than has been experienced historically. Typically, enough water to maintain compensation flow and local demand for 30 days.
Dead Water	Volume of water that cannot be used for water treatment, either due to siltation of the reservoir or the volume that is below the lowest draw off point.

The Kielder WRZ is a surface water dominated, complex, conjunctive use zone with most of sources being directly supported via the Kielder Transfer Scheme. The remaining sources in the Kielder WRZ are supported via Kielder Reservoir due to our ability to transfer water around the potable network.

Drought trigger levels have been assigned to three drought indicator sources in the Kielder WRZ:

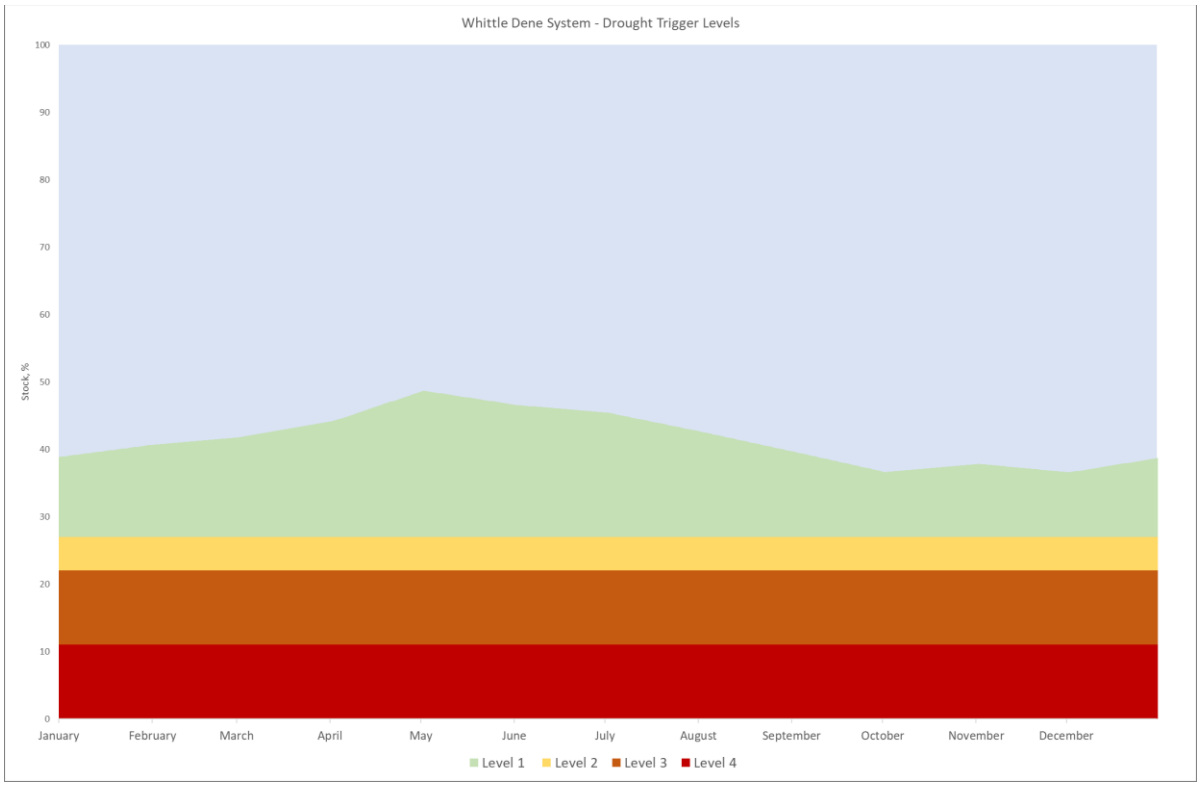
- Whittle Dene System (combined storage of Colt Crag, Little Swinburne, West Hallington and East Hallington).
- Derwent Reservoir
- Weardale System (combined storage of Burnhope, Waskerley, Hisehope and Smiddy Shaw)

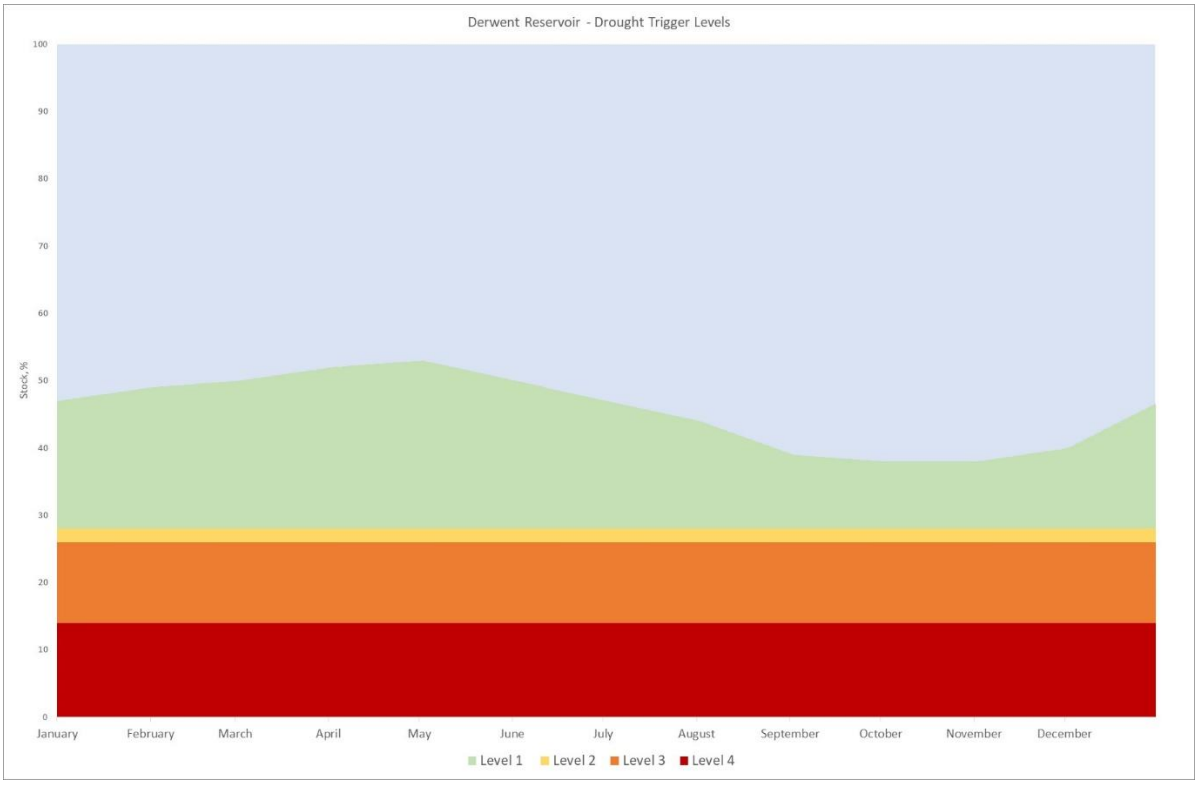
These reservoirs were chosen as drought indicator sources as they best represent the resource availability in the Kielder WRZ.

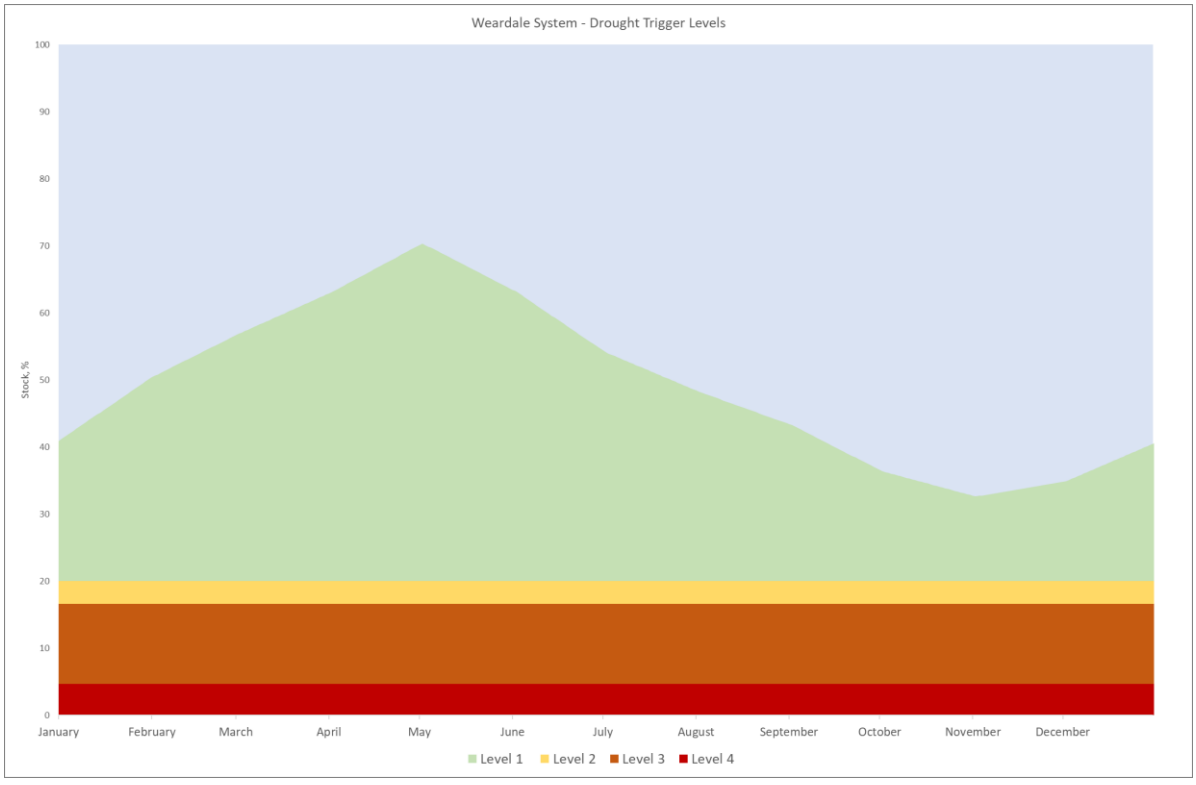
The operational control curves for the relevant reservoirs were combined for each drought indicator source and then used a basis for the LOS triggers, as shown in the table below.

Level of service		What this means	Trigger Level
Level 1	Appeal for restraint	Ask our customers to use water wisely. For example, watering plants at night and not watering the lawn because grass is resilient to drought.	Set 5% above the drought zone, this is approx. 9 days of storage above the drought zone.
Level 2	Temporary Use Ban	Applies mainly to the domestic use of water and stops the use of a hosepipe or sprinkler for any garden watering or cleaning.	Set 5% above the emergency storage level, this is approx. 9 days of storage above the emergency storage level.
Level 3	Drought Order Ban	Expands what has been applicable to the domestic customer under the Temporary Use Ban, to non-domestic or commercial customers.	Set at the emergency storage level, this is approx. 30 days of storage above the dead water level.
Level 4	Standpipe and Rotacuts	A temporary reduction or nil supply of water at the customer tap and use of stand pipes to fill containers.	Set at the dead water level, therefore level 4 restrictions will not be part of any DO calculations.

The trigger levels for each of the drought indicator groups are shown below.




Derwent Reservoir - Drought Trigger Levels
Stock, %
100
90
80
70
60
50
40
30
20
10
0
January
February
March
April
May
June
July
August
September
October
November
December
Level 1
Level 2
Level 3
Level 4


Weardale System - Drought Trigger Levels
Stock, %
100
90
80
70
60
50
40
30
20
10
0
January
February
March
April
May
June
July
August
September
October
November
December
Level 1
Level 2
Level 3
Level 4

5.2.2 Surface water – rivers

The three major rivers that we abstract from (Tyne, Wear and Tees) are all regulated rivers. This means that they are all subject to a minimum maintained flow requirement which means the river flow must be maintained at or above the minimum maintained flow. As these rivers can all be supported from Kielder Water, via the Tyne-Tees Transfer, it means that we can maintain the flows at such a level as to not impact on the abstraction volume available. Therefore, there are no drought triggers applicable to the river levels as regulating the rivers to maintain available abstraction at fully licenced capacity is a business as usual operation.

5.2.3 Groundwater

Groundwater level Trigger Levels have been developed in consultation with the EA Groundwater Team (Newcastle) in order to identify when groundwater levels are at low (green), moderate (amber) or high (red) risk of exceeding calculated acceptable groundwater abstraction rates within the Magnesian Limestone aquifer system (which includes both the Magnesian Limestone and Permian Sand aquifer units). An acceptable abstraction rate is one that does not exceed one of the following abstraction constraints: Pump intake level (providing the pump cannot be lowered to increase abstraction); Deepest Advisable Pumped Water Level (DAPWL) (generally fixed by a physical aspect of the borehole construction such as an adit or a fixed pump intake level), or to prevent ingress of groundwater from the underlying Coal Measures aquifer (which have been contaminated by rising mine water levels); or Abstraction Licence conditions.

The Trigger Level for the Kielder WRZ groundwater supply boreholes have been calculated as follows:

Site	Control Level (Red)	Ml/d	Control Level (Amber)	Ml/d	Control Level (Green)	Ml/d	Justification
BH 14	-18mOD	8.31	-8mOD	<8.31	2mOD	<8.31	Both GWS Control Level (Red) based on minimum groundwater level to prevent ingress of Coal Measures Groundwater into Magnesian Limestone aquifer via a reversal of hydraulic gradient based on current pumping levels by Coal Authority at Dawdon. Red = 0m headroom, Amber = 10m headroom and Green = 20m (recommended) headroom
BH 15	-13mOD	10.24	-3mOD	<10.24	7mOD	<10.24	
BH 10	-13.6mOD	10.67	-8.5	5.5	-8mOD	5.13	Control Level (Green) is based on 2020 Yield Curve at which GWS is likely to exceed annual abstraction licence/365 days. Control Level (Amber) is borehole potential yield (constrained by pump intake level). Control Level (Red) is DAPWL GWL (top of adit).
BH 11	24mOD	7.5	33mOD	5.3	37mOD	4	Control Level (Green) is based on 2020 Yield Curve at which GWS is likely to exceed annual abstraction licence/365 days. Control Level (Amber) is borehole potential yield (constrained by daily average licence level). Control Level (Red) is pump intake level,
BH 13	-22mOD	8	-12mOD	6.18	-4mOD	4.6	Control Level (Green) is based on 2020 Yield Curve at which GWS is likely to exceed annual abstraction licence/365 days. Control Level (Amber) is borehole potential yield (constrained by daily average abstraction licence). Control Level (Red) is DAPWL GWL which should never be exceeded.
BH 12	-23mOD	8.65	-17mOD	4.32	-15mOD	4	Control Level (Green) is based on 2020 Yield Curve at which GWS is likely to exceed annual abstraction licence/365 days. Control Level (Amber) is GWL constrained by pump capacity. Control Level (Red) is pump intake level,
BH 16	-41.5mOD	2.55	-41mOD	2.52	-40.5mOD	2.5	Control Level (Green) is 1m above pump intake. Control Level (Amber) is 0.5m above pump intake. Control Level (Red) is pump intake level. Due to borehole construction constraints the pump cannot be lowered deeper into the borehole in the event of the GWL falling below the Red Control Level.
BH 17	-15mOD	8.7	-12mOD	8.2	-1mOD	7	Control Level (Green) is based on the 2020 Yield Curve at which GWS is likely to exceed annual abstraction licence/365 days. Control Level (Amber) is GWL constrained by pump capacity. Control Level (Red) is DAPWL GWL which should never be exceeded.
BH 18	-23.5mOD	9.5	-10mOD	9.1	-3mOD	8.9	Control Level (Green) is the 2020 Average Pumped Water Level at daily licence (8.9mld). Control Level (Amber) is an arbitrary value between the red and green Control Levels. Control Level (Red) is pump intake level/DAPWL,

Abstraction rate based on control level GWL in 2020 Yield Curve (or most recent if no 2020 yield curve is available)

5.3 Berwick and Fowberry Water Resources Zone

In the Berwick and Fowberry WRZ 100% of the supply is abstracted from the Fell Sandstone aquifer. Recently we have carried out modelling work in partnership with the British Geological Survey (BGS) to determine the sustainable yields, based on historic data, of all our boreholes in the Berwick and Fowberry WRZ. Drought triggers for the Fell Sandstone aquifer, based on the BGS modelling results have been developed.

The historical lowest observed dry-weather pumped groundwater level, in February 2017, is -6mOD. This, along with the modelled pumped groundwater level during a 1-200 year drought event of -15mOD, were used to construct drought triggers based on the storage level in the aquifer.

Level 1	85% of calculated aquifer saturated thickness remains
Level 2	75% of calculated saturated aquifer thickness remains
Level 3	60% of calculated saturated aquifer thickness remains
Level 4	40% of calculated saturated aquifer thickness remains

5.4 Understanding the drought vulnerability of our supply systems

As part of our WRMP19, we have assessed the drought vulnerability of our supply systems to the worst droughts on record (which has a return period of 1 in 200 years or greater) and were able to conclude that we have sufficient supply headroom.

However, the latest Drought Planning and Water Resources Planning Guidelines require all water companies to assess the vulnerability of their supply systems to different types of drought events and the probability and impacts of such events occurring. We are currently undertaking this work as part of preparing our WRMP24. Some but not all of this work has been completed in time for this Draft Drought Plan and so for our Kielder Water Resource Zone, we have undertaken an assessment which uses the principles of the UKWIR 'Drought Vulnerability Framework' (17/WR/02/12). The outputs from this assessment are presented in Appendix 1.

The Drought Vulnerability Framework assessed the resilience of the Kielder System to droughts of a range of durations (6, 12, 18, 24 and 36 months) and return periods (100, 200, 500 and 1000 years). The assessment looked at droughts ending in October. The demand placed upon the system during the drought modelling was deployable output.

The number of days of failure of the system were recorded for each drought, with failure occurring either when the demand could not be met, or the emergency storage level of a reservoir was reached. Only the 1 in 500 and 1 in 1000 droughts for the 6 month duration had any failure days.

5.5 Testing of our Drought Plan Triggers

We have tested the effectiveness of our drought plan triggers for the Kielder Water Resource Zone with respect to meeting our levels of service against:

- the droughts used in our baseline planning assumptions for our WRMP19; and
- a plausible more extreme drought using the results of our Drought Vulnerability Framework Assessment and 1 in 500 drought groundwater modelling.

The results of the testing, including worked examples, are presented in Appendix 2.

The worked examples:

- show how we would expect our drought plan to work under the drought scenarios;
- confirm what actions we would take;
- demonstrate the expected time frames and durations for each action.

6 WHAT WE WILL DO IN A DROUGHT

6.1 Overview

This section of our Draft Drought Plan sets out all of the actions we may take during a drought.

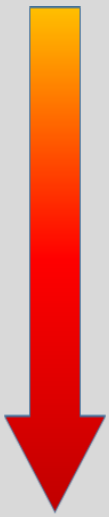
6.2 Formation of Drought Management Group

The first action to be implemented in the lead up to a drought will be the formation of our Drought Management Group (DMG). Drought measures will then be implemented in the order presented in Section 6.3 below as determined by the DMG, and ratified by our Executive Leadership Team and Board.

Our DMG acts as the hub of our drought management process. The DMG has responsibility for reviewing water availability and demand on a weekly and/or daily basis and deciding whether and when drought measures should be implemented, and when they should be subsequently withdrawn. Implementation will be strongly influenced by reference to ambient hydrological conditions (see Section 4 and exceedance of the trigger levels indicated in Section 5).

6.3 Drought Actions

We have categorised each of our drought plan actions using the level 1 to 4 definitions detailed in the table below.

Severity of the drought	Level	Demand side actions	Supply side actions
Drought Plan 	Level 1	▪ Communications campaign ▪ Increased leakage control	▪ Optimising sources ▪ Reducing treatment works outage ▪ Reducing process losses
		▪ Formal Appeal for Restraint for voluntary reduction in water use	▪ Increased use of Kielder Transfer Scheme ▪ Tankering to spring supplies as required.
	Level 2	▪ Temporary use bans	
	Level 3	▪ Drought Order Non-essential use ban	
		▪ All possible actions to avoid emergency drought orders including Pressure Reduction	
Emergency Plan	Level 4	▪ Emergency drought orders (such as standpipes)	

If needed, we will implement the drought actions in the order they appear in the table above.

Our drought plan only includes Level 1 to 3 drought actions. Level 4 actions are included in our Emergency Plan although in our worked examples (see Appendix 2) we have included the likely triggers for these actions.

All of our Level 1 to 4 drought actions are described in Sections 7 and 8 below.

We will implement our demand side actions in a timely manner and will have them in place long enough to have a measurable impact on water demand, which we measure continuously and report daily.

We have prepared a Summary Drought Options Form for each of our drought actions (see Appendix 5) which contain the following information:

- Option Implementation Assessment: triggers, yield/demand saving, implementation timetable, permissions required and risks;
- Drought Management Area to be applied;

- Environmental Assessment: the risk to the environment, summary of possible environmental effects, details of studies, monitoring requirements and mitigation actions.
- Impact on Other Activities
- The risks associated with this action: for instance, social and economic factors and uncertainties associated with timings and water savings

7 DEMAND SIDE DROUGHT ACTIONS

7.1 Overview

This section of our Plan describes the demand side drought actions which could be used to address potential water supply shortages during a drought. Although it is highly unlikely that we will ever require anything other than a Level 1 action, for completeness we have included a description of other level actions.

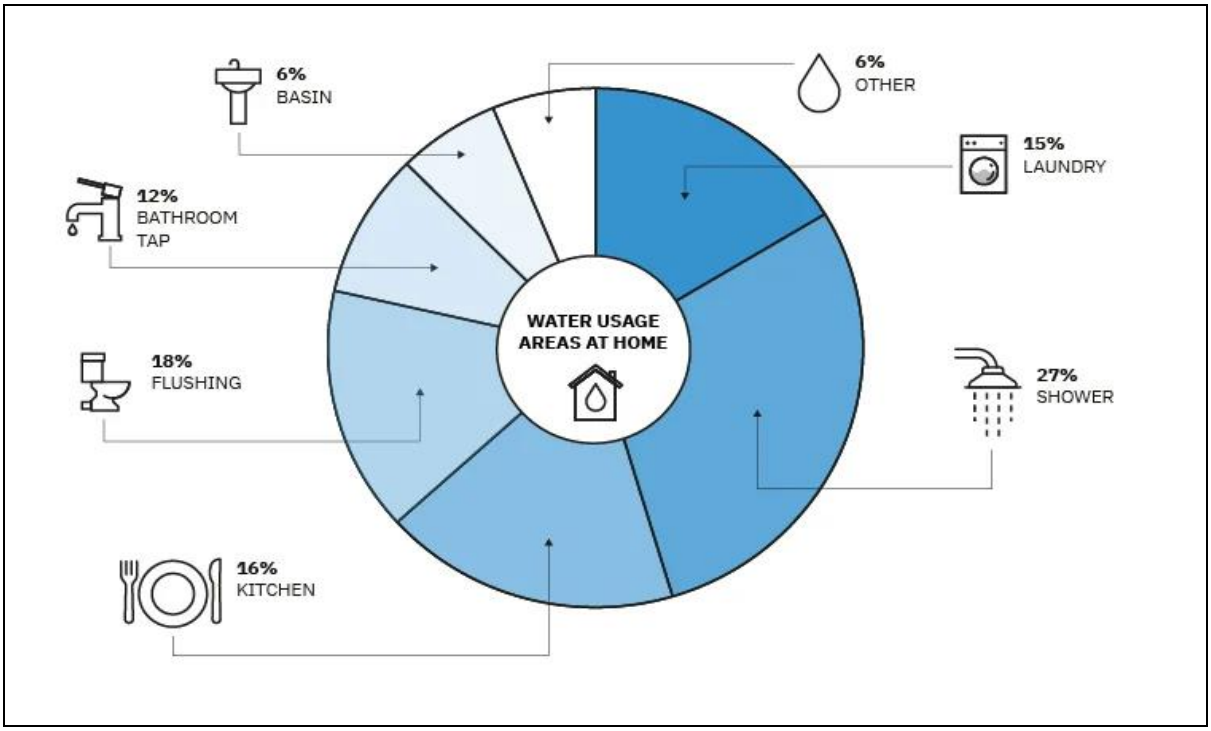
7.2 Level 1 Drought Actions

7.2.1 Campaigns to encourage customer to use less water

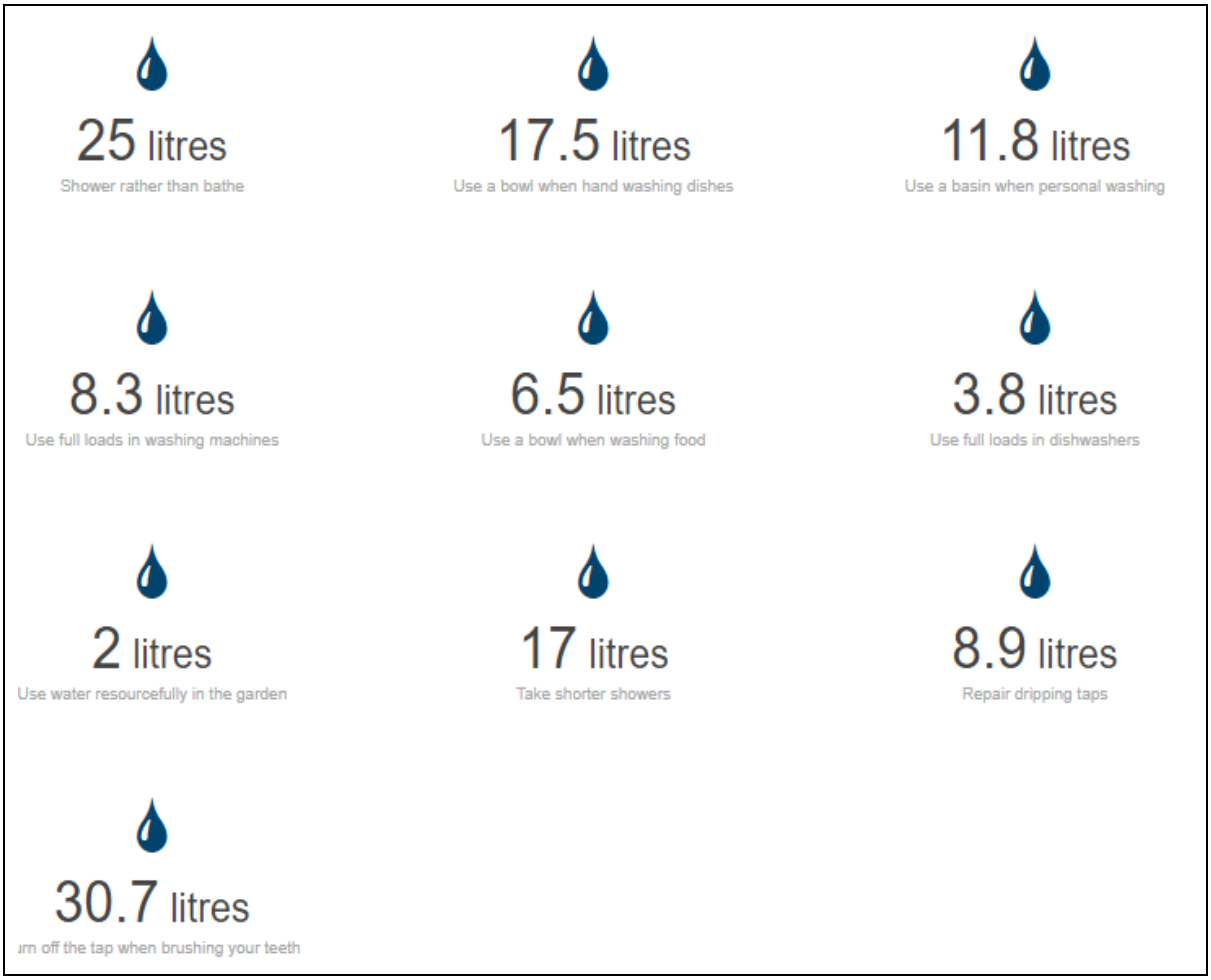
Enhanced dry weather messaging

Following a period of sustained dry weather and once the Environment Agency has announced our supply area is in an environmental drought, then we will increase the level of dry weather and water efficiency messaging we undertake. We will convey strong messages to customers in relation to how dry weather is affecting the environment and our water resources and how they can help by reducing the water use and using water wisely. Examples of the water saving tips we would use are shown below.

