



South Staffs Water



# South Staffs Water Final Drought Plan



October 2018

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## Executive Summary

This plan has been prepared by South Staffs Water, for its South Staffordshire Water region of operation in compliance with its statutory duty, as a water undertaker, to prepare and maintain a drought plan.

A drought plan is defined as;

*'a plan for how the water undertaker will continue, during a period of drought, to discharge its duties to supply adequate quantities of wholesome water, with as little recourse as reasonably possible to drought orders or drought permits'.*

Drought Plans compliment water undertakers' Water Resources Management Plans (WRMPs). Whilst WRMPs take a long term 25 year view of how water companies plan to meet future demands, drought plans set out the short term operational steps that companies will take before, during and after a drought. They should be flexible enough to deal with a range of possible drought scenarios, and be able to demonstrate, with confidence, to customers and other stakeholders how management decisions and actions will be taken and communicated during a drought. This plan sets out the measures and actions that we will take before, during and after a drought to provide a secure water supply to customers, with minimal impact on the environment.

South Staffs Water published its first statutory drought plan in late 2007 and updated it in 2013. We are now required to update it again, in line with the latest legislation and published guidance. We have based this plan on our previous 2013 drought plan, but have developed it in accordance with the latest Environment Agency guidance, and to incorporate recent events and operational changes since the last plan.

This revised plan includes the 2010-12 drought sequence in our analysis, and we have also reviewed the vulnerability of our sources to more severe and extreme droughts, as well as developing some of our drought indicators to provide additional early warning of the potential onset of drought events.

Our supply side options presented in this plan have been amended to reflect the current operational conditions and status of source works. The sections on environmental assessment and monitoring and mitigation of supply options have been expanded against the previous drought plan to include an assessment of all supply options in addition to that of drought permits. Demand actions remain unchanged; however, we have revised and expanded the section on Communications to align with Company changes to roles and responsibilities, and to include recommendations arising from the 2010-12 drought review.

The changes to our updated plan do not alter the conclusion in the previous plan, following published guidance, that a Strategic Environmental Assessment is not required.

In the South Staffordshire Water region we have for many years maintained a healthy supply demand balance with licence capacity at a level to provide security of supply and flexibility of operations. This licence capacity has been utilised during droughts when demand is raised and supplies from some sources may be affected by low rainfall. Deployment of resources in this way

is a vital part of our drought management strategy. There is some uncertainty regarding future licence capacity arising from implementation of the Water Framework Directive. We are currently working closely with the Environment Agency to understand whether this will result in a reduction in licence capacity available for use during drought periods. If this were to be the case, we may need to review drought triggers and actions and provide a further updated drought plan.

In support of this work, we have undertaken an environmental assessment of abstractions that are likely to increase as a result of drought management actions. This has shown that use of existing licenced abstractions during a drought has the least environmental impact of any options to manage supplies during a drought, and requires no recourse to apply for drought permits.

In summary, the Company is confident that it has robust plans in place to deal effectively with a range of droughts, through the implementation of a series of timely and appropriate management actions. This plan is based on the information currently available to us which includes some short term uncertainty. The plan will be reviewed as necessary to address changes arising from clarification of this uncertainty. This plan explains in more detail how our management actions have been derived, and how they will be communicated, in the event that they need to be implemented.

# 1 Introduction

## 1.1 Overview of the Process

The drought planning process undertaken by water companies is covered by a number of statutes:

The Water Act 2003, by amending the Water Industry Act (WIA) 1991 Section 39, introduced a statutory requirement for water companies to prepare and maintain drought plans. In addition the Flood and Water Management Act (FWMA) 2010 introduced miscellaneous provisions relating to particular aspects of drought planning – including temporary bans on water usage – which in turn, modified certain provisions of the WIA relating to hosepipe bans. Further provisions for the publication of drought plans on consultation and responses to representations are within the Drought Plan Regulations 2005.

Water companies are advised to follow the latest Environment Agency (EA) guidelines when preparing their drought plans to ensure that all the provisions of current legislation are met.

A Drought Management Plan sets out how we will respond to periods of extended dry weather and demonstrates how we will monitor and manage these drought events, and the actions we will take before during and after a drought. To manage droughts of varied severity and longevity we plan to use a range of drought management interventions on both the supply and demand side to maintain supplies. A longer planning timeframe and the management of the supply demand balance under normal conditions and climatic fluctuations is considered in our Water Resources Management Plan (WRMP).

Our last Drought Management Plan was published in February 2013, and in accordance with the Drought Direction 2016 this draft plan has been submitted to the Secretary of State for the Department of the Environment, Food and Rural Affairs (DEFRA) within 4 years and 3 months of the anniversary of the previous published plan. This plan has been produced in accordance with the latest published Environment Agency Drought Plan guidance, published in July 2015.

The Drought Direction 2016 requires companies to include the following;

*3.—(1) A water undertaker, in its drought plan, must address the following matters—*

- (a) the management structure that the water undertaker will put in place during a drought and an explanation of how the management structure will manage, communicate and make decisions during a drought;*
- (b) the magnitude and duration of droughts for which the drought plan has been tested;*
- (c) the permits and approvals that the water undertaker expects to need in order to implement the drought management measures;*
- (d) the discussions that have occurred between the water undertaker and the bodies responsible for granting those permits and approvals*

*and the arrangements for discussions with those bodies during the onset, duration and abatement of all droughts covered by the drought plan;*

*(e) the measures that may be needed to mitigate any adverse effect on the environment resulting from the implementation of a drought management measure;*

*(f) the permits and approvals that the water undertaker expects to need in order to implement those mitigation measures; and*

*(g) the compensation that may need to be made as a result of the implementation of a drought management measure.*

## **1.2 The South Staffs Region Drought Plan**

The Company published its first statutory drought plan for the South Staffs Region, formerly South Staffs Water Company, in September 2007, in accordance with the legislation and EA supplementary guidance current at that time. The 2007 plan was revised in 2013 following the introduction of the Flood and Water Management Act on 1 October 2010, which constituted a material change.

In 2012 South Staffs Water merged with Cambridge Water. Due to the nature of drought plans and the geographically separate areas of the regions, each region of South Staffs Water publishes its own drought plan.

The Drought Plan Direction 2016 states that companies should produce a draft Drought Plan for submission to the Secretary of State;

*(b) for a revised drought plan—*

*(i) if section 39B(6)(a) of the Act applies, within 6 months after the date on which the material change of circumstances occurs; and*

*(ii) if section 39B(6)(c) of the Act applies, within 4 years and 3 months after the date on which its drought plan, or its last revised drought plan, is published.*

This Plan is divided into sections as below:

- Sections 1 – 3. These sections outline the requirement and process for producing this plan, along with supporting and background information on the context of water supply in the South Staffs region.
- Section 4. Explains the drought scenarios we have considered, historic drought sequences and experiences
- Section 5. Discusses the drought triggers that we use, and how these have been developed
- Section 6. Outlines the management actions that are available to reduce demand or increase supply and the structure of the decision making for implementing various actions
- Section 7. Considers the environmental impacts of our proposed actions.
- Section 8. Describes our plans to monitor drought conditions, the drought indicators used, and the environmental impacts of our actions as well as our plans to mitigate these impacts.

- Section 9. Outlines our drought management structure
- Section 10. Describes the communications strategy applied before during and after a drought
- Section 11. Provides a summary of actions we would take at the end of a drought.
- Section 12. Discusses the conclusions of this plan, and some of the uncertainty that we have considered in this plan.

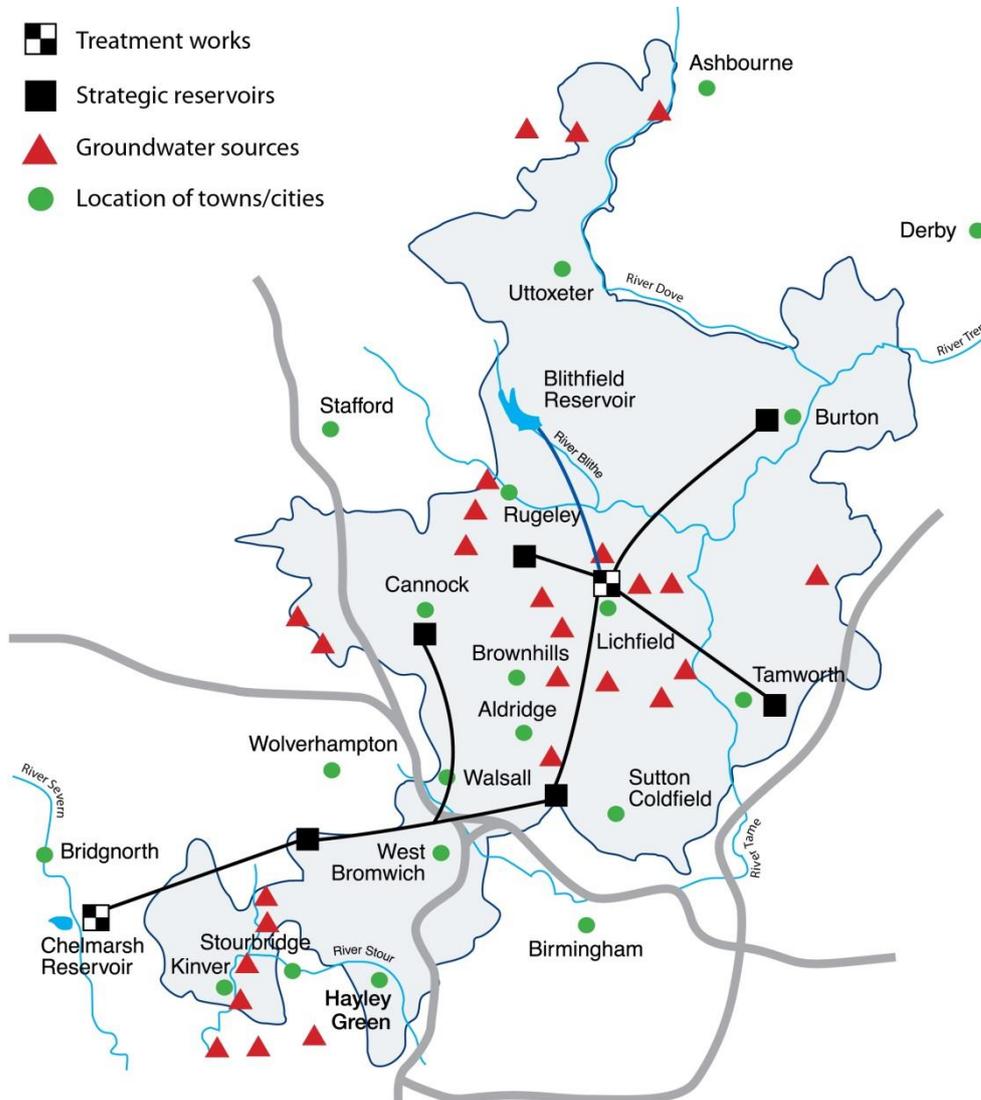
We are required when publishing our drought plan to exclude any matters of commercial confidentiality and any material that is contrary to interests of National Security. We confirm that our plan does not contain any commercially confidential information.

### 1.3 Background to South Staffs Water

In the South Staffs region, South Staffs supplies wholesome potable water to a population of 1,322,000 in the West Midlands and the Black Country, an area that extends to Uttoxeter in the north, Kinver in the south-west and Tamworth and Burton-upon-Trent in the east. The area supplied is shown in Figure 1.

We have a well-integrated water supply network and can move water all around our area of supply. The Company's water resources are supplied in a dry year approximately equally from surface water and groundwater sources linked by an extensive strategic mains network. We operate two surface water works and 26 groundwater sources (boreholes). One of our surface water works provides a major bulk supply to Wolverhampton (Severn Trent Water) and there are also a number of other small bulk imports and exports with Severn Trent Water, which have been in operation for a number of years at the periphery of the Company's supply area.

**Figure 1 South Staffs Region Area of Supply**



## 2 Consultation on the Draft Drought Plan

South Staffordshire Water is committed to engaging with all of the stakeholders who have an interest in this plan. The Company has undertaken consultation with key stakeholders on this Draft Drought Plan. We are publishing this plan to seek comments from the general public and a wider group of stakeholders in our supply area and these will be incorporated into the Final Drought Plan for the South Staffs region.

### 2.1 Pre consultation

In accordance with the EA drought plan guidance we have consulted with statutory consultees prior to producing our draft plan to identify any issues of importance and for any comments that we should consider in our plan. Our pre-consultation ran from 4 to 26 August 2016, for which we contacted the following stakeholders to invite comments for consideration in the revised plan;

- Defra
- Environment Agency
- Natural Resources Wales
- Severn Trent Water
- Anglian Water
- Natural England
- Ofwat
- Customer Challenge Group
- Consumer Council for Water (CCW)
- Canal & River Trust
- E. ON UK PLC
- MPF Generation Limited
- EDF Energy (West Burton Power) LTD
- RWE Generation UK PLC
- Keadby Generation LTD (Scottish and Southern Energy PLC)

Under the EA guidance companies are also required to consult with any licensed water supplier which supplies water to premises in the undertaker's area via the undertaker's supply system. There are currently no such licensed water suppliers operating in the South Staffs region of supply. The comments received during the pre-consultation are presented in Appendix A, and have been summarised in Table 1 below;

**Table 1 Summary of Pre Consultation Comments**

Consultee	Nature of response received	Relevant section of Plan
Defra	No response	N/A
Environment Agency	<p>The key points to be considered in the revised Drought Plan are:</p> <ul style="list-style-type: none"> <li>• The sequencing of drought actions - customer restrictions and demand interventions should be implemented prior to any drought permit/order application.</li> <li>• Effective engagement with customers and stakeholders in a drought.</li> <li>• An appropriate range of drought scenarios to ensure the plan is robust, including more severe drought events than those in the historic record.</li> <li>• An assessment of the effect that the plan will have on Water Framework Directive status or potential. Specifically, whether the increased use of any licence would cause deterioration under the Water Framework Directive.</li> <li>• The requirements for environmental monitoring and assessment needed to support the draft plan. Details of the environmental monitoring programme should be included in the drought plan</li> <li>• A review of monitoring and mitigation options detailed in the River Severn Works Drought Order Environmental Report to account for any in-combination effects of all possible drought permits/orders in place at the same time on the River Severn. In particular the Environment Agency's River Severn Drought Order.</li> <li>• Natural England (NE) views if any proposed drought actions may affect a designated site.</li> <li>• Management of small import/export agreements in place with neighbouring companies.</li> </ul>	<p>6 &amp; Table 4</p> <p>10</p> <p>4</p> <p>7</p> <p>8</p> <p>8</p> <p>8</p> <p>6</p>
Natural England	No response	N/A
Natural Resources Wales (Cyfoeth Naturiol Cymru)	No comments on proposed approach. Should any alteration to the operation of Clywedog be considered as part of drought plan please consult with NRW	

Consultee	Nature of response received	Relevant section of Plan
Severn Trent Water	No response	N/A
Anglian Water	No response	N/A
Ofwat	No response	N/A
Customer Challenge Group	<p>Levels of service – If levels of service are to change than consultation with this Group should be undertaken.</p> <p>Presentation of the plan –supply options within the plan needs to be presented more clearly and consistently in order to enable proper evaluation. There should be greater transparency over their costs and hierarchy of actions to demonstrate best value to customers.</p> <p>Consistency of drought messages across water companies, the Environment Agency and other stakeholders needs to be maintained. Customer communication should consider a much wider range of channels including social media.</p>	<p>3.2</p> <p>6</p> <p>10</p>
Consumer Council for Water (CCWater)	<p>The revised plan should:</p> <ul style="list-style-type: none"> <li>• Follow the principles set out in the Water UK/UKWIR Code of Practice on Temporary Use Restrictions, demonstrating an understanding of the impact of any measures on different customer groups.</li> <li>• Reflect customers' priorities and preferences in relation to the actions that a Company plans.</li> <li>• Explain the Company's strategy for engaging with domestic customers, including its strategies for both managing drought and promoting water efficiency in non-drought times. Customer communication should consider a much wider range of channels including social media.</li> <li>• Show evidence of engagement and reflect the views of relevant stakeholders, such as Government departments, other water companies, NGOs, business and the agriculture sector.</li> <li>• Outline what would happen in an emergency drought situation, such as when supplies might be interrupted/subject to rota cuts or standpipes.</li> <li>• Be clearly written and accessible and provide a customer friendly non-technical summary and examples of customer leaflets and FAQs.</li> </ul>	<p>6 &amp; 10</p> <p>6</p> <p>10</p> <p>2</p> <p>6.4.6</p> <p>to follow for public consultation phase</p>

Consultee	Nature of response received	Relevant section of Plan
Canal & River Trust	No specific comments to proposed approach. Need to be involved if any drought plan options might impact on the CRT network of canals and river navigations within and adjacent to the South Staffs Water supply area. In addition, CRT will explore ideas and options for drought support.	
E. ON UK PLC	No response	N/A
MPF Generation Limited	No response	N/A
EDF Energy (West Burton Power) LTD	Need to consider as part of impact assessment of any drought schemes that river based power stations still require access to sufficient volumes of water to run their plant and enable them to meet their capacity market obligations should they be required to run.	6.4.1
RWE Generation UK PLC	Potential effects on electricity producers need to be fully considered in the drought planning process with a view to ensuring national electricity security of supply is not compromised.	6.4.1
Scottish and Southern Energy PLC	Will respond to draft plan	N/A

## 2.2 Consultation on the Draft Plan

This draft plan was published on 28<sup>th</sup> April 2017, initially to Defra for approval of security measures. Following Direction from the Secretary of State to publish publically, there follows a period of 8 weeks for representations to be made on this plan. Any representations received will be responded to, and a statement of response (SoR) will be published 7 weeks after the close of the consultation period detailing any revisions made to the final plan as a result of the representations.

Our statement of response (SoR) to representations received was published 24 November 2017 detailing any revisions made to the revised draft plan as a result of the representations. A revised final plan will be published once approval to do so is received from the Secretary of State following publication of the SoR.

In July 2018, Defra wrote to give permission to publish the final South Staffs Water drought plan on condition that we commit to make specific changes in relation to:

- Adjusting the sequencing of our drought options to allow adequate time to ensure the benefits of implementing Temporary Use Bans (TUBs) are realised before implementing the Blithe and Trent drought permit.

The Government guidelines for consultation on the Drought Plan indicate that the following groups must be notified of the consultation;

- The Secretary of State for Environment Food and Rural Affairs
- The Environment Agency
- Ofwat
- Relevant water undertakers –Severn Trent Water, Anglian Water, Bristol Water
- The relevant Local Authorities
- Natural England
- English Heritage
- Canal and Rivers Trust (formerly British Waterways)
- The Consumer Council for Water

In addition to meeting these minimum requirements for consultation the Company will undertake additional consultation with a selection of interest groups or individuals;

- Members of Parliament
- The British Horseracing Authority
- The British Swimming Pool Federation
- The Car Wash Association
- The Horticultural Trades Association
- The National Council for the Conservation of Plants and Gardens
- The Royal Yachting Association
- The Racecourse Association
- The Turfgrass Growers Association
- The National Farmers Union
- The Country Land and Business Association Limited
- The Drinking Water Inspectorate
- The Angling Trust
- The relevant Wildlife Trusts

Stakeholders wishing to make representations, comments or raise questions on the draft plan are advised to submit them to:-

The Secretary of State for Environment Food and Rural Affairs  
Drought Plan Consultation  
Water Availability and Quality Programme  
Department for Environment Food and Rural Affairs  
Area 2C Ergon House

Horseferry Road  
London SW1P 2AL

Or by E-mail to [water.resources@defra.gsi.gov.uk](mailto:water.resources@defra.gsi.gov.uk)

The consultation will be communicated to these parties by direct correspondence, and to the wider general public via the Company website, a press release and any other appropriate communication channels, as described in Section 10.

## **3 Water Resources in the South Staffs Region**

### **3.1 Supply Demand Balance Position**

The Company's current Water Resources Management Plan (WRMP14) includes details of our projected resources position and is published on our website <https://www.south-staffs-water.co.uk/about-us/our-strategies-and-plans/our-water-resources-plan>. The WRMP examines the way in which we plan to meet the demand for water over the next 25 years.

The Company has a single Water Resource Zone (WRZ) which has been defined according to WRMP methodologies and requirements. This boundary matches the regional area of supply (Figure 1).

The current plan forecasts modest growth in demand over the 25 year period and demonstrates that deployable output exceeds dry year average daily demands and that we are confident we can maintain security of supply for our customers under normal conditions. Projected peak demands for the critical period of a 'peak week' over the planning period can also be met with available peak deployable output. The current plan demonstrates a continued surplus of supply over demand that will meet the expected increased demand until 2040, whilst maintaining headroom in supplies.

The available Deployable Output (DO) in the WRMP is subject to the licenced volumes at annual average, and peak day, being available to the Company. These abstraction licences are granted by the Environment Agency, and in some cases these contain conditions under which we must restrict our abstraction to avoid unacceptable environmental impacts.

The WRMP will be revised this year and a draft publication is due to be submitted to the Secretary of State in December 2017. Prior to this the Environment Agency will notify all water companies of the requirements of a new National Environment Programme (NEP) detailing each companies obligations to review and potentially amend abstraction licences to address risks to the environment. This programme may include Sustainability Reductions that reduce available deployable output. The EA is currently developing its approach to achieving Sustainable Catchments through the NEP and is expected to publish more detail whilst this draft drought plan is in the consultation period. Until this detail is received the potential impact on the Company's drought plan cannot be determined. If there is a material impact requiring significant change to the drought plan then a revised drought plan may be triggered in accordance with the legislation.

### **3.2 Levels of Service – Frequency of Restrictions**

Despite the drought conditions experienced in 1995, the Company has not imposed a hosepipe ban since the record drought on the River Severn in 1976. This level of service was confirmed in the 2014 Final Water Resources Management Plan.

The Company uses a water resources allocation model called AQUATOR to examine resource availability by simulated drought years. The model uses an extended year inflow sequence for Blithfield Reservoir, and for the River Severn.

This drought plan is consistent with the WRMP, which assumes for planning purposes that a stated level of service as justified by the current supply-demand balance, together with experience gained during recent droughts (see Section 4.1), is as follows:

- the need for a major publicity campaign requesting voluntary savings of water not more than once in 10 years
- a temporary use ban (TUB), previously known as a hosepipe ban (which was redefined under the terms of the Flood and Water Management Act 2010) on average not more than once in every 40 years
- a restriction on non-essential usage not more than once in every 80 years
- rota cuts or use of standpipes are not anticipated to be required under reasonably foreseeable circumstances.

### **3.3 Compensation**

Unless it is judged unreasonable by virtue of exceptional circumstances, in the event that customers' supplies were to be interrupted or cut off under the authority of an ordinary drought order (non-essential use ban ) or emergency drought order, the Company may consider that compensation would be payable (or credits made) to those affected. Customers may be able to claim compensation in the event of supplies being interrupted or cut off as a result of our mismanagement during a drought.

Any compensation payments would be in accordance with our Code of Practice for domestic and business customers, and the Guaranteed Standards Scheme (GSS), available on the Company website [www.south-staffs-water.co.uk](http://www.south-staffs-water.co.uk), and periodically updated. Total payments will be capped at the average annual bill for the previous year. Our guarantees do not apply if we are prevented from meeting standards in exceptional circumstances or severe weather, including droughts.

The payments will be varied from time to time, in line with our guaranteed standards scheme.

### **3.4 Deployable Output**

The overall amount of water available to meet demand is measured in terms of the Company's 'deployable output'. This is derived using a water resources modelling package called AQUATOR to calculate how much water can be reliably delivered through our network over a wide variety of conditions. The model calculates the water resources that would be available to the Company, given a repeat of the climatic conditions previously experienced over an extended historic period. The hydrological constraints (simulated river flows and reservoir inflows) are modelled in combination with abstraction licence, infrastructure and asset constraints (including groundwater yields independently assessed), given a range of demands. This enables the conjunctive use benefits of the Company's resource system to be examined.

Any changes to deployable output are reported on annually in the Water Resources Management Plan Annual Review submitted to the Environment Agency and published on our website.

The groundwater yields were comprehensively reviewed in 2012 following the drought of 2010/11. These assessments were updated in 2016 to reflect changes in plant, operational practice and availability, including the loss of some groundwater sources due to pesticide contamination in 2014. It remains the case that with some minor exceptions the water level (i.e. drought) does not constrain deployable output, rather it is abstraction licence, treatment capacity and/or water quality issues which affect this.

The Aquator model has recently been updated for both this drought plan and in preparation for our next Water Resources Management Plan (WRMP19). It makes use of the updated groundwater yields and looks at an extended historic record between 1884 and 2014, thus incorporating 19<sup>th</sup> Century droughts as well as the recent 2010/11 dry period.

### **3.5 Summary of Recent Investment**

Investment in the Company's treatment works and distribution network since the peak demands observed during the 1995 drought has improved the Company's ability to manage a future drought. This work has comprised:

- Extensive investment in infrastructure which, along with associated operating policies and pressure management schemes, significantly reduced the Company's level of leakage. This, in combination with reduced non-household demand, has seen the average volume of water supplied fall from around 350 MI/d in the early 1990s to below 300 MI/d now.
- Duplication and /or replacement of key elements of the strategic mains network including the installation of new booster stations
- Installation of new treatment and blending schemes at a number of groundwater sources
- Major expansion of our Central treatment works and licencing and installation of the River Blithe Pumpback scheme

After the 2010/11 drought further investment has included

- Upgrades to the West Bromwich Booster to improve transfer rates between the River Severn Works and the Central Works during drought
- Significant progress on the borehole asset management programme to maintain or replace older boreholes and implement improved operational management to reduce outage and improve resilience

### **3.6 Leakage and efficient use of water**

The Company's policy is to continue to manage leakage at or below the economic level. This is carried out by means of free repair policies for defective supply pipes on private property of domestic customers; the continued use of sophisticated techniques to detect, locate and rapidly repair hidden leaks in the public highway as well as bursts; and by an active programme of replacement of older mains vulnerable to future failure.

The Company currently has a relatively low proportion of metered household customers (current meter penetration is around 30% of billed properties compared to an industry average of just above 40%). The Company has a range of policies to promote metering so that customers have a financial

interest in avoiding high water usage. These include: the provision of free meters to existing domestic customers who wish to opt in, the metering of all (except those impractical to meter) non-household properties; and compulsory meters for all new supplies and customers with exceptional use such as owners of swimming pools and those wishing to use unattended garden watering devices.