WATER USE IN THE HOME

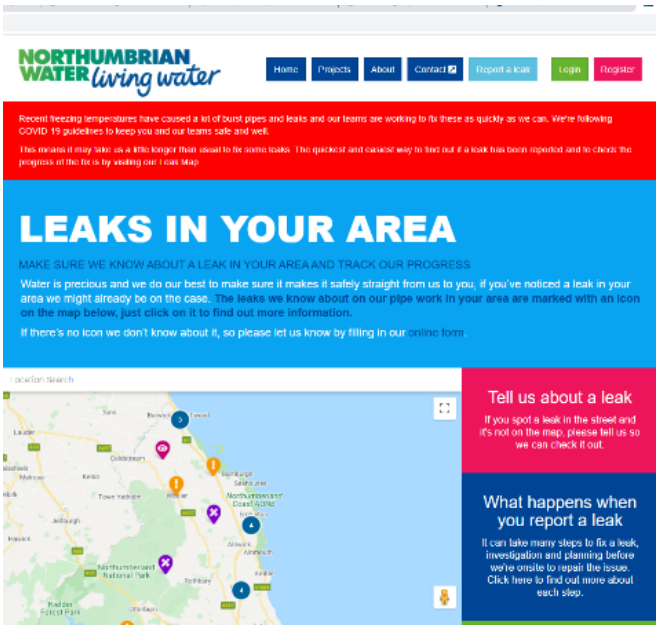


WATER SAVING TIPS AND THE QUANTITIES OF WATER THAT CAN BE SAVED



Appeal for Restraint

If a drought deepens and turns into a water resources drought, then our first action will be a Level 1 Appeal for Restraint.



At an industry level previous droughts have shown that an Appeal for Restraint can result in average demand reduction of between 0 and 5%. However, our experience is that a demand saving of nearer to 7% is achievable. This may decrease in the future as meter penetration increases and customers have already altered their water use because of being on a measured supply. However, we will only know this through experience gained during future droughts.

We will monitor and measure demand and if the 7% demand savings are not achieved, then we would consider implementing a TUB earlier than planned.

Our full Drought Plan Communications Plan is presented in Section 10.

7.2.2 Leakage Reduction

Overview

Prolonged periods of drought may result in soil shrinkage and increased ground movement causing mains to fracture and leakage values to increase. We have made significant progress in reducing leakage from our network and already have some of the lowest levels of leakage in the country. However, we recognise that we must reduce leakage further and have agreed with our regulators that we will reduce leakage by a further 15% by 31 March 2025. We will achieve this through the use of innovative technologies to find leaks, through additional resource for find and fix and through mains renewal.

Our supply network is divided up into District Metered Areas (DMAs) which are small managed areas of the network with flow meters monitoring inlet flows. All of our DMAs are reviewed on a weekly basis to prioritise the areas for leakage detection activities. This period can be shortened during drought or severe weather events and can be prioritised to address specific issues and areas of severe drought.

Increased Leakage Find and Fix during Drought

We know that during drought, when we are asking customers to reduce their own water use, our customers will rightly expect us to promptly repair any burst pipes. During prolonged dry weather, the number of burst water mains can increase.

Consequently, we will ensure that workloads are prioritised and if necessary, resources are increased, in order to repair all visible leaks as soon as possible, often the same day. This is a key aspect of working with our customers to reduce overall water demand during a drought.

During a drought, our leakage find and fix teams will focus on those areas where we are most at risk of needing to implement drought actions.

Reduce Mains Pressure

Pressure reduction within treated water networks reduces water pressure to a level that reduces the risk of leakage and burst pipes while also maintaining acceptable pressure at our customers' taps. This is achieved through the use of pressure sensors and pressure reducing valves. Pressure reduction also reduces the flow rates from existing leakage sites and reduces wastage at customers taps caused pressure being higher than it needs to be.

We continually monitor network pressure and will continue to ensure that pressure remains at optimised levels. Consequently, there are no further opportunities to reduce pressure within the network to reduce leakage without impacting adversely on pressure at our customers' tap and this is not considered a viable action in our drought plan.

Reducing mains pressure below our agreed levels of service to reduce customer water use is considered in Section 9 (Extreme Drought Measures).

7.2.3 Metering

Water metering is an important part of our strategy for managing demand. Meter penetration our region currently stands at 40% (as of 28 February 2021).

We actively promote the benefits of installing a water meter to our customers including that installation is free, that it can help reduce usage and therefore reduce their water bill.

It is our policy to meter the following types of domestic property:

- all customers who opt to have a meter;
- all new properties; and
- properties where water is used in significant quantities, including:
    - for garden watering, other than by hand-held apparatus. This includes the use of sprinklers; and
    - for the automatic replenishing of ponds or swimming pools with a capacity greater than 10,000 litres. Unmetered bills will draw customers' attention to this.

Customers are required to notify us if they are using water for any of these purposes. Arrangements will be then made to fit a meter at no cost to them. During a drought, particularly prior to the introduction of any restrictions on water use, the requirement

for large discretionary users of water to have a meter installed will be emphasised in our drought communications.

We have made considerable progress over recent years to increase meter penetration in order to support customers in reducing their water use and bills. This has included encouraging customers to opt for a free meter by giving annual information on free meter installation in our billing documentation, numerous metering campaigns over the years and a programme of selective meter installations on non-household properties.

During drought, we will enhance our promoting of the uptake of water meters.

7.2.4 Water Conservation Measures (Water Efficiency)

Overview

We have been running a wide variety of water efficiency projects since 1997 including large-scale home retrofit projects, school audits and education, business audits, research projects and initiatives with partners such as housing associations. Our water efficiency strategy has demonstrated its value by delivering quantifiable and sustainable water savings through innovative, creative and leading projects.

A critical part of our ongoing programme is the monitoring of results to quantify actual water demand savings and how sustainable they are. We strive to be proactive and innovative. This has involved researching the most cost effective methods of reducing water consumption, developing new analysis techniques, and improving our understanding of people's behaviour and motivations to evaluate the most beneficial approaches to promoting water efficiency as well as providing practical advice and help to customers.

We have reviewed our strategy as part of our Water Resources Management Plan 2019 and our strategy continues to be based on a process of reviewing effectiveness, making improvements and responding to new opportunities to trial new products, evaluate new methods of working, work with new partners and improve our measurement and analysis techniques.

Every Drop Counts

Every Drop Counts is our largest ever water saving campaign, taking a truly innovative and wide-reaching approach by offering customers the chance to participate in a range of initiatives that are usually delivered at different times and places throughout the year. During prolonged dry weather or drought, we deliver enhanced dry weather messaging through Every Drop Count.

Further information on Every Drop Counts is included in our Water Resources Management Plan 2019. It uses a combination of targeted advertising and community-

based marketing to maximise participation in the wide range of water efficiency projects to help communities not only save water, but energy and money too.

A key component of the campaign is the offer to householders of a free plumber-led home retrofit visit worth over £130. The water and energy saving visit includes the installation of a wide range of retrofit products alongside effective engagement with the householder to enact long-term behaviour change. Participating customers that have received an Every Drop Counts water efficiency retrofit visit are each saving on average 21.3 litres per day. This equates to an annual saving of 7,775 litres which in turn results in monetary savings of approximately £21 on each participating customer's water and sewerage bills.

On an annual basis, we deliver the Every Drop Counts whole-town approach in a specific town selected for varying reasons. Each annual campaign is launched with a stakeholder engagement event in May, following which the home retrofits and school educational programmes are delivered throughout the summer. Activity concludes in October, following which the autumn sees a period of customer research and data analysis, and throughout the winter the identification of recommendations and planning for the subsequent year. Our Whole Town Approach allows us to promote our Priority Services Register (www.eswater.co.uk/priority) and "water without the worry" leaflet (www.eswater.co.uk/watersure). It also allows us to understand which of our water saving tips and products they like the most which helps us refine our offer. In deciding which towns to focus our annual campaigns in, we take account of our current water resources position and whether we are in or likely to be in prolonged dry weather situation.

A key component of Every Drop Counts is an overarching innovative marketing campaign. The campaign aims to generate a buzz around the community using billboards, electronic panels, stunt marketing and newspaper/radio advertisements to raise awareness. We also worked with the environmental charity Groundwork to deliver a series of customer engagement events that were tailored to provide opportunities for our customers to sign-up for a water saving retrofit in the local high street, at supermarkets, shows and festivals. By working in partnership with the community and environmental charities, we also able to engage community champions to deliver a series of customer engagement stands, utilising their understanding of the community to encourage wider participation.

The Ripple Effect

The Ripple Effect is our new Water Efficiency education programme initiative:

www.nwg.co.uk/responsibility/working-with-schools/the-ripple-effect/

As with Every Drop Counts, we would use this initiative during prolonged dry weather to promote our dry weather messaging.

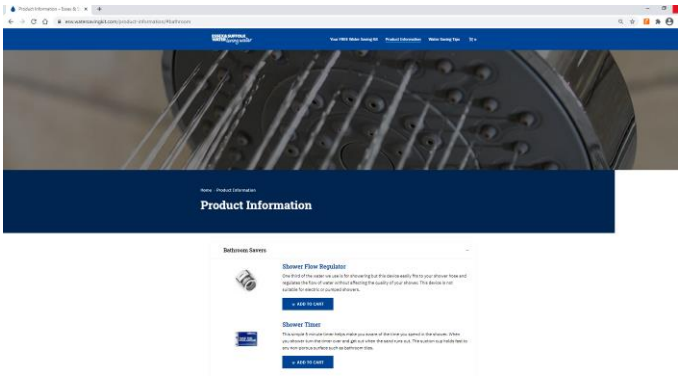
When we all make small changes to our water use, we can make big waves in protecting our precious water supply. Consequently, we are inviting school

communities to get involved in the programme. Through a range of films, interactive games and activities for 8 to 11 year olds, The Ripple Effect encourages everyone to learn more about water and make small changes to protect our water supply. Everyone can become a part of The Ripple Effect by becoming Water Trackers who are expert protectors of water and guardians of the water cycle.

We hope that children will build their knowledge at Water Tracker Training Camp and test their knowledge on a journey through Water Tracker House. Both journeys contain a suite of interactive, flexible curriculum-linked resources that can also be used individually, as well as for remote or home learning.

Water saving products

We offer a range of water saving products to our customers free of charge. They are available from our website https://esw.watersavingkit.com/ and are promoted using social media, through customer frontline staff and our water saving programmes.



Our products and offers are summarised below:

Water Saving Product Type	Water Saving Product name	How it will help customers save water
Bathroom Savers	Shower flow regulator	One third of the water we use is for showering but this device easily fits to your shower hose and regulates the flow of water without affecting the quality of your shower. This device is not suitable for electric or pumped showers.
	Shower timer	This simple 5 minute timer helps make you aware of the time you spend in the shower. When you shower turn the timer over and get out when the sand runs out. The suction cup holds fast to any non-porous surface such as bathroom tiles.
	Water saving tap inserts	The tap inserts work by introducing air into the flow reducing the amount of water and energy used. They are easy to fit to taps with a circular outlets and comes fit a fitting tool included.
	Universal sink plug	Ideal for any sink or bath with a leaky plug, avoiding the need to top up with water, Can be used in any plug in any fitting.
Toilet Savers	Save A Flush Bag	The Save-a-flush is an effortless way to reduce water use in the bathroom. It's a bag filled with crystals which you easily pop into your cistern. The crystals will then expand to save 1.2 litres of water every time you flush. Suitable for toilets with a handle cistern 7.5 litres or more capacity.
	Toilet Leak Detection Capsules	The dye tablets are used to identify leaks in a toilet that can waste water. Simply drop a tablet in the cistern and know in a few minutes if a repair needs to be made.

Water Saving Product Type	Water Saving Product name	How it will help customers save water
Garden Savers	Water Storing Gel	The water gel granules absorb water when the soil is watered and then release it back into the soil when the plants need it. They can be mixed in into the soil when planting hanging baskets, containers, window boxes, pots, flower beds etc.
	Water Sticks	A simple solution to the problem of when to water your plants. Simply push it into the soil and look at the colour of the paper. Red means it needs a water, blue means your plant has enough water.
	Trigger Hose Gun	Using a hose to water your plants and borders can use a lot of water, especially if we have a long hot summer. The trigger on this hose gun makes it easier to turn on and off the water supply, helping to reduce wastage. It also offers multiple jets whether you are watering your hanging baskets or flower beds.
Discounted water saving products		We have agreed with affiliate companies customer discounts for water butts to allow rain water harvesting.

Water Efficiency During Drought

During drought conditions promotion of water saving products will be enhanced. Our water efficiency strategy will be to:

- increase our water efficiency messaging emphasising the need to “Use Water Wisely” under the campaign heading of Every Drop Counts;
- promote how our customers can reduce their water use; and
- promote our water efficiency offer (see table above).

Additionally, we will continue to:

- undertake household water efficiency retrofit projects
- promote our large scale educational programme aimed at primary schools; and
- provide information to customers on how to save water via the company website, in billing literature, in dedicated leaflets, on social media and through a widespread radio campaign.

Outside of this, customers are able to purchase water butts at low prices through a partnership we have with a water butt supplier.

In the event of a drought, the scale and pace of the campaign can be increased and focused particularly on the delivery of key water efficiency messages to encourage customers to request free water saving devices.

7.2.5 Operational Water Usage: Flushing of water mains and Service Reservoir Cleaning

Regular flushing of our water mains is a necessary requirement to ensure compliance with drinking water quality regulations. However, during a drought, this may send out the wrong message to our customers. We also have a programme of service reservoir cleaning which uses water.

During a drought, we will consider suspending our flushing and reservoir cleaning programmes. This could save 1.12 Ml/d and will support our water efficiency messages. Some flushing may always be necessary for hygiene purposes and we would never compromise on this.

7.3 Level 2 Demand Side Drought Actions

The following section describes the next level of drought actions and is included for completeness since we would not envisage the necessity to ever progress to this level.

7.3.1 Temporary [Water] Use Bans (TUB)

Overview

Temporary Use Bans, commonly referred to as TUBs, are powers granted to water companies to impose restrictions on customers' water use. Previously these were referred to as 'hosepipe bans' but they were modified in 2010 under the Flood and Water Management Act to cover a wider range of restrictions.
TUBs can be introduced quickly – seven days after an advert has been placed in newspapers in the area which will be affected. They predominantly focus on water use by domestic customers because this provides the largest water saving and helps protect public services and the economy.

When we need to introduce a TUB, we will take account of the WaterUK / UKWIR Code of Practice and Guidance on Water Use Restrictions. This provides guidance on the effective implementation of water use restrictions by way of Temporary Use Bans (TUBs) and Drought Orders (DO) to help manage demand during times of drought.

We will ensure that we implement a TUB in a proportionate manner, by considering the balance between any impact on an individual or particular group of customers with the overall public interest. In line with the Code of Practice, we will consider among other aspects:

- the nature and seriousness of the water supply situation;
- the water savings from introducing the TUB;
- the feedback from stakeholders including neighbouring water companies and Water Resources North; and
- whether the restriction will impact on vulnerable customers or groups.

TUB definitions are presented in Appendix 9.

The remainder of this section sets out how we will introduce and withdraw a TUB in what we believe to be a proportionate and reasonable way.

Trigger for a TUB

The Drought Management Group will consider a TUB once reservoir storage falls below the TUB control curve or when Berwick groundwater levels fall below the TUB

control curve. Worked examples illustrating when our DMG will prepare for a TUB are presented in Appendix 2.

We will ensure that TUBs are always in place before the need to apply for a drought permit or order (between 1 April and 1 October) and will ensure they are in place long enough to have a measurable impact on customer demand. We measure customer demand daily and would expect to see a reduction in demand within 1 to 2 weeks.

Areas of Restrictions

If a TUB is ever required in the future we intend to apply it at the Drought Management Area scale (i.e. Kielder and Berwick Water Resource Zones). This is because the two water resource zones are geographically separate with no link between them.

Phasing of Restrictions

As the introduction of TUBs gives water companies a wider range of powers it is important we give careful consideration to the phasing of restrictions. Different levels of drought will be triggered at different times, according to each water company's water resource limits, so companies can decide to implement restrictions in stages according to local conditions, rather than apply them in full at once. This helps mitigate the impact of restrictions on business which undertake water use activities as part of their core business, such as car washes.

However, we will apply the full TUB powers before progressing to the next restriction, for example, implementing TUBs before applying for a Drought Order.

Temporary Water Use Ban Demand Saving

Our experience of a TUB is in our Essex & Suffolk water operating region. In the 1990s droughts, TUBs were required although then they were known as "hosepipe bans". Our experience of these bans provides us with a reasonable expectation of what customer water use savings from a future TUB might be.

A Level 1 Appeal for Restraint will have already been implemented before a TUB and this will have already reduced garden watering, specifically of lawns, and so we need to be careful not to overestimate the savings from potential restrictions by double counting savings.

Nevertheless, we conclude that a TUB will deliver an additional demand reduction of around 5% on top of the 7% saving made from an Appeal for Restraint. This is an annual average which if used over a peak demand period (April-September) could result in a 15% saving. This is based on evidence from previous hosepipe bans and also accounting for the temporary use ban including all hose pipe use (not just domestic gardens). This 5% saving does however assume there are no exemptions to the TUB.

Communicating the Introduction, Phasing In and Lifting of Temporary Restrictions

We will inform our customers of the introduction and lifting of temporary use restrictions by email (where we have an email address), through our website (www.nwl.co.uk), through our social media channels and through the issue of press releases to both national and independent radio stations and television channels.

We will inform neighbouring water companies, Water Resources North, NAVs and water retailers for business by email through our agreed communication contact.

TUB advertising and timeline to implementation

Section 76B(2) of the Water Industry Act 1991 sets out the procedure for implementing a TUB:

> *"Before the period for which a prohibition is to apply the water undertaker must give notice of the prohibition and its terms-*
>
> *a. in at least two newspapers circulating in the area to which it is to apply, and*
> *b. on the water undertaker's internet website."*

The notice of prohibition must set out clearly the terms and extent of the proposed prohibition and specify the date on which the prohibition will commence and the area to which the ban will apply. We must also provide details of how customers can make representations about the proposed prohibitions to us, and leave a reasonable period for the representations to be made.

We consider a reasonable period to be 21 days from when the notice of the prohibition is posted on our website. This allows the advertisement of the ban to appear in the local newspapers, which may only be published weekly, and 14 days for representations to be made as a result of the newspaper advertisement. In the event that we receive an unexpectantly large response to the TUB consultation, we will bring in extra resource to manage this.

The majority of Water Resources South East (WRSE) and Water Resource East (WRE) water companies have agreed a universal TUB enforcement policy which we will also follow (see Appendix 8).

Aligning our Approach to Introducing a TUB and Reducing Demand

We will work with neighbouring water companies and Water Resources North to ensure that we align our approach to drought messaging and the introduction of TUBs. We will ensure that we share our supply demand position in a timely manner, will consult on our messaging and will ensure they are aware of our intention to implement a TUB in a timely manner.

There could be a situation where our neighbouring water companies need to introduce a TUB but we do not because our TUB triggers have not been met. In this instance, we do not believe that we should introduce a TUB simply because a neighbouring

water company has done, however we would ensure that our drought messaging was supportive of our neighbouring water companies' positions.

Exceptions

Water companies can grant exceptions from these restrictions for customers and businesses. These exceptions aim to minimise the impact on vulnerable customers and the economy. The following pages set out who can apply for exceptions and what they cover.

There are two types of exceptions to these restrictions which can be applied by water companies:

- Statutory Exceptions – activities/water uses which are exempt from the legislation; and
- Discretionary Exceptions – activities/water uses which are not covered by a statutory exception but water companies can grant the use of a hosepipe under certain circumstances.

Discretionary Exceptions can be further split into two categories:

- 'Universal' – these exceptions have been agreed by all companies who signed up to the Drought Code of Practice (A document which aims to ensure a common approach to drought management by UK Water companies). Such exceptions do not require customers to write or make representation to the water company to obtain permission; and
- 'Other concessions' – these are exceptions which individual water companies can choose to offer customers, depending on the particular circumstances. These exceptions do require customers to write or make representation to the water company to obtain permission.

Summary of exceptions

The following table sets out the statutory, universal discretionary and agreed discretionary temporary use ban exceptions for Northumbrian Water which is in line with most other water companies in the Water Resources North, Water Resources East and Water Resources South East regions.

Tub category	Statutory exception	Discretionary universal exception (granted by all water companies)	Suggested discretionary concessional exception (granted by individual water companies)
1. Watering a garden using a hosepipe	Using a hosepipe to water a garden for health or safety reasons. NB In this category, the definition of "a garden" includes "an area of grass used for sport or recreation". Therefore it should be noted that watering areas of grass, which are used for sport or recreation, is covered by a Statutory Exception for health & safety only in relation to the active strip/playing area, not the entire ground.	▪ To Blue Badge holders on the grounds of disability ▪ Use of an approved drip or trickle irrigation system fitted with a pressure reducing valve (PRV) and timer	▪ To customers on the company's Vulnerable Customers List who have mobility issues but are not in possession of a Blue Badge ▪ To water newly laid turf for first 28 days
2 Cleaning a private motor-vehicle using a hosepipe	A "private motor-vehicle" does not included (1) a public service vehicle, as defined in section 1 of the Public Passenger Vehicles Act 1981 (c), and (2) a goods vehicle, as defined in section 192 of the Road Traffic Act 1988 (d)	▪ To Blue Badge holders on the grounds of disability ▪ Use of a hosepipe in the course of a business to clean private motor vehicles where this is done as a service to customers	▪ To customers on the company's Vulnerable Customers List who have mobility issues but are not in possession of a Blue Badge
3. Watering plants on domestic or other non-commercial premises using a hosepipe	Does not include watering plants that are (1) grown or kept for sale or commercial use, or (2) that are part of a National Plant Collection or temporary garden or flower display.	▪ To Blue Badge holders on the grounds of disability ▪ Use of an approved drip or trickle irrigation system fitted with a PRV and timer	▪ To customers on the company's Vulnerable Customers List who have mobility issues but are not in possession of a Blue Badge ▪ To water newly laid turf for first 28 days
4. Cleaning a private leisure boat using a hosepipe	(1) cleaning any area of a private leisure boat which, except for doors or windows, is enclosed by a roof and walls. (2) Using a hosepipe to clean a private leisure boat for health or safety reasons	▪ Commercial cleaning ▪ Vessels of primary residence ▪ Cases where fouling is causing increased fuel consumption ▪ Engines designed to be cleaned with a hosepipe	▪ To prevent or control the spread of non-native and/or invasive species
5. Filling or maintaining a domestic swimming or paddling pool	(1) filling or maintaining a pool where necessary in the course of its construction (2) filling or maintaining a pool using a hand-held container which is filled with water drawn directly from a tap (3)	▪ None	

Tub category	Statutory exception	Discretionary universal exception (granted by all water companies)	Suggested discretionary concessional exception (granted by individual water companies)
	filling or maintaining a pool that is designed, constructed or adapted for use in the course of a programme of medical treatment (4) filling or maintaining a pool that is used for the purpose of decontaminating animals from infection or disease (5) filling or maintaining a pool used in the course of a programme of veterinary treatment (6) filling or maintaining a pool in which fish or other aquatic animals are being reared or kept in captivity		
6. Drawing water, using a hosepipe, for domestic recreational use	None	▪ None	
7. Filling or maintaining a domestic pond using a hosepipe	Filling or maintaining a domestic pond in which fish or other aquatic animals are being reared or kept in captivity	▪ Blue Badge holders on the grounds of disability	▪ To customers on the company's Vulnerable Customers List who have mobility issues but are not in possession of a Blue Badge
8. Filling or maintaining an ornamental fountain	Filling or maintaining an ornamental fountain which is in or near a fish-pond and whose purpose is to supply sufficient oxygen to the water in the pond in order to keep the fish healthy	▪ None	▪ To operate water features with religious significance
9. Cleaning walls, or windows, of domestic premises using a hosepipe	Using a hosepipe to clean the walls or windows of domestic premises for health or safety reasons	▪ To Blue Badge holders on the grounds of disability • Commercial cleaning	▪ To customers on the company's Vulnerable Customers List who have mobility issues but are not in possession of a Blue Badge

Tub category	Statutory exception	Discretionary universal exception (granted by all water companies)	Suggested discretionary concessional exception (granted by individual water companies)
10. Cleaning paths or patios using a hosepipe	Using a hosepipe to clean paths or patios for health or safety reasons	▪ To Blue Badge holders on the grounds of disability ▪ Commercial cleaning	▪ To customers on the company's Vulnerable Customers List who have mobility issues but are not in possession of a Blue Badge
11. Cleaning other artificial surfaces using a hosepipe	Using a hosepipe to clean an artificial outdoor surface for health or safety reasons	▪ To Blue Badge holders on the grounds of disability ▪ Commercial cleaning	▪ To customers on the company's Vulnerable Customers List who have mobility issues but are not in possession of a Blue Badge

Company Exemptions additional to legislative exemptions

Following the implementation of a TUB, we will consider any appeals for exemptions made to us and will take account of other water companies' experience of exemptions during similar droughts.

We intend to introduce exemptions that will benefit vulnerable customers and, in the initial stages at least, reduce to a minimum the economic consequences of a drought on our non-household customers. The precise groups and activities to be exempted during any TUB will form part of the advertisements that are necessary to introduce a drought and will also appear on our website. The extent of exemptions granted will be dependent on the severity of the drought that we are in.

We intend to allow:

- customers who hold a Blue Badge to water their own garden with a hosepipe, if no other fully able-bodied person is permanently resident at the property;
- the commercial cleaning of windows using a pole attached to a hose;
- the commercial washing of private motor vehicles;
- watering of playing surfaces used for International or National sporting events; and
- depending on the severity of the drought, and the outcome of studies into their impact, we will consider exempting:

    - the filling of domestic swimming pools if they are filled in accordance with Best Practice Guidance;

- the watering of newly laid turf if done in accordance with Best Practice Guidance; and
- the use of certain micro-irrigation systems if proven to be water efficient.

We will also consider, at the time of implementing a TUB, any other reasonable cases made for exempting any particular group or activity covered by the ban.

Reimbursement of licence fees paid by customers

A TUB or Drought Order Ban forms part of the Level of Service we have with our customers and no general refund of any part of the customer's water bill is refundable as a consequence of a ban being introduced. However, a very small number of customers who have a large water use, but whose property we are unable to install a meter at, pay for this additional water by an annual licence. The three groups requiring this type of licence are the unmeasured customers with either:

- a swimming pool (circulating);
- a swimming pool (un-circulating); and
- a sprinkler.

In the years when a TUB is required, each of these customers will be reimbursed 1/12 of their annual licence fee for each calendar month, or part of any month, for which their use of water for which the licence is required, is restricted.

7.4 Level 3 Demand Side Drought Actions

7.4.1 Non-Essential Use ban (NEUB)

On average, once every 200 years, a drought and corresponding shortage of raw water may become so acute that we have to implement restrictions on the use of water that are more severe than those introduced under the Temporary Use Ban (TUB). These tougher restrictions are known as a Non-Essential Use Ban (NEUB).

NEUBs are a set of measures granted to water companies to impose further restrictions on the use of water as long as certain legislative test are met. These powers are sought by applying to the Secretary of State at Defra for a drought order.

It is very difficult to estimate the effect of this type of water use restriction on customer demand as very little data is available. We have assumed that further restrictions on water use beyond appeals for restraint (7%) and a temporary use ban (5%) will yield an additional reduction in demand of 2%, giving a total estimated demand reduction of 14%.

Before applying for a Drought Order to restrict water use, water companies are expected to have made full use of their powers under the WIA 1991, as stated in the Explanatory Memorandum to the Water Use (Temporary Bans) Order 2010:

> *"By extending the water uses that water undertakers may prohibit under section 76(1) of the Act [WIA 1991], water undertakers may be able to delay or avoid the need for drought orders under the Water Resources Act 1991"*

The Drought Direction 2011 sets out the restrictions available under an Ordinary Drought Order, as allowed for under Section 73 of the Water Resources Act 1991 (WRA 1991). These are:

- Watering outdoor plants on commercial premises;
- 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; and
- Operating cisterns.

In order to grant a Drought Order under the WRA 1991 73(2), the Secretary of State must be satisfied that: “By reason of an exceptional shortage of rain (see Appendix 6), a serious deficiency of supplies of water in any area exists or is threatened”.

The potential timescales for introducing restrictions by recourse to a Drought Order are significantly longer than those for Temporary Use Bans under the WIA 1991, and the Secretary of State would typically require a public inquiry or hearing to be held if an objection were received.
Under Schedule 8, paragraph 3(c) of the WRA 1991, we would be required to publish a notice of our application for a Drought Order to restrict water use, which would state that objections to the application may be made to the Secretary of State within seven days from the date on which it is served or published.

The table below summarises the statutory, universal and discretionary exceptions relating to a NEUB that we will adopt.

	Drought Order Category	Statutory Exemptions	Universal Exception	Discretionary Exception	UKWIR Suggested Discretionary Exceptions
1	Watering outdoor plants on commercial premises	This includes plants which are in a pot or container that is outdoors or under cover and plants which are in the ground under cover. This does not include plants grown (i.e. cultivated or propagated) or kept for sale or commercial use or plants part of a National Plant Collection or temporary garden or flower display.	None	Use of an approved drip or trickle irrigation system fitted with a PRV and timer is set for use in the evening or night.	Use of an approved drip or trickle irrigation system fitted with a PRV and timer
				Water newly bought plants for the first 28 days after the implementation of the ban.	Watering newly-bought plants
2	Filling or maintaining a non-domestic swimming or paddling pool	This restriction shall not apply to: ▪ Pools open to the public (a pool is not open to the public if it may only be used by paying members of an affiliated club or organisation). ▪ Filling or maintain a pool that is used by pupils of a school for swimming lessons. ▪ filling or maintaining a pool where necessary in the course of construction. ▪ filling or maintaining a pool using a hand-held container which is filled with water drawn directly from the tap. ▪ filling or maintaining a pool designed, constructed or adapted for use in the course of a	None	None.	Swimming pools serving industrial training if considered justified
					Swimming pools with covers
					Pools with religious significance
					Pools fitted with approved water conservation or recycling systems
					Pools that are subject to significant repair and innovation

	Drought Order Category	Statutory Exemptions	Universal Exception	Discretionary Exception	UKWIR Suggested Discretionary Exceptions
		programme of medical treatment. ▪ filling or maintaining a pool that is used to decontaminate animals from infections or disease. ▪ filling or maintaining a pool used in the course of veterinary treatment. ▪ filling or maintaining a pool in which fish or other aquatic animals are being reared or kept in captivity.			
3	Filling or maintaining a pond	This restriction shall not apply to ponds in which fish or other aquatic animals are being reared or kept in captivity or to filling or maintaining the pond with a hand-held container which is filled with water directly from the tap.	Blue Badge holders on grounds of disability	None	Customers on the company's Vulnerable Customer List who have mobility issues but are not in possession of a Blue Badge
4	Operating a mechanical vehicle washer	None	None	On biosecurity grounds	Washers which recycle water and thus use less than 23 litres per wash
					On biosecurity grounds
5	Cleaning any vehicle, boat, aircraft or railway rolling stock	Cleaning any vehicle, boat, aircraft or railway rolling stock for health and safety reasons	None	On biosecurity grounds	Low water use technologies
					Small businesses whose sole operations are cleaning of vehicles using hosepipes
					Those using vessels as a primary residence

	Drought Order Category	Statutory Exemptions	Universal Exception	Discretionary Exception	UKWIR Suggested Discretionary Exceptions
					Cases where fouling of hulls causes fuel consumption
					To remove graffiti
					To prevent of control the spread of non-native and/or invasive species
6	Cleaning any exterior part of a non-domestic building or non-domestic wall	Cleaning any exterior part of a non-domestic building or non-domestic wall for health and safety reasons	None	To remove graffiti by applying to the wholesale supplier	Small businesses whose sole operations are cleaning of buildings using hosepipes
					Low water use technologies
					To remove graffiti
7	Cleaning a window of non-domestic building	Cleaning a window of non-domestic building using a hosepipe for health and safety reasons	None	Small businesses whose sole operations are cleaning of windows using hosepipes.	Small businesses whose sole operations are cleaning of windows using hosepipes
8	Cleaning industrial plant	Cleaning industrial plant using a hosepipe for health and safety reasons	None	Biosecurity	To remove graffiti
9	Suppressing dust	Suppressing dust using a hosepipe for health and safety reasons	None	None	None
10	Operating cisterns on unoccupied buildings	None	None	None	None

The programme for implementing a Drought Order is best considered in 3 stages:

Stage 1: Preparing and lodging an application

Our application will:

i. state the reasons why a Drought Order is being sought;
ii. include an environmental report with supporting information, including how we have enacted our Drought Plan up to that time;
iii. include a section on the social and economic impacts that the additional powers to restrict the use of water will have. Whereas our Temporary Use Ban predominantly restricts the use of our domestic customer base, a Drought Order Ban is likely to have a greater economic effect on commercial businesses.
iv. Include copies of the required advertisements, meaning that the Drought Order must be advertised prior to the application being made to Defra.

Applicants are required to publish a notice of the Drought Order Application in local newspapers and the London Gazette. The Environment Agency and all Local Authorities in the company's area must be sent a service notice by priority mail. The company must also make a copy of the application available for viewing and advise that objections should be made to the Secretary of State within a seven day period. We would include all of the application documentation and advertisements on our website during the advertising period.

Stage 2: Hearings or inquiries

If any objections are received, the Secretary of State must hold a local inquiry or hearing unless he/she considers the Drought Order must be made urgently.

The process around the inquiry or hearing is a lengthy one. An inspector must be appointed, a location identified and a date agreed upon. The company is the required to advertise the hearing in the same manner as it advertised the application. Again, a 7 day advertising period is required by statute.

Following the hearing the Inspector must prepare a report setting out their recommendations to the Secretary of State. The Secretary of state will then make their decision and advise the company accordingly.

Although theoretically this whole process could be done in 26 days, in reality at least three months should be allowed. This time scale and the need to minimise any hearing or inquiry to a single event, dictates that we will seek all permissions in one go, but may impose them flexibly.

Stage 3: Implementation

Once the Drought Order has been approved, and before it can be enacted, the company must again advertise, in the same manner as previously, that it will be implementing the drought order that has been granted.

Depending on the prevailing conditions, including the time of year, we would intend to enact all of the prohibitions granted under the Drought Order at once, or introduce only

those necessary at that time to preserve water. This phased approach of selectively banning certain actions granted under the Drought Order is the most proportionate response to the situation. The decision on which order to introduce certain restrictions on use will only be decided after the Drought Order is granted. This will ensure that we can restrict the minimum uses of water necessary at any particular time whilst minimising any economic impact.

A Drought Order can only be granted for a maximum of 6 months and extended for up to a further six months. The order can only be extended by further application to the Secretary of State.

The activities that can be banned under a Drought Order include:

1. Watering outdoor plants on commercial premises
2. Filling or maintaining a non-domestic swimming or paddling pool
3. Filling or maintaining a pond
4. Operating a mechanical vehicle washer
5. Cleaning any vehicle, boat, aircraft or railway rolling stock
6. Cleaning non-domestic premises
7. Cleaning a window of a non-domestic building
8. Cleaning industrial plant
9. Suppressing dust
10. Operating cisterns

Further Non-Essential Use definitions are presented in Appendix 10.

7.5 Compensation arrangements

Individuals (e.g. owners of a water source or those who have an interest in a source) who suffer a loss or damage as a result of a drought permit or drought order are entitled to compensation.

The rules for compensation are set out in Schedule 9 to the Water Resources Act 1991.

In the unlikely event that a third party incurs losses or damages as a result of a drought order or permit overriding their rights to the water, the process to apply for compensation is as follows:

- The claimant must serve notice on our parent company (Northumbrian Water Limited) stating the grounds of the claim and the amount claimed. The Environment Agency is not involved in the claims process;
- Claims must be made within six months of the date of expiry of the permit; and
- Disputes are referred by the claimant or applicant to the Upper Tribunal, and are not a matter dealt with at the hearing. The Upper Tribunal may make an award during the duration of the permit in respect of likely damage, though in so doing it may have regard to the amount of water which was likely to have been available to the claimant as against others.

8 SUPPLY SIDE DROUGHT ACTIONS

8.1 Overview

This section of our Plan describes the supply side drought actions that we may employ to address potential water supply shortages during a drought. We do not have any Level 3 supply side actions that would require a Drought Permit or Drought Order.

8.2 Level 1 Supply Side Drought Actions

8.2.1 Optimising sources

Prior to the implementation of any drought measures, efforts will be focused on averting the effects of drought through maximising existing resources. We will ensure that we maximise abstraction from river sources which can directly be supported from Kielder in order to maintain reservoir storage and groundwater sources during the early stages of drought.

8.2.2 Outage Reduction

From time to time we will experience planned outage (e.g. planned maintenance) and unplanned outage (e.g. due to poor raw water quality) at our Water Treatment Works. This could result in one source being used more than is desirable during a drought. Generally, we undertake planned maintenance at treatment works during the winter when customer demand is lower and planned maintenance of raw water pumping

stations after our reservoir refill season. If we were undertaking planned maintenance of our assets during a drought and this was impacting resources we would look to defer the maintenance. We would also consider bringing forward planned asset improvement works if this had a positive effect on our water resource position.

We continue to invest in our treatment works to reduce unplanned outage which, for example, might be caused by algal blooms. For example, we are investing in a new treatment process at our principle River Tyne Water Treatment Works which will enable our processes to maintain output even when we experience poor raw water quality in the River Tyne.

8.2.3 Tankering

In some smaller isolated areas, the only option to provide additional supplies in the event of spring yield falling and the relevant service reservoir level reducing is to tanker potable water into the service reservoir, which ensures that tankering poses no biosecurity risks as there are no discharges to the environment. Therefore the service reservoir level is the trigger. We generally utilise tankers with a carrying capacity of $30m^3$. Plant and procedures are already in place with dedicated fill points at Whittle Dene and Broken Scar WTW. The quantities of water required in tankering operations are minimal and has no impact on the overall deployable output of these works. In practice, due to the location of these areas, tankering will take place from Whittle Dene WTW. Analysis suggests that a maximum of two tankers a day would be required giving a volume of $60m^3$. This is negligible in comparison to the DO of the works.

8.2.4 Operation of the Kielder Transfer Scheme

As described previously this scheme allows us to maintain raw water supply to the majority of treatment works. It would be operated in accordance with the Kielder Operating Agreement Appendices.

8.2.5 Alterations to the Potable Distribution System

As required water could be made available to the Wear OA and the supplement from the Wear OA to the Tees OA would cease. This would require minor valving operation on the distribution system.

8.2.6 Lowering Borehole Pumps

We consider that our submersible borehole pumps are already at a level whereby they would remain operational even during a 1 in 200 year drought. Nevertheless, there is scope to lower the pumps in our boreholes should a more severe drought result in increased drawdown of the pumped groundwater level. This would be achieved by adding additional lengths of rising main (the pipe that connects the pump to our raw water mains).

The trigger for this would be when the groundwater level is less than 5m above the pump intake.

8.3 Environmental Drought Actions

We will work closely with the Environment Agency to implement actions to mitigate an environmental drought. Actions would include enhanced dry weather messaging and the operation of compensation discharges as set out in our abstraction licences.

As part of the Kielder Operating Agreement, releases from the reservoir are determined using the Kielder Operational Release Model which uses drought, dry, typical or wet factors to determine the releases made from the reservoir into the North Tyne. The releases are made to ensure the ecological health of the rivers North Tyne and Tyne.

8.4 Drought Actions to support other sectors

As was the case in 2018, we will consider on a case by case basis proposals put forwards by agri-abstractors. Our assessment will consider:

- forecast utilisation (by NWL) of individual abstraction licence licensed quantities in the current reporting year and what headroom, if any, we have. In terms of groundwater abstraction, headroom would be assessed against the recent actual baseline; and
- the EA's current trading position (specifically with regard to the water body / catchment that the EA will consider trading within).

Any short term trade would need to be discussed and approved by the EA.
Given the potential for animal welfare issues, we will consider on a case by case basis how we can help livestock farmers without mains water (e.g. tankered water), should they have drought related issues with their private abstractions.

There are several private domestic water supplies predominantly in rural areas which may require support in the event of the supplies failing. Where practicable, our policy is to support with the use of bowsers to provide a potable supply for domestic use and we would work with the relevant local authorities to understand the scale and location of any potential supply issues.

8.5 Discounted Drought Actions

8.5.1 Deepening boreholes

We do not consider borehole depth to be a drought constraint. If it was, we would consider drilling a new borehole to be preferable to deepening an existing borehole. Consequently, deepening boreholes is not an action in this Drought Plan.

8.5.2 Reducing Process Losses

Process losses are the waste waters generated from our water treatment processes. For example, in order to maintain the output of our filters, we have to regularly back wash them to remove the particulates that the filters have removed from the incoming raw water source. The back-wash water is a process loss.

We regularly monitor process losses to ensure our treatment processes are optimises. Consequently, we do not consider there to be further scope to do this during a drought.

9 EXTREME DROUGHT MEASURES

9.1 Section Overview

This section identifies the drought actions we could implement in an extreme drought (after Level 3 restrictions such as non-essential use bans) to delay the need for Level 4 severe drought restrictions such as emergency drought orders that authorise standpipes or rota cuts.

We have considered whether the actions:

- are practical to implement during an extreme drought;
- are likely to be temporary;
- are technically feasible; and
- will generally not result in permanent increases to deployable output i.e. usually distinct from WRMP options

We have explored the full range of potential actions included within the ordinary drought order legislation (section 74(2) of the WRA 1991) when planning for an extreme drought. The options include applying to:

- take water from any source specified subject to conditions;
- prohibit or limit the use of water for any purpose specified;
- discharge water to any place specified subject to restrictions;
- prohibit or limit taking of water by an appropriate agency; and
- suspend or modify restrictions relating to abstraction, discharge, supply, filtration of water.

The extreme drought measures we have identified are provided in the table below and include:

- a summary of the actions that are available up to the point of needing to apply for an emergency drought order;
- the type of action (supply or demand);
- the Water Resource Zone(s) in which it would apply;
- a description of the action and the likely trigger for needing it (where appropriate related to reservoir storage);
- an indication of the likely benefit or saving;
- identification of significant barriers, and
- an indication of the timescale for implementation.

In prioritising the implementation of these extreme measures, we will ensure that the demand actions are implemented before more extreme supply side actions.

9.1.1 Viable Extreme Measures

The table below summarises the extreme drought actions we have identified.

Type of action	Water Resource Zone	Summary of action	Trigger for action to be used	Likely benefit / saving	Barriers	Environmental impacts	Timescales	Priority order
Demand	All	**Media & Communications:** National campaigns to change culture, excessive water use seen as socially unacceptable, keeping customers aware of the current storage situation, Day Zero language, guides for customers to show how to restrict water use to 50 litres/ person/day. Hard hitting messages and images.	This would be implemented after all Level 3 actions have been implemented and then based on priority order in this table.	Logically, this action will result in a reduction in demand. However, we do not believe it is possible to quantify the saving.	Hygiene - Covid	No significant adverse environmental effects as the measure is to reduce demand and therefore abstraction.	2 weeks	1
Demand	All	**Supply pipe repairs:** Free and fast supply pipe repairs for customers	This would be implemented after all Level 3 actions have been implemented and then based on priority order in this table.	0.18Ml/d	Need customer's permission which is not guaranteed (impacts on driveways); Availability of resource (inhouse or contractors)	No significant adverse environmental effects as the measure is to reduce demand and therefore abstraction.	3 weeks	2
Supply	All (where opportunities exist at the time)	Trades/transfers: Short term trades between companies/sectors.	This would be implemented after all Level 3 actions have been implemented and then based on priority order in this table.	Would be determined on a case by case basis taking account current resource position and water availability.	Donor permission; EA Trading Policy	This option might require abstraction above recent actual levels. The action would not be pursued if it required abstraction above their own licensed quantities.	6 weeks	2
Demand	All	Removal of Statutory Exception 3:- Cleaning any area of a private leisure boat which, except for doors and windows, is enclosed by a roof and walls.	This would be implemented after all Level 3 actions have been implemented and then based on priority order in this table.	Small reduction in demand. Unquantified	May need emergency powers	No significant adverse environmental effects as the measure is to reduce demand and therefore abstraction.	Normally within 28 calendar days	4
Demand	All	Removal of Statutory Exception 4:- Filling or maintaining a pool where necessary in the course of its construction.	This would be implemented after all Level 3 actions have been implemented and then based on priority order in this table.	Small, unquantified demand saving	Non-essential use ban. Delay of pool construction and subsequent Impact on business.	No significant adverse environmental effects as the measure is to reduce demand and therefore abstraction.	Normally within 28 calendar days	4

Type of action	Water Resource Zone	Summary of action	Trigger for action to be used	Likely benefit / saving	Barriers	Environmental impacts	Timescales	Priority order
Demand	All	Discretionary Universal Exceptions 3:- Commercial customers that use hosepipes in the course of their day to day business operation for example hand car washing, window cleaning, graffiti, excluding the watering of domestic gardens.	This would be implemented after all Level 3 actions have been implemented and then based on priority order in this table.	Could be a worthwhile but unquantified saving.	Ban under NEUB (Drought Order Ban)	No significant adverse environmental effects as the measure is to reduce demand and therefore abstraction.	Immediate	4
Demand	All	Removal of Statutory Exception 2:- Watering plants that are (1) grown or kept for sale or commercial use or (2) that are part of a National Plant Collection or temporary garden or flower display.	This would be implemented after all Level 3 actions have been implemented and then based on priority order in this table.	Small reduction in demand. We would still encourage this group to maximise use of re-use water	This would permanently remove collections. Impact on business.	Loss of important National collections	Normally within 28 calendar days	5
Demand	All	Discretionary Universal Exception 2:- Use of an approved drip or trickle irrigation watering system, fitted with a pressure reducing valve and a timer, that are not handheld, that place water drip by drip directly onto the soil surface or beneath the soils surface, without any surface run off or dispersion of water through the air using jet or mist.	This would be implemented after all Level 3 actions have been implemented and then based on priority order in this table.	Could be significant if use encouraged wide spread fitting.	Covered by Ban. Not essential compared to standpipes/rota cuts	No significant adverse environmental effects as the measure is to reduce demand and therefore abstraction.	Immediate	5
Demand	All	Removal of Statutory Exception 7:- Filling or maintaining a pool used in the course of a programme of vetinary treatment.	This would be implemented after all Level 3 actions have been implemented and then based on priority order in this table.	Small, unquantified saving	Animal welfare	No significant adverse environmental effects as the measure is to reduce demand and therefore abstraction.	Normally within 28 calendar days	6
Demand	All	Removal of Statutory Exception 8:-Filling or maintaining a pool in which fish or other aquatic animals	This would be implemented after all Level 3 actions have been implemented and	Would ask owners to minimise water use but would not ban	Animal welfare	Could affect fish stocking/conservation.	Normally within 28 calendar days	6

Type of action	Water Resource Zone	Summary of action	Trigger for action to be used	Likely benefit / saving	Barriers	Environmental impacts	Timescales	Priority order
		are being reared or kept in captivity	then based on priority order in this table.					
Demand	All	Removal of Statutory Exception 9:-Filling or maintaining a domestic pond in which fish or other aquatic animals are being reared or kept in captivity.	This would be implemented after all Level 3 actions have been implemented and then based on priority order in this table.	Would ask owners to minimise water use but would not ban	Animal welfare	No significant adverse environmental effects as the measure is to reduce demand and therefore abstraction.	Normally within 28 calendar days	6
Demand	All	Removal of Statutory Exception 10:- Filling or maintaining an ornamental fountain which is in or near a fish pond and whose purpose is to supply sufficient oxygen to the water in order to keep the fish healthy.	This would be implemented after all Level 3 actions have been implemented and then based on priority order in this table.	Would encourage owners to use alternative aeration but would not ban	Animal welfare	No significant adverse environmental effects as the measure is to reduce demand and therefore abstraction.	Normally within 28 calendar days	6
Supply	All	**Drought orders:** Use full range of powers available with drought orders: - temporary increases to licences that have been reduced or revoked - compensation flow reductions - abstraction from alternative sources.	This would be implemented after all Level 3 actions have been implemented and then based on priority order in this table.	Would be determined on a case by case basis taking account current resource position and water availability.	Need for emergency drought order. Environmental impacts, WFD objectives.	Potential for long term / permanent impacts on ecology and WFD status. See section below on Overriding Public Interest	Normally within 28 calendar days	7
Demand	All	Discretionary Universal Exception 1:- Watering a garden attached to a domestic dwelling, or watering plants on a domestic premises using a hosepipe by people with severe mobility problems who hold a current Blue Badge as issued by their local authority.	This would be implemented after all Level 3 actions have been implemented and then based on priority order in this table.	Ask to minimise use. Demand saving thought to be small but unquantified	Discriminatory	No significant adverse environmental effects as the measure is to reduce demand and therefore abstraction.	Normally within 28 calendar days	8

Type of action	Water Resource Zone	Summary of action	Trigger for action to be used	Likely benefit / saving	Barriers	Environmental impacts	Timescales	Priority order
Demand	All	Removal of Statutory Exception 1:- Using a hosepipe for health or safety reasons where they include (a) removing or minimising any risk to human or animal health or safety and (b) preventing or controlling the spread of causative agents of disease	This would be implemented after all Level 3 actions have been implemented and then based on priority order in this table.	Logically, this action will result in a reduction in demand. However, we do not believe it is possible to quantify the saving.	We would need emergency powers. Adverse hygiene issues and impact on business	No significant adverse environmental effects as the measure is to reduce demand and therefore abstraction.	Normally within 28 calendar days	8
Demand	All	Removal of Statutory Exception 1:- Using a hosepipe for health or safety reasons where they include (a) removing or minimising any risk to human or animal health or safety and (b) preventing or controlling the spread of causative agents of disease	This would be implemented after all Level 3 actions have been implemented and then based on priority order in this table.	Logically, this action will result in a reduction in demand. However, we do not believe it is possible to quantify the saving.	We would need emergency powers; Adverse hygiene issues and impact on business	No significant adverse environmental effects as the measure is to reduce demand and therefore abstraction.	Normally within 28 calendar days	9
Reduced mains pressure	All	Pressure management: Further reduce pressure while still maintaining essential services, night time reductions.	This would be implemented after all Level 3 actions have been implemented and then based on priority order in this table.	Unknown	Customer support; Ofwat, DWi and CCWater approval. Vulnerable customers but we know who they are and would ensure their needs are met.	No significant adverse environmental effects as the measure is to reduce demand and therefore abstraction.	6 weeks	10

9.1.2 Discounted Extreme Measures

The table below summarises the extreme drought actions which we have discounted because we do not believe that they are viable.

Type of action	Summary of action	Reason for Discounting
Demand	**Removal of Statutory Exception 5:** Filling or maintaining a pool that is designed, constructed or adapted for use in the course of a programme of medical treatment.	Not considered due to effect on health
Demand	**Removal of Statutory Exception 6:** Filling or maintaining a pool that is used for the purpose of decontaminating animals from infections or disease.	Not considered on animal welfare/ possible human health grounds
Demand	**Tariff changes:** Higher tariffs for high use, reward scheme for using less water, incentive scheme e.g. bill rebate, postcode scale targets and reward for all if target met.	Socially discriminatory against those that can still afford verses those that can not.
Demand	**Relocations:** Relocate farm stock and/or businesses	No powers (for Government)
Demand	**Non-potable use:** Temporary rainwater capture systems on buildings, temporary barriers to help capture water in fields, mass fitting of free water butts in homes.	Will be in severe drought so volumes concerned unlikely to be significant / worthwhile.
Supply	**Catchment actions:** Water use plans across sectors, link users to share resources.	Farm reservoirs likely to be empty in any case, farm river abstraction under Section 57 notice leaving only groundwater which not feasible.
Supply	**Sea Tankering:** Moving water around, sea tankering.	Discounted based on significant water quality / drinking water compliance risks. Additional barriers include availability of tankers.
Supply	**Supply schemes:** Fast tracking of WRMP schemes.	We are undertaking WRMP24 options appraisal now and none of the schemes could be implemented sufficiently quickly.
Supply	**Network changes:** Temporary pipelines, new supplies, speed up construction process e.g. overland pipes.	We are undertaking WRMP24 options appraisal now and none of the schemes could be implemented sufficiently quickly.
Supply	**Effluent re-use:** Redirecting discharge direct to TWs	Would require an RO plant. Discounted based on significant water quality / drinking water compliance risks, public perception, suitable blending point, inability to deliver in time. Additional barrier includes permits required to discharge effluent and suitable discharge point.
Supply	**Effluent re-use:** Relocate to other watercourses.	Would require an RO plant. Discounted based inability to deliver in time. Additional barrier includes permits required to discharge effluent and suitable discharge point.
Supply	**Desalination:** Mobile plants.	Discounted for time constraints and location. See 9.2.2
Other	Towing a water bag	Discounted due to high costs and need for pipeline. See Section 9.2.3
Other	Towing an iceberg	Discounted due to high costs and need for pipeline See Section 9.2.4

9.2 Esoteric Drought Options

9.2.1 Overview

Esoteric options are those assumed to be unlikely to be realised at present due to technical complexity, environmental concern, high cost and/or problems of promotion. However, these factors change with time, and certain esoteric measures could eventually be considered viable in times of drought, when more cost-effective measures have been exhausted.

This section provides an overview of options that could potentially be considered as drought actions in the event of an unprecedented prolonged and severe drought. These are as follows:

- Desalination of Brackish Water via Mobile Plant;
- Sea Tankering
- Towing Flexible Bags

9.2.2 Desalination of Brackish Water via Mobile Plant

Although seawater desalination is not currently considered a viable long term water resource option, the costs particularly for brackish water desalination are decreasing such that the option could be examined as a solution for peak lopping and/or as a contingency option in severe drought.