The Company continues to promote the efficient use of water by its customers. The WRMP14 includes a target for effective savings of 1litre/property/per day, which is incorporated into the Company ODI for reduction of per capita consumption. A number of targeted campaigns are undertaken each year, and the Company provides the following services to its customers;

- Free water saving products, including W.C. cistern devices, and shower and tap inserts
- Promotion of other water saving products such as water butts and shower heads through partnership with Save Water Save Money
- Promotion of grey water use and water recycling technologies for efficient new and refurbished buildings, through local development plans and councils
- Support and advice for registered social landlords on metering strategies for dwellings.
- A minimum of one major public water efficiency event each year
- Regular updates and water efficiency messages on the Company website and on bill inserts for measured customers
- An annual promotion or media campaign with a focus on water efficiency

## 4 Drought Scenarios

### 4.1 Drought Scenarios Covered by this Plan

In order to demonstrate how the Company's proposed drought actions would be implemented and to test the associated triggers, different scenarios have been examined to show how a range of historic droughts would be managed, given current water demands, operational practice and supply infrastructure (as outlined in Section 3.5 above). Within the drought scenarios planned outage is assumed to be managed in line with Company policy outlined in Section 5 but there is also an assumption that unplanned events contribute to an average loss to supply of 10 Ml/d (in line with the WRMP14 outage allowance) over the periods in question. This work makes use of the latest Company Aquator model which has been updated for use in the forthcoming Water Resources Plan (WRMP19).

The Company operates a single integrated resource zone, supplied by the River Severn, by Blithfield Reservoir, and by 26 groundwater sources.

In general the Company's groundwater sources are not significantly affected by droughts. This is because all of our groundwater sources abstract from the Sherwood Sandstone aquifer. During drought periods, regional groundwater levels in this aquifer typically only fall by 1-3 metres. For the majority of our sources this does not affect our ability to supply. As a result we do not consider it necessary to examine specific groundwater drought scenarios.

The River Severn is susceptible to a single season drought, as evidenced by the 1976 drought. This is because river flows can fall quickly, especially following a period of low rainfall and low groundwater levels. Low groundwater levels can result in a reduction in groundwater baseflow from the Triassic Sandstone aquifer in Shropshire, which is an important component of river flow on the Severn, especially during low river flows.

The River Severn is regulated (supported) by releases from Clywedog Reservoir, from the Shropshire Groundwater Scheme (SGS), and to a lesser extent by releases from Lake Vyrnwy. Releases are made in order to maintain a minimum flow on the river as determined by the gauging station at Bewdley. River regulation is managed by the Environment Agency. Storage levels at Clywedog are the key measure for the Environment Agency for drought severity and for triggering actions (see section 5.2).

Blithfield Reservoir is considered to be two season critical, as its lowest storage levels occur in the second year of a drought if the reservoir has failed to refill over the winter. The critical period on record is 1975/76, although other significant droughts on the record occurred in 1892/97, 1933/34, 1995/96 and 2010/11.

The period 2010/11 was marked by an exceptional shortage of rain in the Company supply area which led to notably low groundwater levels and periods of notably low river flows in the Trent catchment. Storage levels in Clywedog Reservoir were not exceptionally low helped by summer rain in Wales and regulation was maintained through 2011 without use of the Shropshire Groundwater Scheme. Accordingly the Company was able to manage demand by the deployment of its relatively drought-resistant groundwater

sources and maximisation of River Severn resources. This combined with suppressed summer demand meant that the drought was not as severe as the 1995/96 event. The drought broke in December 2011 and was followed by an exceptionally wet spring and summer 2012.

The Company has not identified a separate summer and winter drought scenario as the control curves cover the entire year. It is possible that where a hosepipe ban may be indicated by the trigger curves, this may not be appropriate during winter months, and in any case it is assumed when modelling scenarios that there is no benefit outside the spring/summer period based on national studies. The Company will consider the implementation of such options in the context of the time of year when the trigger curve is crossed.

The response of our water resources system to a range of historic droughts has been examined using AQUATOR, our water resources model. The model simulates the previous 133 years of climate data and examines how the Company would meet current demands for water. This modelling has confirmed that the most severe droughts from the historic record that would affect the Company, are 1892/97, 1975/76 and 2010/11, and their rainfall characteristics are tabulated below. These drought periods also include the most severe single season droughts on record (e.g. 1976) and are therefore considered the most appropriate scenarios to test this drought plan. Each of these scenarios is considered in more detail below.

Drought	Duration (years)	Total rainfall (mm)	% of LTA	Deficit from LTA (mm)
1893-98	5	3398	84	635
1974-76	2	1341	83	273
2009-11	2	1330	82	284

Modelled storage at Clywedog has been provided by Severn Trent Water/Environment Agency, and was derived from Severn Trent Water's water resources model.

The AQUATOR model has also been used to explore the resilience of the Company's resources against a more extreme 200 year drought scenario. This has been carried out by adjusting the rainfall and flow data for four time periods, two annual (1933-1934 and 1995-96) and two 2-year (1975-76 and 2009-2011). The rainfall and flow data for the Blithfield Reservoir catchment was evaluated statistically to establish the likely 200 year outturn and the model data for each time period adjusted accordingly. Model data for the Trent and Severn was also adjusted to ensure its consistency with the adjusted Blithfield data, in accordance with long term statistical relationships.

All model results consider a conservative (high) demand case. They use a profile of surplus summer demand over winter background water consumption based on the exceptional demands observed in 1995. Modelling was also carried out assuming a 2006 profile when high summer demands were of much shorter duration and these consistently show less impact. This supports the

observation of a reduced impact of the 2010/11 drought when summer demands were very low.

The trigger curves and actions associated with each reservoir are detailed in Sections 5 and 6.

## **4.2 Resilience against Historic Droughts**

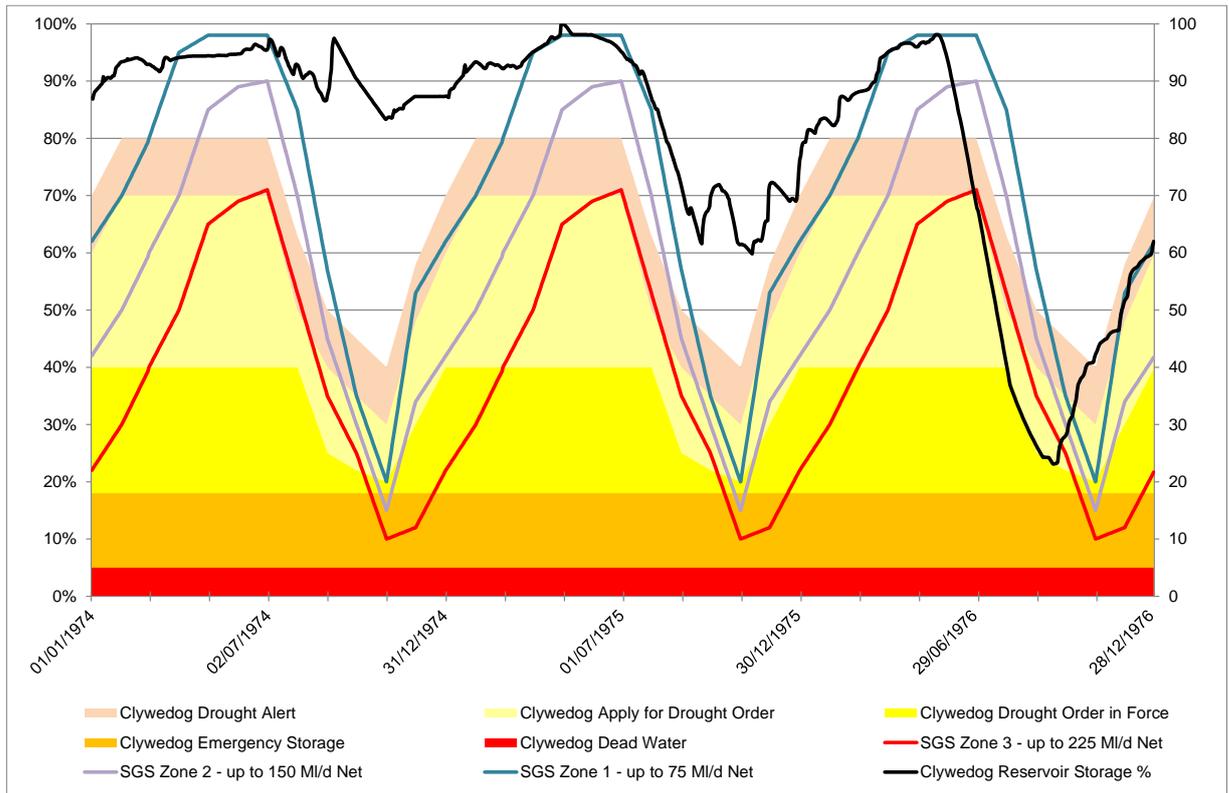
### **4.2.1 Repeat of 1974 to 1976 Drought (two season drought)**

The 1975/76 drought was a two season drought which was characterised by a very dry winter. In addition, 1976 was one of the driest single years on record, and it represents the critical single year for the River Severn. The modelled storage at Clywedog (River Severn) and at Blithfield is illustrated in Figures 2 and 3.

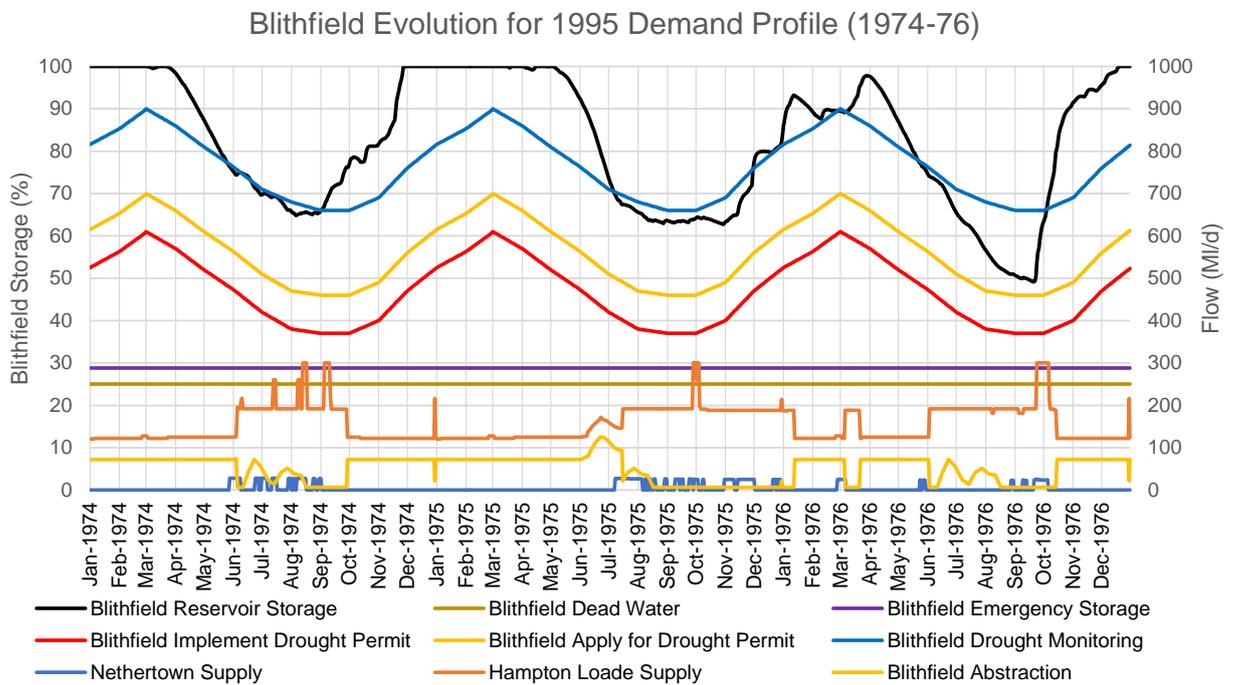
Clywedog Reservoir levels fall to 60% but above any trigger levels in 1975 and recover in the winter of 1975/76. In 1976 there is an early and very rapid recession between May and September with lowest levels at around 25%. The 1976 recession drops below the Clywedog Apply for Drought Order curve in late June and the Clywedog Drought Order in Force curve at the beginning of August. Recovery starts in mid-September but levels remain in the Clywedog Drought Alert zone for the remainder of the year. Similarly SGS triggers for 75 MI/d, 150 MI/d and 225 MI/d are rapidly crossed between May and June and it is anticipated that the Severn would be under Maximum Regulation prior to imposition of a drought order in the autumn.

Blithfield Reservoir storage falls below the drought monitoring curve in 1974 and 1975 and does not fully recover in the winter of 1975/76. There is a rapid recession in 1976 between April and September and thereafter the reservoir levels rapidly recover. Minimum reservoir storage is 50% which is above the Apply for Drought Permit curve.

**Figure 2 Modelled Storage at Clywedog 1974 to 1976**



**Figure 3 Modelled Storage at Blithfield 1974 to 1976**

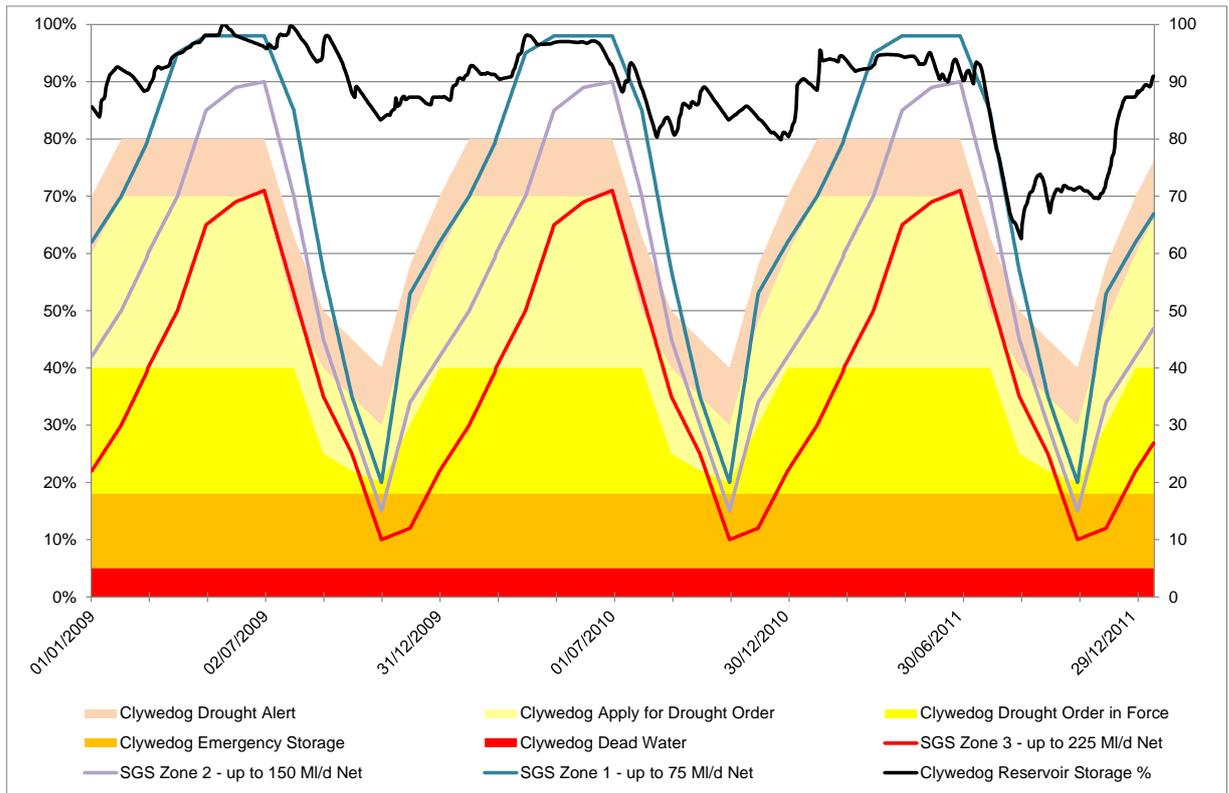


#### 4.2.2 Repeat of the 2010 to 2012 drought (two season drought)

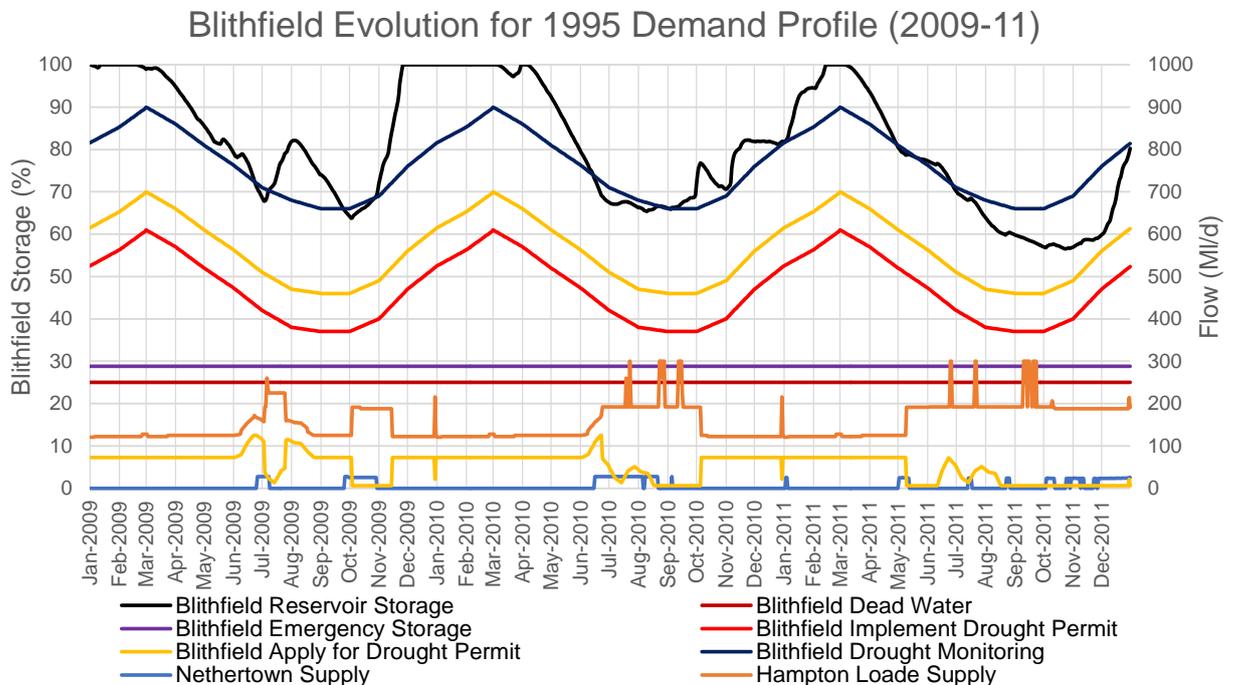
2010/11 was a severe two-year drought and is the most recent event for which the Company has operational experience. Although rainfall was exceptionally low over the two year period, summer temperatures were seasonally low to moderate and regional customer demands in the summer peak period unremarkable. As a consequence the event did not precipitate any significant demand management measures. A hosepipe ban was called by a number of water companies in the South East in 2012 but was lifted after a short period after the start of an exceptionally wet spring and summer. Low flows were encountered in Blithfield Reservoir leading to low reservoir levels in summer and autumn 2011; and groundwater levels were also low and led to minor output reductions in the Company's few drought sensitive boreholes. In contrast summer rainfall in Wales contribute to River Severn flows and reduce 2011 releases from Clywedog. Clywedog levels do not fall below 80% in 2010 and recover over the winter. Storage falls sharply during July and August 2011 but recovers in September and the reservoir starts to refill in November. The Clywedog trigger curves are not crossed during the event although there are extended releases for regulation purposes from the reservoir and SGS.

Blithfield levels recede to below 70% and below the drought monitoring curve in 2010 but are stabilised by conservation measures. Levels briefly recover over winter 2010/11 but recede sharply in spring 2011 following a period of exceptionally low rainfall. They reach a minimum of 57.5% and require extensive conservation measures to stabilise above the Apply for Drought Permit curve. Levels start to recover in December.

**Figure 4 Modelled Storage at Clywedog 2009 to 2011**



**Figure 5 Modelled Storage at Blithfield 2009 to 2011**

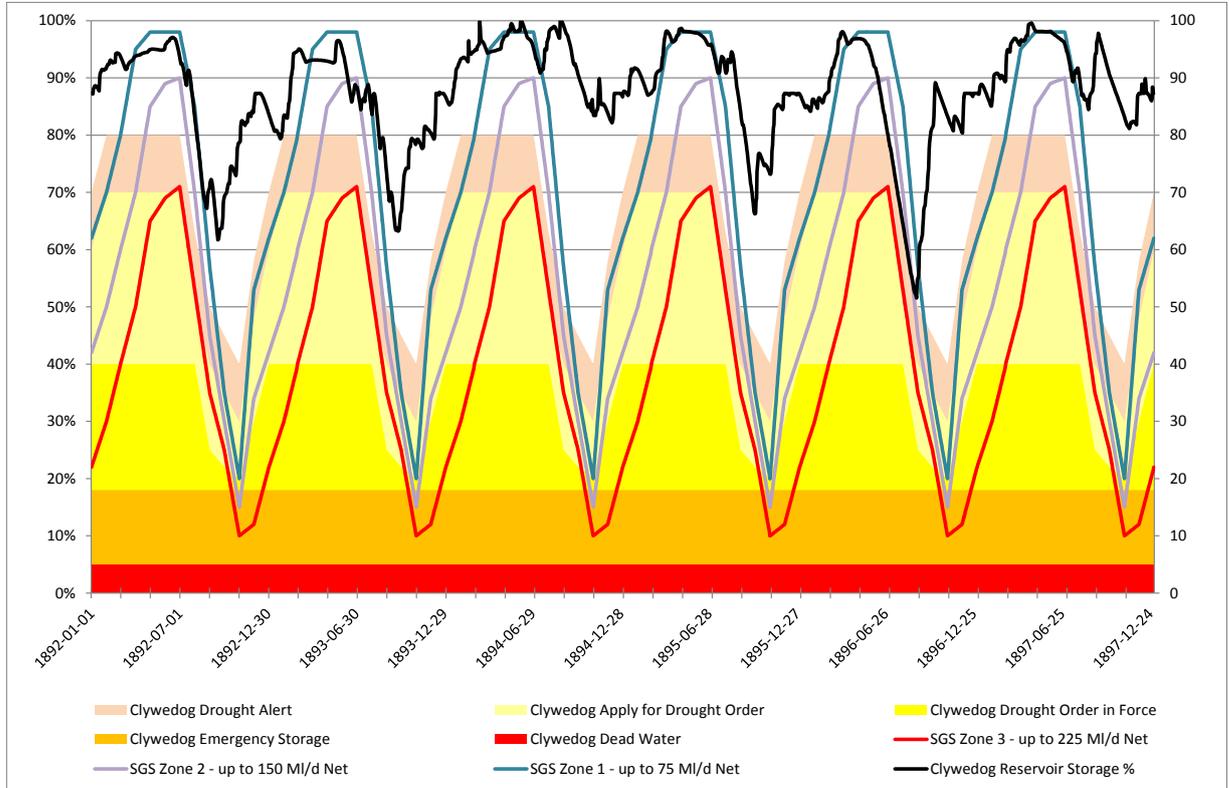


**4.2.3 Repeat of 1892 to 1897 Drought (multi-season drought)**

The 1892/97 period was a series of successive dry summer droughts of moderate to severe intensity. Contemporaneous accounts record some

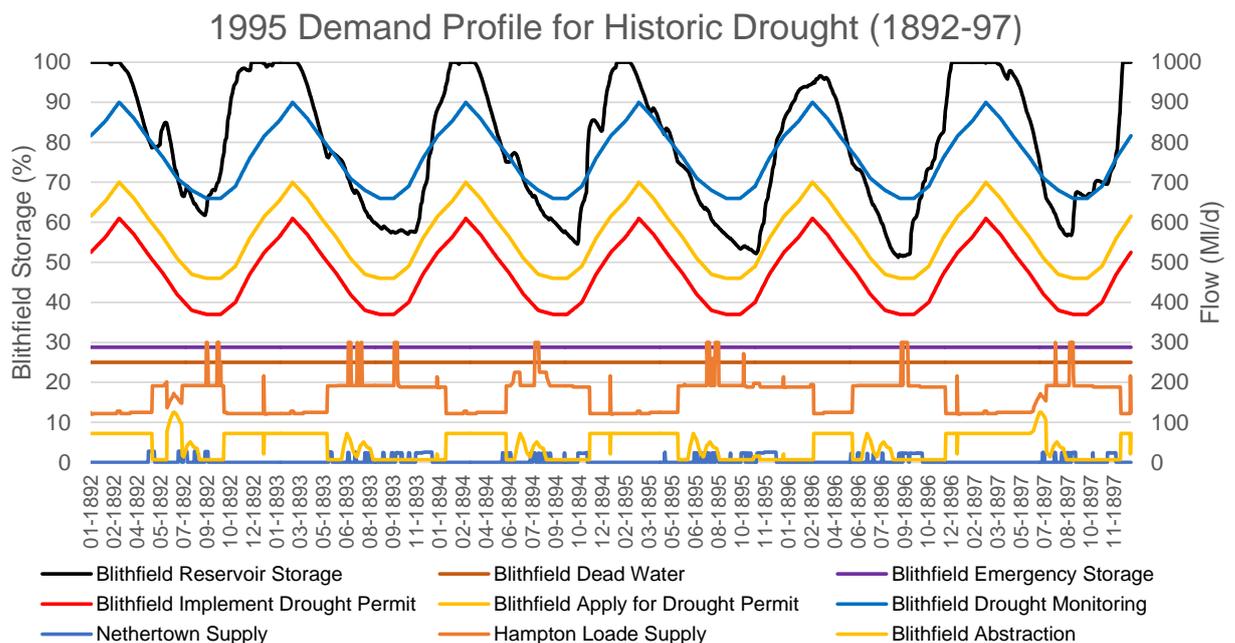
problems with high demand and water shortages in the years 1895 and 1896. This sequence of years has been analysed to consider supply system vulnerability in multiple year drought sequences as most of the sequences previously studied have not exceeded two years.

**Figure 6 Modelled Storage at Clywedog 1892 to 1897**



Clywedog reservoir levels fall to below 70% in four of the six years and would be accompanied by extended periods of river releases. The reservoir levels fall below the Shropshire Groundwater Scheme (SGS) 70 MI/d curve in every year during the early spring. In two years, 1893 and 1896, early recessions mean reservoir levels fall below the SGS 150 MI/d curve and in 1896 levels run parallel to the Clywedog Drought Alert trigger for two months in the summer.

**Figure 7 Modelled Storage at Blithfield 1892 to 1897**



Blithfield reservoir levels fall below the drought monitoring curve in each of the six years and fall to 51.2% in 1896 but do not trigger the apply for drought permit curve. It is likely that appeals for restraint would be requested from customers. Notably reservoir levels refill in each year apart from winter 1895/96.