Reverse osmosis (RO) is likely to be the preferred treatment process for brackish water desalination, as it uses less energy than the alternatively used method of multi-stage flash (MSF) distillation. Also unlike MSF distillation, RO plants can be 'packaged' and skid-mounted for simple delivery and installation, although such plants are usually small in yield, largely due to the maximum size of plant that can be transported by lorry. A 5 Ml/d capacity temporary plant could however be achievable by connecting a number of smaller 1 Ml/d units in parallel.

However, there are two key issues to be resolved in consideration of brackish water desalination as a drought option:

Time

The time period for ordering and agreeing contractual agreements with a supplier, plant delivery, plant commissioning and testing, and providing linkage to the supply network, is such that the minimum time between ordering plant and producing water for use is estimated at 8 to 12 months.

Location

The number of locations for such a unit with an adequate supply of brackish water are limited to coastal or estuarine areas.

Given the above issues it is unlikely that this drought option would be employed unless in a very severe drought.

9.2.3 Sea Tankering

Sea tankering is a proven method of supplementing water resources in a drought, and Northumbrian Water gained experience of this in the 1980's when 425 Ml of water was tankered from Teesside to Gibraltar.

The yield from tankering is constrained by the size and number of tankers being used. Typically tankers have between 300 and 500 Ml capacity. A single 350 Ml capacity tanker would be able to deliver the equivalent of 50 Ml/d based on a seven day round trip including loading and unloading. The long term nature of contracts associated with tankering operations means that this option would have to provide a continuous and ongoing yield for a number of years.
High unit costs for utilising sea tankering, as a drought option, means that it would only be considered after all other lower cost options have been exhausted. The potential requirement for a pipeline from the tankering mooring point to a suitable storage point makes the option highly unlikely in the short term.

9.2.4 Towing Flexible Bags

The idea of towing flexible bags filled with freshwater from areas of surplus water to areas of shortfall came into fruition in the 1990's. Technology exists to attach flexible bags, made out of strong polypropylene to tugs that would be able to tow the bags.

High unit costs for utilising flexible bags as a drought option means that it would only be considered after all other lower cost options have been exhausted. The potential requirement for a pipeline from the mooring point to a suitable storage point also makes the option highly unlikely in the short term.

10 CUSTOMER COMMUNICATIONS

10.1 Overview

We recognise the importance of customer communication during prolonged dry weather and drought, both in terms of how we explain our water resources position and how we secure customer co-operation in reducing water use.

The overall objective of our Drought Plan Communication Plan is to encourage customers to reduce their own water consumption voluntarily and help to reduce their mains water demand.

Drought communications are in addition to our ongoing water efficiency programme. However, where possible, the messaging will be aligned to emphasise the importance of using water wisely during a drought.

We will encourage our customers and water retailer's customers (i.e. businesses) to use less water through our communications campaigns. We will do this through additional targeted water efficiency initiatives which will focus on water use and customer behaviour both in the home and garden. In developing our communication campaigns, we will liaise with a range of organisations including but not limited to neighbouring water companies, Water Resources North (WReN), the Environment Agency (EA) and National Farmers Union (NFU).

Our full Drought Plan Communications Plan is presented below. In developing it, we have taken account of:

- the findings in the UKWIR report 'Drought and demand: potential for improving the management of future drought';
- our experience of prolonged dry weather and drought; and
- the conclusions of the Consumer Council for Water's 2013 report 'Understanding drought and resilience'.

In summary, our Communications Plan:

- aims to balance the needs of the three customer groups identified by CCWater:
    - Social Conscious – those that see drought as an environmental issue and want practical water efficiency tips
    - Unengaged urban who are not sure about the causes of drought but want to know more about the bigger picture; and
    - Service motivated – those who see it as being a water company issue and want to know what we are doing about it first.is an agile communications plan that:
- confirms what actions we will take and when we will communicate with our customers about our drought status and ask of them;
- sets out how we will communicate in a clear and timely way with customers, partners and other interested groups during a drought.
- promotes using varied and innovative communications channels to help customers reduce water use;
- covers all stages of drought and is flexible and adaptive (agile) to changing supply and demand situations;
- confirms we will engage early with our customers (i.e. before we need to implement a Level 1 Appeal for Restraint); and
- outlines how we will join up communications with neighbouring companies, regional groups and with regulators (e.g. joint press briefings).

When planning communications with our customers, we will consider best practice and international examples as well as the conclusions of the Consumer Council for Water's report 'Understanding drought and resilience', 2013.

10.2 Keeping customer and stakeholder informed during drought

Once we have entered a period of prolonged dry weather, we will ensure that we inform our customers, retailers, regulators and other stakeholders (such as local resilience forums, fire and rescue services and power plant operators):

- how a drought is developing;
- what we're doing to manage it;
- how it might affect their supply; and
- the actions they can take to help reduce water use.

We will do this in a timely, proactive way to help mitigate the impacts of prolonged dry weather and drought on the environment.

As a drought takes hold, we will increase our engagement with customers and other stakeholders to raise their awareness of our water resource position and also the impact of water use on the environment.

We have developed with Anglian Water and Wheatley Solutions a web-based application called Watersource. Watersource comprises several modules, one of which is to show the current drought status (e.g. no drought, environmental drought, water resources drought and whether level 1, 2 or 3 drought actions are live) in all water company water resource zones. Currently, Watersource covers, Essex & Suffolk Water, Northumbrian Water, Anglian Water, Cambridge Water, Hartlepool Water and Yorkshire Water although the ambition is for it to cover all water companies in the future. We believe that this will be a useful tool for sharing information with stakeholders (e.g. retailers).

10.3 Monitoring the Effectiveness of Communication Activities

We will monitor and evaluate the effectiveness of our communications activities during a drought by tracking the daily demand for water and through customer feedback via our website and social media channels. This information will be used to refine our messaging and also to help develop more effective communication plans for future drought events.

10.4 Communication Channels

10.4.1 Overview

Drought communications will focus on key water resource, demand and water efficiency messages and will provide advice on how customers can save water.

Depending on the severity of drought, the following tools could be used:

- Local press and radio advertising;
- Mailouts to all customers;
- Text messaging to customers;
- Boosted Facebook / Twitter posts;
- Website / banner advertising; and
- roadshows (e.g. use Flo in key town centre locations so staff can engage directly with customers to communicate our water resources position and to promote our Water Efficiency campaigns, Every Drop Counts and Whole Town Approach.

10.4.2 Channels

- Media Releases
- NWL website: www.nwl.co.uk
- Media Interviews (spokespeople will be selected and briefed by the Communications team)
- Letters to key stakeholders (MPs, district/borough councillors, parish councils)
- Postings on local partner websites (e.g. local councils)
- Briefings for Customer team

- Employee communications

10.4.3 Media

As well as trade and industry press, all local media for NW would include:

- BBC Look North
- ITV Tyne-Tees
- All local newspapers
- All local Radio Stations

10.4.4 Social Media

NW social media accounts include:

- Twitter
- Facebook
- LinkedIn

10.4.5 Stakeholders

We would consider contacting the following stakeholders to encourage them to share and reinforce our messaging, for example, by including our messages in their newsletters or distributing them to members:

- Caravan parks/holiday homes
- Leisure centres
- NFU
- SME's
- Housing associations
- Allotment groups

10.4.6 Advertising

We will consider creating a series of radio, newspaper and public transport adverts which can be cascaded across the area. Paid for advertising will help us cover all bases and communicate with customers that are not as accessible in hard to reach places or who are engaging with us digitally.

10.4.7 Internal Communications

Sharing the golden thread messaging with our employees is crucial in supporting our customers. We are able to send employee text messages, newsletter updates and attend regular team briefings to make sure our people understand the impact of drought on the business and how we can help our customers. From ensuring that our operational teams are only cleaning mirrors, lights and windows on fleet vehicles to reporting leaks on our leakage portal while out in the field.

10.4.8 Direct customer communications

Sending text messages direct to customers on a postcode or network supply area basis allows us to keep the tone of being honest and transparent and provide customers with the need to know information to support them through a period of drought.

10.4.9 Our Website

www.nwl.co.uk is a one stop shop for information for our customers. They can check if there is an issue in their area by entering their postcode, access their accounts as well as reporting leaks through our leakage portal.

During drought, we will create website alerts and instant pop-ups to make customers aware of any relevant information. Our website has dedicated **Save Water** pages for our customers with information covering how they can reduce water consumption in their homes and gardens throughout the year.

In the event of a drought, we will be create an FAQs page for our customer to ensure any queries or worries they may have are answered. Our website chat function is linked directly to Facebook Messenger where customers can contact a quick response, freeing up, freeing up our phonelines for emergencies, hard to reach and vulnerable customers

10.5 Drought Messaging Actions

10.5.1 Overview

Our drought messaging will be reinforced with facts covering the current rainfall, customer demand, reservoir storage, groundwater level and river flow position. We will provide a consistent message to our customers and other stakeholders including but not limited to neighbouring water companies, WReN, NFU and the media. The messaging for ‘Waters worth saving’ from Water UK will help emphasise this at a national level.

Our messaging will generally be accompanied with or a signpost to a list of top water saving tips for the garden and home.

10.5.2 Triggers for Drought Messaging

The triggers for enhanced dry weather messaging and formal Appeals for Restraint are illustrated on our worked examples in Appendix 2.

10.5.3 Dry Weather Messaging and Level 1 Appeals for Restraint

A key part of customer engagement during dry weather and drought is informing customers how they can reduce their water use. Examples of water saving tips that we might use in our business as usual dry weather messaging include:

- Turn off the tap when brushing your teeth and save 6 litres of water each time;
- Use a water butt to collect and store your rainwater;
- Put a save-a-flush device in your toilet cistern and save up to 1 litre of water every time you flush;
- Use full loads in your dishwasher and washing machine;
- Replace washers on dripping taps - they can waste up to 26 litres of water in 24 hours - that's enough for a shower;
- Use a bucket rather than a hose to wash the car;
- Shower rather than bath and save 10 litres every time;
- Use a bowl when hand washing dishes 7 litres every time;
- Water plants in the evening to retain moisture in the soil;
- Report any leaks you spot so that we can fix them quickly - ring the leak line on 0800 393 084; and
- Get a water butt to collect rainwater and use in the garden.

Actions at this stage will include:

- General update press releases confirming a period of dry weather, that we are managing resources and encouraging customers to report leaks and to use water wisely;
- Frequent water efficiency messaging across all of our social media channels. This will include engaging infographics / animations and we will ask our partners to share these posts;
- A dedicated dry / warm weather advice section on the website which will be regularly updated with press releases / media statements; and
- Q&A's prepped and given to customer team in the event of difficult questions being asked via telephone. External Q&As will also be put on the dedicated page of our website.

Example messages include:

- Water supplies remain healthy for this time of year.
- However, due to dry weather and more people working at home, demand for water is high.
- We are managing the situation carefully and have plans in place to help keep the water flowing for our customers.
- We are doing X, Y, Z to help maintain water supplies.
- There are currently no plans for a hosepipe ban.
- We would encourage customers to use water wisely now in case the dry weather turns into a drought.
- Customers can do X, Y, Z to help save water around the home and garden.
- Warm weather can cause ground movement which can lead to burst pipes. We are asking customers to help us out by reporting these to us so we can get them fixed as quickly as possible.

As a drought deepens and once the trigger for a Level 1 Appeal for restraint has been reached, we will repeat the actions detailed above and will confirm the latest escalated position. Additionally, we will:

- enhance our social media posts to target areas with tips and advice on using water wisely; and
- Contact key stakeholders such as the Chamber of Commerce, the NFU and other related parties within the affected areas and ask that they share our messaging;
- send e-newsletters to customers in affected areas providing tips and advice on using water wisely; and
- consider running an advertising campaign targeted at those areas affected.

10.5.4 Level 2 Temporary Use Ban (TUB) Messaging

If our Drought Management Group concludes that we need to implement a TUB, then we will ensure we follow the legal requirements as outlined in Section 7.3.1. We will also ensure that we effectively communicate to our customers how the bans will affect their use of water.

Once our DMG has agreed a TUB is required, we will undertake a two-week consultation, after which the temporary use ban will be in place. We will ensure we are resourced to be able to effectively manage our messaging as well as to deal with increased media interest.

Where appropriate, we will issue joint customer communications with Water Resources North and its members.

Prior to announcing the TUB, we will ensure:

- press releases are drafted and approved, with appropriate FAQs included;
- location and timing for media interviews are agreed;
- our spokesperson is fully briefed;
- our website is updated;
- Social media posts are agreed and scheduled;
- emails to stakeholders are drafted with draft social media posts included so they can also share our messaging; and
- we have liaised with neighbouring water companies, WReN, EA, NFU and other interested groups.

Announcing Ban

The following tasks will be undertaken:

- Press releases will be issued one day in advance, under embargo;
- Media interviews to be carried out at agreed locations;
- Website update will go live; and

- Social media posts will be scheduled in advance and monitored to manage enquiries.

Example messages include:

- Rainfall for the proceeding 3 / 6 / 9 / 12 months is x% below average
- Reservoir storage is currently at x% which is x% below average for the time of year.
- Groundwater levels are currently below average for the time of year.
- Demand is currently running at x% above average.
- A combination of prolonged dry and warm weather and elevated demand has led to our water resources being at levels which are significantly below average for the time of year. With no rain in the forecast, to ensure we are able to maintain resilient supplies should the drought deepen, we will be implementing a temporary use ban (TUB) across our supply area from XX/XX/XX.
- This is not a decision we have taken lightly, and we thank customers who have already been doing their bit to save water to help us preserve supplies.
- We ask customers to abide by the restrictions and to do everything they can to save water at this time.
- Those who do not adhere to the TUB can be subject to a £XXX fine.
- Warmer weather causes ground movement which can lead to burst pipes. We are asking customers to help us out by reporting these to us so we can get them fixed as quickly as possible.
- We have one of the best records in the water industry for dealing with leakage and are continuing to invest and find new ways to improve on this.
- We will lift the TUB once rainfall, reservoir storage and groundwater levels return to more normal levels for the time of year.

Following Ban Announcement

The following tasks will be undertaken following the announcement of a TUB:

- Daily social media posts reminding customers of planned restrictions and pointing them to our website for more information. Continue daily messaging on how customers can save water (a separate social media plan will be required);
- Record video with key spokesperson explaining why temporary use ban is needed, how customers are affected and urging them to continue to use water wisely;
- Press release ‘mythbuster’ – Providing some more detail on the temporary use ban, and how customers will be affected (to cover some of the most common questions asked on social media); and
- Reminder press release – Issued 1 or 2 days after implementation.

Post Ban Implementation

Proactive communication in the week following the introduction of the TUB will be limited to reinforcing our key messages, providing factual information about the TUB and encouraging customers to reduce their water use. Following this initial period,

more proactive communication will be introduced, focusing on other ways we are managing the situation (tackling leakage / bursts etc). Other actions include:

- Press release on surviving without a hosepipe. Promoting the alternatives to using a hosepipe and confirming what is/isn't covered by the ban;
- Social focussing on confirming that the ban is in place, what is/isn't covered, pointing customers to website as main source of information. Continue to push water efficiency messages; and
- Website FAQs to be reviewed and updated depending on enquiries received.

Ban Withdrawal

We will liaise with neighbouring water companies, WRE, EA, NFU and other interested groups on our plan to withdraw the TUB. Once agreed, we will issue press releases and social media posts confirming that the TUB is withdrawn but that everyone should continue to use water wisely. Additionally, we will update our website, media interviews will be facilitated with agreed a spokesperson and our Customer team will be briefed to handle enquiries.

Key messages might cover the following points:

- Thanks to the excellent response from our customers to our appeals to use water wisely, and increased rainfall in our region, we will be lifting the hosepipe ban on XXXXXX;
- The ban was required due to extremely low levels of rainfall, more people spending time at home and increases in demand for water;
- We ask our customers to continue conserving water as much as they can this time, as it will take some time for our reservoir and groundwater levels to return to normal levels. This will help us avoid the prospect of further restrictions;
- We ask customers to continue with the water saving habits they have adopted during this time as much as possible, as this will help us maintain supplies all year round; and
- We thank customers for their help and patience during this period.

10.6 Working with others during Drought

10.6.1 Overview

We will work with a wide range of interested groups and partners to enhance our messaging in order to reduce demand for water during a drought.

10.6.2 National Drought Group (NDG)

The national drought Group (NDG) was set up by the Defra Secretary of State in February 2012 to manage that drought. It will meet in future droughts to provide a multi sector overview and strategic management of the drought. It commissions working groups to undertake specific pieces of work and includes senior decision makers from the EA, government and principal drought stakeholders.

Once re-formed, we will work with the NDG in order to contribute to the cross sector coordination of drought issues.

10.6.3 Other water companies and Water Resources North

We will work closely with our neighbouring water companies and with WReN and will look to provide joint regional messaging where a drought is affecting the region.

10.6.4 The Environment Agency

We work closely with both area and national EA teams and outside of drought have quarterly liaison meetings and senior manager meetings. During prolonged dry weather, our water resources position would be discussed at both of these meetings.

Outside of drought, we share our water resource position (surface water storage) with the EA on a weekly basis.

10.6.5 Non-household Customers

Our Wholesale team will work closely with NAVs and the non-household retailers whose customers (i.e. non-household businesses) we also supply. Our Wholesale team have agreed contacts with each of the NAVS and retailers who we will expect to relay all of our key drought and water efficiency messages and asks to minimise water use to their customers. Likewise, we will expect them to comply with any restrictions on water use that we impose on our own customers.

We will also work closely with business organisations such as the Chamber of Commerce or the LEP. We would create a business-specific press release with advice on how businesses can use water wisely. We would also create social media posts with info for SME's and tag in the Chamber of Commerce and other SME groups. As well as this, we would boost LinkedIn posts, to target specific job titles. We would create an e-leaflet with guidance on what to do in hot weather conditions and send this on an email with guidance and draft social media posts to stakeholders such as MP's, Chamber of Commerce, Councillors and other local authorities. We could also create a specific business-focused section of the website where SMEs can go to get info. We could also ask the Chamber of Commerce to share our messaging with all of their database.

10.6.6 Priority Services Register (PSR) Customers

During a drought, the priority would be to ensure PSR customers have water supplies and bottled water in case of an emergency. To get this messaging across we would send letters to customers and would also work with partners such as Age UK, the local NHS and the Trussell Trust. During the earlier summer months, we would also do some proactive social media posts encouraging people to sign up to the PSR register.

10.6.7 Schools

During the summer months, we will continue to promote the Ripple Effect, which is our brand-new education programme that teaches children about the importance of water. We will continue to push this across our social media channels, and we can reach out to schools in effected areas and supply them with our educational resources.

10.6.8 Local Resilience Forum

We always maintain a close relationship with our Local Resilience Forums, and this would continue during a drought. We would engage with them to increase awareness and engagement with local responders.

10.6.9 Housing associations

We would work closely with housing associations to create a specific press release encouraging housing associations to get tenants to save water. We would ask housing associations to share this in any newsletters they put out. We would also create social media posts for housing associations to share or boost on their accounts. As well as this, we would create an e-leaflet that housing associations could share with tenants. We would also create our own bespoke social media posts and tag in housing associations.

10.6.10 Landlords

Similar to the housing associations, we would work closely with the landlord association and create a specific press release which would encouraging landlords to get tenants to save water. We would also ask local landlords associations to share this in any newsletters they put out. We would create social media posts for landlords/association to share/boost on their accounts and also e-leaflets that they can share with tenants. Alongside this we would create our own social media posts and tag in associations.

10.6.11 Shared Homes / Student Accommodation

In this case, we would work closely with the higher education facilities in the region . We would work with them to create a specific press release with guidance for students and would engage with the university radio station or publications and offer up a spokesperson for interview. We could also potentially engage with journalism / communications course students and see if they could use and distribute our messaging. In addition we would create social media posts across all platforms, as well as boosted posts targeting specifically 18-25-year-olds. We would also create some posts for the universities/SU's to share. An e-leaflet would also be created, and we could ask the university to distribute this to all of their students.

10.6.12 High rise flats

Here, we would create a specific press release with advice for people living in high rise flats, and work with the local councils to share this messaging. As well as this, we would create social posts and boosted Facebook posts focussing on areas with a high number of high rise flats. As well as this, we would provide the councils with an e-leaflet with guidance on what residents should do during the hot weather. We would see if local council could share this with tenants. We could also potentially look at doing customer letters.

10.6.13 Farms

We have built a strong relationship with the NFU, and we would utilise this to our advantage. We would work with the to create a farm-specific press release with details on what farmers can do to use water wisely. We would ask that this could be sent out as part of the NFU's weekly newsletter. We would also create farm-specific e-leaflet with advice and ask them to share this with their members on our behalf. We would also use social media to post and tag in farming groups with our messaging.

10.6.14 Caravan/Holiday homeowners

For holiday homeowners or caravan owners, we would create a specific press release with guidance on how to use water wisely. Alongside this, we would create social media posts across all platforms to raise awareness and create e-leaflet with advice on what to do. We would also reach out to larger holiday park brands to see if they can share our messaging and take actions at their sites. We could potentially send out customer letters to the site managers with messaging.

10.6.15 COVID-19

In the event that COVID-19 and lockdowns are still active throughout a period of drought, our face to face and experiential communications and engagement with customers will be postponed. If this is postponed there will be flexibility to use this budget for highly targeted marketing and advertising to our customers, including direct mail outs and text messages to support them throughout.

11 Environmental Assessment

11.1 Overview

The following is a list of Sites of Special Scientific Interest (SSSI) within our area of supply in which abstraction points or reservoirs are sited. None of the SSSI's will be affected by any drought action as no action involves increasing abstractions beyond agreed licensed limits.

- Lune Forest
- River Tyne at Ovingham
- Muggleswick, Stanhope & Edmondbyers Commons & Blanchland Moors
- Mere Beck Meadows
- Shipley & Great Woods
- River Coquet & Coquet Valley Woodland
- Kielderhead & Emblehope Moors
- Kielder Mires
- Appleby Fells
- Upper Teesdale
- Rigg Farm & Stake Hill Meadows
- Backstone Bank & Baal Hill Woods
- Hannah's Meadows

In addition the following SACs fall in our area of supply:-

- Border Mires, Kielder – Butterburn
- Castle Eden Dene
- Durham Coast
- Ford Moss
- North Northumberland Dunes
- North Pennine Moors
- Roman Wall Loughs
- Simonside Hills

- Harbottle Moors
- Moor House – Upper Teesdale
- Newham Fen
- Thrislington
- Tweed Estuary
- Tyne and Allen River Gravels

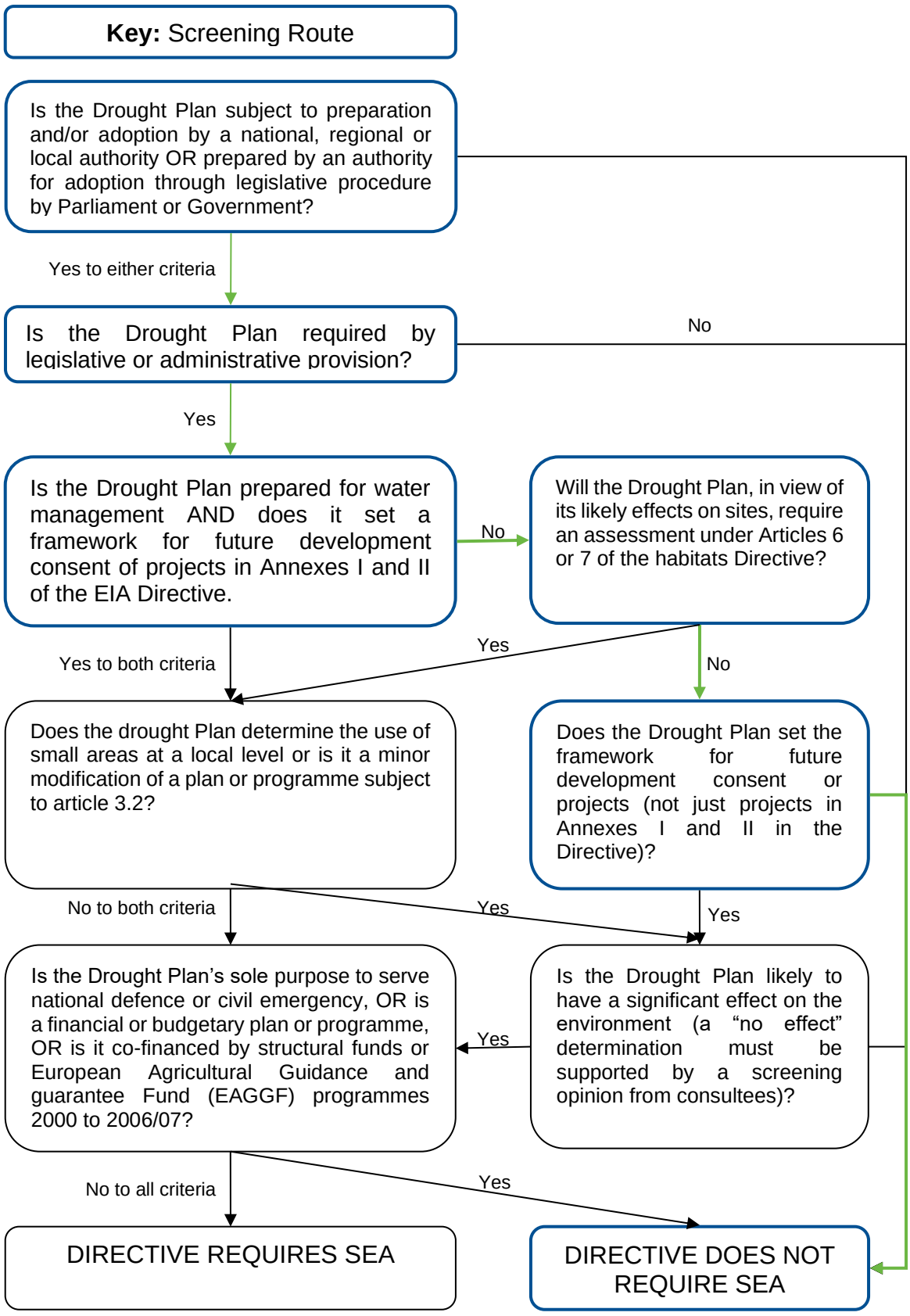
Where applicable abstraction licences set out Minimum Maintained Flows (MMF) in rivers which we have to adhere to. These MMF's are designed to eliminate areas of water stress during periods of increased abstraction. An example being water from Kielder Reservoir which is released at rates which, taking into account other abstractions, maintain a minimum river flow below our most downstream point at Ovingham.

11.2 Habitats Regulations Assessment

There is not a requirement for a Habitats Regulation Assessment to be undertaken as none of the supply side actions involves increasing abstractions beyond existing licensed limits.

11.3 Strategic Environmental Assessment

Figure 4 below illustrates the key stages and the results of our SEA screening exercise.



Source: UKWIR (2007) Guidance for Water Resources Mgt Plans & Drought Plans

Figure 4: Key Stages of Screening

The results of the screening exercise are as follows:

i. We will prepare and adopt the Drought Plan and under the EIA Directive, we are considered an “authority”;
ii. The Drought Plan is required by legislative provision, being a statutory document under the Water Act 2003 amending the Water Industry Act 1991;
iii. The Drought Plan will be prepared for water management but does not set a framework for future development;
iv. None of the Drought Plan supply side actions involve increasing abstractions beyond existing licensed limits which are deemed sustainable. Therefore, there should be no significant environmental effects. Consequently, the Drought Plan, in view of its likely effects on sites, will not require an assessment under Articles 6 or 7 of the habitats Directive.
v. The Drought Plan does not set the framework for future development consent or projects (not just projects in Annexes I and II in the Directive).