#### 4.2.4 Summary of Resilience of Drought Plan to Historic Drought Scenarios

The simulation of the operation of the system during the historic droughts under the current scenario of demand shows that:

- The system is resilient against historic droughts at the current level of baseline demand, using conservative demand assumptions for summer peaks based on the 1995 profile.
- Modelling suggests there would be a need to activate Appeals for Restraint for relatively short periods during these events even when using conservative (high) demand assumptions. Assuming the drought plan actions are followed promptly and the supply infrastructure is not subject to further unforeseen events, no further demand savings measures are required as water conservation in Blithfield is enough to avoid crossing the Hosepipe Ban trigger. It is likely however that a more precautionary approach with respect to Appeals for Restraint would be followed than suggested by the modelling. In particular, emerging conditions in the Spring of a severe drought, as measured by robust statistical analysis as discussed in Section 5, would lead to a major campaign of this sort to inform customers to use water wisely and reduce consumption to prevent imposition of a hosepipe ban.
- A future occurrence of a drought like that of 1975/76 would lead to the lowest stored volume in Blithfield, which would nonetheless be close to

50%. A slightly higher minimum volume would occur with a drought like that in the 1890s, while 2010/11 is slightly less severe.

### 4.3 Resilience against more extreme droughts

The system has been tested using a simulated 200 year drought event. Four temporal patterns, two annual (1933-1934 and 1995-96) and two 2-year (1975-76 and 2009-2011) have been studied based on a thorough statistical treatment of their likelihood and the ability to extrapolate more extreme events. No pattern from the 19th century was considered as the uncertainty with the base data is significantly higher. The Blithfield inflows (in MI) relating to a 200-yr return period previously estimated have been distributed based on these sequences as follows:

Drought	Historical	200-yr
1934-35	34,371	20,512
1974-76	57,100	47,085
1995-96	24,399	21,339
2009-11	51,085	42,384

The rainfall distributions are tabulated below for comparison with the historic droughts in Section 4.1. In all cases the pattern of rainfall has been taken from observed historical sequences but adjusted downwards so that it matches the 1 in 200 year calculated event.

Drought	Duration (months)	Total rainfall (mm)	% of LTA	Deficit from LTA (mm)
1934-35 1994-95	12	518	64	290
1974-76 2009-2011	24	1215	79	322

The results of the modelled scenarios are shown in figures 8 and 9 below. All scenarios, as expected, reveal lower resulting reservoir levels against the original unperturbed scenarios discussed in the sections above. However in no cases is there either a requirement for a temporary use ban or any further management measures that put the supply system under stress. The main effect is in an increased number of days where Appeals for Restraint are required to help manage summer demand.

#### 4.3.1 Summary of resilience of drought plan to extreme drought scenarios

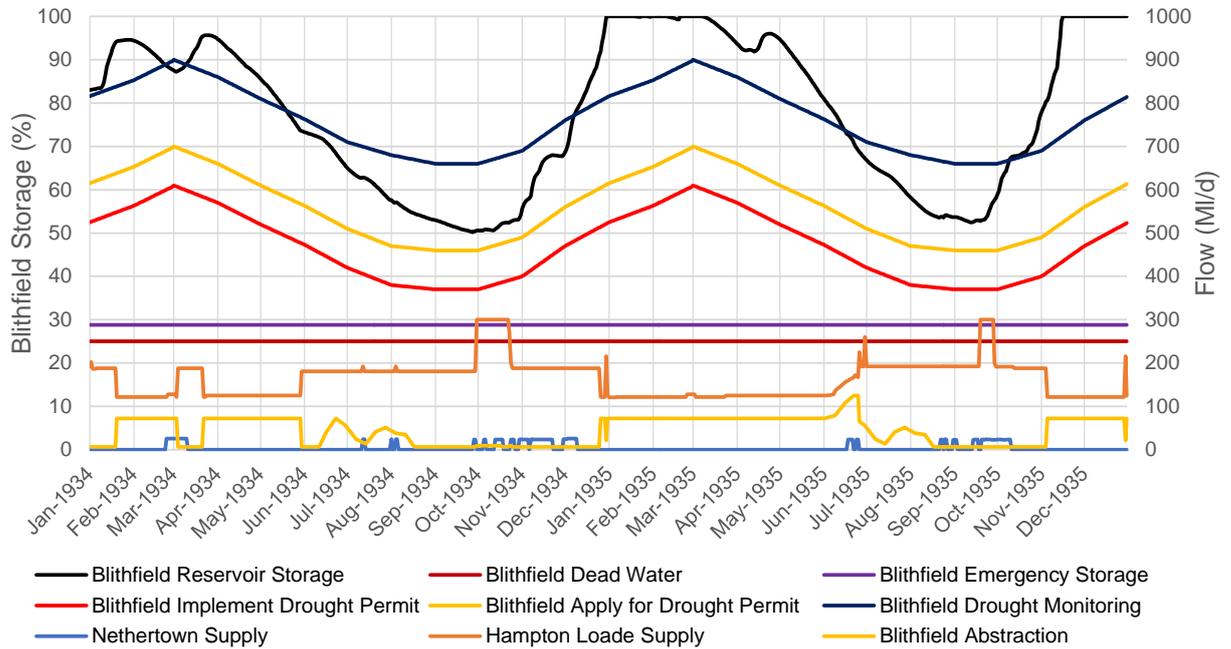
The simulation of the operation of the system during the 200-yr droughts under the current scenario of reduced baseline demands (using high summer peaks as observed in 1995) shows that:

- The system is resilient against potential future 200-yr droughts.

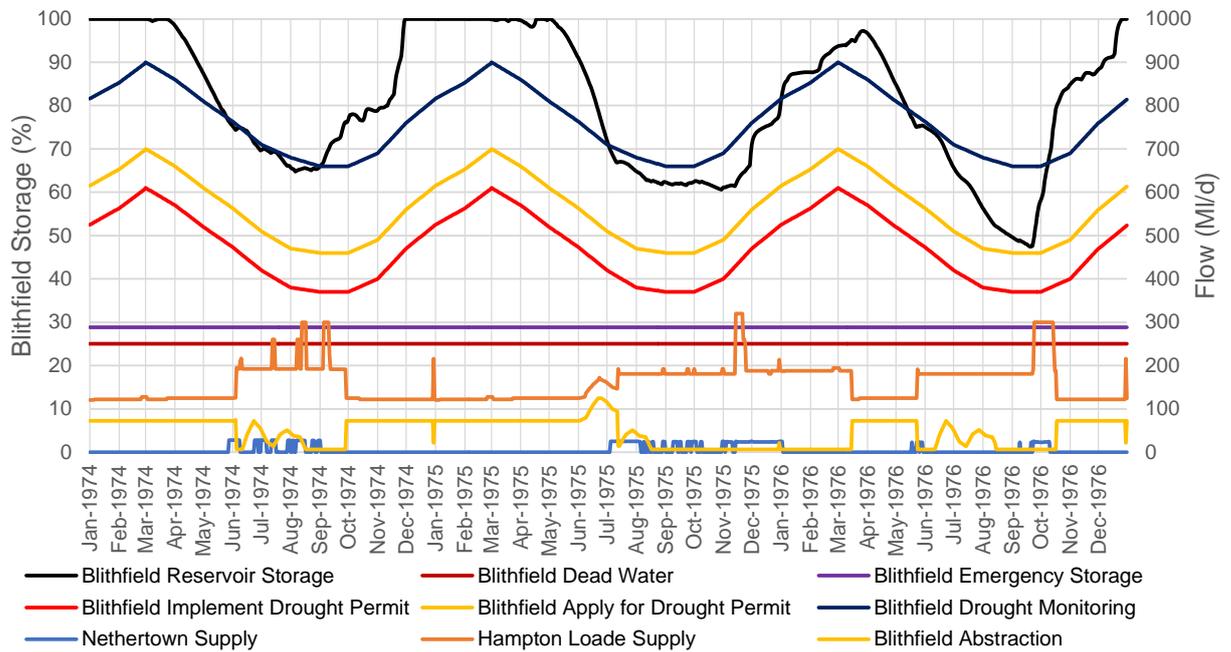
- Modelling suggests there is an increased need to activate Appeals for Restraint for extreme droughts. However, no further demand savings measures are required, even for these extreme drought scenarios, as water conservation in Blithfield is enough to avoid crossing the Temporary Use Ban trigger. As discussed in Section 4.2.4, in practice a customer campaign would be initiated in the spring if there was good evidence of severe drought conditions emerging.
- If demand is maintained at the current level there is no risk of hosepipe bans or drought permits/orders during the extreme droughts studied. There would, however, be a risk if demand approached the deployable output of the system or there was a significant degradation of supply infrastructure.
- A future occurrence of a 200-yr drought with a temporal pattern similar to that of 1975/76 would lead to the lowest stored volume, which would nonetheless be close to 50%.
- Under this drought scenario, the sum of the average abstraction at River Severn Works and the maximum potential supply from groundwater sources is greater than winter demands. Given this, supply can be transferred from the River Severn Works to Blithfield when conservation of water in the reservoir is needed, thus reducing the drawdown at Blithfield to that related to the minimum 6MI/d draft for blending purposes. The abstraction at the River Severn Works is not limited by drought conditions in the Severn during this scenario.

Figure 8 Modelled scenarios for extreme drought Part I

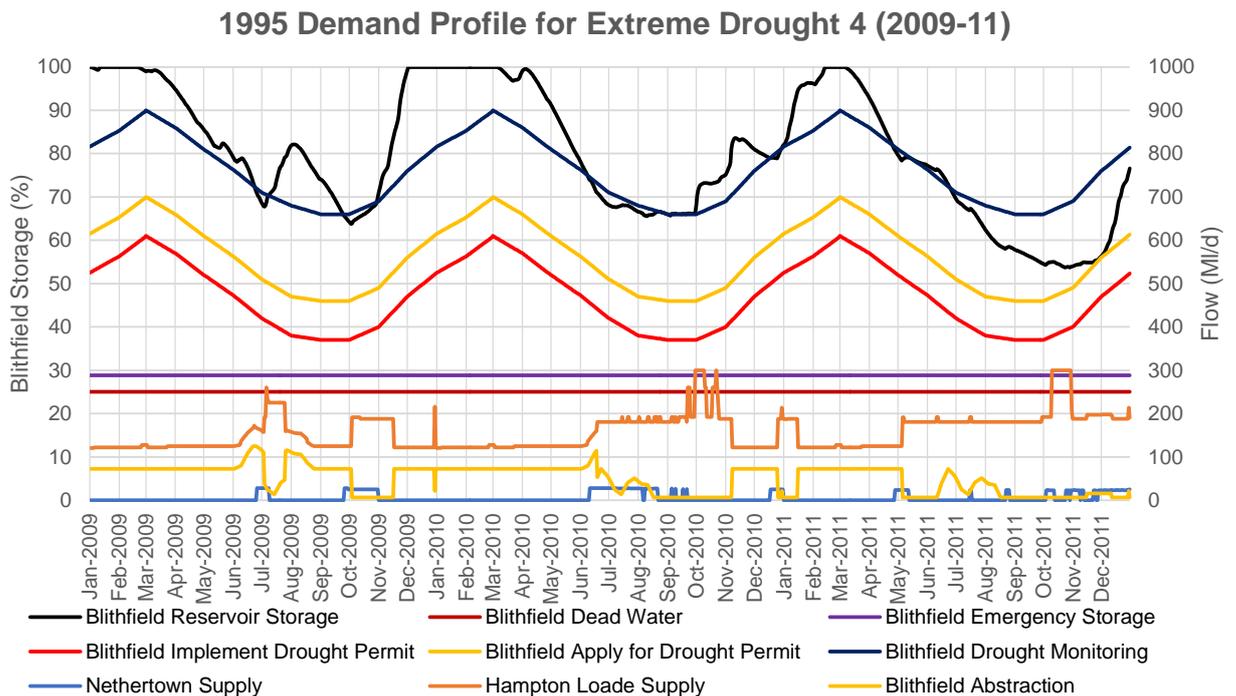
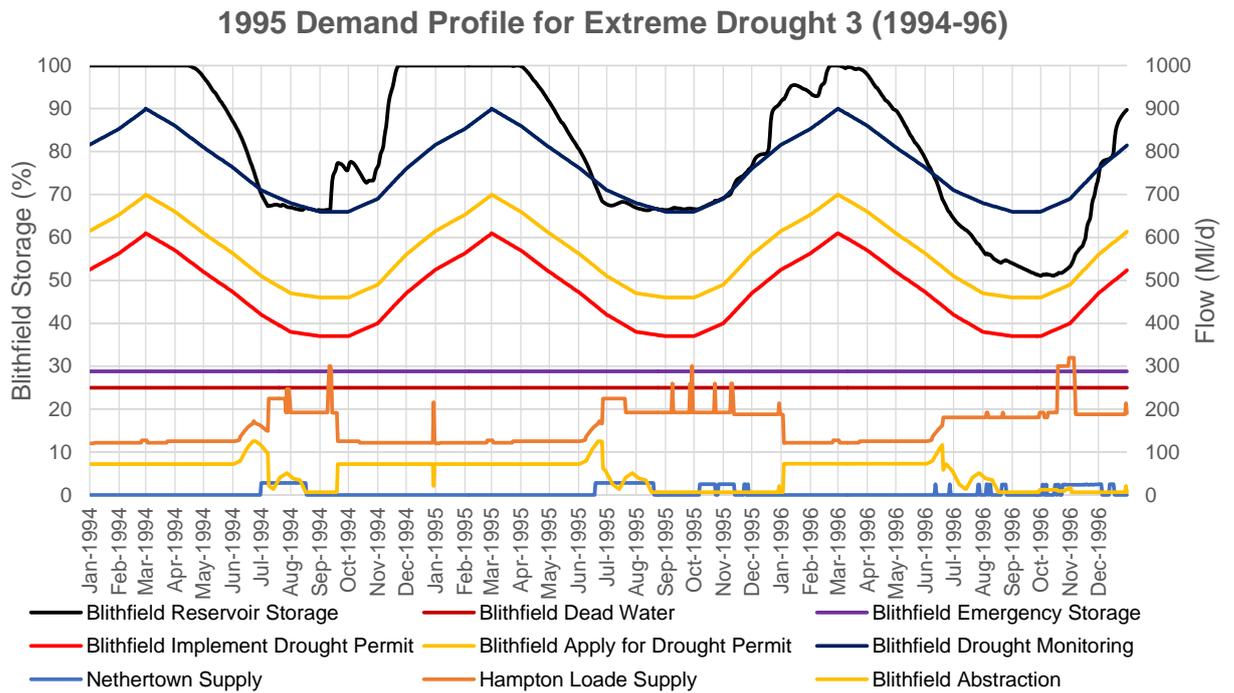
### 1995 Demand Profile for Extreme Drought 1 (1934-35)



### 1995 Demand Profile for Extreme Drought 2 (1974-76)



**Figure 9. Modelled scenarios for extreme drought Part II**



## 5 Drought Control Rules - Triggers and Actions

The aim of this plan is to demonstrate how we would manage resources and demands through a number of variable but plausible drought sequences, by implementing a range of available management options. The plan does not set out to be prescriptive, as maintaining flexibility in the face of particular circumstances is a key requirement, but presents a framework and timetable of actions to be considered through the most likely drought sequences we might expect. This allows operational managers to make informed decisions and develop action plans to apply in an effective manner.

### 5.1 Hydrological Monitoring

The Company collects a range of hydrological data to monitor climatic and water resources conditions.

#### 5.1.1 Rainfall and effective recharge

The Company maintains a network of 14 rain gauges at selected treatment works, groundwater sources, and service reservoirs. This information is also provided to the Environment Agency. Company rainfall statistics are based on the long term daily data from its gauge at Seedy Mill (1912 to present day). Daily data are also measured at the River Severn Works (1968 to present day).

The Environment Agency (EA) maintains and reports on a comprehensive hydrometric and environmental monitoring network, developed between the 1960's and 1990's, for the purposes of its duties to protect and improve the water environment. This information has been made available to water companies by the Agency. The Company has arrangements to exchange data at selected sites where the EA directly measure rainfall using tipping bucket rain gauges.

Climate data is collected by the Met Office as part of its MORECS service and weekly averaged data of rainfall, evaporation and soil moisture deficit (a measure of how dry the soil is) is purchased by the Company.

#### 5.1.2 River Flows and Reservoir Volumes

Operational data on reservoir level, reservoir storage, abstraction and compensation releases from Blithfield Reservoir are recorded on the Company's telemetry system. Blithfield storage is the main drought trigger within this plan. Inflows from the River Blithe upstream of the reservoir have also been directly measured since 2012. Longer term inflow statistics are determined by mass balance calculation from the operational data, and further estimated by use of a catchment HYSIM model for the long term historic period (1884 to 2014).

River flows are measured by the Company on the Blithe, in order to manage the River Blithe Pumpback abstraction, and the supporting River Trent abstraction.

River Blithe flows are measured more accurately at the EA flow gauging station at Hamstall Ridware. The EA also measures river flows at a number of sites along the River Trent including North Muskham which is used to regulate the Pumpback abstraction by means of a Hands Off Flow. Data from key EA

gauges can be accessed by means of telemetry systems to allow a rapid response to prevailing environmental conditions.

Bankside storage reservoir levels are measured continuously by the Company as part of the River Severn Works supply system.

The EA collates reservoir level data for Clywedog Reservoir and Lake Vyrnwy and maintains flow gauging station along the length of the River Severn as part its operational management of the River Severn.

### **5.1.3 Groundwater levels**

The Company maintains an automated groundwater level monitoring system at its groundwater sources, which is linked to telemetry. Information on abstraction rate and pumping water level is recorded, and can be compared to historical records when required.

The EA maintain a number of groundwater observation boreholes across the supply area and in the Shropshire Groundwater Scheme catchments which are used to support River Severn regulation. These are generally manually measured monthly, or use recording equipment which has to be accessed on site monthly.

### **5.1.4 Environmental data**

In addition, the Company, as part of the National Environment Programme, has installed a number of flow gauging stations and groundwater level piezometers in vulnerable catchments with automated monitoring equipment. Data on these catchments has been collated for a period of between 2 and 5 years so far.

### **5.1.5 Drought Indicators**

The Company has recently carried out a review of drought indicators in preparation for this plan. This has considered the use of various statistical aspects of the hydrologic datasets outlined in the previous section as useful indicators of the various droughts observed in the historic record back to the 19th Century.

### **5.1.6 Blithfield Reservoir and the River Blithe Pumpback**

The Company will continue to monitor and analyse reservoir storage trends using forecasting tools to advise operational use of Blithfield Reservoir. In addition to this, it has developed statistical tools that indicate the severity of rainfall deficits and low flows observed in any particular year. These will be used as part of its assessment of an exceptional shortage of rain should it need to apply for a drought permit. The cumulative flow and rainfall data for the upper catchment in the calendar year has been developed for this plan as a good indicator of emerging drought conditions.

The availability of the River Blithe pumpback is an important element of operational management for Blithfield Reservoir but is dependent on flows in the lower Trent at North Muskham. There are periods in most years when flows fall below the Hands Off Flow (HOF) so this event is not a drought

indicator in itself but extended periods of flows are characteristic of droughts. The Company monitors river flows on a daily basis and has established a level of concern which alerts the Company to likely failure in 30 days if no rainfall occurs.

#### **5.1.7 The River Severn Works and River Severn**

The assessment of hydrological data and prediction of drought conditions is carried out by the Environment Agency who operate the River Severn Regulation Scheme on behalf of the environment and all abstractors.

The EA use a variety of techniques such as analysis of groundwater level and river flow recessions, cumulative rainfall analysis (e.g. Tabony tables) as well as other modelling and forecasting tools.

In all but the wettest of years River Regulation is carried out. The EA provide a regulation prospects forecast at the start of the season and once regulation has started weekly regulation updates. These include their forecasts for the likelihood of regulation using the Clywedog and Shropshire Groundwater Scheme (SGS) and, potentially, the likelihood of application for a River Severn Drought Order.

In addition to this, the Company has identified statistical tools that indicate the severity of rainfall deficits and low flows observed in any particular year, independent of the regulated river system. These will be used as part of its assessment of an exceptional shortage of rain should it need to apply for a drought order. Single season flow in River Tanat and Met Office rainfall data for the Welsh Mountains area in conjunction with cumulative rainfall deficits and naturalised river flows in the Shropshire Plains have been identified for this plan as good indicators of emerging drought conditions.

#### **5.1.8 Groundwater Sources and the Environment**

Indicators of groundwater drought are provided by the Environment Agency observation borehole network. These are reported monthly through its Monthly Water Situation report (Midlands Area) which is generally published on the tenth day of the following month. For groundwater droughts this highlights where groundwater levels are “Below Normal”, “Notably Low” or “Exceptionally Low” defined as equivalent to an event worse than 1 in 4 years, worse than 1 in 8 years, and worse than 1 in 20 years.

The Company’s groundwater sources are generally resilient to drought with only a couple of sources impacted by low groundwater levels. However flows in some rivers and streams supported by baseflow from aquifers can be very vulnerable to changes in groundwater levels and this may affect the Company’s actions, particularly where we have put flow compensation schemes in place. In the past the Company has not used a groundwater drought indicator / trigger. However, for this revised draft Drought Plan we have included a number of groundwater indicators and actions (Section 5.2.7 and 5.2.8) which will be trialled and refined over the course of the plan.

The Company’s work has determined that long term (36 - 48 month) cumulative rainfall is a good predictor of groundwater levels in the EA groundwater network. Accordingly, we propose to use Company daily rainfall data collected

at the Central and River Severn Works along with the relevant MORECS data to monitor pseudo groundwater levels across our supply area. We propose to align these triggers to the same bands as those used by the Environment Agency as described above (i.e. below normal, notably low and exceptionally low).

## 5.2 Drought Triggers

### 5.2.1 Drought Severity and Drought Triggers

The Company has adopted a colour coded system which identifies the severity of a drought. This colour coding is aligned with the two control rules used by the Company to manage a drought situation, at Blithfield Reservoir, and the River Severn (Clywedog). These control rules define the drought trigger curves and actions which can be taken as the severity of the drought increases. The colour coding is also aligned with the Drought Management and Communication Plan (Sections 9 and 10). The alignment of the colour coding system and the drought triggers is shown below; the triggers are described in more detail in the following sections.

Colour	Description	Blithfield Trigger	River Severn Trigger
Blue	Normal Operation	above 1	above 1
Yellow	Drought Monitoring	1	1
Orange	Drought	2	2
Red	Severe Drought	3	3

As noted in Section 4 the two critical resources within the Company are the River Severn and Blithfield Reservoir, as our groundwater sources are largely unaffected by drought.

The Environment Agency is responsible for managing the River Severn, and it has developed a set of trigger curves at Clywedog Reservoir in order to manage the river during a drought. These trigger curves have been included in this Drought Plan (Section 5.2.2) and Figure 10.

Drought trigger curves have also been developed by the Company for Blithfield Reservoir (Section 5.2.6) and Figure 11.

In addition to these control rules the Company will give due regard to a number of other factors when considering whether to implement its drought management actions. These factors include: the demand for water; sources which may be out of supply; the medium term weather forecast; the soil moisture deficit; the time of year, and; whether the level in Blithfield Reservoir is rising or falling. The Company reserves the right to use its discretion in the interpretation of the control rules and the implementation of the available actions.

## 5.2.2 River Severn Triggers and Actions

The River Severn is a regulated river that is managed by the Environment Agency. Releases from Lake Vyrnwy and Clywedog Reservoir, and abstraction from the Shropshire Groundwater Scheme are used to maintain the flows in the river. Under the current control rules the Environment Agency is required to maintain a flow at Bewdley of at least 850 MI/d (as a 5 day average), with a minimum daily flow of 650 MI/d.

The river is managed by the Environment Agency in order to protect public water supplies and other abstraction rights, to maintain the environmental habitat of the river, to maintain freshwater flows into the Severn Estuary, and to protect navigation rights and the other amenity uses. The Company has no control on the use of the river regulation sources but it assists the Environment Agency in managing river flows.

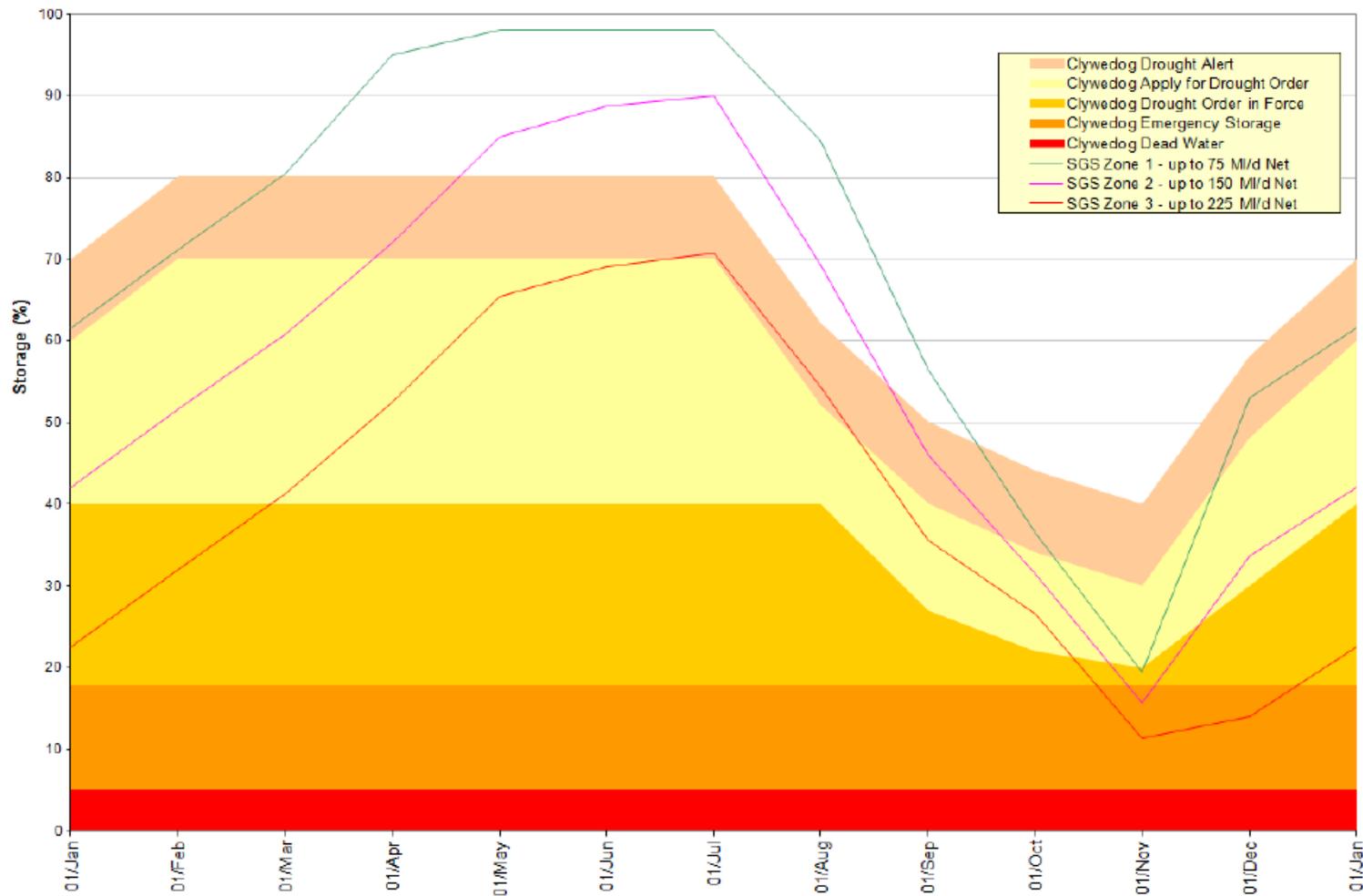
The West Midlands Area of the Environment Agency also maintains drought plans and the 2016 versions<sup>1</sup> are available on request from their National Customer Contact Centre.