Given the above, our Drought Plan does not fall within the remit of the SEA Directive and therefore does not requires an SEA to be undertaken and an Environmental Report to be prepared.

11.4 Water Framework Directive Assessment

The Water Framework Directive (WFD) requires all water bodies to meet Good Ecological Status (GES) or Good Ecological Potential (GEP). Overall ecological status or potential is made up of a number of biological, physiochemical, hydromorphological and chemical quality characteristics called elements. The overall status is determined by the lowest element status. For example, if biological status was ‘moderate’ and the rest of the components were ‘good’, the overall status of the water body would be ‘moderate’.

Article 4.1 of the WFD sets the following ‘Environmental Objectives’:

- **WFD Objective 1:** No changes affecting high status sites
- **WFD Objective 2:** No changes that will cause surface water bodies to fail to achieve GES or GEP
- **WFD Objective 3:** No changes that will result in a deterioration of surface water bodies ‘Ecological Status’ or ‘Ecological Potential’
- **WFD Objective 4:** No changes that will permanently prevent or compromise the ‘Environmental Objectives’ being met in other water bodies
- **WFD Objective 5:** No changes that will cause failure to meet good groundwater status, or result in a deterioration of groundwater status.

None of the supply side actions involve increasing abstraction beyond existing licensed limits. Consequently, the actions in this Drought Plan should not compromise any of the Environmental Objectives detailed above.

11.5 Invasive Non Native Species (INNS)

As part of our WINEP commitments we are undertaking a programme to identify the potential for the transfer of INNS during our normal operation of the Kielder Transfer Scheme, and then identifying any mitigation measures which can be put in place.

In order to support the environment and maintain supplies to treatment works in the Kielder WRZ during a drought we will be increasing the utilisation of the Kielder Transfer Scheme which we use to varying extents most years. These transfers of raw water are included in our WINEP investigations on INNS.

Increasing river flows above those usually experienced in a drought could potentially have the positive impact of reducing stress in aquatic and riparian habitats, thus making them less vulnerable to colonization by INNS, including reducing the establishment of more drought tolerant species. Conversely, there is the potential for an increase in the transport of INNS, compared to normal summer low flow conditions.

11.6 Environmental impact assessment of Kielder Transfer Scheme

In order to maintain supplies to treatment works in the Kielder WRZ, the potential for support from Kielder Reservoir is utilised to varying degrees each year. As a drought develops the use of Kielder Reservoir increases with releases increasing in magnitude and duration in order to maintain supplies and guarantee the Minimum Maintained Flows (MMF) on the Rivers North Tyne, Tyne, Wear and Tees as well as providing compensation water for the River Derwent.

The normal release regime reflects flow variation and seasonality but the implications on the ecology of the various rivers of prolonged use of the transfer scheme in a drought is not currently understood.

As part our WINEP commitments we are undertaking an investigation into the effects on sedimentation in the North Tyne as a result of the current operation of Kielder Reservoir. We propose to build on this report and produce an environmental assessment on the effects of extended use of the Kielder Transfer which will review the potential impacts on species and habitat in the catchments affected by its use.

We will agree with the EA the overall assessment approach and timeframe although plan to complete this work by 31 March 2021. We will work with the EA who currently have ongoing local and national monitoring programmes and will agree any additional baseline monitoring requirements. Consideration will be given to alignment and overlap with any other scheduled environmental investigations and assessment work being undertaken through regional planning and WINEP.

12 END OF DROUGHT

12.1 Overview

The recovery or potential recovery from drought will be based on the latest rainfall, reservoir storage, groundwater levels, river flows and customer demand data which will be monitored by our Water Resources team and Drought Management Group. We have defined control curve triggers for our Level 1, 2, 3 and 4 drought actions and have provided surface water and groundwater worked examples in Appendix 2.

The true end of a drought can only be determined retrospectively. However, the trigger we will use for coming out of a drought is when actual reservoir storage or groundwater levels are above the Level 1 Drought Action control curve for 2 weeks. However, we would take an agile approach to deciding whether to return to business as usual (i.e. non-drought) messaging and would consider:

- Operational experience;
- water resources forecasts using our Aquator models
- whether there is an improving situation with increasing reservoir levels, lake levels and groundwater levels;
- the time of year (i.e. whether going into summer or winter); and
- the short and medium term weather forecasts.

We will make a careful judgement as to whether to remove restrictions since an apparent ending of drought conditions could easily be confused with a temporary

respite in a prolonged drought sequence. Additionally, decisions will be balanced with the need to avoid impacting on customers and business for longer than is necessary.

Prior to concluding a drought has ended, we would consult neighbouring water companies, Water Resources North and other interested stakeholders to obtain their view on drought recovery. We will only declare the end of a drought after confirming with the Environment Agency that the water resource situation and associated threat to public water supply has returned to normal. We will communicate this to our customers as outlined in our Communications Plan.

If the Level 3 drought permits were required, we will continue to carry out environmental monitoring and assessment for a period after hydrological triggers have recovered to understand how the environment is recovering.

12.2 Post Drought Review

We will complete a Post Drought Review (PDR) comprising data collation and report writing within four months of a drought ending. It will be overseen by our Business Continuity Team and all members of the Drought Management Group will be expected to contribute.

The review will identify lessons learnt and also consider potential improvements both to our Drought Plan and wider drought management strategy. Additionally, where appropriate, the need for future investment to limit the impact of similar drought conditions occurring in the future will be considered, as will the need for any additional monitoring. The PDR will examine:

- the hydrological conditions leading up to the drought and the effectiveness of our drought indicators;
- the effectiveness of drought trigger levels and whether they should be amended;
- the effectiveness of our drought actions (including the effects of restrictions on water use, communications campaigns and leakage management);
- the actual environmental impacts of our drought management actions;
- the effectiveness of any mitigation measures;
- lessons learnt to improve your environmental assessments, monitoring plans and mitigation measures in our drought plan;
- the effectiveness of our communications plan;
- implications of the drought for future levels of service;
- what longer term improvements to resilience may be needed and to reflect this in our next WRMP; and

Recommendations for improvement to our drought management process will be made where appropriate and shared with the Environment Agency.

12.3 Revision of Drought Plan

We will review this Drought Plan annually and will update in line with the Drought Regulations it if there are any material changes.

13 REFERENCES

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14 GLOSSARY

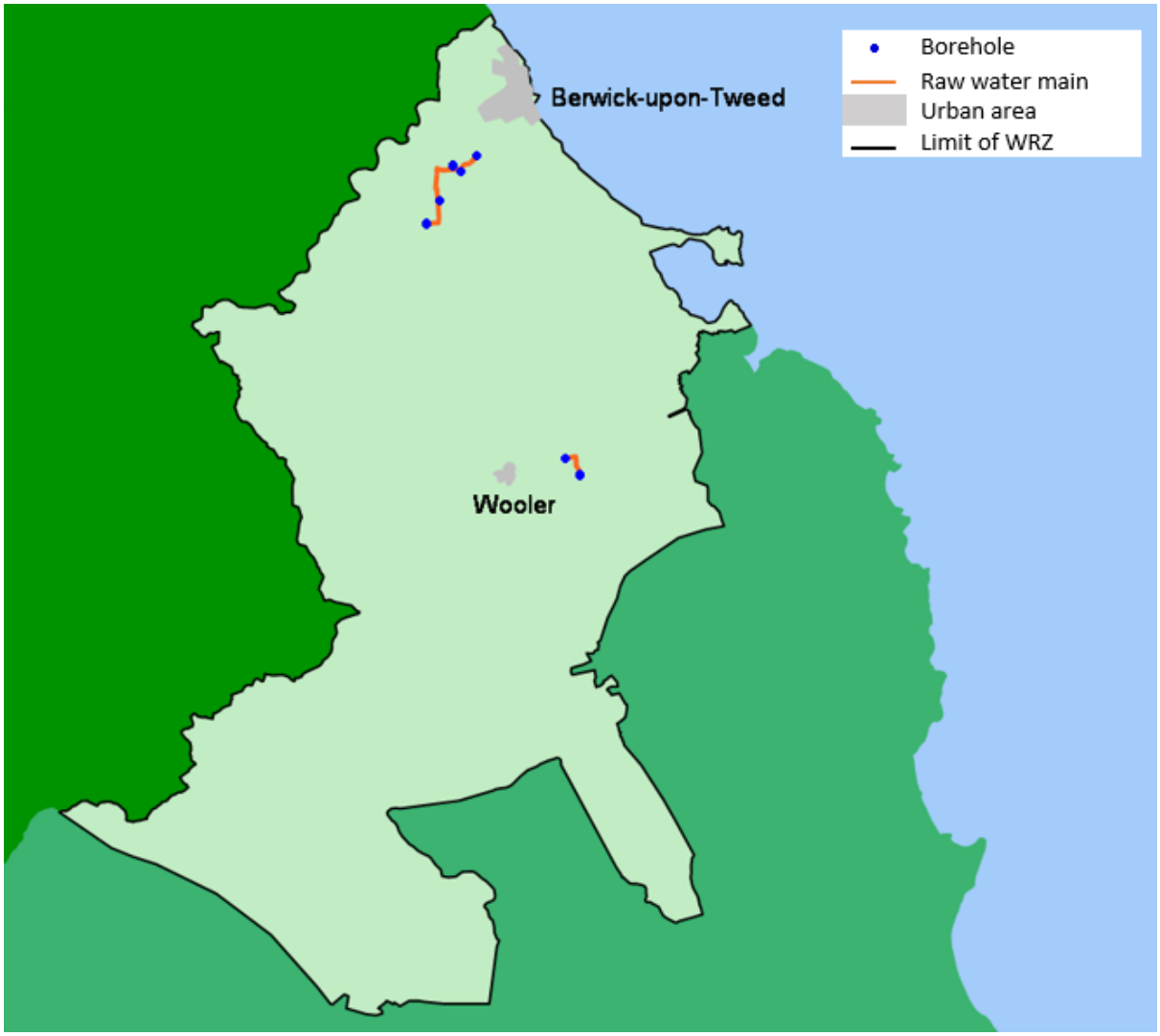
Abstraction	The removal of water from any source, either permanently or temporarily.
Abstraction licence	The authorisation granted by the Environment Agency to allow the removal of water from a source.
Baseline	Information on the environment that details conditions prior to implementation of a drought 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 the environment, abstraction licence, pumping plant and/or well or aquifer properties, raw water mains and/or aquifers, transfer and/or output main, treatment or water quality.
Drought order	An authorisation granted by the Secretary of State under drought conditions which imposes restrictions upon the use of water and/or allows for abstraction/impoundment outside the schedule of existing licences on a temporary basis.
Drought permit	An authorisation granted by the Environment Agency under drought conditions which allows for abstraction/impoundment outside the schedule of existing licences on a temporary basis.
Environmental assessment	An assessment of environmental sensitivity and likely impacts from implementing drought management actions.
Environmental monitoring plan	A plan describing 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; and post drought monitoring.
Environmental report	The report that accompanies an application for a drought order or drought permit. It is 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	Central Government (Defra)
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.
Water Resource Zone	The largest possible zone in which all resources, including external transfers, can be shared and hence the zone in which all customers 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.
Habitats regulation assessment (HRA)	A HRA identifies whether or not drought actions will have an adverse effect on a site's (SPA or SAC) integrity.

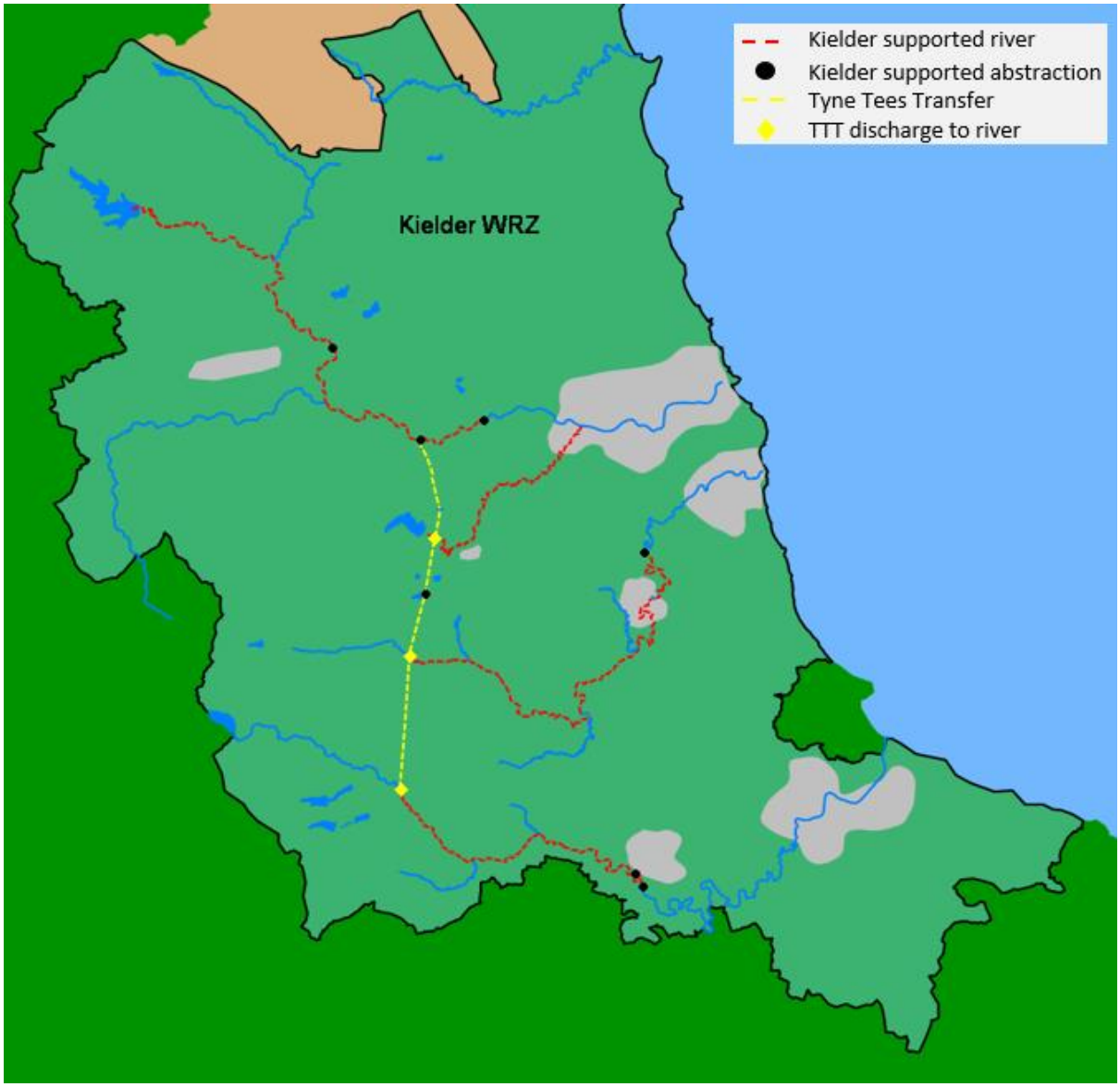
15 MAPS

Map of Area of NW Supply Area

Map of Kielder Water Resource Zone



Map of Berwick and Fowberry Water Resource Zone



Map of Kielder Transfer Scheme

APPENDICES

APPENDIX 1: DROUGHT VULNERABILITY ASSESSMENT

We are required to test the plan against different types of droughts (in terms of magnitude and duration) and identify when our supply is likely to be vulnerable.

In order to carry out this assessment we have completed the following:

- an assessment which uses the principles of the UKWIR 'Drought Vulnerability Framework' (17/WR/02/12).
- Stochastic drought modelling.

DROUGHT VULNERNABILITY FRAMEWORK

The UKWIR guidance provides an approach that water companies can use to improve the understanding of the vulnerability of their systems to drought and demonstrate this graphically by producing 'drought response surfaces' (DRS) for their Water Resource Zones (WRZs).

The guidance recommends several different calculation approaches based on the data availability and the level of modelling available for each WRZ, these approaches are detailed in the table below.

Nature of Drought Rainfall Data and Hydrological Modelling	Nature of WRZ and Deployable Output Assessment	Approach Number	Notes/Comments
Stochastically based rainfall data (normally includes hydrological models, but can include multi-site flow generation)	Conjunctive with *rapid* simulator	1a	Where direct flow generation has been used then rainfall deficit/flow analysis required
	Conjunctive but *no* rapid simulator	1b	Uses a sample of the full stochastic data set ('drought libraries')
Synthetically based rainfall data	All	2	Requires Extreme Value Analysis (EVA) to estimate risk/return period
Historic rainfall data with rainfall/runoff and/or groundwater models	SW storage dominated (with behavioural model)	3a	Requires EVA of rainfall, and yield/return period behaviour
	Groundwater or run of river only	3b	Requires EVA of rainfall and flow/level return period behaviour
Historic rainfall data with no hydrological models	SW storage dominated (with behavioural model)	4a	Rainfall EVA and rainfall deficit/inflow relationships needed
	Groundwater or run of river only	4b	Rainfall EVA and rainfall deficit/level/flow relationships needed

For the Kielder WRZ approach 4a was deemed to be the most appropriate due to not having, at the time, a full coverage of rainfall runoff models for the WRZ.

The calculation steps for Approach 4a as set out in the UKWIR guidance are detailed below.

1. Carry out EVA to determine the probability of each deficit/duration cell

2. Systematically generate synthetic events (intensity & duration) for a selection of deficit/duration cells using the historic record.

3. Run behavioural model for the selected level of demand

4. Calculate the number of days deficit for each synthetic event.

5. Scale impacts (see Section 6.1). Smooth 'days failure' figures in the matrix as appropriate. Compare the EVA plot of minimum levels or flows against the critical duration drought outputs to scale the DRS inputs

6. Plot DRS

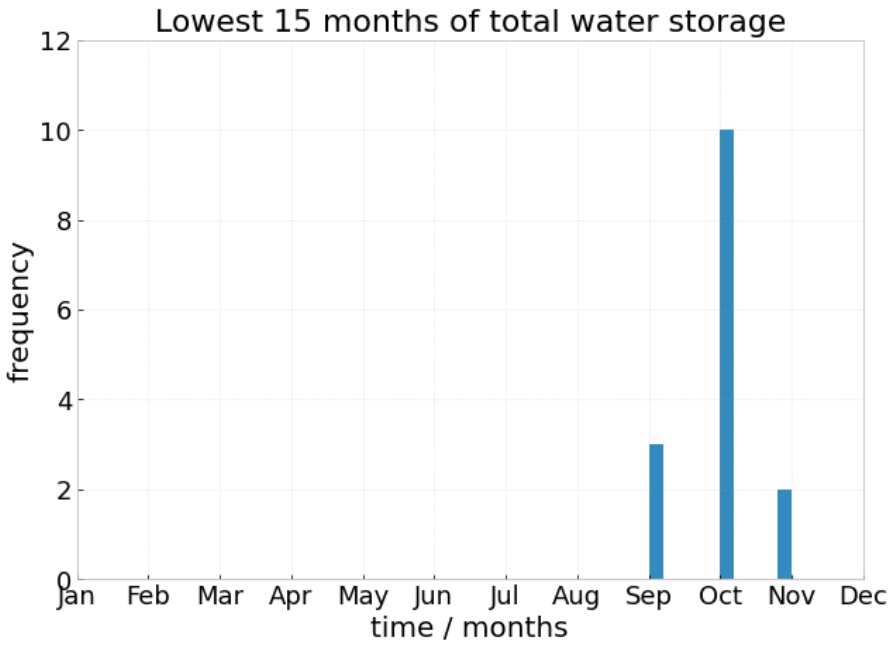
Prior to carrying out the calculations required to complete the drought vulnerability analysis there are two common decisions that need to be made:

- Decide upon which 'month ending' timings should be used to generate the DRS.
- Decide upon what level of demand the analysis should be run at.

SELECTION OF 'MONTH ENDING'

The guidance recommends that for a WRZ with a high level of storage that is driven by the annual average DO the month ending parameters are set 3 months apart, historically the lowest storage levels experienced have been in October.

Analysis of minimum storage levels within the Kielder WRZ was carried out by summing the monthly storage values for all reservoirs in an Aquator model run, using DO demands, and finding the month with the minimum storage value in each year from 1926-2014 (89 years). The minimum storage in each year was ranked, and the frequency of months containing the minimum storage in the 15 lowest years were plotted. Of these 15 years, 13 of the lowest storages occurred in October and, since this significantly dominated the sample of the most extreme years, only October was used in the analysis.



LEVEL OF DEMAND USED

To carry out this assessment several different levels of demand could be used such as.

- Total demand (DI)
- Total demand plus Target Headroom
- Total demand plus Target Headroom plus Outage
- Demand equivalent to DO

As deployable output is circa 123% of demand in the Kielder WRZ, and the system is constrained by licence/pumping capacities running the Aquator model at anything less than a demand equal to DO, would not place the system under enough stress to fully assess the risk to supplies during an extreme drought.

RAINFALL ANALYSIS

The daily catchment rainfalls, as used to construct the flow sequences for Aquator, for Burnhope, Cow Green, Derwent and Kielder were averaged to produce a single daily time series. This single timeseries of rainfall data was taken forward for the analysis.

The DVF manual requires rainfall frequency analysis for different drought durations to be based on the same end-months as the selected drought end-month for the water resources system. As only October was identified as a critical end-month for reservoir drawdown, rainfall analysis should be based on rainfall totals up to the end of October for every year of record.

Further analysis of the rainfall data was undertaken to assess if the October end month durations (6, 12, 18, 24 and 36 months) were representative of the population rainfall

distribution, a Kolmogorov-Smirnov (K-S) test was carried out for all month ends, for each duration. For the purposes of this investigation we extended the sampling regime to include month-end durations that were not significantly different from the central one of interest.

Rainfall series of various durations were then tested against several extreme value (EV) distributions. Overall, they fitted best with a three-parameter GEV distribution, the results of this analysis are in the table below.

Table of rainfall depths as percentage of LTAs

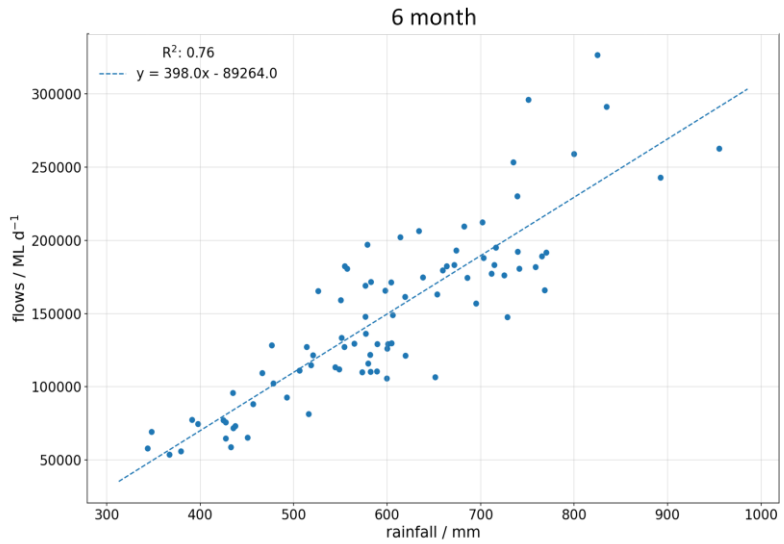
Return period	Duration				
	6month	12month	18month	24month	36month
2	74%	92%	100%	181%	116%
5	62%	80%	86%	92%	97%
20	52%	70%	75%	83%	88%
50	46%	64%	70%	79%	84%
100	43%	61%	67%	77%	81%
200	41%	58%	64%	75%	79%
500	38%	54%	61%	72%	77%
1000	34%	52%	59%	70%	75%

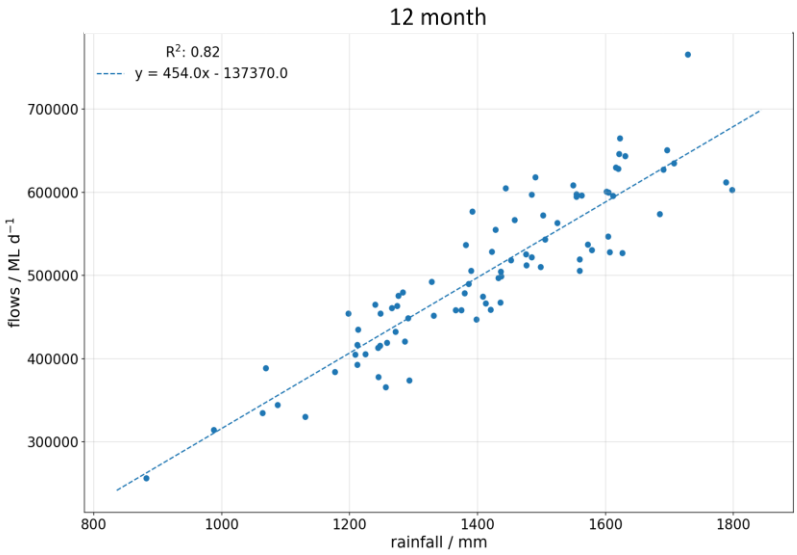
GENERATION OF SYNTHETIC EVENTS

Method 4a requires the creation of river flow sequences representing droughts of different durations and return periods. This is achieved by defining a relationship between rainfall over a given duration and the runoff volume accumulated over the same duration for the same events in the same catchments. This relationship is then used to generate runoff totals from the return period rainfall totals derived from the GEV analysis. Once the runoff volume has been estimated it must then be translated into a daily flow series for onward use in the water resources model.

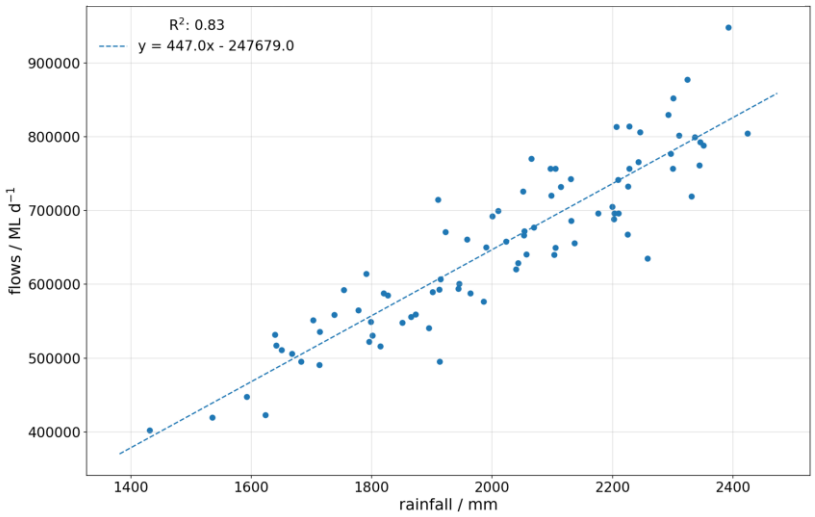
The key assumption in the approach is that the return period for the rainfall total and duration of interest translate directly over into the same return period for a given duration and volume of runoff.

The figures below show the catchment rainfall (mm) against recorded runoff (Ml/d) over the same period for durations from 6 months through to 36 months. The dashed line is the line of best fit using linear regression model, the equation of which is displayed in the legend.