The control rules for the River Severn are based on storage levels at Clywedog Reservoir (the main source of river regulation). These rules were recently reviewed by the Environment Agency during the preparation of its last Drought Plan. South Staffordshire Water, other major public water supply stakeholders on the river (Severn Trent Water, United Utilities and Bristol Water) and other abstractors were consulted by the Environment Agency as part of this process. United Utilities was consulted because the reservoir at Vyrnwy (a United Utilities asset) can be used to regulate the River Severn. The control rules produced by the Environment Agency are attached as Appendix G. The Environment Agency's drought triggers are shown on Figure 10.

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<sup>1</sup> Shropshire Herefordshire Worcestershire and Gloucestershire Drought Action Plan Environment Agency, June 2016 and Staffordshire, Warwickshire & West Midlands Drought Action Plan Environment Agency, April 2016

**Figure 10 River Severn Drought triggers for Clywedog Reservoir and the Shropshire Groundwater Scheme**



After River Severn Drought Order Environmental Report (Environment Agency, Version 7 - December 2013)

The main elements of the Environment Agency's River Severn control rules are summarised below:-

- Crossing the Drought Alert trigger initiates a meeting of the Environment Agency and the water companies to discuss the potential drought order. Preparations are made for the potential drought order application and the Environment Agency issues appeals for the public to reduce demand.
- When the Apply For Drought Order trigger is crossed the Environment Agency applies for a drought order to the Secretary of State. Voluntary reductions in abstractions are requested
- When the Drought Order In Force trigger is crossed the drought order conditions become live (see Appendix G). The main condition affecting the Company is a 5% reduction in abstraction licence at the River Severn Works.
- If the Emergency Storage trigger is crossed the minimum flow at Bewdley is further reduced and the releases from Clywedog are constrained even further. Endeavours will be made to maintain flow at Bewdley but releases will be limited to no more than 1.5% of remaining storage. Further reductions in public water abstraction will be sought up to 20%

The Company has aligned this Drought Plan with the River Severn triggers in the Environment Agency Plan; however there are still some areas of uncertainty over the management of the River Severn in a severe drought. These uncertainties are discussed in Section 12.2

The Company has adopted from the EA River Severn Drought Plan the triggers and main actions for managing a drought affecting the River Severn (Figure 10). These control rules are colour coded to identify the increasing severity of a drought, as described above. The supply and demand management options that may be implemented at each trigger are described in more detail in Section 6.

Use of the Clywedog drought triggers in this plan reflects the importance of the River Severn Works supply to the Company. However, low storage levels at Clywedog alone will not necessarily trigger action by the Company and this will also be dependent on the storage situation at Blithfield. For example if Blithfield is in a healthy position then drought management actions are likely to be delayed. If Blithfield storage is approaching a trigger (2-3 weeks away) then actions may be initiated immediately.

The potential effect of low storage levels at Clywedog is therefore to accelerate drought management actions linked to Blithfield by 2-3 weeks and ultimately to trigger a drought order application for the River Severn Works.

The use of the Clywedog trigger curves and the timing of actions are further discussed in Section 4 with reference to specific droughts.

### **5.2.3 The River Severn Collaborative Modelling**

Severn Trent Water first developed a water resources simulation model for the River Severn (& River Wye) using a modelling package called RESSIM. This model was later updated in AQUATOR. This is currently the most advanced model available for examining different water resource scenarios on the river. The model simulates river flows, reservoir storage, and the amount of water available to meet different demand scenarios. The model has been used directly by the Environment Agency (by agreement with Severn Trent Water) for the purposes of investigating the impact of water company and EA drought orders. It has also been used to provide river flow and

regulatory assumptions for more detailed assessment of the South Staffs Water supply system. The Severn Trent Water model is a potential tool for advising drought strategy at the start of the regulation season but its complexity and the resources required to carry out model runs means that it is unlikely to be used as an operational tool in drought management.

#### **5.2.4 Use of Bankside Storage to Assist River Regulation**

The Company has bankside storage at the River Severn Works on the River Severn. This provides the facility to assist the Environment Agency with the regulation of the river. The Environment Agency can request the Company to adjust its proposed daily abstraction from the River Severn when it is considered that there is a risk that minimum flows at Bewdley will not be maintained with the regulation releases which have been made. In these circumstances the Company can take water out of bankside storage to maintain its volumes of water production thus leaving more water in the river.

The Company complies with such requests from the Environment Agency on a best endeavours basis. In the event of operational constraints the Company is not required to comply. At all times the Company ensures that there is no risk to the provision of public water supply.

Assistance with river regulation in this way is in the interests of all parties as it helps improve the efficiency of regulation releases and the maintenance of supplies for continued regulation in the event of on-going dry weather.

It will be essential that there is co-ordination between the operations of South Staffordshire Water and the Environment Agency during a drought period.

#### **5.2.5 Co-ordination of Drought Management on the River Severn with Severn Trent Water**

South Staffordshire Water's abstraction licence at the River Severn Works is a joint licence with Severn Trent Water, and up to 1/3 of the licence can be used to supply Wolverhampton (Severn Trent supply area). In addition, the licence at the River Severn Works is linked to Severn Trent Water's abstraction licence at its own works, further downstream on the River Severn. The total abstraction from the two sites cannot exceed 431 Ml/d.

These complex joint licences mean that it is essential for close co-operation between the two companies during a drought to ensure that licence conditions are not breached. The two companies have discussed alignment of their respective Drought Plans and this is reflected in the communication strategy in this plan.

#### **5.2.6 Blithfield Reservoir Triggers and Actions**

The drought trigger curves for Blithfield Reservoir are shown in Figure 11. These curves have been derived using operational experience, and by modelling the inflows into the reservoir and the demand on the Central Works. The trigger curves and associated actions are summarised below in the normal order of escalation. However, the exact timing and sequence of implementation will depend on the circumstances prevailing at the time.

Normal operation takes place above the drought monitoring curve. The output from our Central Works is only restricted by the capacity of the works or by the abstraction licence.

When the Drought Monitoring Trigger curve is crossed the Company transitions from the normal cost optimisation mode to a resource conservation mode of operation. The range of potential actions that may be implemented at this stage are described in Section 6. These include a range of demand management options, minimising abstraction from our Central Works (to help conserve storage at Blithfield), using the River Blithe pumpback, if River Trent flows are above the Hands Off Flow limit (>2650 Ml/d) and putting surplus potable water into the reservoir to augment levels in the reservoir.

As the Apply for Drought Permit curve is approached the Company will consider the need for a drought permit to maintain the River Blithe abstraction and the need for and likely benefits of imposing a temporary use ban. The Environment Agency and Defra expect that demand restrictions will have been implemented before a drought permit is granted unless it can be proven that there will be no savings from a temporary use ban, for example in winter when there is little or no hosepipe use.

As the Apply for Drought Permit curve is further approached the Company will begin preparations for making an application for a drought permit.

If conditions continue to deteriorate the Company will make appeals for customers to reduce demand and consider imposing a temporary use ban at this point.

When the Apply for Drought Permit curve is crossed the Company will begin the process of applying a temporary use ban (TUB) and will start the 21 day period described in section 6.2.4 that allows customers to make representations and for the Company to consider them. However, if the Company can implement the TUB sooner than this then it will do so. Once the TUB is in place the Company would assess the impact over 7 to 14 days before applying for a drought permit. Should the water resource position improve in this period the Company may not need to apply for a drought permit. The usual timescale for the Environment Agency (EA) to provide a decision on this is 12 days.

In line with other water companies in the country the Company would only implement TUBs during periods when they will reduce demand. Although every drought is different, a TUB is not expected in the period October to March inclusive. If the Company is in this period and does not implement a TUB prior to applying to the EA for a drought permit it will demonstrate:

- That it has explored other demand saving measures (water efficiency, pressure management, more leakage control etc.)
- That it has not used a TUB because it would only result in minimal savings
- Why it had not implemented a TUB earlier in the year.

So, in most cases, when the Company submits an application for a drought permit a temporary use ban will already have been in place for at least a week.

Figure 11 Control Curves for Blithfield Reservoir

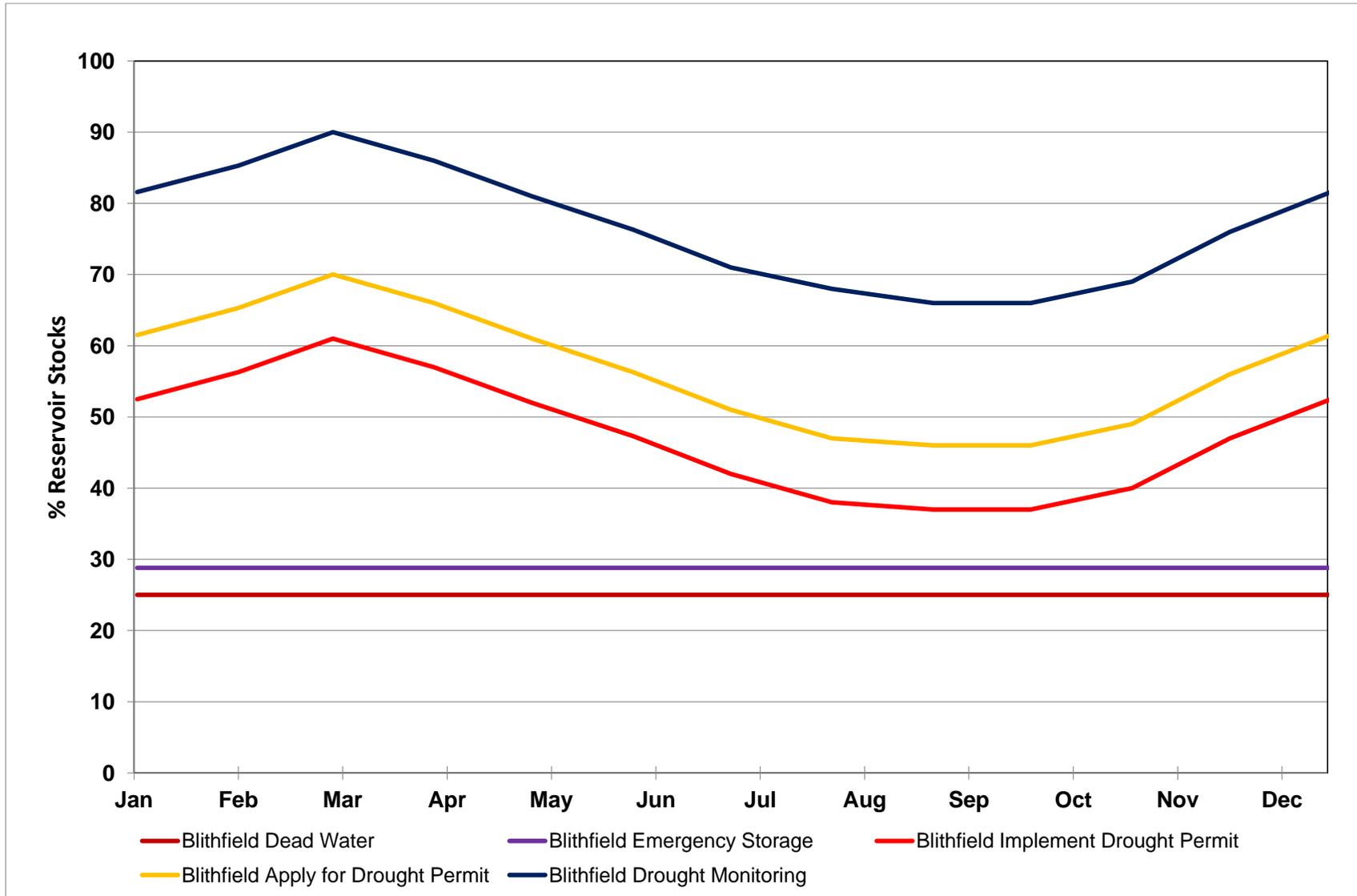
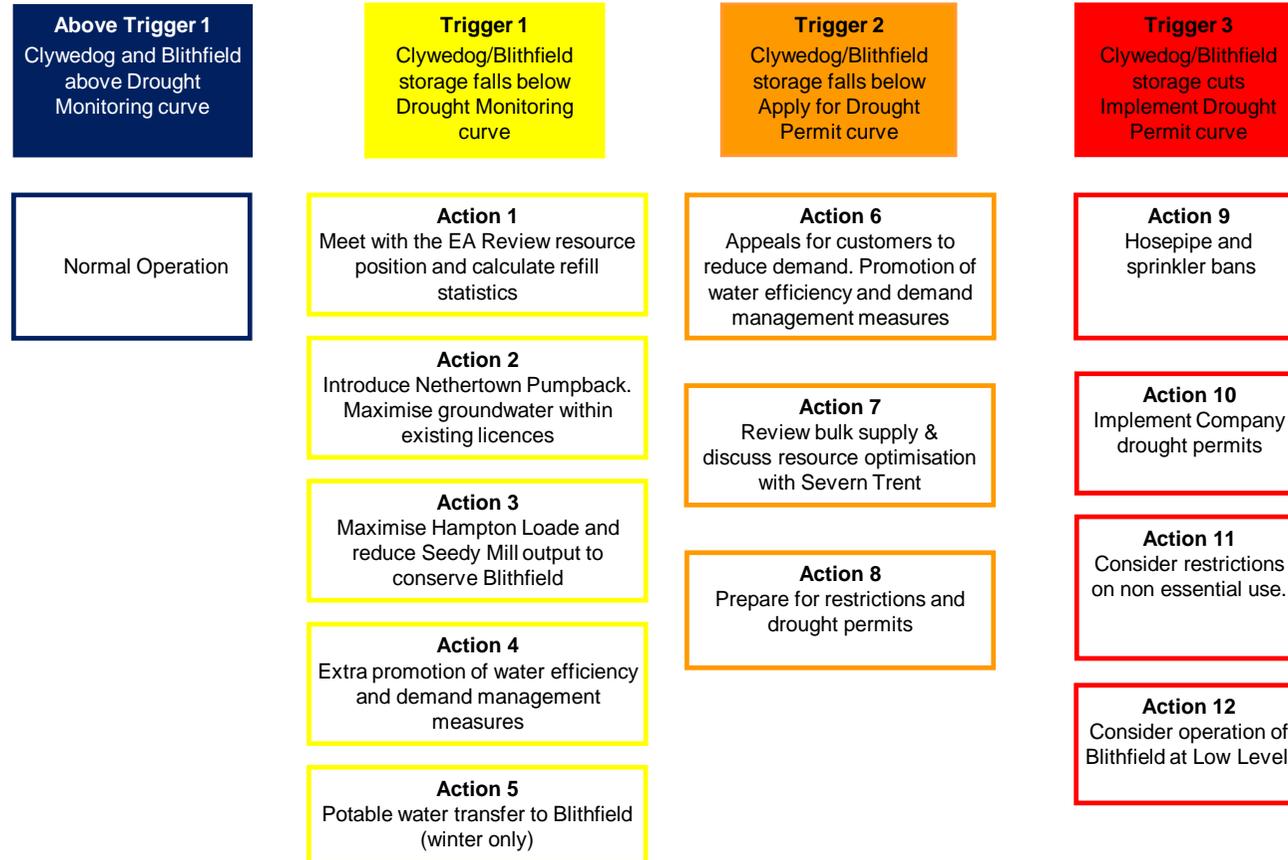


Figure 12 Drought Control Rules and Actions

### DROUGHT CONTROL RULES: TRIGGERS & MAIN ACTIONS



Note: The order of actions is an indication of priority, however the Company reserves the right to change the order as circumstances dictate

The Implement Drought Permit curve is used to illustrate when the drought permits would be operational.

If the level in Blithfield continues to fall then the Company will consider the need for and likely benefits of an Ordinary Drought Order to restrict non-essential uses of water at commercial premises. If this is deemed appropriate and beneficial then an application will be made.

The Emergency Storage Curve is 4% above the dead storage curve. This water will only to be used as a last resort and is a buffer before dead storage is reached. Dead storage (25%) represents the level of storage below which it is difficult to abstract water because of the hydraulics of the system and the quality of the water would decline such that treatment may have to be curtailed at times. The Company is currently investigating ways it can make better use of the unused storage in the reservoir and what works and /or treatment measures might be required. This control curve review is being carried out for the Company's next water resources plan (WRMP19).

A detailed description of the full list of supply and demand actions that may take place as each trigger curve is crossed is included in Section 6. Throughout this process the Company will liaise with the Environment Agency, Severn Trent Water and CCWater. In particular discussions will take place with Severn Trent Water and CCWater around implementation of any temporary use ban to ensure that the information to customers is clear and there is little potential for confusion. The control rules are set to align with the Company's stated level of service of only having hosepipe bans in genuinely exceptional circumstances (once every 40 years on average).

The Company will consider carefully the need for, potential benefit of and the timing of implementation of a temporary use ban. As discussed earlier, it is entirely possible that although a ban may be indicated by trigger curves, this may not be appropriate during winter months.

The recommendation to begin the preparation of any drought permit and order applications will be made by the Company's Drought Management Team (followed by Board approval) several weeks before the Apply For Drought Permit line is crossed, and this will depend on the particular drought permit/order and the specific conditions that are in existence at the time. Section 7 describes the programme of environmental impact assessment that the Company has undertaken to support the potential drought permits/orders.

The Company's triggers and main actions for managing a drought affecting Blithfield are shown on Figure 12. These are colour coded to identify the increasing severity of a drought, as described in Section 5. The supply and demand management options that may be implemented at each trigger are described in more detail in Section 6.

The timing and sequence of the implementation of a temporary use ban, a drought permit/order and an Ordinary Drought Order will depend on the exact circumstances at the time. However, it is the Company's view that it would be unacceptable to customers to experience a temporary use ban earlier than is necessary. Example timelines are shown below to illustrate the possible sequence of events. However, as mentioned earlier, the Company may accelerate or delay this process if this was in the best interests of customers or the environment.

Example Timeline for Imposition of Temporary Use Ban and Implementation of a Drought Permit

Day 1	Pre-consultation on TUB and Drought Permit
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Day 14:	Advertise TUB giving 2 weeks' notice
Day 28:	Consider representations
Day 35:	Implement TUB
Day 42:	Apply for Drought Permit (if conditions have not improved)
Day 54:	Implement Drought Permit (the Environment Agency has 12 days to determine the application)

#### Example Timeline for Imposition of Ordinary Drought Order (ODO) or Non-Essential Use Ban (NEUB)

	Pre-consultation on ODO (this would immediately follow application for Drought Permit, if the situation had not improved)
Day 1:	Advertise ODO/ NEUB giving 7 days' notice and submit application to Defra
Day 35:	Implement ODO/ NEUB (Defra has 28 days to determine the application)

#### 5.2.7 Triggers and Actions for Groundwater Sources

As described in section 5.1.8 we have adopted regional groundwater levels as early indicators of the onset of drought where these are linked to baseflows which influence the River Severn and River Blithe flows. Analysis of reservoir levels and surface water flows are best used to monitor the development of droughts and it is triggers associated with these which have specific actions associated with them. There are no groundwater specific triggers recommended for these sites.

For our own operational boreholes, we have proposed the trial of triggers based on groundwater levels below normal, and the related actions areas follows:

- Groundwater levels below normal – enhanced monitoring. Ensure transducers are functioning in all operational boreholes and institute manual check dips where appropriate. Update site reviews of baseline performance and highlight contingency actions. Provide forecasts and lead times for actions and ensure site specific monitoring and triggers in place.
- Groundwater levels notably low – operational readiness. Actions such as the partial reduction in output from drought vulnerable boreholes or wells are implemented based on site specific triggers such as pumping water levels or turbidity levels. Other actions may be reactive based on problems with local pump performance or design.
- Groundwater levels exceptionally low – further reactive measures may be required and will be prioritised to ensure supplies maintained.

#### 5.2.8 Triggers and Actions for Environmental Schemes

Groundwater levels influencing baseflow are a major issue to vulnerable rivers and streams in our supply area. These will be used to trigger operational readiness to implement environmental support schemes such as Shaft 20/Stowe Pool and Broome Lodge Farm/Windmill Pool. At these specific sites there are separate triggers used for implementation purposes. Accordingly the hierarchy of actions below, whilst closely aligned to Environment Agency reporting, is for general guidance only:

- Groundwater levels below normal – enhanced monitoring. Liaise with Environment Agency local officers to ensure site specific monitoring and triggers in place. Provide forecasts and lead times for actions to operational staff.
- Groundwater levels notably low – operational readiness. Ensure resources in place to implement mitigation schemes e.g. manpower and plant
- Groundwater levels exceptionally low – implement mitigation measures according to agreed site specific triggers

Under the current National Environment Programme (NEP) agreed with the Environment Agency in 2015, implementation of schemes is not sufficiently advanced to determine whether drought is a material issue (some may require intervention more frequently) and if so, what parameters are a useful indicator and/or trigger. In the meantime the Company has an intensive monitoring regime in place and part of each scheme will be to determine this requirement.

Similarly the plan period covers the early part of the next investment period (2020 – 2025), when we anticipate the Sustainable Catchments project to lead to an expansion in NEP work and further requirements will be developed in a similar way.

### **5.3 Triggers Marking the Cessation of Drought Conditions**

The Environment Agency has defined the conditions which will mark the cessation of drought conditions associated with a River Severn drought, and these are detailed in Appendix G. These triggers are set by the Environment Agency for environmental purposes and may not indicate an appropriate cessation of drought conditions for public water supply. The Company will review whether it is appropriate to follow any change in actions which the Environment Agency implements in response to these triggers and will also consider the status of the other resources available to it.

At Blithfield, the Company will consider relaxing drought management actions once levels of storage are 10% above the drought monitoring trigger curve. However, the Company will seek to remove a non-essential use ban, a temporary use ban and a drought permit/order as soon as possible.

If the Company has applied for a drought permit, and storage levels at Blithfield and Clywedog subsequently rise to 5% above the Apply for Drought Order/Permit trigger curve before it is granted by the Environment Agency, we will consider withdrawing the application.

The Company will liaise with the Environment Agency to discuss and confirm the water situation before declaring that the drought is over. The Company will also liaise with Severn Trent Water to ensure appropriate co-ordination of public messages as necessary.

The exact timing of stepping down procedures will depend on several factors, including the rate of refill of Blithfield and Clywedog, the weather forecast, and the other drought specific conditions listed in Section 5 above.

All changes to outputs from stations and other associated stepping down procedures will be sanctioned by the Head of the Drought Management Team.

Following a return to a normal resource position a detailed review will be undertaken within not more than 8 weeks. This review will reflect on actions taken, any positive or negative outcomes and any lessons learnt from the period. Specifically the post drought review will:

- Identify what will be released as a result of the review e.g. a 'lessons learnt' report.
- Identify the timescales for production of this report and timescales for the implementation of any actions arising from it.
- Review the environmental impacts of the drought in conjunction with relevant environmental organisations and bodies where appropriate.
- Determine whether the appropriate environmental monitoring was carried out to measure the impact of any drought permits or drought orders.
- Update the environmental assessment and environmental monitoring plan if necessary.
- Review the effectiveness of any mitigation measures implemented.
- Review the success, effectiveness and costs of all drought management actions.
- Assess how well individual sources delivered additional water and determine where any re-assessment of yields may be needed or investment to maintain yields of sources
- Assess the estimates of demand reductions from the implementation of demand-side drought management actions.
- Identify if the Company needs to make any changes to its demand forecast or longer term demand management strategy if demand patterns experienced during a drought are significantly different to those in the latest Water Resources Management Plan.
- Consider if any strategic investments made as a result of a drought event affect other plans.

#### **5.4 Forecasting the Impact of Drought**

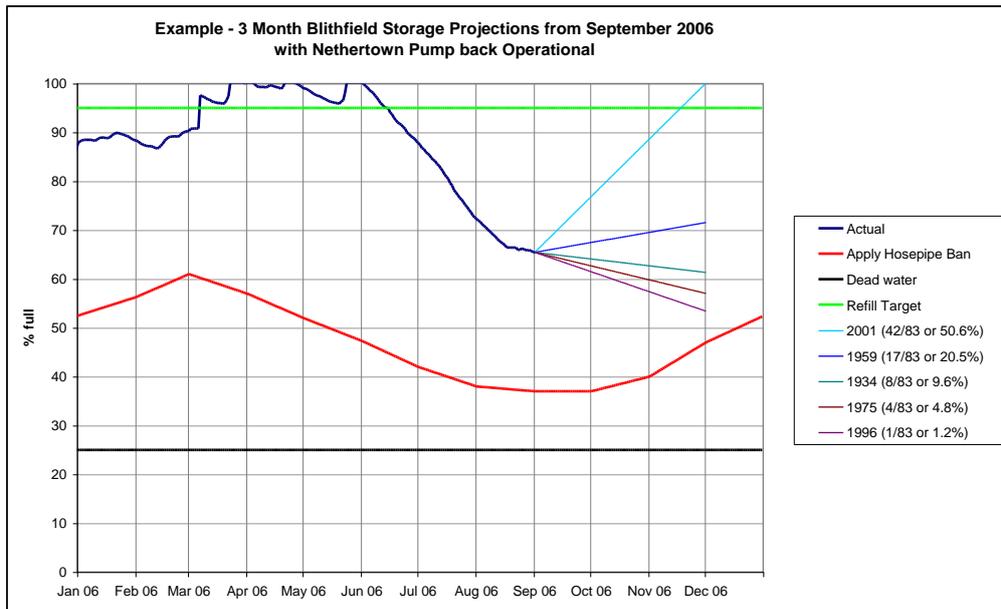
In the absence of accurate long range weather forecasts, the Company needs to understand the potential impact of a range of drought scenarios, at different stages in a drought. The Company will do this by considering each of the 3 main water resources in the following way:

The Company's groundwater sources are largely unaffected by drought, due to the nature of the Sherwood Sandstone aquifer (groundwater levels only fluctuate by a few meters), and therefore no specific scenario analysis is required.

The availability of water from the River Severn at the River Severn Works is determined by flows at Bewdley, by reservoir storage at Clywedog and by the level of River Regulation. The River Severn Drought Management Group will be convened by the Environment Agency once the Drought Alert trigger is crossed at Clywedog and will enable scenario analysis to be undertaken using the joint Environment Agency/ Severn Trent Water AQUATOR model. This will include different scenarios for abstraction, other river demands, and different rainfall - runoff (inflow) sequences. The results will be made available as part of the Severn Drought Management Group.

Storage level scenarios at Blithfield Reservoir will be examined using the Company's prediction tool. This is a spreadsheet model which contains 80 years of simulated inflows to the reservoir, and allows different abstraction, compensation release, and quantities of water pumped back from the River Blithe Pumpback Scheme to be specified. By varying the inflow to the reservoir in the spreadsheet we can simulate reservoir storage levels based on a range of different droughts, and allocate a return

period (probability) to the event. An example of the output of the spreadsheet model is shown below.



By considering the modelling outputs from the River Severn Drought Management Group, and the Blithfield Reservoir storage scenarios, along with a range of additional information, including the short-medium term weather forecast, the soil moisture deficit, the demand profile and forecast, and the available supplies, decisions can be made on the best way to manage the drought in question, using the triggers and options within the plan.

**Table 2 Summary of Drought Management Options – Demand Side**

BLITHFIELD TRIGGER	RIVER SEVERN TRIGGER	OPTION	ESTIMATED DEMAND SAVING (MI/d)	DESCRIPTION/COMMENTS
1	1	Extra promotion of water efficiency and increased publicity campaign	c. 3 MI/d	Communication via the Company website on the current resource position, with appeals for water conservation via press releases. Communication messages will escalate, and could include newspaper and radio messages. Industrial customers may be targeted for water audits and domestic customers may be offered / sent cistern devices.
1	1	Increased leakage detection and repair	c. 1.5 MI/d	Additional finding and fixing of leaks. This action could be initiated within two-four weeks, following a review of available leakage management resources. However the logistics of procuring staff and delivering further leakage reductions means that it is likely to take at least five months to deliver this additional benefit, and there is some considerable uncertainty over the estimated savings.
Just before 3	3	Temporary use ban	c. 10-20MI/d	Assuming a Companywide ban. We have no recent data to determine what saving might be achieved.
3	3	Enhanced pressure management	c. 1.5 MI/d	Bringing forward of existing plans to lower mains pressure to reduce leakage. There is an estimated two months to deliver any additional benefit.
3	3	Consider bans on non-essential use	unknown	This will require a drought order application and a minimum lead time after application of four weeks

Further details are provided in Appendix F.

## 6 Drought Management Actions

### 6.1 Overview

Drought management seeks to balance the needs of customers against the needs of the environment through the consideration and implementation of a range of supply-side and demand-side measures. With the exception of drought orders, any of the measures described in this section may be considered for implementation during the range of droughts for which we have planned, based on our previous experience. We expect that drought orders (see Section 6.2.4) will only be needed under unprecedented drought conditions.

The management actions taken during a drought will be implemented broadly according to the triggers as described in Section 5. These have been developed using the experiences of historical drought sequences and actions along with the predicted impact of more severe droughts using statistical methodologies. A carefully managed strategy will engage with all stakeholders, such as customers, regulators and businesses, and will reduce the impact of drought conditions. A key element therefore, is the communications strategy, which is covered in Section 10 of this plan.

The management actions identified for this plan would allow the Company to manage a progressive drought sequence similar to those historically experienced, and beyond, to a more extreme 1 in 200 year event. The Environment Agency Water Company Drought Plan Guideline states that; *'drought plans do not have to include details of arrangements for providing water supplies to cope with situations when there is a civil emergency as a result of water shortage.'* Therefore, this is not considered within this Plan.

Where a more catastrophic drought could not be dealt with by the actions in this plan, and severe water shortages were experienced, then the Civil Contingencies Act would apply, and the Company's Emergency Plan would be implemented. This would provide additional powers and access to additional resources to ensure water supplies were maintained.

### 6.2 Demand-Side Actions

Normal demand patterns do not present a problem. The introduction of various measures since the 1990s to manage leakage and the later reduction in non-household demand during the 2000's has reduced normal demand to below 300MI/d (see Section 3.5).

The drought options set out in Table 2 and the Appendices include demand side options that will be employed during a drought sequence. The quantities expected to be saved have been derived from experience gained during previous droughts, together with an understanding of demand patterns, notably the causes of fluctuations in demand, and the sensitivity of demand to different types of fluctuation. These have, where applicable, been cross referenced with the UKWIR Code of Practice<sup>2</sup> expected savings. The quantities saved do not represent year-round reductions; they are likely to be seasonal reductions only, curbing peak demands and maintaining a closer to average demand throughout the year. The assumed reductions take account of the

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<sup>2</sup> Managing through drought: Code of practice and guidance for Water companies on water use Restrictions – UKWIR Report 09/WR/33/2 (2009), amended by UKWIR 11/WR/33/3 (2011) and UKWIR14/WR/33/6 (2013)

reduction in demand witnessed over the last 15 years as a result of investment on network infrastructure, leakage reduction by the Company and non-household consumption reductions.

### **6.2.1 Extra Promotion of Water Efficiency and Drought Awareness Messages**

During a drought period more sustained water efficiency campaigns will be established with a greater emphasis on 'quick, short, sharp' messages designed to engage customers and deliver an immediate reduction in demand. Additional communications are likely to take place in two stages once the drought monitoring / drought alert curves have been crossed:

- The Company will issue general water saving messages to the public on the website and in the local press. Other external stakeholders will be updated by email, key Company personnel visits and presentations or other means as required. The Company will also take every opportunity to reinforce water efficiency messages when responding to media contacts.
- As reservoir storage continues to fall towards the Apply For Drought Permit trigger curve, the Company will intensify messages to customers, appealing for water saving and a greater reduction in demand. This will include press releases to raise customer awareness of the drought situation. In addition we will seek to encourage industrial customers to carry out water audits and identify savings.

The demand savings generated by calls for restraint are likely to be small and they are difficult to quantify.

The effectiveness of targeting a reduction in outdoor water use and discretionary water use during the winter may be limited. Therefore the Company will consider the time of year when reviewing its water efficiency promotion during drought periods and it may decide that some of the messages suggested above are not appropriate for the prevailing situation.

### **6.2.2 Leakage Reduction**

In the event of a drought, the Company will actively consider whether additional leakage detection and repair activity could be introduced to assist with demand reduction. However, the logistics of procuring appropriately skilled additional staff in the required numbers, as well as the lead time for delivery of potential savings means that a minimum of 5 months will be required to achieve a maximum saving of 1.5 Ml/d.

As a result of the extended lead times required to achieve a reduction in demand it is the Company's view that additional leakage control will not deliver additional benefit within the timescale of a single season drought. However, if a drought was to extend beyond the end of the season so that Blithfield Reservoir did not refill for the start of the following season then the Company will be more likely to achieve some limited benefits by implementing additional leakage management activities.

Notwithstanding the above, the Company will review the current leakage position and circumstances at the time to give full consideration to implementation of additional leakage detection and repair activities in a single season drought.

The benefits of demonstrating to customers the Company's commitment to making the best use of resources, especially in times of drought, will form part of the process of consideration. The Company recognises that in order to encourage positive action from customers in response to awareness campaigns and calls for restraint it will need

to demonstrate that it is doing all it can to manage demand through leakage management.

### **6.2.3 Enhanced Pressure Management**

The Company is already increasing coverage of new pressure reducing valves (PRV's) to maximize leakage reduction benefits, while maintaining the required level of customer service for mains pressure. This is part of the leakage management strategy submitted to OFWAT and the Environment Agency as part of the AMP6 Business Plan.

This option allows for the acceleration of this programme in the event of a drought. The extent of further pressure reduction is however significantly influenced by the number of shared customer connections within the area, as these need higher network pressures compared to single connection properties. Due to historic practices the Company has a significant number of shared connections, with 40% of properties supplied in this way. As a result, current pressure management schemes usually need to allow more than the Company standard of 20m pressure to maintain supplies, minimise customer service problems and achieve the standards.

Further savings could be achieved, however these will be at the expense of increased supply interruptions, customer contact and pressure failures and will have considerably longer lead times.

The likelihood of levels of service failures with further pressure reduction mean that this option has been included as an option only after all other reasonable demand management measures have been exhausted, including temporary use bans (which have a level of service of once every 40 years on average). The Company believes that a temporary use ban will be more acceptable to customers than widespread low pressure and supply interruptions. The Company has calculated that a saving of 1.5 Ml/d of water will take at least 2 months to deliver.

### **6.2.4 Temporary Water Use Restrictions**

South Staffs Water's published level of service is to introduce a temporary ban on water use on average not more than once in 40 years.

The introduction of the Flood and Water Management Act (FWMA) 2010 effectively superseded water companies' powers to ban hosepipe usage as set out in the Water Industry Act 1991, section 76 by allowing them a wider range of temporary water use restrictions that can be implemented without recourse to a drought order. The FWMA makes provision for applying restrictions to all or part of a Company's area. It also provides the opportunity for companies to apply concessions, and to make exemptions for certain activities. The Water Use (Temporary Bans) Order 2010 provides more detail on types of usage, exemptions and conditions relating to companies' new powers.

The estimated range of savings as estimated by UKWIR research<sup>3</sup> is between 5-9.5% of domestic demands, however experiences from the 2011-12 drought indicate that savings could be in excess of 10%.<sup>4</sup>

The Company will follow the requirements of the FWMA, and the UKWIR Code of Practice<sup>5</sup> when considering temporary water use restrictions, particularly with regard to: the way in which representations will be dealt with; a proportionate response to the prevailing drought conditions; and communication with customers. These areas are discussed in more detail below.

### Representations

South Staffs Water plans to allow a period of 21 days within its implementation programme for receiving and responding to representations on temporary use restrictions. This period is considered appropriate as, once the decision has been made to impose restrictions, the process should be as swift as possible, in order to gain maximum benefit, whilst allowing ample time for reviewing any representations received. This is in line with the guidance set out in the UKWIR *Code of Practice and Guidance on Water Use Restrictions*.<sup>6</sup>

The process for making representations, and the time allocated for this, will be stated in the notices published by the Company to advertise the proposed restrictions. Notice of our intention to implement restrictions will be published on our website and in at least two local newspapers. From the date the notice is published on our website we will allow a minimum of 14 days for representations to be submitted to us. We will consider and respond to representations within a further 7 days making a total of 21 days for implementation of the restrictions. The effects of the representation period have been built into our communications plan – see Section 10, and the timing and triggers for drought actions, in Section 5

Representations received from individuals or groups will be considered by the Drought Management Team in a fair and even-handed manner. To ensure transparency, details of the representations received, the consideration given, the decision reached, and the reasons behind the decision, will be communicated, not only in writing directly to the individual or group making the representation, but also to the general public through regular and timely updates on the Company's website.

### Activities Covered by Restrictions

The FWMA 2010 has increased the range of uses of water that can be controlled by water companies without referring the decision to the Secretary of State. The extended scope of the power in section 76(2) of the WIA 1991 (as amended by section 36 of the FWMA 2010) is as follows:

*“Only the following uses of water may be prohibited –*

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<sup>3</sup> Drought and Demand: Modelling the impact of Restrictions on Demand during Drought, UKWIR 07/WR/02/3

<sup>4</sup> Understanding the impacts of drought restrictions 14/WR/01/13, UKWIR, 2013

<sup>5</sup> Managing through drought: Code of practice and guidance for Water companies on water use Restrictions – UKWIR 14/WR/33/6, 2013

<sup>6</sup> Managing through drought: Code of practice and guidance for Water companies on water use Restrictions – UKWIR 14/WR/33/6, 2013

- a. watering a garden using a hosepipe;
- b. cleaning a private vehicle using a hosepipe;
- c. watering plants on domestic or other non-commercial premises using a hosepipe;
- d. cleaning a private leisure boat using a hosepipe;
- e. filling or maintaining a domestic swimming or paddling pool;
- f. drawing water, using a hosepipe, for domestic recreational use;
- g. filling or maintaining a domestic pond using a hosepipe;
- h. filling or maintaining an ornamental fountain;
- i. cleaning walls, or windows, of domestic premises using a hosepipe;
- j. cleaning paths or patios using a hosepipe;
- k. cleaning other artificial outdoor surfaces using a hosepipe.”

The Water Use (Temporary Bans) Order 2010 provides a definition of “using a hosepipe”, which “includes the following -

- a. drawing relevant water through a hosepipe from a container and applying it for the purpose;
- b. filling or partly filling a container with relevant water by means of a hosepipe and applying it for the purpose.”

It should be noted that, whilst these activities using a hosepipe, as defined by the legislation, are banned, gardens can still be watered using a bucket or watering can, using stored rainwater (in a water butt) or by reusing greywater, from a bath or washbasin.

For clarification, watering a “garden” includes the following: domestic gardens; parks; lawns; grass verges; sports and recreation fields; allotments; and any other green space.

### **Implementation of Restrictions**

The UKWIR CoP on applying water restrictions recommended 4 fundamental principles for good drought management;

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

Our previous drought plan indicated a lead time of two weeks for the implementation of temporary water use restrictions. This timeline has been reviewed and it is now proposed that a lead time of 2 weeks is required to allow internal communication and Governance and external communication with the Environment Agency and neighbouring water companies. A period of 3 weeks will then follow for publication of the notice and receipt and consideration of representations, giving a total lead time of 5 weeks.

We will give notice of our intention to introduce a ban, and the terms of the ban, including any concession, exemptions and phasing, in a minimum of 2 local newspapers and on our website; [www.south-staffs-water.co.uk](http://www.south-staffs-water.co.uk). The notice will clearly state the proposed date of commencement and the period and method for making representations. The notice is a formal and legal requirement which must take a certain format and contain certain information. As such, it needs to be published in full in appropriate media. However, we will also use other channels of communication to make customers aware of the proposed ban and provide plain English versions to describe what it means for them, and highlight concessions and exemptions.

Whilst our Company specific drought triggers will indicate the timing for the consideration of restrictions, we will liaise with neighbouring water companies and the Environment Agency to determine where others may be in the application of their own drought triggers leading to consideration of a temporary use ban. Experience and feedback following the 2011-12 drought shows that a consistent regional approach from water companies to implementing restrictions in terms of timing, concessions and exemptions helps to ensure clear and concise customer communication. Where possible we will endeavour to coordinate the approach to implementing restrictions across Company areas by using consistent messages.

Any applied restrictions will be proportionate to the nature of the water supply situation and the water savings that will result. Current legislation allows for a water Company to impose restrictions within an area smaller than its overall area of supply; however, our approach is to apply restrictions across our whole supply area. As our water supply network is highly integrated, and demand profiles similar across the area, there is no benefit to be gained from a more localised approach. Our approach is consistent with the single water supply zone definition as used in our Water Resources Management Plan (WRMP), and we believe it will prove the least complicated for our customers.

### **Phased Introduction of Restrictions**

The FWMA allows companies to implement restrictions using a phased approach; however, after consideration of this we have concluded that a single phase introduction of a temporary water use ban is most equitable for our customers.

The introduction of restrictions will not be taken lightly, and only implemented when a serious shortage of water poses a threat to customers' security of supply. Therefore the most beneficial effect will be seen from full use of the FWMA powers. A ban will also follow an extended period of appeal for restraint to customers, in which many activities, such as lawn watering will already have been suppressed or curbed. These appeals for restraint have historically led to the greatest reductions, and we would expect to see upwards of 5% reduction in demand from garden watering during the summer months, allowing for the reductions already seen in recent years as a result of increasing meter penetration among domestic customers.

A single phased approach using the full powers of the legislation will ensure maximum water savings are achieved by communicating a clear message to our customers. We believe this approach will also provide a fair and consistent approach to all of our customers, and ensure that the restrictions are easier to understand. The approach is consistent with that taken by neighbouring water companies in their current drought plans.

## Concession and Exemptions

Under current legislation companies have the power to make concessions and exemptions. Having initially discounted this as being impracticable given the size and nature of our supply network we have reviewed the results of the of the 2011-12 drought surveys<sup>7</sup> regarding concessions and exemptions, and would propose the following based on discussions with neighbouring companies prior to their implementation of restrictions in the past;

- Blue badge holders will be included as Discretionary Universal Exemptions to the restrictions
- The use of a hosepipe to fill or maintain a pond containing fish will be included as a Statutory Exception

We will also carefully consider other exceptions for the watering of outdoor plants, and implement any of these in a manner consistent with neighbouring water companies.

Other examples of exemptions that may be considered could include; vulnerable customers; those demonstrating water reuse technologies for watering using a hosepipe; or where it is felt to be in the best interests of the community.

A number of activities under the restricted categories are already exempted:

- a. **Watering a garden using a hosepipe.** The use of hosepipes is exempted under the legislation for; agricultural land, commercial use for the growing of crops, fruit, vegetables and other plants; temporary flower displays, land used for National Plant Collections
- b. **Cleaning a motor vehicle using a hosepipe.** Excludes public service vehicles, and goods vehicles as defined by legislation.
- c. **Watering plants on domestic or non-commercial premises using a hosepipe.** Exemptions are for plants in outdoor pots and in the ground, undercover in public authority or commercial premises, plants grown or kept for sale or commercial use, plants as part of a national collection or flower display
- d. **Cleaning a private leisure boat using a hosepipe.** Exemptions in legislation for vessels used in course of a business, vessels made accessible to the public, cleaning any area of a private boat enclosed by a roof and walls other than doors and windows.
- e. **Filling or maintaining a domestic a swimming pool or paddling pool.** Exemptions for, where necessary during the course of construction, using a hand held container filled directly from a tap, where it is designed constructed or adapted for use in medical treatment, used for decontaminating animals from infection or disease, used in the course of veterinary treatment, in which fish or aquatic animals are being reared or kept in captivity.
- f. **Drawing water using a hosepipe for domestic recreational use** (includes use for water slides or other similar domestic equipment, by adults or children). No exemptions to this category

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<sup>7</sup> (UKWIR 14/WR/01/13)

- g. **Filling or marinating a domestic pond using a hosepipe.** Exemptions include filling or maintaining a pond in which fish or other aquatic animals are being reared or kept in captivity
- h. **Filling or maintaining an ornamental fountain.** Exempt are fountains on or near a fish pond whose purpose is to supply sufficient oxygen to the water to maintain fish health.
- i. **Cleaning walls or windows of domestic premises using a hosepipe.** Exemptions are cleaning activities for health and safety reasons, and likely to be removing risk to animal or human health and safety, or the prevention and control of causative agents of disease.
- j. **Cleaning paths or patios using a hosepipe.** Exemptions are cleaning activities for health and safety reasons, and likely to be removing risk to animal or human health and safety, or the prevention and control of causative agents of disease.
- k. **Cleaning other artificial outdoor surfaces using a hosepipe.** Exemptions are cleaning activities for health and safety reasons, and likely to be removing risk to animal or human health and safety, or the prevention and control of causative agents of disease.

We recognise that the implementation of temporary use bans may have an impact on some commercial trade activities. Whilst hand washing and domestic window cleaning using a hosepipe or water fed pole is banned, these activities can continue, using water from a bucket. Nurseries and garden centres can be affected by a loss of trade, and we will work closely with trade bodies, such as the Horticultural Trade Association and the Turfgrass Growers Association to minimise the impact, by early communication and consultation. We will collaborate to emphasise to customers that watering of plants and lawns is only banned using a hosepipe, and to support available alternatives such as water butts and drought resistant plants.

### Communications

Any decision to introduce temporary restrictions will be made in consultation with the Environment Agency, and neighbouring water companies to ensure a consistent approach across the region. The frequency of these meetings and communications will be increased as a drought situation develops, and joint communications and press releases will be issued, where deemed appropriate for the situation.

Whilst the emerging drought situation may differ for each company in a region, and the timings for implementation of restrictions will depend on the local situation, we will endeavour as far as is practicable, to provide a consistent message to customers. We would expect a National Drought Management Team to be convened for any regionally significant drought and for this to be a primary forum for the alignment of communications and activity by those companies involved.

We will follow the principles laid down in the *Code of Practice and Guidance on Water Use Restrictions*<sup>8</sup> when considering how to implement temporary use restrictions, to ensure that our proposals are consistent, proportionate and clearly communicated, and that representations are considered fairly. Any proposal to introduce a temporary

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<sup>8</sup> Managing through drought: Code of practice and guidance for Water companies on water use Restrictions – UKWIR 14/WR/33/6, 2013

restriction will be advertised on the South Staffs Water website [www.south-staffs-water.co.uk](http://www.south-staffs-water.co.uk) and in at least two local newspapers, as set out in legislation. A variation, or subsequent lifting, of the restrictions will be similarly advertised. The timing of any restrictions will be aligned with neighbouring companies wherever possible.

All actions taken during the process for the implementation of restrictions will be recorded, to provide an audit trail. Any complaints received will be dealt with through the Company's normal complaint handling procedure. Further details of the Communication Plan are included in Section 10.

#### **6.2.5 Ordinary Drought Orders (Non-Essential Use Restrictions)**

The Company's published level of service for the South Staffs region is to introduce restrictions on non-essential usage not more than once in every 80 years. Ordinary Drought Orders allow water companies to further restrict non-essential water use at commercial and institutional premises and are more wide-ranging than the ones introduced under the provisions of the Water Use (Temporary Bans) Order 2010. Provision for drought orders is contained in the Water Resources Act 1991, Section 73 and 74, and requires application to and approval from the Secretary of State, who must be satisfied that a 'serious deficiency of supplies in an area' exists, by 'reason of an exceptional shortage of rain'

The range of purposes to which drought orders apply is set out in the Drought Direction 2011<sup>9</sup>. These are;

- Watering outdoor plants on commercial premises
- Filling or maintaining a non-domestic swimming pool or paddling pool
- Filling or maintaining a pond for ornamental use
- Operating a mechanical vehicle washer
- Cleaning any vehicle boat aircraft or railway rolling stock
- Cleaning non domestic premises
- Cleaning a window of a non-domestic building
- Cleaning industrial plant
- Suppressing dust
- Operating automatic cisterns in unoccupied or closed buildings

As highlighted in Section 6.1 above, we expect that drought orders will only be needed under unprecedented drought conditions. The decision to apply for drought orders would not be taken lightly; hence it is one of the later actions in the management plan and is likely to be needed only in the more severe drought scenarios. Although drought orders can be made in respect of a number of different drought management actions, we would not expect to require an ordinary drought order for any other purpose than the restriction of non-essential use. Before embarking on the process to extend restrictions to the non-domestic sector we would ensure that our powers available under the FWMA 2010 had been fully exercised. In view of the timescale involved in preparing an application and granting an order, of

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<sup>9</sup>[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/182606/droughtdirection2011.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/182606/droughtdirection2011.pdf)

between 3-6 months, the timeliness of the application is paramount. For example, the need for a Drought Order would be considered in advance in readiness for the potential continuation into a third dry winter and preparatory work for such an application undertaken.

The stages required to implement a drought order are as follows:

1. **Preparing and lodging an application** - Publication of advertisements in the press is followed by an application to the Secretary of State, including reasons for requiring the drought order, supporting evidence and information. A period of 7 days is allowed for objections to be made.
2. **Hearings or inquiries** - The Secretary of State will hold an enquiry or hearing if any objections are received. A 7 day period is required for the Company to advertise the hearing.
3. **Implementation** - Once approved, the Company must again advertise the implementation of the granted drought order.

It is not possible to be any more specific here on exemptions and concessions, as the range of drought order restrictions will vary according to the specific circumstances of a particular drought; nevertheless, the Company will follow the requirements of the relevant legislation and guidance; in particular, the Defra publication Drought Permits and Drought Orders<sup>10</sup> and the principles laid down in the Code of Practice for Water Restrictions<sup>11</sup> in order to ensure that our proposals are consistent, proportionate and clearly communicated, and that any objections are considered fairly.

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<sup>10</sup> Drought permits and drought orders, Defra, May 2011, [www.gov.uk](http://www.gov.uk)

<sup>11</sup> Managing through drought: Code of practice and guidance for Water companies on water use Restrictions – UKWIR 14/WR/33/6, 2013

**Table 3 Summary of Drought Management Options – Supply Side**

BLITHFIELD TRIGGER	RIVER SEVERN TRIGGER	OPTION	ESTIMATED DEPLOYABLE OUTPUT (MI/d)	DESCRIPTION/COMMENTS
1	1	Operation of River Blithe Pumpback	Maximised available Deployable Output	The River Blithe / Trent abstractions at River Blithe are only available when flow on the Trent at North Muskham is > 2,650 MI/d
1	1	Ensure existing groundwater and surface water sources are fully operational	Maximised available Deployable Output	Increase output from available sources. Postpone planned outages
1	1	Conserve Blithfield Reservoir	Maximised available Deployable Output	Increase abstraction from the River Severn Works and reduce abstraction from the Central Works. The reservoir control rules will be used as a guide to reducing the output from the Central Works, and the substitution of replacement resource (implemented in stages over the period of the drought)
1	1	Maximise use of enhanced groundwater treatment sites	Maximised available Deployable Output	Seven sources have enhanced treatment plants ordinarily on reduced output.
1	1	Transfer of Potable Water to Blithfield Reservoir	Maximised available Deployable Output	This option is only viable if there is no River Severn drought. An environmental permit may be required.
2	2	Review the potential for bulk supplies between Severn Trent and South Staffs.	Up to 5 MI/d	This option is only viable if there is no River Severn drought and Severn Trent has available water resources. Deployable output gain is a peak week figure
2	2	Apply for drought permits/orders	See below	See below (all permits/orders assumed to take at least one month to implement from date of application)
3	3	Implement drought permit on the River Blithe/Trent.	Up to 23 MI/d	This will allow abstraction from the River Blithe when River Trent flows at North Muskham are below 2,650 MI/d. Volume based on available water in Blithe and assumes that an equivalent volume can be safely abstracted from Blithfield Reservoir.
3	3	Implement drought order at the River Severn Works	9.6 to 24 MI/d	Option 1 is based on rescinding EA drought order imposing 5% abstraction reduction (equivalent to 9.6 MI/d). Option 2 is based on an increase from the restricted rate to works capacity.
3	3	Operation of Blithfield Reservoir at Low Levels	6 to 30 MI/d	This option can be implemented with present infrastructure but is of uncertain reliability owing to poor water quality at low reservoir levels

NB Further details are provided in Appendix H.

### 6.3 Supply-side Actions

The supply options presented in this plan (Table 3) have been reviewed since the 2013 drought plan, as a result of operational changes, maintenance work and environmental agreements with the Environment Agency. Additional detail has been added for clarity where required and consideration given to further measures in the event of an extreme drought, in line with Defra guidance.

At the time of publication the Company is in the process of reviewing its WRMP prior to publication of a draft plan in 2018, and as part of this is screening further options to maintain future security of supply. Some of these options may be proposed as future drought options if they are deemed required to maintain sufficient headroom in deployable output, or as drought permits. The need for drought permits and for considering additional drought options will depend on the review of deployable output, and reductions to this, as a result of licence changes arising from the Environment Agency Sustainable Catchments programme and future NEP requirements.