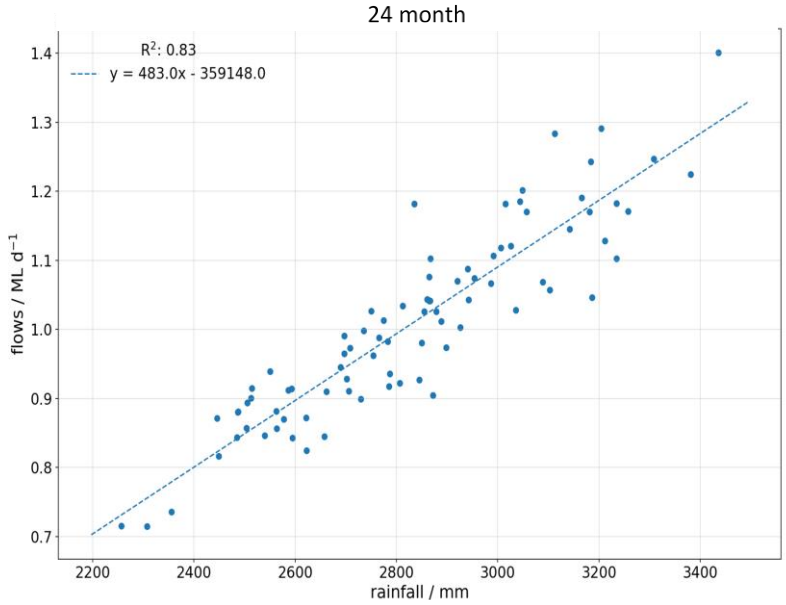

6 month
R²: 0.76
y = 398.0x - 89264.0
flows / ML d⁻¹
rainfall / mm
300000
250000
200000
150000
100000
50000
300
400
500
600
700
800
900
1000


12 month
R²: 0.82
y = 454.0x - 137370.0
flows / ML d⁻¹
rainfall / mm
700000
600000
500000
400000
300000
800
1000
1200
1400
1600
1800

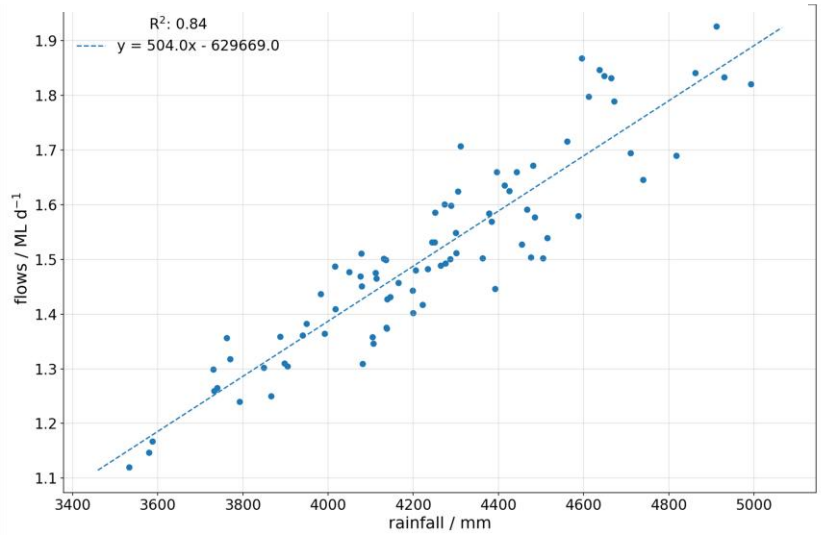
18 month



24 month

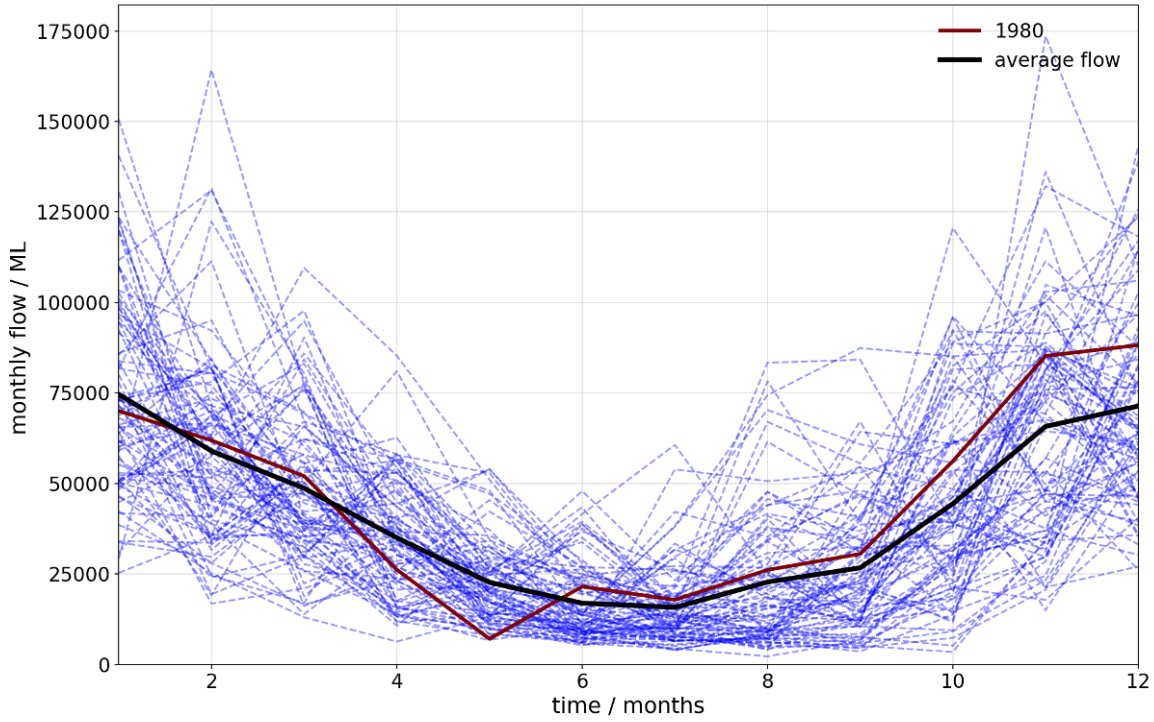


36 month



To estimate the flow for the various return periods for each duration, the drought rainfall factors were used to estimate the extreme rainfall totals for that drought.
The linear regression relationships established between the rainfall and flows were used to turn the extreme rainfalls needed for each drought into a consequential runoff volume. From this, the ratios were calculated between the 'normal' flow for that duration and the newly derived drought flows from the linear regressions.

The DVF manual instructed to find a 'normal' year of flow data which would be used to create the artificial drought series, a least squares estimate (LSE) method was used to find a year whose monthly flow closest matched the average monthly flow across all years.



The 'normal' year daily flow data were the basis of every year in the artificial drought time series. The ratios calculated from the rainfall/flow relationship (explained above) were multiplied by the 'normal' year for the months of the duration of interest and strung together with multiple 'normal' year flows acting as refill years in between droughts.

The general structure of the drought time series was as follows for a given duration:

- 2 warm-up years
- 1 in 100 return period drought (this was 1-3 years, depending on the duration. For 12+ month durations, the drought year, which ended in October, would overlap with the previous year. To account for this, the drought period spanned over 2 or more years)
- 1 cool down year
- 2 warm-up years
- 1 in 200 return period drought

And so forth, until the final return period and a cool down year.

AQUATOR MODELLING

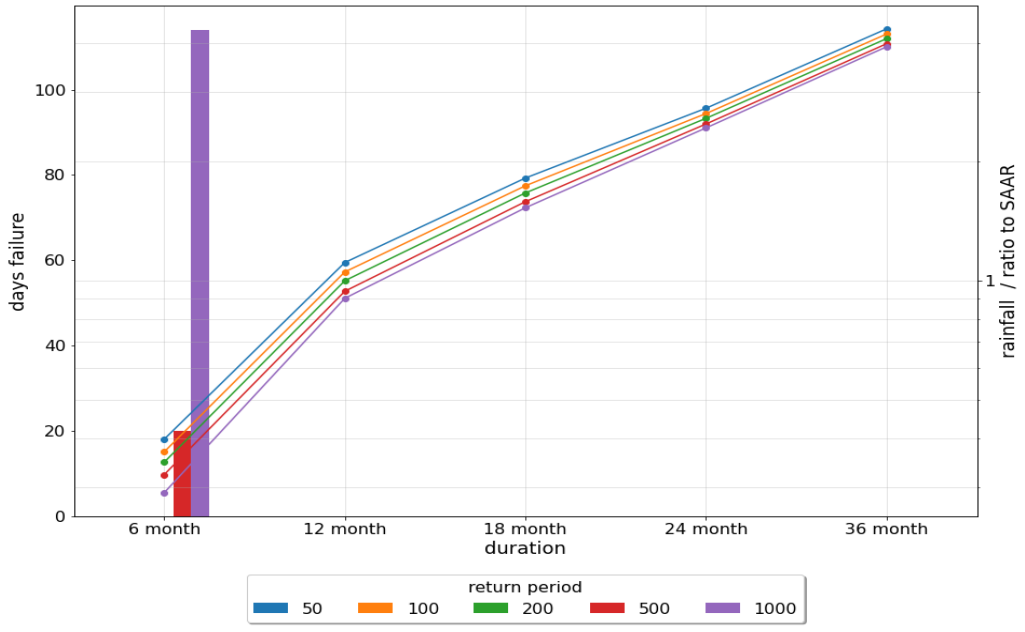
The drought time series for each catchment were input into Aquator Version 4.3 for the Northumbrian Water system and ran with demand set at DO levels (836Ml/d). Failure days occurred when the demand could not be met, or the emergency reservoir storage was used.

The table below summarises the number of failure days for each duration and given return period. Only the 1 in 500 and 1 in 1000 droughts for the 6 month duration had any failure days.

Rainfall return period	Duration (months)				
	6	12	18	24	36
50	0	0	0	0	0
100	0	0	0	0	0
200	0	0	0	0	0
500	**20**	0	0	0	0
1000	**114**	0	0	0	0

DROUGHT RESPONSE SURFACE

An alternate plot to the DRS recommended in the guidance is shown below, that we hope offers more clarity while showing the relevant information. The graph displays the number of failure days (left-hand axis) for the Kielder system as a bar chart and the rainfall (as a ratio of SAAR) on the right-hand axis as a line plot. Duration lengths are along the x-axis and the colours represent the different return periods.



Surface water stochastic modelling

Long-periods of 'stochastic hydrological' data (plausible synthetic scenarios based on historical hydrological patterns) were used to develop inputs to our Aquator XV water resources models. This allows us to better understand the drought resilience of our WRZs as well as being able to evaluate the frequency that Level 4 restrictions may be required.

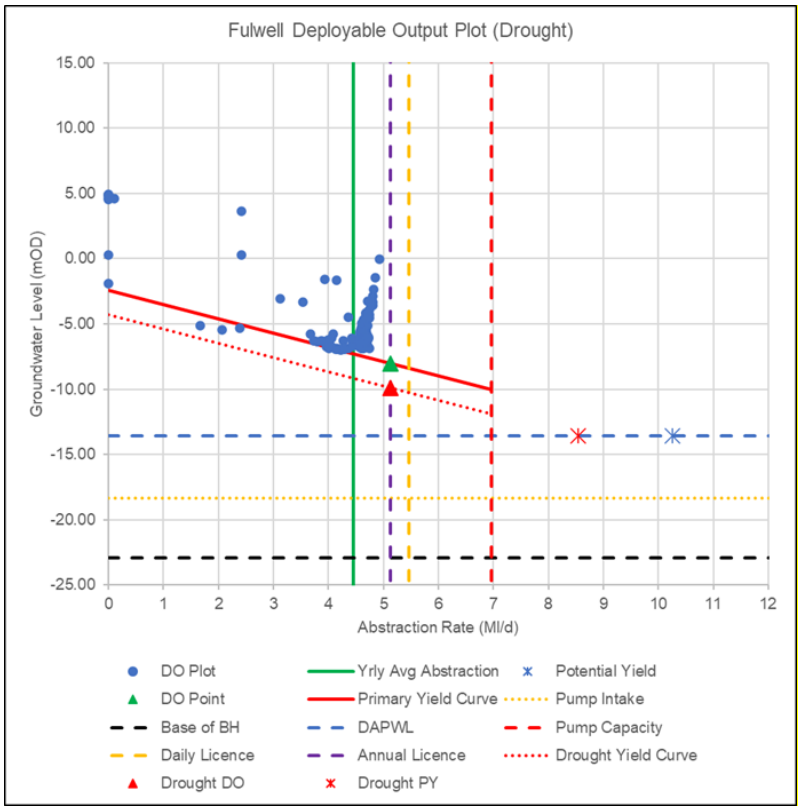
The stochastic timeseries were ran through Aquator XV using the permitted failure method, this is where a water resources model is run multiple times using a long hydrological record and incrementally increasing demand, to get a sense of the system response of the WRZ. The results of the Aquator XV runs were used to produce a profile of return period to DO, this allowed us to determine a representative DO (825.27Ml/d) for a 1:500-year return period based on Level 4 restrictions being a system failure. This DO level may not be associated directly with a specific model run, but rather be interpolated from the DO profile graphed.

The stochastic timeseries were then ran though Aquator XV with the demand fixed at the 1:500 year DO to stress test the system against a wide range of hydrological conditions.

Groundwater synthetic drought modelling

The calculated reduction in groundwater level has been modelled for 1:200 and 1:500 stochastic drought events. These values are used to lower the current DO curve for a specific borehole to calculate the 1:200 and 1:500 DOs.

An example borehole performance graph is shown below.



The graph shows the baseline response (based on 2019 data) of the borehole groundwater level to pumping (Solid red line) and the DO calculated from this (Green Triangle: 5.13Mld at GWL=-8mOD). Baseline response of borehole gwl to pumping is determined manually to include most data available. Whilst a few values fall below this line, including this data would alter the DAPWL DO value, but no other DO value.

The dashed red line shows the impact of a 1:200 year return period drought to the response baseline (drawdown of 1.88m from baseline calculated using Sunderland Groundwater Model) and the recalculated DO (red triangle: 5.13Mld at GWL=-9.88mOD). Purple (vertical) dashed line = Annual average licenced abstraction rate (Primary DO constraint). Blue (horizontal) dashed line = DAPWL. Red star = DO at DAPWL for 1:200 return period drought (Calculated based on intercept with DAPWL constraint with plotted borehole response of groundwater level to pumping for 1:200 year return period).

The results, reduction in groundwater level, of the stochastic modelling is shown below.

Borehole	1:200 Additional drawdown	1:500 Additional drawdown
BH 10	1.88	1.66
BH 11	- **	- **
BH 15	3.11	2.45
BH 14	3.02	2.28
BH 13	2.86	2.08
BH 12	2.25	1.70
BH 16	4.52	3.73
BH 17	15.48	11.35

** The modelled values obtained for Borehole 11 are considered to be invalid. The borehole is known to be recharged via fracture flow. The current Magnesian Limestone groundwater model cannot model recharge via fracture flow. An alternative methodology to derive a meaningful impact on groundwater level and DO of climate change and drought is to use the model values calculated for Borehole 14 which is analogous to the hydrogeological response of the Borehole 11 to abstractions. It is anticipated for the WRMP24, a new groundwater model for the Magnesian Limestone will be available.

It should be noted that the modelled impact of the 1:200 return period drought is greater than the impact for the 1:500 return period drought. This factor is also observed in the Fell Sandstone and Essex and Suffolk regional Chalk groundwater modelling. At present this is considered to be a consequence of the selection of the rainfall data used in the groundwater model. The rainfall pattern prior to the drought (the timing of the start of the drought period), and the duration of the drought, will both have a significant impact on the results of groundwater modelling. The results of stochastic modelling on the Fell Sandstone Groundwater Model will be used to evaluate this observation.

The deployable output values to be used in the drought plan are those calculated for the 1:500 event. Those boreholes constrained by DAPWL are also constrained by the Trigger Level assign to that specific borehole and therefore have lower DO values.

Borehole	DO	Constraint
BH 10	5.13	Licence
BH 11	4.01	Licence
BH 15	6.99	DAPWL/Control Level
BH 14	6.3	DAPWL/Control Level
BH 13	4.59	Licence
BH 12	4.04	Licence
BH 16	2.24	DAPWL/Control Level
BH 17	5.59	DAPWL/Control Level
Total	41.47	

Based on the DAPWL DO data above, it may be seen that the greatest impact of a drought on the Kielder WRZ Groundwater sources is on Borehole 15, Borehole 14, Borehole 16 and Borehole 17. Thus for operational purposes, during a drought, groundwater abstraction rates would be decreased down to the DO levels shown in the table above at these four vulnerable boreholes and increased up to the DO levels shown above at Borehole 10, Borehole 11, Borehole 13 and Borehole 12 in order to maintain the total Deployable Output for the Sunderland GWS of 41.47mld. Should this combined abstraction rate fall short of what is required (due to operational or water quality requirements) then the deficit would need to be made up using the Sunderland Surface water supplies. This is considered achievable by increasing water supply at Mosswood and/or Lumley.

Berwick and Fowberry WRZ

Drought simulations for the Berwick WRZ, which is supplied entirely from the Fell Sandstone groundwater aquifer, were performed using the United States Geological Survey's 'MODFLOW 6' software. A bespoke MODFLOW model was built on behalf of NWL by the British Geological Survey (BGS) based on the most recent geological interpretation of the area by NWL (2018) and Ford et al. (2019). The model was calibrated with groundwater-level data from EA observation wells and NWL abstraction wells for the period 01/01/1988 to 01/12/2018. It simulates transient groundwater flow on daily time steps but with monthly stress period inputs of recharge and abstraction rate. Recharge inputs were calculated from historic rainfall data using the BGS' ZOODRM software, an object-oriented distributed recharge model.

From WReN rainfall and potential evapotranspiration data it was calculated that, under 1 in 200 year return period drought conditions lasting 24 months, rainfall would fall to approximately 75% of its long term average. These data are from the nearest possible rain gauge, though it is outside the confines of the modelled area. ZOODRM was used to estimate a relationship – specific to the recharge zone of the Fell Sandstone aquifer – between such a reduction in rainfall and the concomitant reduction in recharge. This relationship is represented by a numerical factor (0.19), which was applied to the historic recharge inputs to the MODFLOW model for 24 months, beginning at the end of 2009. Retaining the original recharge inputs and representing the drought as a

reducing factor like this provides the opportunity to perturb the model with novel climate scenarios whilst staying relatively true to BGS' original calibration. The aim of this method is to introduce as little additional uncertainty as possible. By comparing the outputs from this amended recharge scenario with those of the baseline historic simulation, a time series of "additional drought drawdown" was produced for each NWL groundwater station. The maximum value of additional drawdown due to the 1 in 200 year drought was assessed against the abstraction constraints (sustainable rates; annual and daily licenced rates) and groundwater level constraints (pump intake; deepest advisable pumped water level; base of borehole) for each well, from which it was possible to identify if there would be a reduction in deployable output under drought conditions.

There were three distinct types of response to the drought. Boreholes 6 and 7 showed a relatively rapid and significant decrease in water level of up to 13.47m and 11.68m respectively, after which they began to recover. Boreholes 5(1) and 5(2) (which were modelled together due to their proximity) displayed the same trend of rapid response followed by recovery, but to a much less significant maximum addition drawdown of 0.86m. Boreholes 3 and 4 showed similarly small additional drawdowns but at the end of the simulation, seven years after the end of the drought, they had not yet begun to recover. At this point, the additional drawdown of their water levels had equilibrated at 1.91m and 0.73m respectively. The modelling results suggest that those wells with greater values of transmissivity are most resilient to changes in recharge due to drought conditions.

For most of the wells, their abstraction is voluntarily constrained by NWL at sustainable rates calculated by the BGS during development of the MODFLOW model. These rates are significantly below the EA-mandated licences and afford NWL with resilience against future changes in groundwater level. The only well which requires a reduction in deployable output during a 1 in 200 year drought event is borehole 3 as here the abstraction is constrained by the pump intake level, due to a very steep yield curve. The loss in DO would be 0.45m3/hr, or, 0.0108Ml/d, although this loss could be recouped by lowering the pump.

APPENDIX 2: DROUGHT TRIGGERS – WORKED EXAMPLES

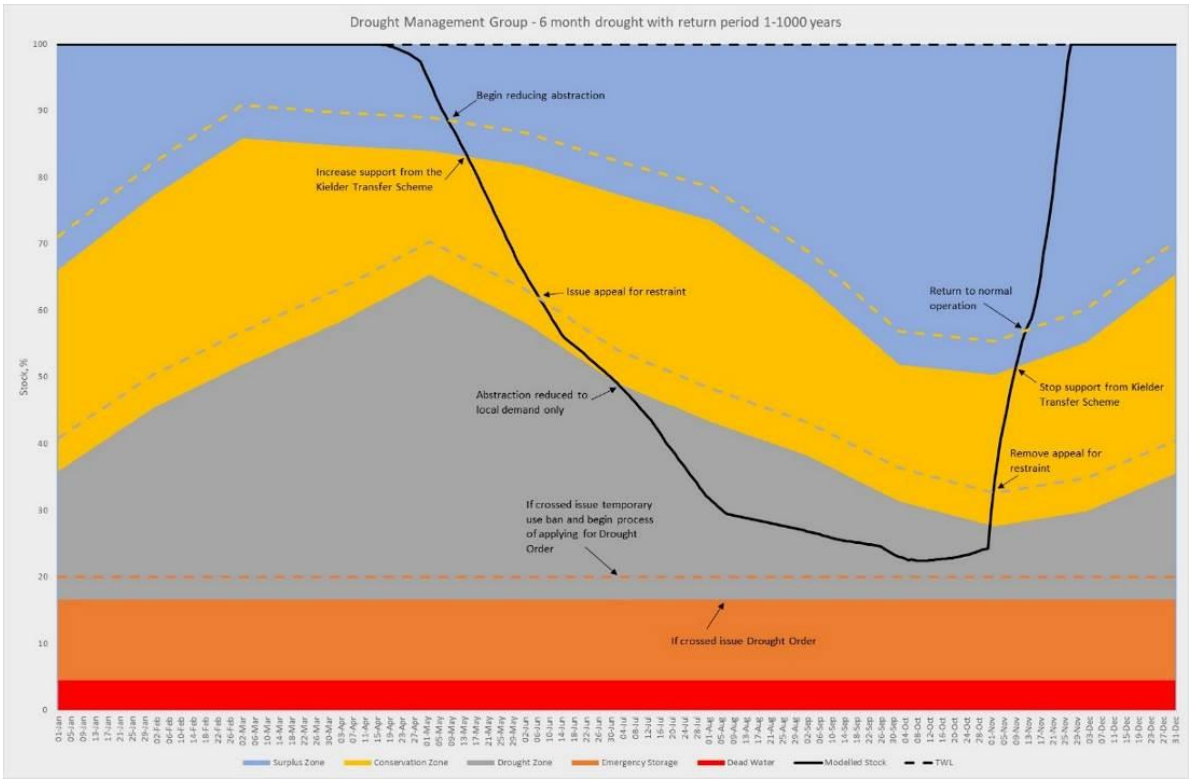
As part of the WRMP19 NW developed our planned level of service (LoS) that customers can expect to receive. LoS are expressed in terms of expectations about the frequency of restrictions on use of water during dry years and set out the standard of service that customers can expect to receive from their water company.

	Level of service	What this means	Stated return period
Level 1	Appeal for restraint	Ask our customers to use water wisely. For example, watering plants at night and not watering the lawn because grass is resilient to drought.	1 in 20 years (5% probability in any one year)
Level 2	Temporary Use Ban	Applies mainly to the domestic use of water and stops the use of a hosepipe or sprinkler for any garden watering or cleaning.	1 in 150 years (0.66% probability in any one year)
Level 3	Drought Order Ban	Expands what has been applicable to the domestic customer under the Temporary Use Ban, to non-domestic or commercial customers.	1 in 200 years (0.5% probability in any one year)
Level 4	Standpipe and Rotacuts	A temporary reduction or nil supply of water at the customer tap and use of stand pipes to fill containers.	1 in 500 years (0.4% probability in any one year)

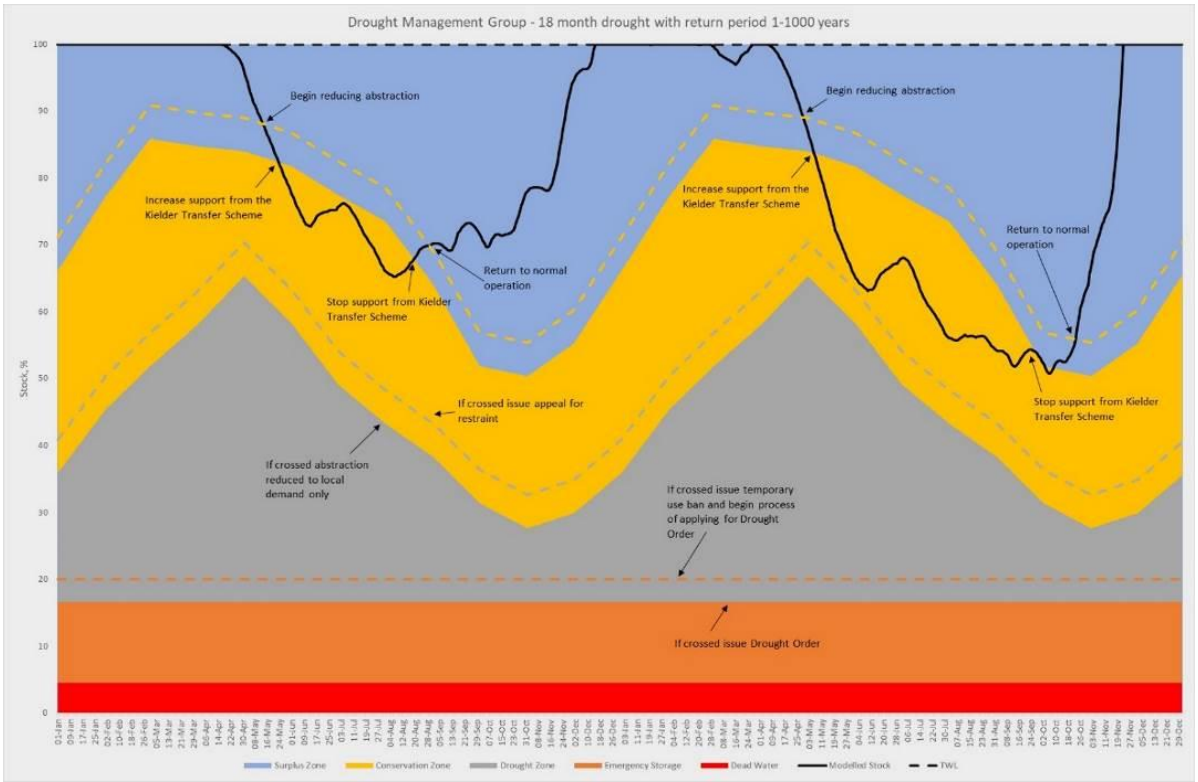
Kielder WRZ

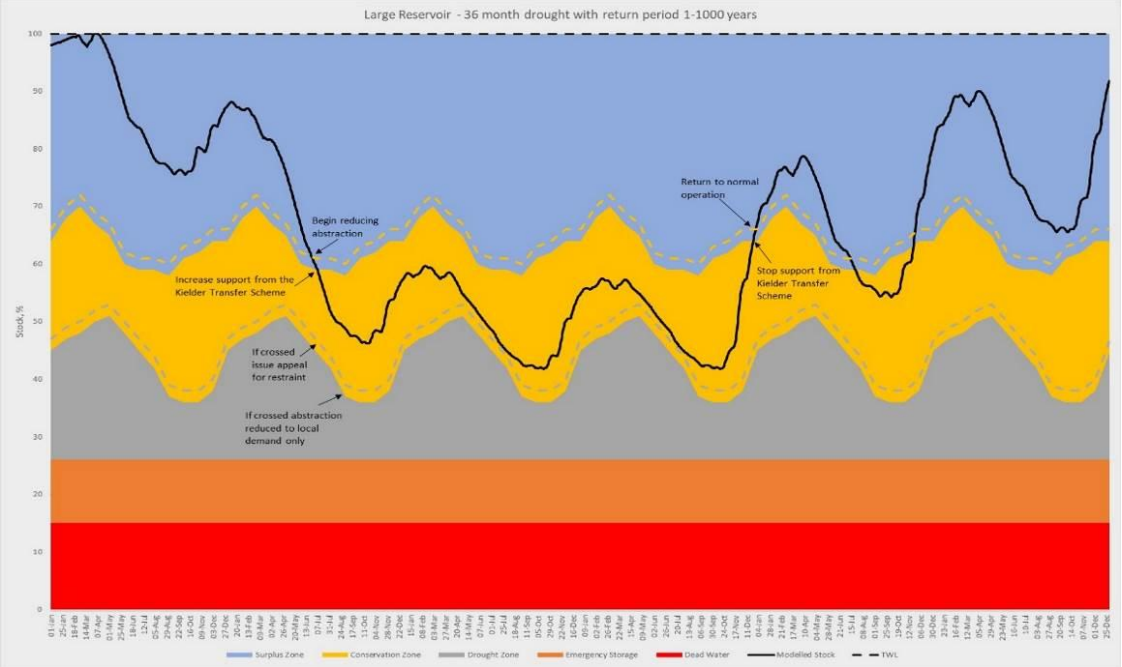
Surface water - reservoirs

The following worked examples are all taken from the Aquator runs used in the DVF analysis, all ran with demand equal to DO. Using DO in the model runs ensures that we are confident that along with meeting demand we can also meet target headroom and outage allowance.