#### 6.3.1 Deployable Output

At the present time the Company can demonstrate headroom in its licensed deployable output, both against average daily demand and against estimated peak week demand. The current Water Resources Management Plan (WRMP14) indicates a surplus over the next 25 years. Modelling of deployable output for the next plan (WRMP19) has suggested that deployable output is likely to be lower for a number of reasons including a more accurate understanding of inflows to Blithfield reservoir and the continuing impact of pesticide contamination of a number of the Company's groundwater sources. However, this work suggests a surplus is likely to remain over the period of this drought plan (2017 – 2022).

Uncertainties which may have a detrimental effect on deployable output could arise as a result of the impact of abstractions on the environment, as determined by the National Environment Programme in the form of Sustainability Changes, and by Water Framework Directive (WFD) standards to be assessed and implemented through the Environment Agency Sustainable Catchments Programme. Climate change could have further impact although is less likely in the short term, particularly as the 2010/12 drought occurred relatively recently and the present supply system has been found to be resilient to this event.

Whilst safeguarding the Company's full licensed capability remains a primary aim, and uncertainty around potential future reductions a concern, this plan has been developed on the basis that we will retain current licence capability for the duration of five years from publication. If any changes become more certain in the interim, we will discuss these with the Environment Agency to determine if they constitute a material change to circumstances that would trigger an earlier review and revision of the plan.

The uncertainties arising from environmental consideration are discussed in more detail in Section 12.

#### 6.3.2 Ensuring Existing Sources are Fully Operational

The Company will ensure that all available plant is commissioned. No planned maintenance works requiring outage will commence once the drought trigger curve has been crossed at Clywedog or Blithfield Reservoir. In the event that maintenance schemes are long standing or of an emergency nature the Company will endeavour to suspend or modify works to maximise the availability of water for public water supply.

### 6.3.3 Conserve Blithfield Reservoir

In normal years when storage levels are high, Blithfield Reservoir is used preferentially to supply local demand over the more distant works at the River Severn Works on the River Severn.

Once the drought trigger curve has been crossed at either Blithfield or Clywedog Reservoir the Company will reduce the abstraction to our Central Works in order to conserve storage at Blithfield Reservoir. The reduction in abstraction to our Central Works will increase in stages as the severity of the drought increases, and storage continues to fall at Blithfield. The reductions in abstraction to our Central Works will be offset by an increase in abstraction from the River Severn Works, and by the other resource options described below.

The existing trigger curves at Blithfield will be used as a guide to the scale and timing of the reductions in abstraction to our Central Works as follows:-

Blithfield Trigger Curve	Abstraction at our Central Works
Above drought monitoring curve	< 120 MI/d
Below drought monitoring trigger curve	< 70 MI/d
Below apply for drought permit curve	< 40 MI/d
Below implement drought permit curve	<30 MI/d
Below emergency storage curve	6 MI/d

The maximum treatment capacity for raw water at our Central Works is currently defined as 120MI/d, and the minimum works output as 6 MI/d. The updated WRMP19 modelling of the Company's deployable output using AQUATOR currently uses these abstraction rules for our Central Works . If these assumptions change as a result of the ongoing WRMP19 work then the impact on the drought plan assumptions will be reviewed.

### 6.3.4 Maximise use of enhanced treatment sites

The Company operates seven groundwater sites with enhanced treatment processes for the removal of cryptosporidium, iron, manganese, arsenic, nitrate and/or pesticides. Under normal year conditions, these plants are at times run at reduced output to optimise cost. The Company will ensure full output is deployed as drought conditions develop.

### 6.3.5 Operation of River Blithe Pumpback

The abstraction licence at River Blithe Pumpback allows water to be pumped from the River Blithe downstream of Blithfield Reservoir back to refill the reservoir. This allows compensation releases from the reservoir to the River Blithe (22.73 MI/d) to be re-used once they have travelled down to the Trent confluence. The abstraction licence requires that at least 9 MI/d is left in the river at the Pumpback site (a greater volume, 17 MI/d, is required during the fish spawning season mid February-mid March). A second abstraction licence on the River Trent, just upstream of the confluence with the Blithe, enables up to 17 MI/d to be pumped back to the intake to maintain flows for the passage of migratory fish. In addition the pumpback scheme is switched off for at least one hour each day of operation to ensure the fish pass is available to migratory fish.

This recirculation allows the entire flow in the Blithe to be pumped back to Blithfield. The option to introduce the pump back scheme will be considered once the drought monitoring trigger curve has been crossed at Blithfield, and the Trent recirculation will be used when the residual flow at the site needs topping up. This will require careful monitoring of the residual flows on the Blithe and a river gauge is monitored by the Company for this purpose.

In addition, consideration will also be given to the use of the River Blithe Pumpback to top up Blithfield if reservoir levels are above the drought monitoring trigger, but storage at Clywedog is below the Environment Agency's Drought alert trigger.

The availability of the scheme both under normal conditions and under a drought permit (see Section 6.4.5) has been modelled using AQUATOR. This shows that the Nethertown pumpback scheme is only available for limited periods under drought monitoring conditions. Experience of operating under these licence restrictions in 2010 and 2011 confirmed this. Accordingly the Company proposes to prioritise the use of the River Blithe Pumpback as early in the drought process as possible whilst water is available.

### **6.3.6 Review the potential for bulk supplies between Severn Trent and South Staffs**

South Staffordshire Water currently supplies and receives small quantities of water to and from Severn Trent Water at the edges of the Company distribution system. These routine supplies are defined by bulk supply agreements between the two companies, with South Staffordshire Water importing c. 0.2 Ml/d and exporting c. 1.5 Ml/d in total. There is little scope for optimising these small quantities in drought conditions.

The largest transfer between the two companies is as part of a joint abstraction licence and supplies water from the River Severn Works to Wolverhampton in the Severn Trent Water supply area (average entitlement of 40.7 Ml/d and peak day entitlement of 48.25 Ml/d). It has been agreed that close liaison will be undertaken in the event of a drought to ensure licence compliance and to optimise available resources.

There are also a number of other bulk supply agreements between the two companies which allow water to be transferred in emergencies or for planned maintenance during periods of low customer demand. These comprise two export agreements to Severn Trent Water at the south east and north west boundaries of our supply area; and an import agreement from Severn Trent Water at the southern most tip of the Company's distribution system. Works have been recently carried out by both companies to ensure that the necessary infrastructure is in place to ensure these agreements can be put in place when required. Nevertheless, it is very unlikely therefore that these bulk supplies will be available to either Company in a drought such as that seen in 1976 or 1995/6 other than under very restricted and short term conditions. However, for completeness this option has still been included in this Drought Plan.

### **6.3.7 Transfer of Potable Water to Blithfield Reservoir**

During periods of low customer demand during the winter there may be a surplus of supply capacity at the River Severn source. This can be used to provide additional water from the potable mains network to Blithfield Reservoir to maintain storage levels during a dry winter when it has not refilled. This option was last deployed in 2011/12 and provides up to 18 Ml/d to the reservoir. The option is dependent on a number of

options already being in place including the minimisation of maintenance, leakage reduction and the maximisation of all enhanced treatment processes at sites such that water is not required elsewhere on the network; and the conservation of our Central Works such that some raw water mains capacity can be used for this option,. Accordingly it would only be deployed at a late stage in a drought to avoid a temporary use ban being required.

This option requires the successful application for an environmental permit or a discharge consent to allow the discharge of treated water into the reservoir. Accordingly it is not likely to be put in place until after a first dry winter.

### **6.3.8 Minor works at Groundwater Sites**

The Company's review of groundwater source yields in 2012 showed very few boreholes are vulnerable to changes to the aquifer water levels in the sandstone aquifer observed in drought. Consequently a sudden decline in individual sites output, requiring modification to pump setting or the deepening of boreholes, is not anticipated. Nevertheless some reactive actions are anticipated.

The Company has a programme of pump efficiency testing and replacement based on a regular monitoring regime. This has the potential to highlight declines in pump performance and/or imminent risk of failure. The Company will look to expedite this programme and bring forward pump replacement where supplies are at risk of interruption.

The Company has undertaken a programme of borehole maintenance since 2005. The objective of this work has been to improve reliability and peak capacity at a number of sites where there had been a history of declining performance. The work has involved the abandonment or repair of some boreholes and re-drilling of others. This work has been combined with the testing and implementation of improved operational management regimes.

Each scheme takes between 3 and 5 years to complete but the Company will consider accelerating individual schemes in the event of a drought. All works will operate within licence conditions in force at the time, including any agreements that may be reached with EA to achieve long term average reductions in abstraction under the NEP programme. Consequently they can be operated without a drought permit.

### **6.3.9 Drought Permits and Orders**

Major abstractions for Public Water Supply are controlled by abstraction licences issued by the EA. These constrain the amount of water that may be abstracted under normal conditions and may restrict this further in dry conditions or may place certain mitigating measures on the water company to protect the environment and/or other users.

Drought Permits and Orders are drought management actions that can allow water companies more flexibility to manage water resources and the effects of drought on public water supply and the environment, for example by changing abstraction licence conditions.

The Company has identified two sites where applications for Drought Permits (DP) may be appropriate:

Potential SSW Site	EA Area
River Severn at the River Severn Works	West Midlands Area
River Blithe Pumpback and River Trent	West Midlands Area

Since publication of the last Drought Plan, the Company has withdrawn its inclusion of a further proposal for the Hanch Tunnel Drought Permit. This is because evaluation of flow data from the Hanch Tunnel during the 2010/12 drought and discussions with the Environment Agency during baseline monitoring in 2013 suggested that the available yield for supply, once mitigation requirements are met, is too low to make the scheme feasible for use.

Each site requires an Environmental Assessment Report, which provides details of baseline conditions and assesses the potential impacts on the water environment from implementation of the proposed Drought Permit/Order. The Environmental Assessment reports identify appropriate mitigation measures and set out an Environmental Monitoring Plan (EMP) to determine the effect of the operation of the Drought Permit/Order (DP). Technical detail on the environmental assessment is included in Section 7 of the Drought Plan and in Appendix F.

The application for a drought permit or order also needs to satisfy the Secretary of State that, by reason of an exceptional shortage of rain, a serious deficiency of supplies of water in any area exists or is threatened. The evidence for this is site specific and analysis of the monitoring data in Section 5.1 is used to demonstrate that the dry weather requiring an application are unusual within the historic record.

#### River Severn at the River Severn Works

The the River Severn Works drought order is described in detail in Section 7.4. It is briefly described below.

The Company's abstraction licence at the River Severn Works is restricted when the River Severn is under River Regulation (when water is being released to support the river), and when the Environment Agency has implemented its own drought order on the River Severn (this requires a 5% reduction in abstraction licences on the river).

The Company has included two options for a drought order at the River Severn Works in this Drought Plan. An application for a drought order at the River Severn Works would only be considered as a last resort, once all other drought permits had been implemented, and would be in response to genuinely extreme conditions. The need for a drought order at the River Severn Works could occur if:

- the storage level at Blithfield Reservoir was below the Implement Drought Permit curve, and;
- the EA has implemented its Drought Order on the River Severn (Appendix G), one of the consequences being a reduction in abstraction of 5% from the River Severn Works, or
- maximum river regulation has been in force and the abstraction licence capacity at the River Severn works is restricted to 192 Ml/d. A period of at least 6 weeks Maximum Regulation has been identified as a trigger criterion.

Under the first option the Company would consider applying for a drought order which would enable a 5% increase in abstraction licence (i.e. to restore the level of

abstraction permitted prior to the Environment Agency drought order). This would restore the output of the River Severn Works to 192 MI/d.

Under the second option the Company would consider applying for a drought order to increase the level of abstraction of raw river water up to 216 MI/d. This would enable conservation of its Bankside Storage Reservoir levels, and allow the Company to utilise the maximum treatment capacity at the River Severn Works during the critical drought period. It is also possible that Option 2 may be required during implementation of an EA Drought Order and this has been used to define the maximum environmental impact case.

A drought order is required, rather than a drought permit, due to the environmental sensitivity of the river, the likely conflict of interest on behalf of the Environment Agency as a Drought Order applicant, and because of the large number of stakeholders who could be affected. A drought order application would be determined by the Secretary of State or Welsh Ministers.

As with the other drought permits in this plan, the modelled annual average deployable output benefit is small reflecting the fact that the 1976 drought scenario ends shortly after the drought permit is initiated in the model. However in reality the timing of the end of any drought is not known and the benefit of the permit could be significantly higher. The potential peak week deployable output benefit of both options is easier to calculate, and ranges between 9.6 MI/d for option 1 (above) and 24.1 MI/d for option 2.

The Company has undertaken an environmental assessment to support this drought order. This environmental assessment is described in more detail in Section 7.4.

The issues surrounding the impact and mitigation requirements of our drought order in combination with drought orders by Severn Trent Water and the Environment Agency are explored further in Section 7.4 and 8.7.3.

#### **River Blithe Pumpback and River Trent**

The River Blithe and River Trent drought permit is described in detail in Section 7.3. It is briefly described below.

The permit would allow abstraction from the Blithe and Trent, to support reservoir storage at Blithfield, at times when the existing abstraction licences would normally be restricted. The current hands off flow is set at 2,650 MI/d on the River Trent at North Muskham (near Newark) and effectively means that during drought periods the abstractions cannot be used for large parts of the year. For example, during the 1995/6 drought there were over 100 days in each year when the flow at North Muskham was less than 2,650 MI/d.

Once the Apply For Drought Permit trigger curve has been crossed at Blithfield the Company will consider making an application for a drought permit to allow the Blithe and Trent abstractions to continue regardless of the flow at North Muskham. As with all drought permits or drought orders the Company will need to demonstrate that this is required in response to a period of exceptionally low rainfall, when compared to the available historic data.

Consideration will also be given to the application for a drought permit on the Blithe and Trent should storage at Clywedog fall below the Environment Agency's Apply for Drought Order trigger. However this assessment will take account of storage at Blithfield and it is unlikely that action would be taken by the Company immediately after the Agency's Apply for Drought Order trigger was crossed. Under these

circumstances it is likely that the Company would defer a drought permit application until Blithfield storage was closer to the corresponding Blithfield trigger (see Section 4).

The permit will allow up to 23 Ml/d to be returned to Blithfield Reservoir and allows an equivalent volume to be safely abstracted for treatment without affecting reservoir levels. Modelling of the Company's water resource system using AQUATOR for the critical drought period (1975/76) indicates that operation of the River Blithe pump back and the Trent recirculation under a drought permit would provide an increase in annual average deployable output of 1-2 Ml/d. This gain is small primarily because in the model the key drought (1976) ends shortly after the permit is activated. This is an effect of the modelling scenario, and in reality the timing of the end of any drought is not known, and the benefit of the permit could be significantly higher.

The Company has undertaken an environmental assessment to support this drought permit. This environmental assessment is described in more detail in Section 7.3.

#### **6.3.10 Groundwater Drought Permits**

Increasing the Company's groundwater output over the full drought period (peak season) cannot be achieved within existing abstraction licences as these are largely fully utilised. Consequently the Company has considered options for operating some existing sites under groundwater drought permits, which would allow a temporary increase of annual groundwater abstraction licence quantities for the duration of the permit. Where 10 year rolling groundwater licences are also in place these conditions would still be adhered to. This would mean that groundwater abstraction will be reduced in subsequent years to 'claw back' the temporary over-use of the licence.

The situation with groundwater abstraction licencing is currently uncertain and complicated by implementation by the Environment Agency of the Water Framework Directive. Changes to abstraction licences proposed in 2015 for ten sites under the National Environment Programme are already being implemented. Further reductions may result from the Environment Agency review of Sustainable Catchments. Consequently the Company is not in a position to make firm proposals for a groundwater drought permit for inclusion within this plan. Nevertheless, as part of its resilience planning the Company anticipates to have infrastructure and plant in place for most permit options.

Further consideration will be given to the potential for drought permit options at all Company sites over the course of this plan. These options would be subject to accelerated further development in the event of an extreme drought of longer duration than previously experienced where the existing permits/orders (Blithe/Trent and River Severn) are already deployed.

#### **6.3.11 Operation of Blithfield Reservoir at Low Levels**

Previous drought plans have assumed that Blithfield Reservoir cannot be drawn down below 25% storage. This is based on the position of the highest intake for the take-off for our Central treatment works. A re-evaluation of the reservoir and treatment work operation has identified that the reservoir can be safely drawn down below this level but at the expense of a reduced summer peak abstraction rate and increased outage risk to the treatment process. As a consequence, this option would only be likely to be employed in extreme droughts when various demand restriction measures are already in place.

## 6.4 Further Options

In their Directions, DEFRA has made it clear that rota cuts and standpipes under emergency drought orders should be avoided at all costs, and that a full range of options should be considered in order to maintain supplies in a drought, without recourse to these measures. The Environment Agency has suggested that these additional measures might include; drought orders to restrict other water users abstractions, emergency engineering works to improve supplies, further leakage control (over and above that already proposed), agreements with industrial water users to reduce their supply, and more extreme drought permits, (which might involve damage to the environment).

The Company has considered the full range of options in the plan, and our approach to each is summarised in Table 4. The following sections give more detail about each option.

**Table 4 Review of Further Options for Drought Management**

Defra Proposed Further Options	Company Proposal
Drought Orders to restrict other water users abstractions	Limited scope due to nature of other licence holders upstream of Company licences.
Emergency engineering works to improve supplies	Will be considered and short list of options maintained as drought develops
Further leakage control	Will be considered and short list of options maintained as drought develops
Agreements to reduce industrial supplies	Will be considered if necessary
More extreme drought permits	River Severn Drought Order considered to be in this category. Future potential groundwater permits (if any) may also fall into this category
Emergency Drought Order (rota cuts)	Not required for droughts up to and including 1 in 200 year return period.

### 6.4.1 Drought Orders to Restrict Other Water Users

The Company does not believe that restricting other abstractors would provide any water resources benefit. There are relatively few large scale consumptive abstractions upstream of Bewdley on the River Severn. Restricting these abstractions will not have any material effect on the licence condition at the River Severn Works. Similarly, restricting the abstractions downstream of Bewdley will not impact on the Works (given that Bewdley is the licence control point).

There are no other significant direct consumptive abstractions associated with the Blithe or Blithfield reservoir, which could be reduced to improve the resource position of the Company.

There are some large non-consumptive abstractions along the major rivers from which the Company abstracts. These are used for purposes associated with the conventional generation of electricity from coal and gas. As a major electricity user in the treatment and distribution of potable water, it would serve no useful purpose to the Company if these generators were affected by drought orders.

The majority of the Company's groundwater abstractions are not constrained by pumping water levels, so there is no scope for reductions in third party abstraction to improve groundwater deployable output (even if there were abstractions nearby).

#### **6.4.2 Emergency Engineering Works**

The Company has considered whether emergency engineering works could be used to improve water resources availability in a severe drought. This is for schemes outside of the scope of those described in section 6.3.8 – Minor Works at Groundwater Sites – and may include works at existing sites or those which would then require a drought permit. The Company is currently appraising options to address the requirement to meet long term water resource challenges and operational resilience. The most advantageous opportunity to improve supplies would be to partially or fully implement one of these options at an earlier stage to meet the short term requirements of an extreme drought. This would avoid expenditure that would not be the long term interest of customers.

The options for emergency works would be identified and prioritised at an early stage by the DMT and steps taken to ensure design and construction plans are in readiness as the drought progresses

#### **6.4.3 Further Leakage Control**

Options to improve the Company's leakage position are discussed in Sections 6.2.2 and 6.2.3 above. Once the savings have been achieved by these measures there are limited opportunities for further gains using pressure management or active leakage control, however activity will be need to be maintained at a high level to maintain these savings. One area of further savings would be accelerate the mains renewal programme already agreed and that has been the subject of the Company's investment programme for previous periods also.

The options for prioritizing renewals programmes to achieve the greatest benefit is leakage reduction would be identified by the DMT to ensure there is the option to implement these as the drought progresses. Mains renewals programmes are disruptive for customers and expensive and lengthy to implement so need to be considered in the light of alternative solutions.

#### **6.4.4 Agreements with Industrial Water Users**

The Company has not contacted individual water users to discuss the potential for reductions in water use in the event of a severe drought, however at this stage it does not believe there is significant scope for this to take place, without major impact.

Post April 2017, eligible non-household customers will be able to choose who provides their retail water services. At this time we do not know how many non-household customers and in which sectors, may choose an alternative retailer. However as a wholesaler, our duty to promote water efficiency will remain and if potential for specific agreements with industrial water users becomes a possibility we would look to work with retailers operating in our area of supply to facilitate this.

#### **6.4.5 Drought Permits (more extreme permits)**

The potential drought order on the River Severn is viewed by the Company as an option of last resort, and falls into the category of a more extreme permit.

The Company has also considered a number of groundwater drought permits, as described in Section 6.3, and has concluded that these may be worthy of further investigation in future.

#### **6.4.6 Emergency Drought Orders**

An emergency drought order would allow the Company to further prohibit water use through rota cuts, and to supply water by means of stand pipes or water tanks for a period of up to 3 months. It is clear from Defra guidance and customer research that this level of water restrictions would be unacceptable. The Company does not state a level of service for the risk of rota cuts or use of standpipes as it is not indicated by the historic record or by consideration of possible extreme events up to a 1 in 200 year frequency. This is included only to recognise that circumstances beyond our control could possibly lead to a threat to supplies during an extreme drought. In practice, if we had to resort to these measures, we would have implemented our emergency plan and would seek additional support under the Civil Contingencies Act to avoid rota cuts and standpipes being required.

## 7 Environmental Impacts

In order to ensure minimum environmental impact from our drought management actions, there is a requirement to monitor and assess the impact of these activities. The Environment Agency provides guidance on the recommended approach<sup>12</sup> which we have applied to our plan. This has only been applied to supply side options as detailed in Section 6.3 as demand side measures are thought to generally have a beneficial or negligible hydrological impact.

The likely impacts on the environment of implementing the supply actions within this drought plan have been assessed, in accordance with this guidance and in consultation with the appropriate competent authorities as required. This includes details of any likely changes as a result of our actions to water flows and levels, Water Framework Directive ecological status, designated sites, priority habitats and other protected areas. Designated sites include Sites of Special Scientific Interest (SSSIs), Special Areas of Conservation (SACs), and Local Nature Reserves (LNRs), which are indicated on Figure 13 showing proximity to Company abstractions. Water Framework Directive water bodies and assessment points are shown on Figure 14.

This drought plan includes an assessment of:

- Likely impact of implementing supply side options
- Likely impact from the increased use of existing licences
- Details of permits required to implement any options
- The risks of implementing any supply side option
- Monitoring and mitigation actions required for any drought management action

We do not consider that our actions in this plan would impact on cultural or heritage sites, the spread of non-native species, water quality or biodiversity under the NERC<sup>13</sup> Act 2006

The following sections largely summarise our updated understanding of environmental and water quality receptors. The impact on the historic environment (cultural or heritage sites) was reviewed at scoping stage and our original assessment of no impact (Enviros, 2008) was found to be still the case.

We have considered the likelihood and frequency of drought management actions occurring, together with the level of environmental impact they may cause by assessing the available data and taking account of the sensitivity of receptors, such as designated or protected sites and features. Our assessments have wherever possible, followed the recommended approach in preparing an Environmental Assessment shown in Figure 15.

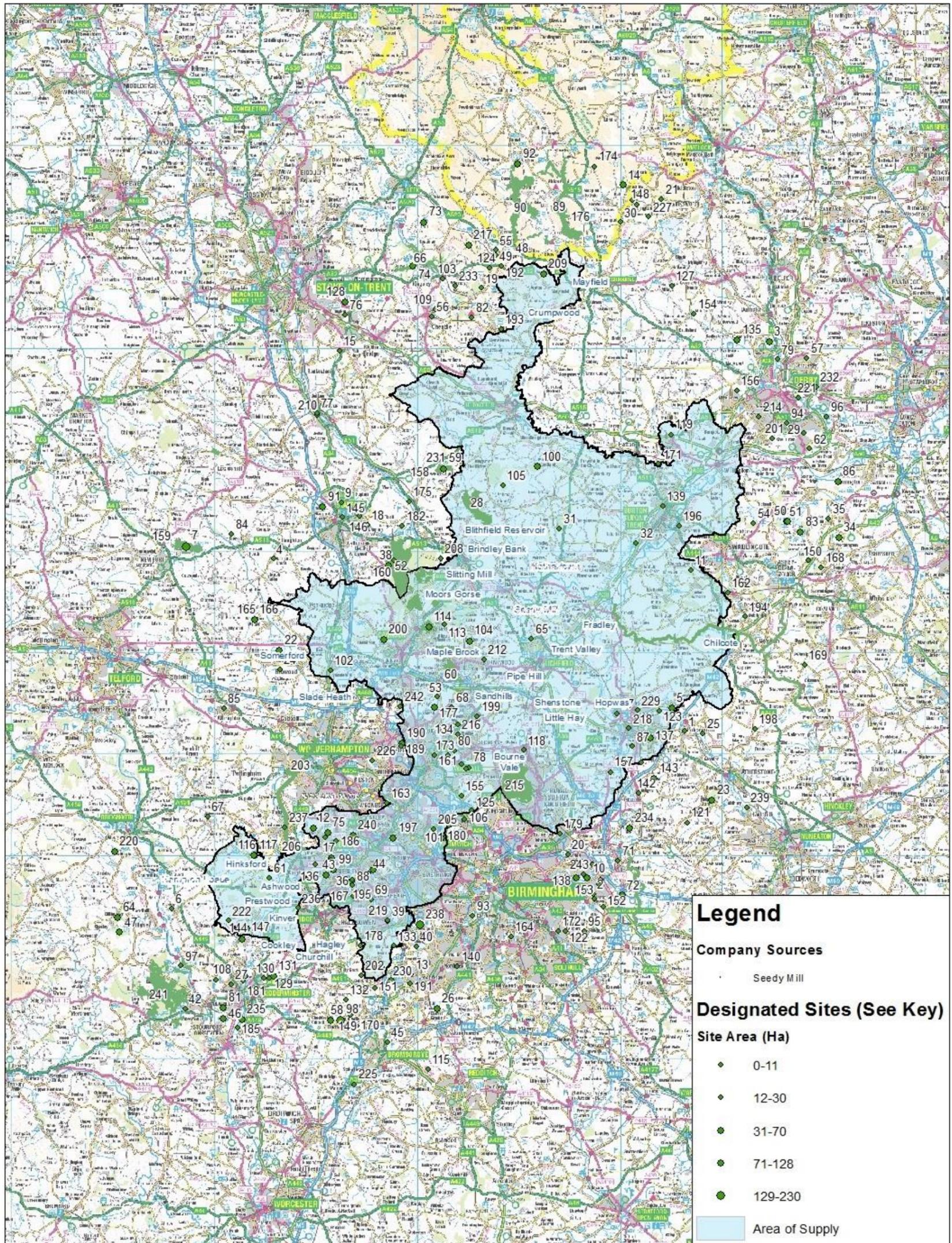
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<sup>12</sup> Environmental Assessment for Water Company Drought Plans, EA, May 2016

<sup>14</sup> Defra (2015a) Drought plans: environmental assessment and monitoring. Guidance. Part of: How to write and publish a drought plan. <https://www.gov.uk/guidance/drought-plans-environmental-assessment-and-monitoring> [accessed 19 May 2016]

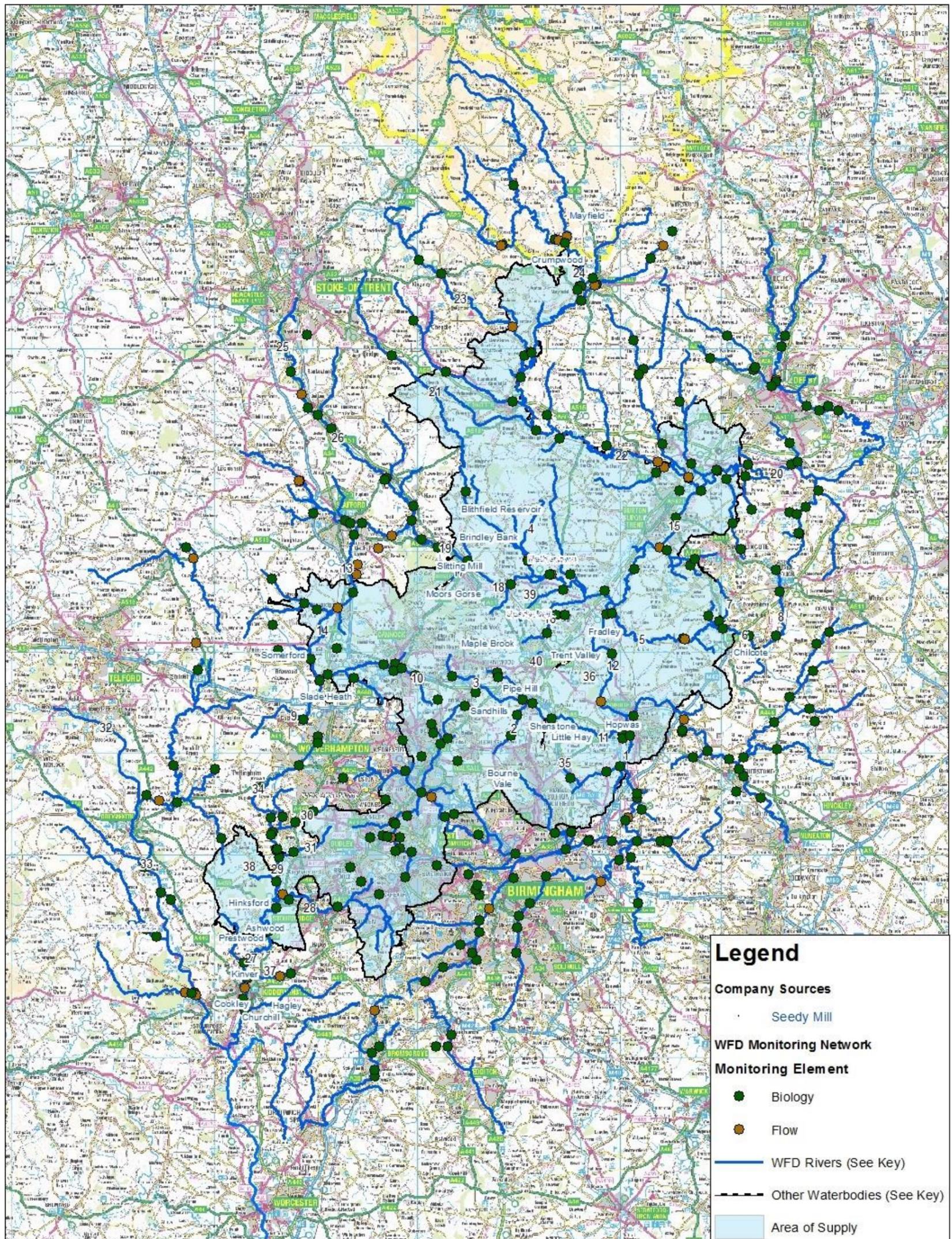
**Figure 13 South Staffordshire Water Area of Supply Showing Company Sources and Statutory Environmental Designations**

South Staffordshire Area of Supply Showing Company Sources and Statutory Environmental Designations

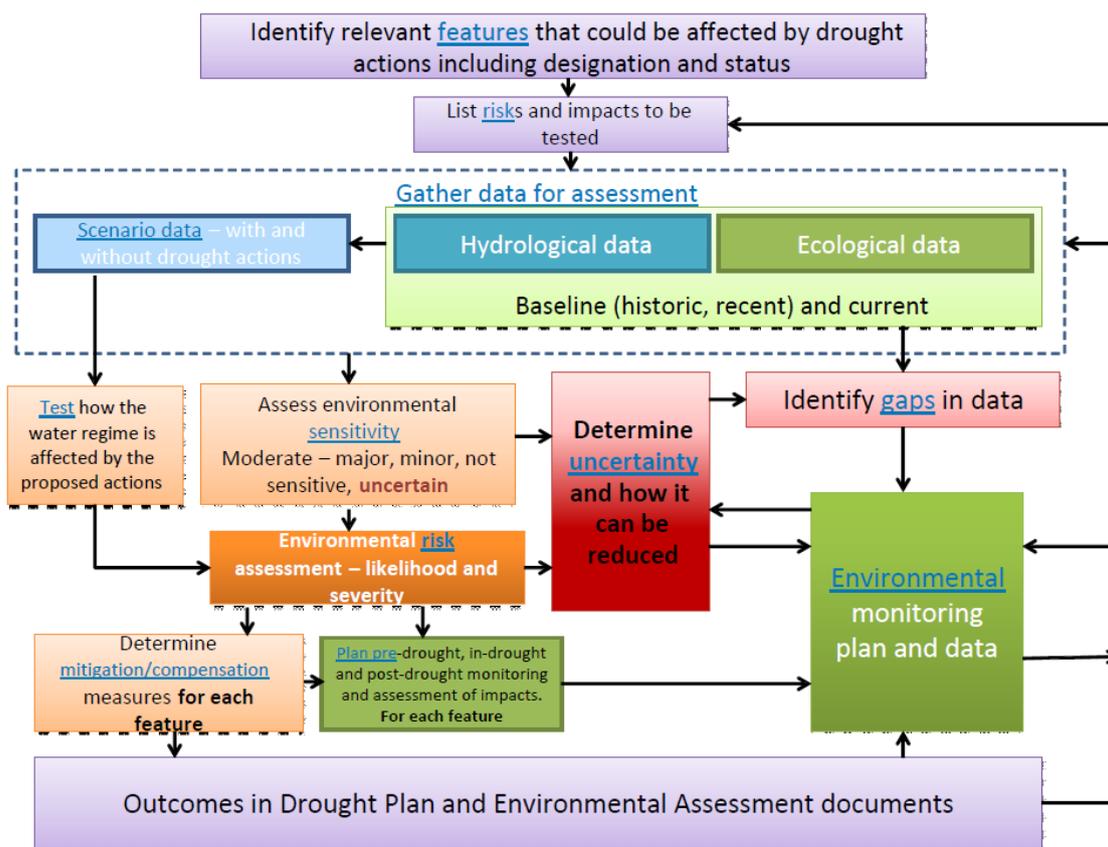


**Figure 14 South Staffordshire Water Area of Supply Showing Company Sources and Water Framework Directive Rivers and Monitoring Network**

South Staffordshire Area of Supply Showing Company Sources and Water Framework Directive Rivers and Monitoring Network



**Figure 15 Flow chart of how to prepare an environmental assessment**



Source: Environmental Assessment for Water Company Drought Plans, EA, May 2016

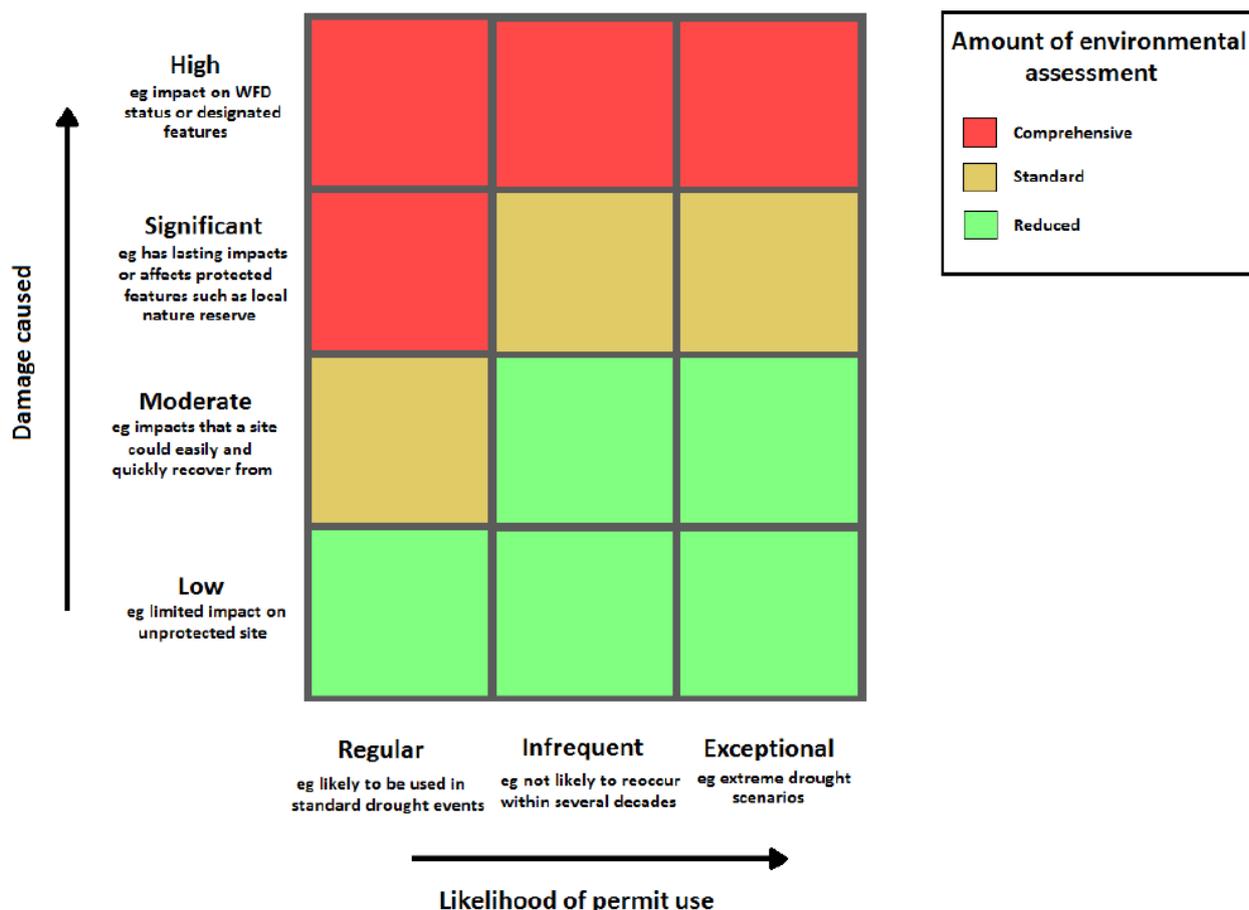
### 7.1 Supply Side Option Assessment

The likely impact of each supply side option has been assessed according to the risk matrix shown in Figure 16. These assessments, together with any associated environmental monitoring or surveys, are summarised in Environmental Assessment forms in Appendix E.

The assessment highlights those supply side options presenting most risk are the two drought permit/order options and those sources abstracting from catchments in the current National Environment Programme and these risks and associated monitoring and mitigation requirements are further discussed below.

In line with the pre-consultation comments, the risk assessment for all supply side options has included a determination whether the increased use of any licence would cause deterioration under the Water Framework Directive. The most relevant of the options in this regard are those to maximise use of existing sources. This has the effect for, drought resilient sources, of increasing abstraction from the long term recent actual to the full deployable output. With the exception of those sources where there is a well-defined link to environmental impact known through the NEP, the impacts are poorly known and/or transient owing to the high storage of the Permo Triassic sandstone aquifer. As further discussed in Section 7.6.3 there are a number of groundwater sources where further NEP investigations are planned to start in 2020 and should these provide new information suggesting some drought impact appropriate mitigation will be put in place from that time

**Figure 16 Assessing the risk level of drought management options**



Source: Environmental Assessment for Water Company Drought Plans, EA, May 2016

## 7.2 Statutory Designated Sites

We have considered the environmental effects of this plan on designated sites, to which the following legislation applies:

- Conservation of Habitats and Species Regulations 2010 – Habitats Directive
- Wildlife and Countryside Act 1981 (as amended by the Countryside and Rights of Way Act 2000)
- Habitats Regulations Assessment (HRA) and Strategic Environmental Assessment Directive (SEA)
- Water Framework Directive, River Basin management Plans and UK Biodiversity Action Plan
- Other protected areas under international agreements such as Ramsar sites and non-statutory sites, such as local wildlife sites and reserves.

The sensitivity of sites to abstraction has been assessed under the Restoration of Sustainable Abstraction Programme (RSA) in conjunction with the Environment Agency under the National Environmental Programme, and will continue to be assessed as part of the EA Sustainable Catchments programme. We have assessed the impacts of increasing abstractions within existing licenced quantities to inform our drought management decision making where this includes flexing abstractions within our published deployable output. The current and future status of these assessments is discussed in Section 7.5.

The sensitivity of Habitats Directive sites are discussed in Section 7.4.

The details of our assessment of environmental impacts arising from implementation of the River Severn Works and Rivers Blithe and Trent Pumpback drought schemes are contained within Appendix F and are summarised below. The monitoring and mitigation plans recommended as a consequence of this work are detailed in Section 8.

### **7.3 Assessments of environmental impact arising from implementation of drought permits and orders**

#### **Methodology**

The impact assessment method follows Defra and EA guidance (Defra 2015a<sup>14</sup>; Environment Agency 2016<sup>15</sup>). These are also consistent with the standard approach recommended for environmental risk assessment and management (CIEEM 2016<sup>16</sup>).

In keeping with this guidance, the study identifies and predicts the magnitude and significance of potential impacts of implementing a River Severn Works Drought Order (DO) compared to the effect of a natural drought (with normal rates of abstraction) on the existing environment. As a drought is possible at any time of the year, the impacts are considered for each season, consider cumulative and in-combination effects, and clearly differentiate between pre-mitigation and post-mitigation impacts, presenting the results for both. Where there are potential impacts on designated sites, these are clearly identified.

The method considers impacts on receptors, a receptor being an organism, habitat or water use activity that may be affected by changes in water availability caused by DO implementation. Table 5 provides a summary of outcomes, which can be positive as well as negative. For water use activities, assessment of impact is more qualitative, being based on expert judgment.

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<sup>14</sup> Defra (2015a) Drought plans: environmental assessment and monitoring. Guidance. Part of: How to write and publish a drought plan. <https://www.gov.uk/guidance/drought-plans-environmental-assessment-and-monitoring> [accessed 19 May 2016]

<sup>15</sup> Environment Agency (2016) Drought plan guideline extra information. Supplement to Environmental Assessment for Water Company Drought Plans. Environment Agency, May 2016.

<sup>16</sup> CIEEM (2016) Guidelines for ecological impact assessment in the UK and Ireland. Terrestrial, freshwater and coastal. Second Edition. Chartered Institute of Ecology and Environmental Management. January 2016. 61 pp.

**Table 5 Impact significance as derived from magnitude of effect and receptor value**

Magnitude of effect	Receptor value				
	International	National	Regional / County	District / Parish	Negligible
High Negative	Critical	Major	Major	Moderate	Negligible
Medium Negative	Major	Moderate	Moderate	Minor	Negligible
Low Negative	Moderate	Minor	Minor	Minor	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Low Positive	Negligible	Negligible	Negligible	Negligible	Negligible
Medium Positive	Critical	Major	Moderate	Minor	Negligible
High positive	Substantial	Major	Major	Moderate	Negligible

### River Severn at River Severn Works

To estimate impacts, the assessment adopted a source-pathway-receptor methodology, which is analogous to the pressures, states and impacts used in the DPSIR (Drivers, Pressures, State, Impact and Response) framework adopted by the European Environment Agency (EEA) to link socio-economy with ecology (EEA 2007<sup>17</sup>) to support the implementation of the WFD. In the context of this impact assessment, and given the current and historical uses of the river and its catchment, the risk pathways may be defined as follows.

#### Sources (pressures)

The primary pressure is the River Severn Works drought order. A drought order would either allow up to 192 MI/d to be abstracted when a 5% reduction would otherwise be imposed, or to increase abstraction to the maximum operational capacity of the Severn works (216 MI/d).

Continued or increased abstraction during a time of drought may be considered the main pressure. However, reduced flow attributable to the River Severn Works abstraction may act in concert with other existing stressors (which themselves may be further exacerbated by flow reduction) such as point and diffuse sources of organic pollution and nutrients from wastewater treatment works and agriculture, as well as morphological impacts (e.g. channel modification) and smaller scale abstractions from other water users.

#### Pathways (states)

These are physical and chemical mechanisms by which the sources (pressures) affect the ecology of the River Severn and the Severn Estuary SAC downstream of

<sup>17</sup> EEA (European Environment Agency) (2007). Halting the loss of biodiversity by 2010: proposal for a first set of indicators to monitor progress in Europe. EEA Technical Report 11/2007, Luxembourg, 38 pp.

the abstraction, including reduced flows and associated hydraulic and geomorphological changes, and effects on water quality.

*Receptors (impacts)*

These are the potential effects of the pressures via the pathways identified on the aquatic habitat, water quality, aquatic ecology, other river users and heritage features in the river reaches identified above.

For each receptor, the potential for effects from the proposed drought order operations have been assessed. Where a significant moderate (or higher) impact is identified, the procedure followed is to consider appropriate mitigation measures.

A summary of predicted impacts is given in Table 6.

For most receptors, only negligible or minor negative impacts have been predicted, particularly for the riverine reaches. The continual improvement in water quality in the River Severn over the last two decades has reduced the sensitivity of certain receptors to low flow events and in general, monitoring data show that river ecology recovers fairly rapidly after droughts. Whilst in-combination impacts with downstream abstractions are also predicted to be negligible, some in-combination effects on the Severn Estuary, particularly associated with the Gloucester and Sharpness Canal abstraction cannot be ruled out.

**Table 6 Summary of predicted impacts from River Severn Works (River Severn) Drought Order**

Impact type	Description of effect				Receptor value	Impact significance	Certainty	Effect on WFD status			
	Timing	Scale	Duration	Magnitude				Potential change	Certainty		
<b>Habitat</b>											
3b River Severn Works to Bewdley	All year	Negligible	Medium term	Negligible	Regional / county	Negligible	Certain	None	Certain		
4 Bewdley to Teme confluence	All year	Negligible	Medium term	Negligible	Regional / county	Negligible	Certain	None	Certain		
5 Teme confluence to Avon confluence	All year	Negligible	Medium term	Negligible	Regional / county	Negligible	Certain	None	Certain		
6 Avon confluence to Maisemore	All year	Negligible	Medium term	Negligible	Regional / county	Negligible	Certain	None	Certain		
<b>Water quality</b>											
3b River Severn Works to Bewdley	All year	Negligible	Medium term	Negligible	Regional / county	Negligible	Certain	None	Certain		
4 Bewdley to Teme confluence	All year	Negligible	Medium term	Negligible	Regional / county	Negligible	Certain	None	Certain		
5 Teme confluence to Avon confluence	All year	Negligible	Medium term	Negligible	Regional / county	Negligible	Certain	None	Certain		
6 Avon confluence to Maisemore	All year	Negligible	Medium term	Negligible	Regional / county	Negligible	Certain	None	Certain		
<b>Fish</b>											
Barbel	Spawning		Spr-Sum								
	Egg incubation		Spr-Sum								
	Juvenile		All year	Negligible	Short term	Negligible	International	Negligible	Uncertain	None	Certain
	Adults		All year								
Brown trout	Spawning		Aut-Win								
	Egg incubation		Aut-Win								
	Juvenile		All year	Negligible	Short term	Negligible	Regional	Negligible	Uncertain	None	Certain
	Adults		All year								
Bullhead	Spawning		Spr								
	Egg incubation		Spr-Sum	Negligible	Short term	Negligible	International	Negligible	Uncertain	None	Certain
	Adults		All year								

Impact type	Description of effect				Receptor value	Impact significance	Certainty	Effect on WFD status		
	Timing	Scale	Duration	Magnitude				Potential change	Certainty	
Chub	Spawning	Spr	Negligible	Short term	Negligible	Regional	Negligible	Uncertain	None	Certain
	Egg incubation	Spr-Sum								
	Juvenile	All year								
	Adults	All year								
Dace	Spawning	Spr	Negligible	Short term	Negligible	Regional	Negligible	Uncertain	None	Certain
	Egg incubation	Spr-Sum								
	Juvenile	All year								
	Adults	All year								
Eel	Elver U/S migration	Spr-Aut	Negligible	Short term	Negligible	International	Negligible	Uncertain	None	Certain
	Adult D/S migration	Aut								
Lamprey (Brook)	Spawning	Spr	Negligible	Short term	Negligible	International	Negligible	Uncertain	None	Certain
	Egg incubation	Spr-Sum								
	Ammocoetes	All year								
Lamprey (River)	Spawning	Spr	Negligible	Short term	Negligible	International	Negligible	Uncertain	None	Certain
	Egg incubation	Spr-Sum								
	Ammocoetes	All year								
	Adult U/S migration	Aut-Spr								
	Juvenile D/S migration	Aut-Spr								
Lamprey (Sea)	Spawning	Spr-Sum	Negligible	Short term	Negligible	International	Negligible	Uncertain	None	Certain
	Egg incubation	Spr-Sum								
	Ammocoetes	All year								
	Adult U/S migration	Spr-Sum								
	Juvenile D/S migration	Aut-Spr								

Impact type	Description of effect					Receptor value	Impact significance	Certainty	Effect on WFD status	
	Timing	Scale	Duration	Magnitude	Potential change				Certainty	
Salmon	Spawning	Aut-Win	N/A	N/A	N/A	N/A	N/A	Uncertain	None	Certain
	Egg incubation	Aut-Spr	N/A	N/A	N/A	N/A	N/A			
	Juvenile	All year	N/A	N/A	N/A	N/A	N/A			
	Adult U/S migration	All year	Negligible	Short	Negligible	International	Negligible			
	Smolt D/S migration	Aut-Spr	Negligible	Short	Negligible	International	Negligible			
Sea trout	Spawning	Aut-Win	N/A	N/A	N/A	N/A	N/A	Uncertain	None	Certain
	Egg incubation	Aut-Win	N/A	N/A	N/A	N/A	N/A			
	Juvenile	All year	N/A	N/A	N/A	N/A	N/A			
	Adult U/S migration	All year	Negligible	Short	Negligible	Regional	Negligible			
	Smolt D/S migration	Win-Spr	Negligible	Short	Negligible	Regional	Negligible			
Twaite shad	Adult U/S migration	Spr	Negligible	Short	Negligible	International	Negligible	Uncertain	None	Certain
	Spawning	Spr								
	Egg incubation	Spr-Sum								
	Juvenile D/S migration	Sum-Aut								
<b>Macroinvertebrates</b>										
3b: River Severn Works to Bewdley	All year	Negligible	Medium	Negligible	Regional / county	Negligible	Uncertain	None	Certain	
4: Bewdley to Teme Confluence	All year	Negligible	Medium	Negligible	Regional / county	Negligible	Uncertain	None	Certain	
5: Teme Confluence to Avon Confluence	All year	Negligible	Medium	Negligible	Regional / county	Negligible	Uncertain	None	Certain	
6: Avon Confluence to Maisemore	All year	Negligible	Medium	Negligible	Regional / county	Negligible	Uncertain	None	Certain	
Setodes punctatus	All year	Negligible	Medium	Negligible	International	Negligible	Uncertain	None	Certain	

Impact type	Description of effect				Receptor value	Impact significance	Certainty	Effect on WFD status	
	Timing	Scale	Duration	Magnitude				Potential change	Certainty
<b>Otter</b>									
Reaches 3b-6: Water quality	All year	Negligible	Medium	Negligible	International	Negligible	Certain	N/A	
Reaches 3b-6: Habitat loss	All year	Negligible	Medium	Negligible	International	Negligible	Certain	N/A	
Reaches 3b-6: Food availability	All year	Negligible	Medium	Negligible	International	Negligible	Certain	N/A	
<b>Macrophytes</b>									
3b: River Severn to Bewdley	All year	Negligible	Medium	Negligible	Regional / county	Negligible	Certain	None	Certain
4: Bewdley to Teme Confluence	All year	Negligible	Medium	Negligible	Regional / county	Negligible	Certain	None	Certain
<b>Invasive non-native species</b>									
Zebra mussel	All year	Negligible	Medium	Negligible	National	Negligible	Uncertain	None	Certain
Signal crayfish	All year	Negligible	Medium	Negligible	National	Negligible	Uncertain	None	Certain
Demon shrimp	All year	Negligible	Medium	Negligible	National	Negligible	Uncertain	None	Certain
Bloody red shrimp	All year	Negligible	Medium	Negligible	National	Negligible	Uncertain	None	Certain
Himalayan balsam	Spr-Aut	Small	Medium	Low	National	Minor -ve	Uncertain	None	Certain
Japanese knotweed	Spr-Aut	Small	Medium	Low	National	Minor -ve	Uncertain	None	Certain
<b>Recreation, navigation, archaeology and heritage</b>									
3b: River Severn to Bewdley	Recreation	All year	Negligible	Medium	Negligible	National	Negligible	Certain	N/A
	Navigation					National			
	Archaeology and heritage					Negligible			

Impact type	Description of effect					Receptor value	Impact significance	Certainty	Effect on WFD status	
	Timing	Scale	Duration	Magnitude	Potential change				Certainty	
4: Bewdley to Teme Confluence	Recreation	All year	Negligible	Medium	Negligible	National	Negligible	Certain	N/A	
	Navigation					International				
	Archaeology and heritage					National				
5: Teme Confluence to Avon Confluence	Recreation	All year	Negligible	Medium	Negligible	National	Negligible	Certain	N/A	
	Navigation					International				
	Archaeology and heritage					National				
6: Avon Confluence to Maisemore	Recreation	All year	Negligible	Medium	Negligible	National	Negligible	Certain	N/A	
	Navigation					International				
	Archaeology and heritage					National				
<b>Industrial and commercial users</b>										
3b: River Severn to Bewdley	All year	Negligible	Short	Negligible	Regional / County	Negligible	Certain	N/A		
4: Bewdley to Teme Confluence	All year	Negligible	Short	Negligible	Regional / County	Negligible	Certain	N/A		
5: Teme Confluence to Avon Confluence	All year	Negligible	Short	Negligible	Regional / County	Negligible	Certain	N/A		
6: Avon Confluence to Maisemore	All year	Negligible	Short	Negligible	Regional / County	Negligible	Certain	N/A		

## River Blithe and River Trent Pumpback

Impacts have been calculated for two scenarios according to the current conditions of the River Trent pumpback (A – 9 Ml/d; B – 17Ml/d) as compared to the Lowest Daily Flow of 15.5 Ml/d recorded during the 1976 drought. A tabular summary of impacts on water quality and ecological receptors is provided in Table 7 and these are discussed below. Note that all impacts are considered to be negative unless otherwise stated.