As can be seen in the graph above the winter refill period is sufficient to fully refill the reservoir group due their relatively small storage capacity and large winter rainfall depths. This is evident in the plots of longer duration droughts, an 18 month drought is shown below, with the reservoirs refilling even in the drier winter.

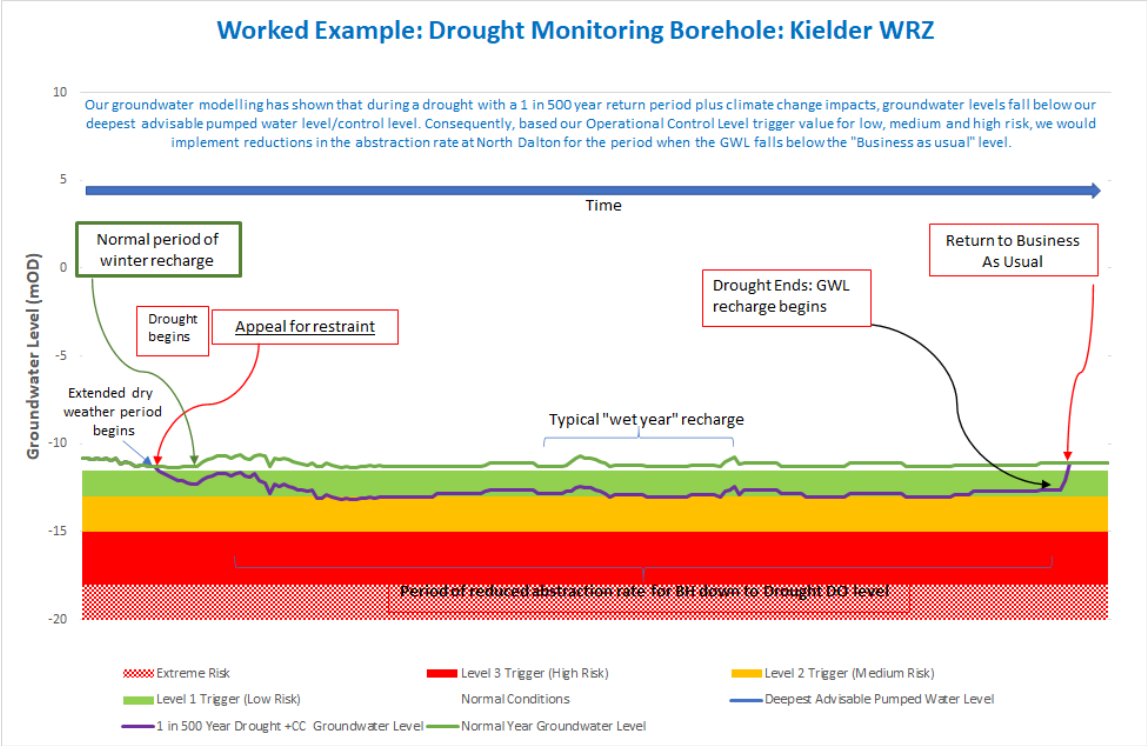




To illustrate the impact of a multi-year drought on a larger reservoir we have included the graph above. It demonstrates that even in an extreme drought (36 month, 1-1000 year return period) the capacity of the reservoir relative to the demand is such that we do not need to implement any restrictions beyond an appeal for restraint.

Groundwater

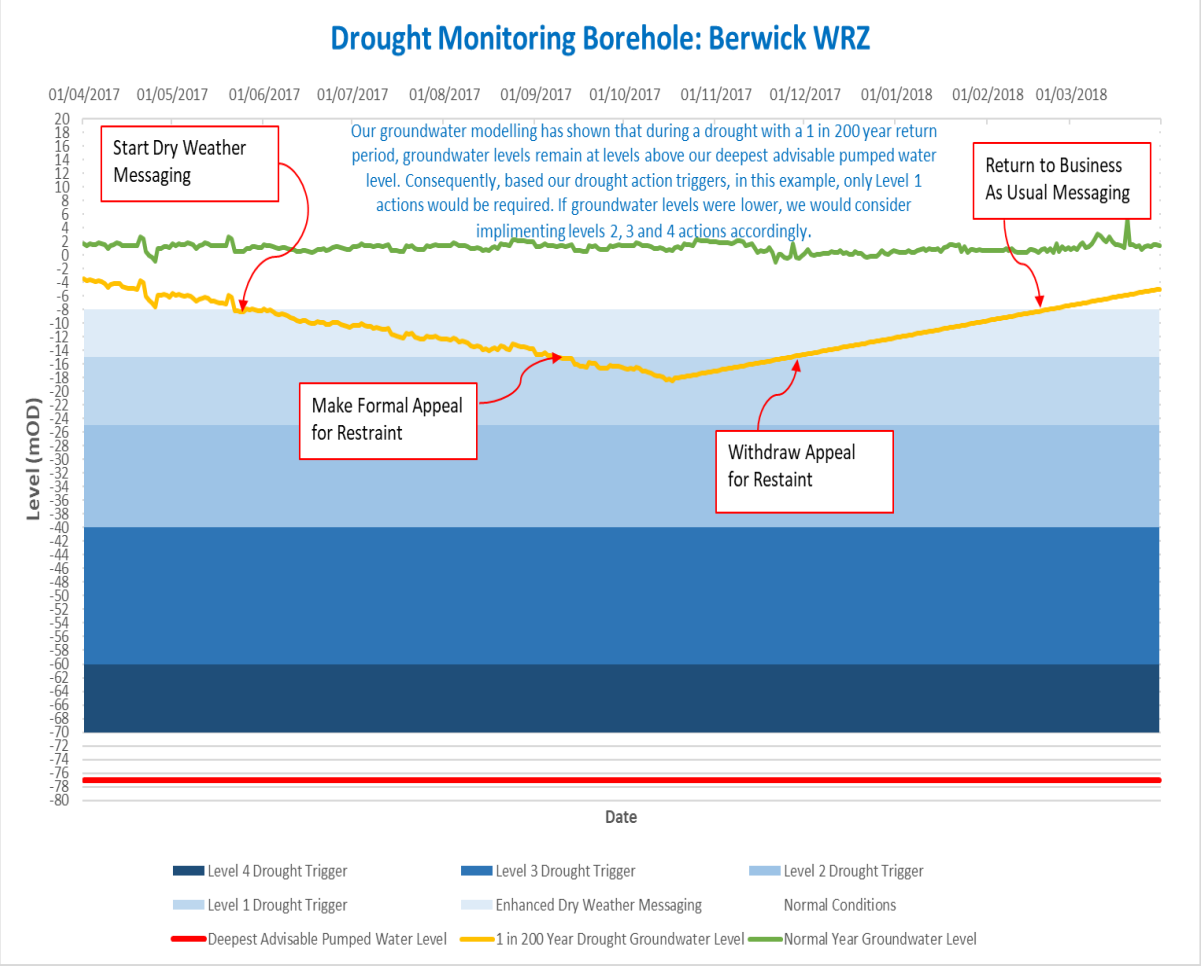
An example of monitoring groundwater level trends and the decision making/actions associated with the various stages of a drought based on the calculated Groundwater Trigger Levels is shown below.



Berwick & Fowberry WRZ

"Normal" groundwater levels in the plot are based on a typical annual seasonal variation in groundwater levels. The 1 in 200 year drought values are derived from the Fell Sandstone Groundwater Model where a 1:200 year rainfall drought event has been calculated as giving rise to an 81% drop in recharge to groundwaters. However, due to the storage capacity of aquifers, groundwater during a drought can be drawn from storage and thus the impact on groundwater levels is mitigated compared to surface water droughts. The Fell Sandstone model, when run for the borehole showing the greatest fall in groundwater level due to a 1:200 drought event shows an approximate 15m fall in local groundwater levels whilst maintaining abstraction at calculated sustainable abstraction rates. This 15m lowering of the water table has been artificially applied to the" normal" groundwater level to produce an example hydrograph of groundwater levels during a 1:200 year drought event.

Enhanced dry weather trigger level = -8mOD. Based on historical lowest observed dry-weather pumped groundwater level in Feb 2017 of approximately -6mOD. 2m headroom between lowest observed gwl and drought trigger is equivalent to approximately 0.33x observed seasonal variation in groundwater level of around 6m. Equivalent to approximately 50% of reduction in calculated gwl due to 1:200 year return period drought (7m) below Dry weather trigger.



EXPERIENCE OF 2018, 2019 AND 2020

The most recent prolonged dry period was in 2018/19 when rainfall varied from 43% of the Long Term Average (LTA) in May to 134% of the LTA in March.

Total stock levels were generally below average for most of the year. The levels started at just above average but as a consequence of the dry spring and summer quickly dropped. Given it size the lower than usual level in Derwent reservoir was a major factor in the overall low stock level. Our usual operations of careful management of reservoir levels enabled a gradual improvement throughout autumn and most of winter. However, a dry December and January saw levels drop again but following a wet March we ended up above average and only slightly below the position at the start of the period.

The level in Derwent dropped through rule curves which meant that our Treatment Works and the river Derwent were supported to varying extents by The Kielder Transfer Scheme from July to year end.

There was never a risk of any restrictions to water supply due to the lower than average reservoir levels because of the capability to support the system from Kielder.

Last year, 2020, combined reservoir storage was above average at the end of March, however due to the extremely dry weather in April and May, along with an increase in demand reservoir stocks were drawn down quickly.

Factors which influenced high demand included –

- **Hand washing and home hygiene:** A key Covid-19 measure is enhanced hand washing and home hygiene which in itself, resulted in an increased demand for water.
- **Home working:** Home working had a significant effect demand in the area.
- **Garden Water Use:** With so many people at home and some being furloughed, people took the opportunity to spend more time in the garden and to both pressure-wash their drives and patios, and to grow more flowers and vegetables.
- **Weather:**. With so many people staying local and postponing holidays, we believe garden water use was much higher than would have normally been the case with increased use of kids “slip and slides”, which require a continuous garden hose supply of water, and paddling pools. Some of the latter require a significant amount of water to fill which in most cases may be single use given how dirty the water quickly gets.

Reservoir stocks and WTW flows were carefully managed throughout the summer, this close management along with the weather turning wetter in June meant that reservoir stocks began to recover. Although demand remained above normal further wet weather in October and over the 2020/21 winter has meant that all reservoirs recovered to a healthy position.

Additionally, during this year we also had high levels of planned outage at our treatment works and even with the higher level of demand in our supply area, we maintained resilient supplies to all of our customers.

APPENDIX 3: DETAILED ENVIRONMENTAL ASSESSMENTS

We do not have any drought permit options and so have not needed to prepare any environmental reports.

APPENDIX 4:
RELEVANT LEGISLATION AND GUIDANCE

In producing this draft Drought Plan, reference was made to the following guidance and legislation:

- Water Company Drought Plan Guideline 2020, Environment Agency
- The Drought Plan (England) Direction 2020
- Drought Plan Guideline Extra Information: Environmental Assessment for Water Company Drought Plans, May 2016, Environment Agency
- Drought Plan Guideline Extra Information: Supplementary Information, April 2016, Environment Agency
- Drought Plan Guideline Extra Information: Drought Permit and Order Application Ready, November 2016, Environment Agency
- Water Company Drought Plan Guideline 2011, Environment Agency
- Water Industry Act 1991
- Water Act 2003 where s.63 inserts new sections 39B & 39C into the Water Industry Act 1991 and s.62 inserts new sections 37B-D into Water Industry Act 1991
- Drought Plan Direction 2005
- Drought Plan Regulations 2005
- Drought Direction 1991
- Flood and Water Management Act 2010 where s.36 amends the Water Industry Act 1991 by substituting a new s.76
- Water Use (Temporary Bans) Order 2010
- Environmental Assessment of Plans and Programmes Regulations 2004
- Conservation of Habitats and Species Regulations 2010
- Wildlife and Countryside Act 1981 as amended by the Countryside and Rights of Way Act 2000, Section 28G.

APPENDIX 5:
EXCEPTIONAL SHORTAGE OF RAIN (ESoR) ASSESSMENT

The Environment Agency issued its latest draft guidance entitled Hydrological guidance for the assessment of an Exceptional Shortage of Rain (ESoR) on 18 March 2021.

The sections in the guidance that relate to drought permit and drought order applications is reproduced below.

Overview

An ESoR needs to be demonstrated as part of any future drought permit or drought order application. In the case of a drought permit or emergency drought order, the Environment Agency or Secretary of State, respectively, must be satisfied that a serious deficiency of supplies of water in any area exists or is threatened due to an exceptional shortage of rain. For a drought order, the Secretary of State must be satisfied that, due to an exceptional shortage of rain, a serious deficiency of supplies exists or is threatened, or such a deficiency in flow or level of any inland waterway to pose a serious threat to any flora or fauna which are dependent on those waters, exists or is threatened.

The EA's guidance states that it is not appropriate to set a prescriptive approach to assessing an ESoR case. Each drought and each situation is unique. This technical guidance provides additional detail on best practice for ESoR assessments and should be read in conjunction with the Environment Agency's supplementary guidance on drought permits and drought orders.

Practicalities

In the case of a water company drought permit application, the water company will undertake the ESoR assessment. A checklist for water companies has been included in this document (see Appendix A) and should be provided to water companies to help with their assessment. The ESoR assessment should include suitable graphical evidence, for example charts, maps and tables, as appropriate, to support the ESoR case.

The Environment Agency expects water companies to follow the methodologies outlined in its supplementary guidance on drought permits and drought orders.

As a minimum, the Environment Agency expect every assessment to include a rainfall ranking and SPI assessment for the full period of analysis available and if appropriate, supported by additional methods agreed by Environment Agency hydrologists.

Appendix A – Exceptional Shortage of Rain (ESoR) checklist for water companies.

Audience: Environment Agency

Purpose

This document is designed for water companies completing an Exceptional Shortage of Rainfall (ESoR) assessment as part of a drought permit application. You (the water company) must follow the checklist below when completing your ESoR assessment. You may wish to use the sub-headings below to structure your ESoR report. This document is not designed to be used as a template for your report.

Checklist

- Consult with the Environment Agency hydrology technical specialists, Area Drought Coordinator and water company lead (OCS) at as early stage as possible to agree the approach.

1. Introduction

- Provide an overview of the application and the area of interest.
- Provide details of the supply situation and the hydrological context.

2. Rainfall data

- You must use areal rainfall data for the catchment area of interest.
- In most circumstances, you should use the Environment Agency's HadUK / DRT dataset for Hydrological Areas which is provided to water companies on a monthly basis. If the Hydrological Areas are not appropriate then rainfall data can be extracted for a bespoke catchment area from the HadUK/DRT dataset by Environment Agency hydrologists. Fully explain which dataset has been used and why.
- If you have calculated areal rainfall yourself (you are strongly advised to avoid this):
  - You will need to demonstrate that your data is of better quality and / or more hydrologically relevant than the HadUK / DRT dataset.
  - Set out the limitations of the dataset.

- Your areal rainfall should be calculated in accordance with British Standard BS7843-4:201296. The rain gauges used must be quality controlled, have minimal missing data and be operated in accordance with British Standard.

3. Period of analysis

- Determine the start and end point of the period of analysis before starting the assessment. This is the period of the rainfall deficit which is used to support the ESoR case. You should agree the period of analysis with the relevant Environment Agency hydrologist, the Area Drought Coordinator and water company lead.
- The application should be submitted as soon as possible after the end of the period over which you believe the ESoR has occurred.
- Start of the period of analysis:
  - Provide clear evidence (e.g. charts / graphs) of the point at which the resource situation is no longer normal for the time of year. This should include both the onset of the rainfall deficit and the effects on the water supply situation.
  - Justify how the variables used here are reflective of the water supply situation in the catchment area of interest.
- End of the period of analysis:
  - Provide clear evidence (e.g. charts / graphs / reference to Drought Plan) that the rainfall deficit has triggered the need for a drought permit.
  - Use the latest rainfall data at the point of the application.

4. Geographical extent of analysis

- Provide justification for the catchment area used in the analysis. In most circumstances, this will be one or several of the Environment Agency's Hydrological Areas.
- Provide evidence of how the rainfall deficit is relevant to the catchment area of the public supply source or the wider integrated water resource zone / sub unit of this zone.
- Catchments less than 10 km² or those without a rain gauge located within them should not be used.

5. Technical rainfall analysis methods

- Refer to the Environment Agency's supplementary guidance on drought permits and drought orders. This is available internally on the Content

Cloud and externally it will be shared with water companies on SharePoint or by request from the Water-Company-Plan mailbox.

- Use the same rainfall dataset (usually HadUK / DRT) for each analysis method (as set out in the sections above) and the same historic period of record (from 1891).
- Use your assessment period of analysis for each method as your main evidence. If you use any shorter periods as supporting evidence (for example, the winter refill period), justify how these are relevant to the water resource situation.
- Detail any limitations and uncertainties associated with the methodology, and the possible impacts on the results.

6. Other meteorological and hydrometric measures

- This analysis should not detract from your evidence that the reason for a serious deficiency is an ESoR.
- Refer to the Environment Agency's supplementary guidance on drought permits and drought orders. This is available internally on the Content Cloud and externally it will be shared with water companies on SharePoint or by request from the Water-Company-Plan mailbox. The internal Environment Agency guidance document contains more details on best practice.
- Use your assessment period of analysis for each method as your main evidence. If you use any shorter periods as supporting evidence (for example, the winter refill period), justify how these are relevant to the water resource situation.
- Detail any limitations and uncertainties associated with the methodology, and the possible impacts on the results.

7. Overview / Other

- You should consider the relationship to the threat of a serious deficiency of supply in the catchment area of interest.
- You should consider the relationship to the water company system.
- You may wish to include a forward look based upon a meteorological forecast

8. Summary and conclusions

- Provide a summary of the evidence for an ESoR drawing on your evidence from your technical analysis.

APPENDIX 6:
SUMMARY DROUGHT OPTIONS FORMS

Demand Side Drought Actions

Demand Side Drought Action Name	Level 1 Appeal for Restraint
Trigger(s) Or preceding actions	Level 1 drought trigger as per worked examples (See Appendix 3) Would follow enhanced dry weather messaging
Demand Saving or DO of Option (Mld)(1)	~0 to 7% annual average ~0 to 14% peak
Location	By Water Resource Zone
Implementation Timetable Preparation time, time of year effective, duration	From DMG approving drought action: - 1 week to implement campaign Most effective during hot weather (late Spring and summer)
Permissions required and Constraints Including details of liaison carried out with bodies responsible for giving any permits or approvals	None required – at water company discretion. Liaison with WReN, neighbouring water companies and EA
Risks associated with option	Customers already sufficiently water-wise resulting in lower saving.

Demand Side Drought Action Name	Level 2 Temporary Use Ban
Trigger(s) Or preceding actions	Level 2 drought trigger as per worked examples (See Appendix 3)
Demand Saving or DO of Option (Mld)	~0 to 5% annual average ~0 to 10% peak
Location	By Demand Management Area (Essex and / or Suffolk)
Implementation Timetable Preparation time, time of year effective, duration	From DMG approving drought action: - 2 weeks to place adverts in newspaper and plan media communication; followed by 3 weeks for representation after publishing on ESW's website
Permissions required and Constraints Including details of liaison carried out with bodies responsible for giving any permits or approvals	None but liaison with WReN, neighbouring water companies, EA, CCW and Defra would take place.
Risks associated with option	Customers already sufficiently water-wise resulting in lower saving.

Demand Side Drought Action Name	Level 3 Non-Essential Use Ban Drought Order
Trigger(s) Or preceding actions	Level 3 drought trigger as per worked examples (See Appendix 3)
Demand Saving or DO of Option (Mld)	~0 to 2% annual average ~0 to 4% peak
Location	By Water Resource Zone
Implementation Timetable Preparation time, time of year effective, duration	From DMG approving drought action: 2 months to finalise drought order application and determination, communication with public, time to place adverts in newspaper and send prohibition notices. Maximum duration 3 months before extension required.
Permissions required and Constraints Including details of liaison carried out with bodies responsible for giving any permits or approvals	Emergency Drought Order Secretary of State Liaison with EA, CCW and Defra required.
Risks associated with option	Negative impact on affected businesses.

APPENDIX 7:
ENVIRONMENTAL PERMITS AND DROUGHT ORDERS

We do not have any drought permit or drought order supply side drought actions.

APPENDIX 8:
TEMPORARY USE BAN REGIONAL ALIGNMENT

We will adopt the following TUB enforcement policy which other water companies, particularly in the Water Resources South East (WRSE) and Water Resource East (WRE) regions have agreed to use,.

The following enforcement policy is a universal document for water companies to use when implementing a TUB.

TEMPORARY USE BAN ENFORCEMENT POLICY

1. Introduction

Northumbrian Water is the statutory water and sewerage undertaker for an area covering approximately [add a broad descriptive geographical].

A map showing the region for which Northumbrian Water is appointed to act as the statutory water undertaker is shown shaded in blue and attached to this document as Appendix 1. This area is referred to within this document as “the Northumbrian Water Region”.

On [date] Northumbrian Water imposed, throughout the Northumbrian Water Region, a prohibition on the use of water for a number of specified categories of use, in accordance with section 76 of the Water Industry Act 1991. This is referred to as the Temporary Use Ban or TUB. The TUB was imposed because of the serious deficiency of water available for distribution and its terms are as follows:

The TUB took effect from midnight on [date] following publication of the notice on the Northumbrian Water website and in the [insert newspaper name], The Times and the Daily Mail newspapers on [date]. The terms of the TUB are attached to this document as Appendix 2.

Under the terms of section 76(5) of the Water Industry Act 1991, if any person fails to comply with the terms of the TUB that person shall be guilty of an offence and liable on conviction in the Magistrates’ Court to a fine of up to £1000.

This enforcement policy sets out the standards and guidance that will be applied by Northumbrian Water when undertaking its enforcement role within the provisions of the Water Industry Act 1991.

Where infringements and contraventions are found, Northumbrian Water will respond in a manner commensurate with the need to safeguard the availability of water available for distribution. Wherever possible, Northumbrian Water will offer advice to those who may have contravened the prohibition in a bid to remedy infringements in a timely and cost effective manner. However, in particular cases, offenders may face prosecution.

The purpose of this enforcement policy is to seek to ensure that when enforcement action is required, it is pursued in a consistent, balanced and fair manner.

2. Overall Aim

It is intended that this policy will seek to ensure compliance with the TUB within the Northumbrian Water Region, in an attempt to conserve water, in a fair, open and consistent manner having regard, where appropriate, to the circumstances of each individual case and the extent to which the terms of the TUB have been contravened.

3. Guiding Principles

Whilst undertaking its regulatory and enforcement role in connection with the TUB, Northumbrian Water will have regard to the following Guiding Principles:

- Any decision regarding enforcement action will be impartial and objective, and will not be affected by race, politics, gender, sexual orientation or the religious beliefs of any alleged offender, victim or witness.
- Northumbrian Water will use as its starting position when considering enforcement of the TUB the belief that the vast majority of persons wish to comply with the terms of the TUB and should be assisted in doing so by Northumbrian Water following the Investigational Phase process set out in Appendix 3 below ("the Investigational Phase"), if reasonably practicable.
- There will be a consistent approach to enforcement whilst recognising individual circumstances.
- Prosecution for an offence under the Water Industry Act 1991 will be considered in all cases, but particularly where a serious, severe, persistent and/or blatant breach of the relevant legislation has taken place or where alternative methods of resolution have failed.

4. Standards

Northumbrian Water will try to meet the highest standards of service whilst undertaking its regulatory and enforcement function in connection with the TUB. The following specific level of service standards will be applied in connection with the TUB: -

- Matters relating to enforcement of the TUB will be dealt with promptly with written enquiries and complaints receiving a response or acknowledgement within ten working days.
- Employees of Northumbrian Water employed to monitor compliance with the TUB will announce themselves on arrival at any premises and promptly show credentials/identification unless they are already known to the person or persons on such premises.
- Employees of Northumbrian Water employed to monitor compliance with the TUB will provide their name and a Northumbrian Water contact telephone number to those persons with whom they are in written contact concerning enforcement of the TUB.
- Complaints relating to persons failing to comply with the TUB will be dealt with promptly, though we will always request the name and address of the complainant. Any such identification will be treated in confidence, but may

need to be disclosed (with prior consent) should formal legal proceedings be taken against the person or persons to which the complaint relates. Anonymous complaints however, will still be investigated.

- Northumbrian Water will be professional, courteous and helpful in its enforcement of the TUB and wherever possible will seek to work with persons towards compliance using the Investigational Phase.
- In accordance with the Investigational Phase at the onset of considering enforcement action Northumbrian Water will provide the person(s) believed to be contravening the TUB in writing with full details of the manner in which it is alleged the TUB has been breached and the steps that are required to be undertaken and by when to avoid enforcement action being taken.

5. Consistent Enforcement

Consistent enforcement action is desirable, but absolute uniformity would be unfair by failing to recognise individual circumstances that may modify action to be taken where it is permissible. Consistency of approach whilst allowing a degree of discretion will be encouraged by:

- Appropriate training and supervision of those employed by Northumbrian Water to monitor and enforce compliance with the TUB. Amongst other things, they will be made fully conversant with the terms of this Enforcement Policy and its Appendices.
- Ensuring there is compliance with the standards set out in this policy by Northumbrian Water.
- Recognition that it may not be in the interests of justice to prosecute a person found to be breaching the terms of the TUB in those cases where there is only sufficient evidence to prove a minor infringement.
  The final decision whether or not to prosecute will be taken by Northumbrian Water's Executive Management Team, who will be aware that each case is unique and must be treated on its own merits.

6. Assessing Appropriate Action (in cases of infringement)

The Investigational Phase that will be undertaken by Northumbrian Water sets out the detailed steps that will be taken by Northumbrian Water **before** enforcement action is taken against a person found to be contravening the TUB. Northumbrian Water will seek to ensure that the process identified in the Investigational Phase attached below as Appendix 3 as it applies to each individual case will be followed to allow a person sufficient time to demonstrate compliance with the terms of the TUB before enforcement action will be taken.

Prosecution will normally be considered where one or more of the following criteria are satisfied:-

- There is a need to protect the public interest and the interests of the environment, health, safety and such other interests.
- Informal approaches have failed.
- The persons concerned have ignored requests for compliance with the TUB.

- There has been a repeated serious and/or blatant contravention which is a clear overt challenge to the TUB and has potential to undermine customer confidence in the fairness of the restriction.

Northumbrian Water accepts that the decision to institute criminal proceedings against a person or persons who fail to comply with the terms of the TUB is a serious one that should only be taken after full consideration of all the facts.

Northumbrian Water is not bound by, but chooses to accept the provisions of the Code for Crown Prosecutors, January 2013 As such, Northumbrian Water will only institute criminal proceedings when it is satisfied that the two stages of the Full Code Test: (i) the evidential stage; and (ii) the public interest stage, have been met.

The evidential stage is passed when there is sufficient evidence to provide a realistic prospect of conviction against each defendant on each charge. A realistic prospect of conviction means that a bench of magistrates, properly directed in accordance with the law, is more likely than not to convict the defendant of the charge alleged.

The public interest stage is applied by balancing public interest factors for and against prosecution. A prosecution will usually take place unless there are public interest factors tending against prosecution which clearly outweigh those tending in favour. Public interest factors that can affect the decision to prosecute usually depend on the seriousness of the offence or the circumstances of the offender. Some factors may increase the need to prosecute but others may suggest that another course of action would be better.

Both the evidential and public interest stages will be considered fairly and objectively by Northumbrian Water.

[Date]

Appendix 1 Map of Northumbrian Water Region

Insert a map showing the geographical area for which Northumbrian Water is appointed as the statutory water ("the Northumbrian Water Region")

Appendix 2: Terms of the Temporary Use Ban

Temporary Use Ban:
Section 76 Water Industry Act 1991
Potable* water supplied throughout the area of [Company name] Utilities Limited must NOT be used for the following purposes:

1. watering a 'garden' using a hosepipe;
2. cleaning a private motor-vehicle using a hosepipe;
3. watering plants on domestic or other non-commercial premises using a hosepipe;
4. cleaning a private leisure boat using a hosepipe;
5. filling or maintaining a domestic swimming or paddling pool (except when using hand held containers filled directly from a tap);
6. drawing water, using a hosepipe, for domestic recreational use;

7. filling or maintaining a domestic pond (excluding fish ponds) using a hosepipe;
8. filling or maintaining an ornamental fountain;
9. cleaning walls, or windows, of domestic premises using a hosepipe;
10. cleaning paths or patios using a hosepipe;
11. cleaning other artificial outdoor surfaces using a hosepipe.

Definition of a garden
A “garden” includes all of the following: a park; gardens open to the public; a lawn; a grass verge; an area of grass used for sport or recreation; an allotment garden, as defined in section 22 of the Allotments Act 1922; any area of an allotment used for non-commercial purposes; and any other green space.

Exemptions
The following will be exempted from the restrictions:

i) using a hosepipe in a garden or for cleaning walls or windows of domestic premises, paths or patios, a private leisure boat or an artificial outdoor surface, where such use is necessary for health and safety reasons.

ii) people with severe mobility problems who hold a current Blue Badge as issued by their local authority will not be prohibited from using a hosepipe to water a garden attached to a domestic dwelling, plants on domestic premises, or allotments where the Blue Badge holder is the tenant.

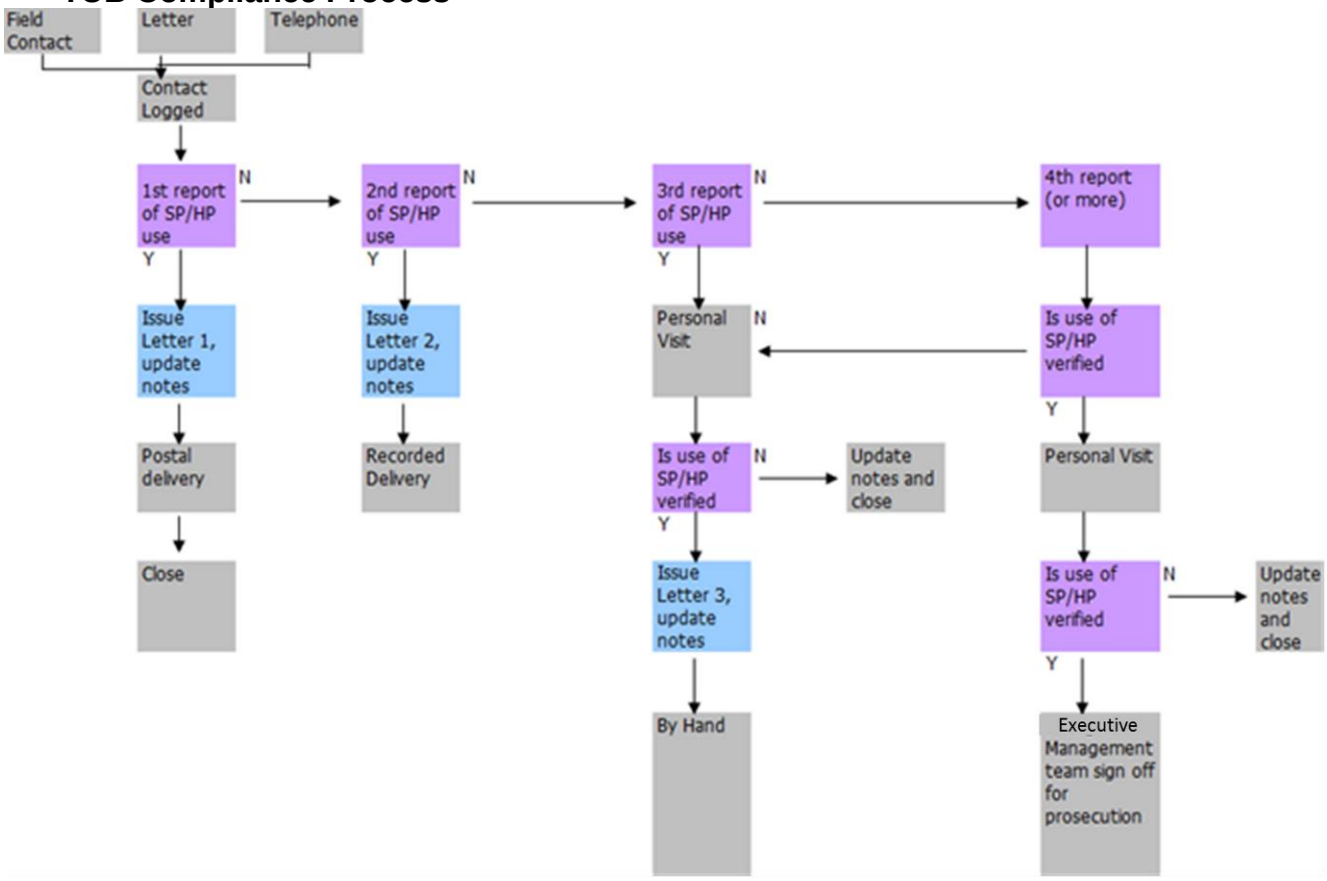
iii) using a hosepipe to clean a private motor vehicle, walls and windows of domestic premises, or paths, patios and other outdoor surfaces where this is done as a service to customers during a business.

iv) using a hosepipe to water an area of grass or artificial outdoor surfaces used for sport or recreation, where this is required in connection with a national or international sports event. A list of qualifying events will be published on [Company name]’s website and updated as and when required.

v) drip or trickle irrigation watering systems, fitted with a pressure reducing valve and a timer, that are not handheld, that place water drip by drip directly onto the soil surface or beneath the soil surface, without any surface run off or dispersion of water through the air using a jet or mist.

Appendix 3: TUB Non-compliance Investigational Phase (Flowchart)

TUB Compliance Process



APPENDIX 9:
TEMPORARY USE BANS DEFINITIONS

Definition of "using a hosepipe"

For the purposes of a TUB, we have used the definition of "using a hosepipe" as that given in the Water Use (Temporary Bans) Order 2010 as follows:

a) Drawing relevant water through a hosepipe;
b) Drawing relevant water through a hosepipe from a container and applying it for the purpose; and
c) Filling or partly filling a container with relevant water by means of a hosepipe and applying it for the purpose.

A reference to a hosepipe includes anything designed, adapted or used for the same purpose as a hosepipe. "Relevant water" refers to mains water i.e. supplied by the water undertaker; it does not include water supplied before the water restriction was implemented.

The legislation does not state any exemptions to the definition of a hosepipe.

We considered whether micro-irrigation systems should be exempted from a temporary use ban but concluded that they should not be exempted. Whilst we recognise micro-irrigation systems use water more efficiently than a hosepipe or sprinkler, a 1 in 20 year ban is more about conserving water than using water more efficiently. If micro-irrigation was exempted from a hosepipe ban, more systems would be sold during the ban thereby decreasing some of the volume of water conserved from the imposition of the hosepipe ban.

The above definition of a hosepipe applies to all of the 11 categories detailed below:

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

Although all of these uses of hosepipes are banned, it is important to note that during any TUB, gardens may still be watered:

- by hand using a bucket or watering can;

- with grey-water (ex bath/ washbasin water) through a hosepipe; and / or
- using rainwater from a water-butt through a hosepipe (assuming sufficient rainfall).

Further explanation of uses to be banned

Watering a garden using a hosepipe

The definition of "a garden" has been widened and clarified under the Water Use (Temporary Bans) Order 2010. We intend to ban the use of watering using a hosepipe for all categories allowed to be banned, with no exceptions.

The areas where watering a garden using a hosepipe will be banned under Phase 1 are:

a) a domestic garden
b) a park
c) gardens open to the public
d) a lawn
e) a grass verge
f) an area of grass used for sport or recreation
g) an allotment garden
h) any area of an allotment used for non-commercial purposes
i) any other green space

Exemptions: Under legislation a "garden" does not include the following, meaning hosepipe use is allowed to continue in these areas under a Phase 1 temporary use ban.

a) agricultural land
b) other land used in the course of a business for the purposes of growing, for sale or commercial use, any crops, fruit, vegetables or other plants.
c) land used for the purpose of a National Plant Collection.
d) a temporary garden or flower display
e) plants (including plant organs, seeds, crops and trees) which are in an outdoor pot or in the ground, under cover. NB for domestic purposes watering of these by a hosepipe is still banned under our Phase 1 but it comes under a different category in the legislation.

(Legislation excludes the banning of "watering a garden using a hosepipe" when the use is for "health or safety reasons". However use of this exclusion is likely to be rare and the company would scrutinize the genuineness of such a claim).

Cleaning a private motor-vehicle using a hosepipe

Washing of any private motor vehicle, using a hosepipe is banned. This includes commercial car wash businesses that use hosepipes or pressure washers to wash customer's cars. Private cars can still be washed by householders and commercial businesses by hand using water from a bucket.

Exemptions: Legislation excludes:

a) a public service vehicle, as defined in section 1 of the Public Passenger Vehicles Act 1981; and
b) a goods vehicle as defined in section 192 of the Road Traffic Act 1988.

NB. Taxis and minicabs are public service vehicles and are therefore excluded from the ban.

Commercial carwashes, that do not use a hosepipe or similar apparatus, are also exempt from this ban.

Watering plants on domestic or other non-commercial premises using a hosepipe

This category covers the banning of watering by a hosepipe of plants which are in an outdoor pot or in the ground, under cover (predominantly plants growing in a greenhouse border).

"Domestic or other non-commercial premises" means

a) Any land, building or other structure used or enjoyed in connection with the use of any of the following which is used principally as a dwelling:

    - A building or part of a building
    - A caravan
    - A boat
    - Any land or premises which is not used principally for the purpose of a business

Exemptions: Legislation defines some exemptions:-

- Plants in outdoor pots and in the ground, undercover in public authority premises
- Plants in outdoor pots and in the ground, undercover in commercial premises
- Plants grown or kept for sale or commercial use
- Plants that are part of a National Collection or temporary garden or flower display.

Whilst Local Authorities are not restricted in their watering of plants, using a hosepipe, in outdoor pots or in the ground, under cover by the Phase 1 ban, we would expect them to also cease watering this category when a ban is imposed. This is likely to be seen to be fairer by the public and helps to fulfil a Local Authority's duty under the Water Act 2003 to conserve water.

Cleaning a private leisure boat using a hosepipe

Using a hosepipe to clean a private leisure boat is banned. A private leisure boat is defined as "a vessel or other thing, other than a seaplane, which is designed, constructed or adapted to move through, in, on or over water". Boats in private ownership only are included, whether trailer launched or not. The ban includes all small water craft also e.g. canoes, kayaks, jet skis etc.

Exemptions: Legislation exempts the following:

- Vessels used in the course of a business
- Vessels made available or accessible to the public
- Cleaning of any area of a private leisure boat which, except for doors and windows, is enclosed by a roof and walls
- Using a hosepipe to clean a private leisure boat for health or safety reasons.

Filling or maintaining a domestic swimming or paddling pool

A domestic swimming or paddling pool is defined as swimming or paddling pool, other than a pool that is being used for the purpose of a business, which is:

a) in a building or part of a building used principally as a dwelling; or
b) on any land or in any building that is used or enjoyed in connection with (a).

Exemptions: Legislation excludes filling or maintaining a pool:

a) where necessary in the course of its construction
b) using a hand-held container filled with water drawn directly from a tap
c) that is designed, constructed or adapted for use in the course of a programme of medical treatment
d) used for the purpose of decontaminating animals from infections or disease
e) used in the course of a programme of veterinary treatment
f) in which fish or other aquatic animals are being reared or kept in captivity.

Drawing water, using a hosepipe, for domestic recreational use

This category covers the banning of the use of a hosepipe to operate water slides or other domestic recreational equipment. This is interpreted to mean both slides designed to be used with water and any temporary or ad hoc water slides or sprinklers. Recreational use covers the use by adults or children.

Exemptions: There are no legislative exemptions.

Filling or maintaining a domestic pond using a hosepipe

This restriction is fairly limited in the number of ponds likely to be effected. A wider ban on filling ponds comes in under the Phase 2 restrictions and requires the company obtaining a Drought Order under the Drought Direction 2011. A “domestic pond” is defined as a pond, including a swimming pond, on land that is used in connection with a building, or part of a building, used principally as a dwelling; and is not being used for the purpose of a business. A pond can be natural or man-made and can be internal or external, and includes ornamental ponds.

Exemptions: Legislation excludes filling or maintaining a pond in which fish or other aquatic animals are being reared or kept in captivity.

Filling or maintaining an ornamental fountain

This category covers any water fountain or water cascade that serves a purpose that is primarily decorative. This includes sculptures that have a water component. Filling by any means is banned including permanent plumbing.

This ban applies equally to fountains, cascades and sculptures using water that are privately owned or publicly owned. It also applies to features that use recycled water.

Exemptions; Legislation exempts the filling or maintaining of an ornamental fountain which is on or near a fish pond and whose purpose is to supply sufficient oxygen to the water in the pond in order to keep the fish healthy.

Cleaning walls, or windows, of domestic premises using a hosepipe

This category refers to the cleaning of walls or windows on domestic premises using a hosepipe. The restriction also applies to businesses cleaning domestic walls or windows using such apparatus as water-fed poles.

A domestic premise is defined as:

a. A building used principally as a dwelling or dwellings
b. A garage, shed, outbuilding or other building or structure used or enjoyed in connection with a building used principally as a dwelling; or
c. A wall or other means of enclosure within the cartilage of a building used principally as a dwelling.

Exemptions: Legislation exempts cleaning activities for health and safety reasons. However these are likely to be rare with health or safety reasons likely to be restricted to:

- Removing or minimising any risk to human or animal health or safety; and
- Preventing or controlling the spread of causative agents of disease.

Cleaning paths or patios using a hosepipe

This ban on use applies regardless of who is carrying out the cleaning and regardless of whether they are on domestic or commercial premises. The ban applies whatever the paths or patios are made of.

Exemptions: Legislation only exempts cleaning using a hosepipe for health or safety reasons. Again these exemptions are likely to be rare and similar to the exemptions for H & S given in (**9**).

Cleaning other artificial outdoor surfaces using a hosepipe

This category bans the use of a hosepipe for outdoor cleaning of artificial surfaces regardless of who is doing the cleaning and regardless of whether the premises are domestic or commercial. Artificial outdoor surfaces are defined as:

a) Any area outdoors which is paved or laid with hard or artificial material;

b) Timber decking;
c) A quay (including a jetty, pontoon, wharf or slipway).
d) A trailer designed, constructed or adapted to launch boats or other vessels or craft into water, other than a private motor vehicle
e) The roof of any domestic premises.

Exemptions: Legislation only exempts cleaning using a hosepipe for health or safety reasons. Again these exemptions are likely to be rare and similar to the exemptions for H & S given in (**9**).

APPENDIX 10:
NON-ESSENTIAL USE BAN DEFINITIONS

Commercial Premises

- For the purpose of a Drought Order, commercial premises are defined as:- "any land, building, other structure or premise not being domestic or other non-commercial premises within the meaning of the Temporary Water Use Ban".

Watering outdoor plants on commercial premises using a hosepipe

- This banning of activity covers:
  - Plants which are in a pot or other container that is outdoors or undercover
  - Plants which are in the ground under cover.
  -
- **Exemptions**: Legislation exempts the watering of plants using a hosepipe that are:-
  - Grown or kept for sale or commercial use; or
  - Part of a National Collection or temporary garden or flower display.

Filling or maintaining a non-domestic swimming or paddling pool

- For the purpose of the Drought Order, the Drought Direction 2011 defines non domestic swimming or paddling pools as "a swimming or paddling pool as defined and covered by the Water Industry Act S76(2)(e). The intention is that filling of domestic pools will already have been banned under the Temporary Water Use Ban.

- **Exemptions**: Legislation exempts the following from filling or maintaining pools:
  a. That is open to the public
  b. Where necessary in the course of its construction
  c. That is designed, constructed or adapted for use in the course of a programme of medical treatment
  d. That is used for the purpose of decontaminating animals from infections or disease
  e. Used in the course of a programme of veterinary treatment
  f. In which fish or other aquatic animals are being reared or kept in captivity
  g. That is for use by pupils of a school for school swimming lessons

  For the purpose of exemptions "Open to the public" is defined as:

  A pool is **not** open to the public if it may only be used if the user is a paying member of an affiliated club or organisation i.e. these are not exempt.

Filling or maintaining a pond

- This extends the areas of pond filling or maintaining being banned beyond those already covered by the Temporary Water Use Ban. Non domestic ponds are now also covered by the ban on the use of hosepipes and both domestic and non-domestic ponds are banned from having water added by a fixed pipe. Ponds include manmade and natural ponds of any size.

- **Exemptions:** Legislation exempts the filling of any ponds, domestic or non-domestic, by hosepipe or fixed pipe, which contains fish or other aquatic animals that are being reared or kept in captivity. It also excludes the filling of any ponds using a hand-held container which is filled with water directly drawn from a tap.

Operating a mechanical vehicle-washer

- This is fully defined as “operating a mechanical vehicle-washer, whether automatic or not”.

- **Exemptions:** There are no exemptions in legislation. While we are not considering any outright exemptions, we would intend to delay implementing this ban, for as long as we consider sensible, for mechanical washers that recycle water and use less than 23 litres of water per vehicle wash.

Cleaning any vehicle, boat, aircraft or railway rolling stock using a hosepipe

- A boat is interpreted, in this case, as a vessel or other thing that:
    - Is designed, constructed or adapted to move through, in, on or over water; and
    - Is not a private leisure boat within the meaning applied under the Temporary Water Use Ban.
- A vehicle is defined as any of the following which is not a private motor vehicle within the meaning of the Temporary Water Use Ban:
    - A vehicle, designed, constructed or adapted for use on roads; or
    - A trailer or other thing designed, constructed or adapted for attachment to a vehicle falling within a) above.
    - Railway rolling stock is interpreted to include passenger train cars, freight train cars, locomotives and tube trains.
    - Aircraft are interpreted to include privately and commercially owned airplanes, helicopters, gliders and hot air balloons.

- **Exemptions:** The only exemption in legislation is on the grounds of health or safety reasons.

Cleaning non-domestic premises using a hosepipe

- The activity to be banned is defined as:
  - Any exterior part of a non-domestic building other than a window
  - A non-domestic wall

- **Exemptions:** The only exemption in legislation is on the grounds of health or safety.

Cleaning a window of a non-domestic building using a hosepipe

- This restriction is equivalent in all ways to that covered under the Temporary Water Use Ban for domestic properties. The ban extends to the use of water fed poles where mains water is the source used to create the de-ionised water.

- **Exemptions:** The only exemption in legislation is on the grounds of health or safety.

Cleaning industrial plant using a hosepipe

- In this restriction "plant" is defined to mean "*The equipment, including machinery, tools, instruments and fixtures necessary for an industrial operation"*
- **Exemptions:** The only exemption in legislation is on the grounds of health or safety.

Suppressing dust using a hosepipe

- The Drought Direction 2011 defines "using a hosepipe" as:
  - Drawing relevant water through a hosepipe from a container and applying it for the purpose; and
  - Filling or partly filling a container with relevant water by means of a hosepipe and applying it for the purpose.
- This also includes anything designed, adapted or used for the same purpose as a hosepipe.
- **Exemptions:** The only exemption in legislation is on the grounds of health or safety.

Operating a cistern in any building that is unoccupied and closed

A cistern is defined as meaning an automatically-operated flushing cistern which services a WC pan or urinal.

Occupation of a building by security staff is interpreted to comprise a building that is “unoccupied”.

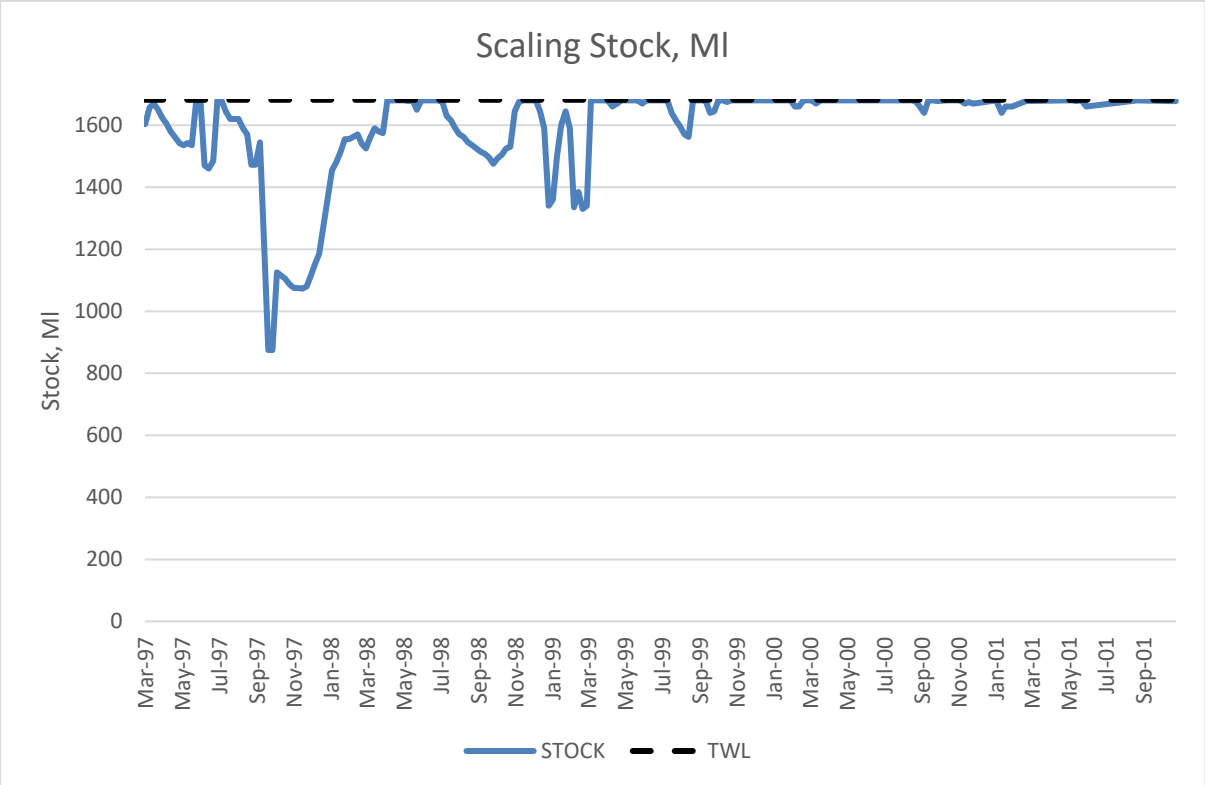
APPENDIX 11:
COMPENSATION ONLY RESERVOIRS

A Compensation Only Reservoir (COR) is a reservoir that is owned and operated by a water company but that has no links whatsoever (direct or indirect) to that company's public water supply network. So for example, the COR would not be listed as a source of supply in the company water resources management plan or as an option to provide public water supply in its drought plan. The main or sole function of the COR is to provide a discharge of water (known as a compensation flow) to the downstream watercourse.

We have one such reservoir, Scaling Dam, at the extreme south east of our region. Built in 1953 with a capacity of 1690 Megalitres (Ml) it originally supplied Scaling Water Treatment Works. The treatment works were abandoned in 1999 and the reservoir is now used only for leisure purposes.

Under the Cleveland Water Order 1950 we must make a continuous compensation release of not less than 0.682 Ml.

The graph below shows the storage in the reservoir prior to and after the abandonment of the treatment works.



The key legislation for drought incident management in relation to CORs is set out in the Water Resources Act 1991 (WRA 1991, Part 2, Chapter 3) which states:-

If the Secretary of State is satisfied that, by reason of an exceptional shortage of rain, there exists or is threatened—

(a) a serious deficiency of supplies of water in any area, or
(b) such a deficiency in the flow or level of water in any inland waters as to pose a serious threat to any of the flora or fauna which are dependent on those waters,
then,**]**, subject to the following provisions of this Chapter, he may by order (in this Chapter referred to as an "ordinary drought order") make such provision authorised by this Chapter as appears to him to be expedient with a view to meeting the deficiency.
In the case of a drought the assumption is that the necessity for action would be in line with b) above and the requirement would be to alter the compensation flow.

Currently the reservoir generally operates at or close to its Top Water Level (TWL) and the only adjustments we make are to increase the downstream flows above compensation in an attempt to avoid the reservoir overflowing.

From the graph above it can be seen that in Sept 1997 the level dropped to 875 Ml.

Based on an example where the level starts just below the TWL with a storage volume of 1600 Ml and it can be dropped to the 1997 low level of 875Ml then the compensation flow could be maintained for some 1063 days or just under 3 years with no water entering the reservoir, which is highly unlikely scenario.

Similarly if the compensation release was to be doubled then it could be maintained for some 18 months. These duration of these extreme examples could be extended by allowing the reservoir to fall below the 1997 value.

We therefore conclude that there is very little likelihood of the requirement for a Drought Order with regards to Scaling Dam.