### *7.3.1.1.1 Impacts on physicochemistry*

The physical environment and water quality are not classed as receptors, but instead as processes that will affect receptors.

There is little impact on hydraulics anticipated in the reach of the River Trent affected by the Drought Permit (DP) abstraction, with the possible exception of reductions in velocity. Hydraulic changes in the lowest reach of the River Blithe between the intake and the confluence with the River Trent, are greatest when pumpback flows are reduced to 9 Ml/d (Scenario A), but do not exceed 20% of the Lowest Daily Flow and would be over a very short reach.

Little increase in sedimentation is expected, and the daily period when the River Blithe abstraction is stopped to facilitate fish movement will have a small flushing effect, so sediment will be subjected to frequent disturbance and redistribution.

Water quality impacts are considered to be negligible for the River Trent, and for the River Blithe most water quality elements are negligible.

### *7.3.1.1.2 Impacts on fish*

The habitat analysis indicated that the drought permit would cause impacts to spawning and adult habitat for several fish species. However, the River Blithe downstream of the site is a relatively homogenous reach and suitable spawning habitat is absent in this section. Adverse impacts to fish habitat associated with the drought permit are therefore considered to be negligible.

The drought permit has the potential to reduce fish passage at the Pumpback weir due to a reduction in the frequency and magnitude of flows through the fish pass.

Impacts in the River Trent are predicted to be negligible.

### *7.3.1.1.3 Impacts on other ecological receptors*

Impacts on macroinvertebrates in the River Blithe are predicted to be of minor significance for habitat loss and water quality, and negligible significance for flow modification and sedimentation. This acknowledges some unknowns in the indirect impact of increased phosphate loading, but also that impacts will be very localised and recovery will be relatively rapid. No significant impacts are predicted in the River Trent.

Based on the knowledge of otters' feeding behaviour and the predicted magnitude of habitat changes under reduced flow, it is considered that implementation of the drought permit is likely to have Negligible or Low impact on otters.

### *7.3.1.1.4 Impacts on invasive non-native species*

A Pumpback water transfer scheme could potentially transport zebra mussel from the River Trent to the lowest reach of the River Blithe, which would have a minor negative impact on the river as its effect would be localised. The mussel is prevented from actively moving further upstream due to the presence of the fish pass. There may also

be a minor negative impact of Himalayan balsam and the New Zealand mud snail. Other impacts are considered negligible. It is, however, important to emphasise the degree of uncertainty in these predictions. There is also an absence of available information on several high impact species that may be present, and therefore as a precautionary approach their impacts are classed as unknown and they are included in monitoring proposals.

#### *7.3.1.1.5 Impacts on socio-economic receptors*

Impacts on recreational boating are considered to be negligible. Impacts on industrial and commercial use, in the form of irrigation water abstraction, are negligible. Impact on anglers and fishing is negligible for the Rivers Blithe and Trent but is predicted to be low for Blithfield Reservoir.

#### *7.3.1.1.6 Summary of impacts water quality and ecological receptors*

A tabular summary of impacts on water quality and ecological receptors is provided in Table 7.

#### **Transfer of Potable Water to Blithfield Reservoir**

As part of the review of the River Blithe Pumpback drought permit the same techniques were used to assess the impact of the potable water transfer to Blithfield Reservoir (Table 8). This scheme is independent of the drought permit and therefore not conditional on its operation, but some of the same receptors are involved.

The assessment concluded that water transfer from the potable water network may potentially have a negative impact on phosphate concentrations as the Company routinely doses its supplies with phosphate for plumbo-solvency control, to reduce the risk of lead entering customers' taps from lead supply pipes. This may potentially temporarily raise phosphate concentrations such that they align with a lower WFD classification. However, the time required for the transfer to move phosphate concentration into the Bad category far exceeds the time over which the transfer would operate (as it only operates during winter months). The impact on phosphate concentration, and therefore WFD classification, of the DP operation per se is negligible. The overall impact significance (Table 8) is predicted to be at worst (if the transfer is operated longer than planned) moderate negative for Blithfield Reservoir, in view of its SSSI status, and minor negative for the River Blithe, as it has a lower receptor value than the reservoir.

**Table 7 Summary of impacts on water quality and ecological receptors from River Blithe Pumpback Drought Permit**

Key: Neg=negligible.

a) River Blithe

Scenario	Impact type		Description of effect				Receptor value	Impact significance	Certainty	Effect on WFD status			Monitoring required	Mitigation required
	Impact type 1	Impact type 2	Timing	Scale	Duration	Magnitude				Potential change	Likely duration	Certainty		
A+B	Water quality	Phosphate	All year	Large	Medium	Med	District	Minor -ve	Uncertain	Yes	Medium	Uncertain	Yes	No
A	Brown trout/salmon	Habitat	All year	Small	Medium	Med	Nat	Minor -ve	Uncertain	No			Yes	No
B	Brown trout/salmon	Habitat	Winter, spring	Neg	Medium	Med	Nat	Neg	Certain	No			No	No
A	Bullhead	Habitat	All year	Small	Medium	Med	Nat	Minor -ve	Uncertain	No			Yes	No
B	Bullhead	Habitat	Winter, spring	Neg				Neg	Certain	No			No	No
A	Spined loach	Habitat	All year	Small	Medium	Low	Nat	Minor +ve	Uncertain	No			Yes	No
B	Spined loach	Habitat	Winter, spring	Neg				Neg	Certain	No			No	No
A	Dace	Habitat	All year	Small	Medium	Medium	Nat	Minor -ve	Uncertain	No			Yes	No
B	Dace	Habitat	Winter, spring	Neg				Neg	Certain	No			No	No
A	River/ brook lamprey	Habitat	All year	Small	Medium	Low	Nat	Minor -ve	Uncertain	No			Yes	No
B	River/ brook lamprey	Habitat	Winter, spring	Neg				Neg	Certain	No			No	No
A+B	Fish passage		All year	Small	Medium	Low	Nat	Minor -ve	Uncertain	No			Yes	Yes
A+B	All fish	Water quality	All year	Neg				Neg	Certain	No			No	No
A	Macroinvertebrates	Habitat	All year	Small	Medium	Low	District	Minor -ve	Certain	No			No	No

Scenario	Impact type		Description of effect				Receptor value	Impact significance	Certainty	Effect on WFD status			Monitoring required	Mitigation required
	Impact type 1	Impact type 2	Timing	Scale	Duration	Magnitude				Potential change	Likely duration	Certainty		
B	Macroinvertebrates	Habitat	Winter, spring	Neg				<b>Neg</b>	Certain	No			No	No
A	Macroinvertebrates	Flow modification	All year	Neg				<b>Neg</b>	Certain	No			No	No
B	Macroinvertebrates	Flow modification	Winter, spring	Neg				<b>Neg</b>	Certain	No			No	No
A	Macroinvertebrates	Sedimentation	All year	Neg				<b>Neg</b>	Certain	No			No	No
B	Macroinvertebrates	Sedimentation	Winter, spring	Neg				<b>Neg</b>	Certain	No			No	No
A	Macroinvertebrates	Water quality	All year	Small	Medium	Low	District	<b>Minor -ve</b>	Certain	No			No	No
B	Macroinvertebrates	Water quality	Winter, spring	Small	Medium	Low	District	<b>Minor -ve</b>	Certain	No			No	No
A+B	Otter	Water quality	All year	Neg				<b>Neg</b>	Certain	No			No	No
A	Otter	Habitat	All year	Neg				<b>Neg</b>	Certain	No			No	No
B	Otter	Habitat	Winter, spring	Neg				<b>Neg</b>	Certain	No			No	No
A+B	Otter	Food availability	All year	Neg				<b>Neg</b>	Certain	No			No	No
A+B	Invasive species	Zebra mussel*	All year	Small	Permanent	Medium	National	<b>Minor -ve</b>	Uncertain	No			Yes	Yes
A+B	Invasive species	Himalayan balsam	All year	Small	Medium	Medium	National	<b>Minor -ve</b>	Uncertain	No			Yes	No
A+B	Invasive species	New Zealand mud snail	All year	Small	Medium	Low	Regional	<b>Minor -ve</b>	Uncertain	No			No	No
A+B	Invasive species	Other species	All year	Negligible				<b>Neg</b>	Uncertain	No			Yes	No

\*Impact downgraded from moderate due to the very small length of river affected.

b) River Trent

Scenario	Impact type		Description of effect				Receptor value	Impact significance	Certainty	Effect on WFD status			Monitoring required	Mitigation required
	Impact type 1	Impact type 2	Timing	Scale	Duration	Magnitude				Potential change	Likely duration	Certainty		
A+B	Water quality	Phosphate	All year	Neg				<b>Neg</b>	Certain	No			No	No
A+B	Brown trout/salmon	Habitat	All year	Neg				<b>Neg</b>	Certain	No			No	No
A+B	Bullhead	Habitat	All year	Neg				<b>Neg</b>	Certain	No			No	No
A+B	Dace	Habitat	All year	Neg				<b>Neg</b>	Certain	No			No	No
A+B	River/ brook lamprey	Habitat	All year	Neg				<b>Neg</b>	Certain	No			No	No
A+B	Macroinvertebrates	Habitat	All year	Neg				<b>Neg</b>	Certain	No			No	No
A+B	Macroinvertebrates	Flow modification	All year	Neg				<b>Neg</b>	Certain	No			No	No
A+B	Macroinvertebrates	Sedimentation	All year	Neg				<b>Neg</b>	Certain	No			No	No
A+B	Macroinvertebrates	Water quality	All year	Neg				<b>Neg</b>	Certain	No			No	No
A+B	Otter	Water quality	All year	Neg				<b>Neg</b>	Certain	No			No	No
A+B	Otter	Habitat	All year	Neg				<b>Neg</b>	Certain	No			No	No
A+B	Otter	Food availability	All year	Neg				<b>Neg</b>	Certain	No			No	No
A+B	Invasive species	All species	All year	Neg				<b>Neg</b>	Certain	No			No	No

**Table 8 Summary of impacts on water quality and ecological receptors from Transfer of Potable Water to Blithfield Reservoir**

Scenario	Impact type		Description of effect				Receptor value	Impact significance	Certainty	Effect on WFD status			Monitoring required	Mitigation required
	Impact type 1	Impact type 2	Timing	Scale	Duration	Magnitude				Potential change	Likely duration	Certainty		
A+B	Water quality	Phosphate	All year	Large	Medium	Med	Regional	<b>Mod -ve</b>	Uncertain	Yes	Medium	Uncertain	Yes	Yes

## 7.4 Habitats Regulations Assessment

The EU Habitats Directive, which seeks to safeguard Europe's natural heritage, was transposed into UK law by the Habitats Regulations 1994. The Regulations require a Habitats Regulations Assessment (HRA) to be undertaken to determine whether plans are likely to have a significant effect on European Sites, including Special Areas for Conservation (SACs), candidate SACs (cSACs), Special Protection Areas (SPAs) and Ramsar sites (Wetlands of international importance).

The Company has carried out the following HRA in fulfilment of its Habitats Regulations obligations.

A study of the River Mease in AMP4<sup>18</sup> looked into the potential impacts of groundwater abstraction on this SAC by the Company at Chilcote. This study concluded that there is no evidence to suggest that abstraction at current rates is causing a significant detrimental impact on the river flow. It stated that, in general, anthropogenic pressures on river flows (abstraction and discharges) are in balance. At the time of the study, Chilcote PWS was operating close to the average daily licence limit (6.9 Ml/d). The peak licence rate was and remains restricted by the treatment plant currently on site. Given the semi confined nature of the aquifer and the slow response rate of surface water to changes in abstraction, it was assessed as very unlikely that short periods of abstraction at the higher, peak licence rate will be translated into impacts on the river low flows as long as annual abstraction remains the same.

In addition to Habitats Directive sites within or immediately adjacent to the Company's supply area, the Company has reviewed downstream sites that may be affected by its activities. The result was that the Severn Estuary Special Area of Conservation (SAC) and Ramsar site were assessed within the HRA of the River Severn Drought Scheme (RSDO) environmental assessment work in 2012<sup>19</sup>. The site encompasses an area of 73,715 hectares predominantly comprising mudflats and sandbank habitats with small areas of reef and salt meadow. The estuary provides a migratory conduit for diadromous fish species. The report concluded that no significant effects are likely as a result of the River Severn Works DP proposals 'alone'; however, it is not possible to conclude no adverse effect 'in-combination' with other drought schemes operated by Severn Trent Water and the Environment Agency as a result of the Gloucester and Sharpness Canal abstraction operated by the Canal and River Trust (CRT) by the Severn Estuary. This issue is also reported as unresolved in the latest published assessment by the Environment Agency (2013<sup>20</sup>). They however assessed that if the abstraction by the CRT to the Gloucester & Sharpness Canal could be limited to 300 Ml/d there would be adequate mitigation against impact on the site and its designated species by the various drought measures in combination. If the EA cannot secure agreement with the CRT it has stated it would have proved grounds of Imperative Reasons of Overriding Public Interest under the Habitats Directive to allow it to impose the RSDO.

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<sup>18</sup> AMP4 Low Flow Investigation Sites Desk Study: River Mease, Report 6608R5, ESI June 2006

<sup>19</sup> Review and Update of Drought Permit Environmental Assessment Report: River Severn at River Severn Works HRA. Report 60757 R1D2 Appendix B, ESI November 2012

<sup>20</sup> Habitats Regulations Assessment (River Severn Drought Order) EA Report Version 3 - December 2013

## 7.5 Strategic Environmental Assessment

European Directive 2001/42/EC, otherwise known as the Strategic Environmental Assessment or SEA Directive, requires the “assessment of the effects of certain plans and programmes on the environment”. Information and guidance on to how to comply with the Directive was published by the Office of the Deputy Prime Minister (ODPM), in its 2005 publication *A Practical Guide to the Strategic Environmental Assessment*. A subsequent UKWIR report<sup>21</sup>, adapted the ODPM guidance for the water industry.

The decision-making process set out in the UKWIR report to determine whether plans require an SEA is presented in the form of a decision tree, which is reproduced as Figure 17.

Water companies, as responsible authorities, must determine if their drought plans fall within the scope of the SEA Directive. The Company has followed the UKWIR guidance, the decision tree, and the Environment Agency’s drought planning guideline to arrive at an informed decision in this regard. The conclusions of the process are summarised below.

The response to questions 1 and 2 is “yes”, as South Staffs Water is clearly an ‘authority’ within the meaning of the Directive, and the drought plan is a statutory requirement.

In response to question 3, although the drought plan is prepared for water management, it does not set a framework for future development consent of projects in Annexes I and II to the EIA Directive (Art. 3.2(a))

Question 4 asks whether the plan, in view of its likely effect on sites, requires an assessment under Article 6 or 7 of the Habitats Directive (Art. 3.2(b)). This question has been addressed in our environmental assessment and in Section 7.4 above and the Company has concluded, with the endorsement of Natural England, that no assessment is needed.

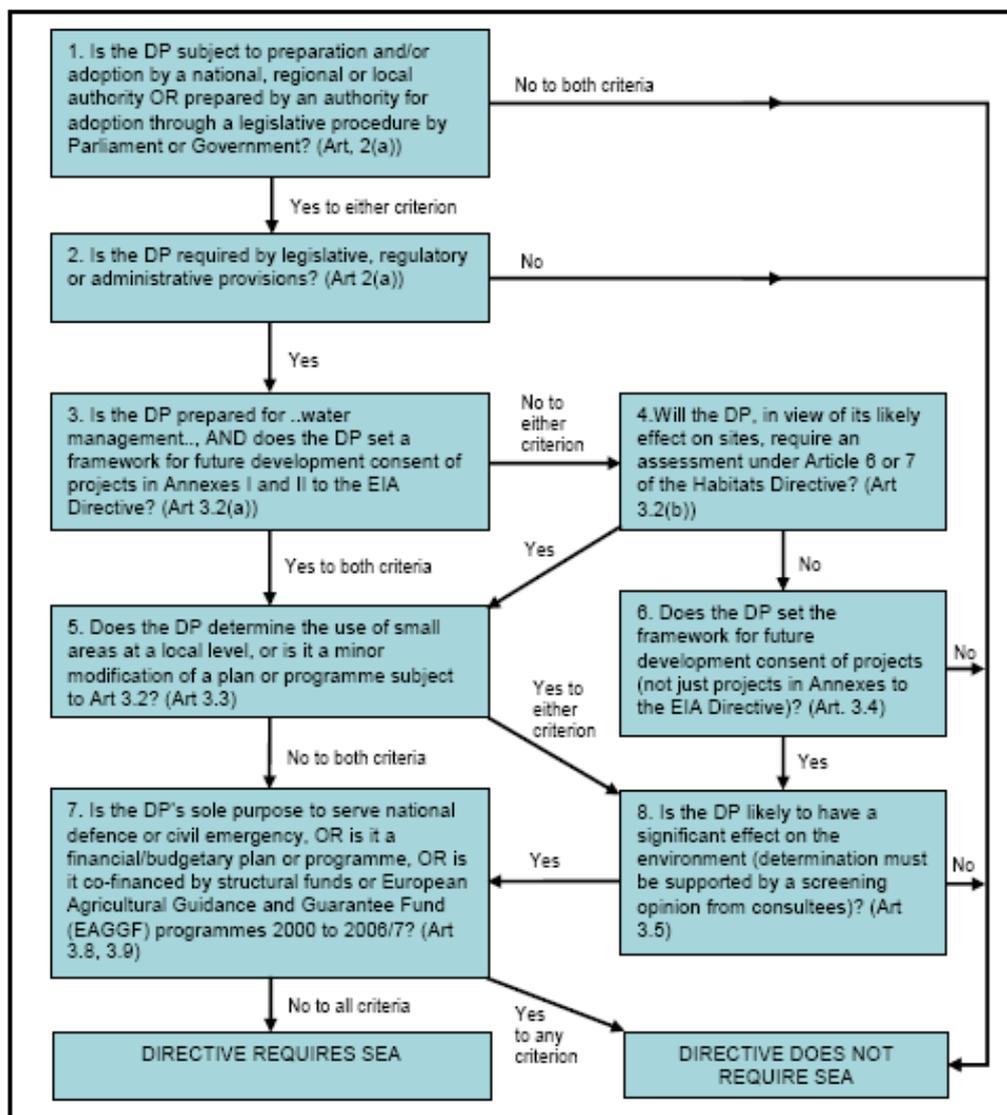
Question 6 seeks to determine whether the plan sets the framework for future development consent of projects (not just projects in Annexes to the EIA Directive) (Art. 3.4). The drought plan for the Cambridge region drought plan does not set the framework for future development consent, and the answer is therefore “no” to this question.

Having followed published guidance it is the Company’s conclusion that a Strategic Environmental Assessment (SEA) is not required in respect of this drought plan.

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<sup>21</sup> Strategic Environmental Assessment – Guidance for Water Resources Management Plans and Drought Plans (07/WR/02/5), UKWIR 2007

**Figure 17 Decision Tree for Strategic Environmental Assessment (SEA)**



## 7.6 National Environment Programme

### 7.6.1 Previous investigations

The National Environment Programme (NEP) seeks to identify catchments where public water supply abstraction is damaging the environment and requires companies to implement schemes to mitigate this damage. Since 2010 this objective has been to ensure that all water bodies (wetlands, lakes, streams and rivers) achieve Good Ecological Status (GES) under the Water Framework Directive (WFD) as enacted under UK legislation. Where water bodies are heavily modified for the purposes of navigation or water supply (e.g. reservoirs) the objective under WFD is to achieve a lesser level i.e. Good Ecological Potential (GEP). The NEP supersedes previous initiatives going back to the 1980's such as the Low Flows project, and is also known as the Restoring Sustainable Abstraction (RSA) initiative.

The NEP generally seeks to rectify problems that exist under normal year abstraction conditions, although these may only be seasonal e.g. dry stream beds in summer. Nevertheless schemes are designed to be reasonably resilient against drought, in as much as the scheme is not expected to outperform natural drought conditions, without abstraction.

### **Leamonsley Brook and Stowe Pool SSSI**

These water bodies were studied in the 1990's and identified among the Top 40 Low Flow Rivers. As a consequence a mitigation scheme was implemented in the late 1990's by South Staffs Water relocating and reducing groundwater abstraction in the area to allow groundwater levels to recover and restore baseflow from the aquifer to these streams and pools.

In addition a number of drought schemes were put in place to provide additional support in the case of an exceptional dry year.

- SSW augmentation to lakes at Maple Hayes School
- EA river augmentation Pipe Green Borehole
- SSW river augmentation Hanch Tunnel Shaft 20

The borehole augmentation points have been formally licenced by means of abstraction licences since the last Drought Plan. The drought measures are administered by the EA on the basis of their monitoring network. The drought measures were operated successfully in the 2010/12 drought and are not of concern for the purposes of this Plan.

### **Blakedown Brook and Hurcott and Podmore Pools SSSI**

Following concerns raised by Natural England and local people over the drying of historic mill ponds of amenity and environmental significance during a series of dry years in the 1990's, a joint investigation was carried out by the Environment Agency, South Staffs Water and Severn Trent Water (STWL). This led to a number of measures to support pool levels and river flows in summer periods and dry years.

- EA augmentation of levels in Pavilion and Swan Pools by boreholes
- STWL augmentation of Blakedown Brook with enhanced treated sewage effluent from Roundhills Sewage Works (known as the Hagley Pumpback scheme)
- SSW support of Windmill Pool by borehole augmentation
- SSW reductions in groundwater abstraction from Hagley Pumping Station

The measures are administered by the EA on the basis of their monitoring of pool levels and river flows. They were operated successfully in the 2010/12 drought and are not of concern for the purposes of this Plan in terms of flows and levels.

Nevertheless the scheme is under current investigation due to evidence of poor to moderate ecological status as evidenced by ecological and chemical criteria. This is further discussed below.

## **7.6.2 Current Investigations**

### **Rising Brook**

The recent study of the impact of groundwater abstraction on flows and ecological status was started in 2010. Flows over the upper reaches of the Rising Brook disappear in the summer largely due to groundwater abstraction from a SSW pumping station. This is complicated by surface fissures arising from subsidence of former 20<sup>th</sup> Century coal mine workings which are thought to increase the rate of losses.

A scheme to restore flows along the catchment and improve the resilience of its ecological status is at trial stage, however one of its goals will be to identify what drought resilience can be built into the scheme to maximise flows and GES where

feasible. It should be noted that groundwater abstraction tends to be reduced in a drought as the key site is vulnerable to low groundwater levels. While it may be put in place during the course of this plan, the most likely actions in the event of a drought will be to work with the EA to ensure reaches in the catchment not affected by groundwater abstraction are protected. This will make use of the extensive temporary monitoring network put in place for the NEP work.

### **Bourne Black Brook**

This study was started in 2010. The principal area of concern identified has been the lack of flows in the Crane Brook tributary of the Bourne Black Brook whose course runs between Chasewater Reservoir and the village of Shenstone. Secondary concerns have been raised by the EA over the impact of groundwater abstraction on flows and GES of the Little Hay brook which is a non WFD river but whose status supports that of the catchment as a whole.

Trials have taken place of augmentation of the Crane Brook from a mothballed SSW borehole site which have been encouraging. It is likely that this element of the scheme will be put in place over the course of this plan. Other measures to improve flows and/or mitigate the impact of drought have not yet been identified. The most likely actions in the event of a drought will be to work with the EA to ensure that augmentation of the Crane Brook reaches trialled are robust and that the vulnerability of reaches not supported by treated sewage effluent is clearly understood and any measures identified are implemented where found to be feasible. This will make use of the extensive temporary monitoring network put in place for the NEP work.

### **Checkhill Bogs SSSI and Spittle Brook**

Checkhill Bogs SSSI has been studied since 2005 and concerns raised over the impact of groundwater levels on water levels and stream flows through the site. The site is designated for secondary wet alder woodland along a line of former mill pond sites of which only one remains intact. Flows fall rapidly every year and the lower part of the site dries out most summers. As a further consequence of low flows the WFD status of the surface water body does not meet GES. Invasive non-native species and site management are also contributory factors to its unfavourable status.

Trials of surface water management and habitat management are underway but augmentation trials have been delayed due to extended wet weather during the proposed test period in Summer 2016. However intensive monitoring of natural events has provided encouraging evidence that flows of a similar magnitude to the augmentation proposals may be sufficient to maintain a surface water flow across the area of interest. It is probable that a scheme will be put in place over the course of this plan and one of the goals of its design will be to ensure that it is resilient to drought where feasible. This will make use of the extensive temporary monitoring network put in place for the NEP work

### **Blakedown Brook and Hurcott and Podmore Pools SSSI**

As noted in Section 7.6.1 above, further investigations have been required to see what options there are to improve GES arising from the use of treated sewage effluent to support river flows. The appraisal of options is at an early stage and it is likely that any scheme will not be put in place much before the end of this plan. These studies are being carried out jointly between the Company and STWL. The most likely actions in the event of a drought therefore will be to work with the EA and STWL to ensure key reaches in the catchment are protected by existing mitigation

measures. This will make use of the extensive temporary monitoring network put in place by the EA and the Company for the NEP work.

#### **Blithfield Heavily Modified Water Body**

The River Blithe between Blithfield Reservoir and its confluence with the River Trent is regarded as a heavily modified water body (HMWB) under the Water Framework Directive because the natural flow regime has been altered by the impoundment of the river for the reservoir. As a HMWB it is however required to meet good ecological potential. It was assessed in 2012 as being of only moderate ecological potential as concerns were raised over certain measures not being adequate to mitigate impacts on: movement of fish; downstream river flows, and: morphological characteristics of the downstream river.

The Company is undertaking studies to confirm the underlying causes of these concerns and to undertake trials of possible solutions. It is probable that any changes required will be put in place over the course of this plan. Nevertheless the nature of the HMWB is such that compensation releases required under the reservoir impoundment licence are such that summer river flows during dry years are higher than those that would naturally occur. Accordingly the area of concern in a drought is largely focussed around operation of the River Blithe Pumpback intake. The Company has carried out pre weir works to improve operation of the fish pass when no abstraction is taking place. It has also instituted a daily shutdown period of one hour during operation to ensure that any migrating fish have an opportunity to pass into the middle reaches of the river. These mitigation measures will be further reviewed in the course of the NEP investigations. As discussed in Section 8 monitoring and mitigation will be escalated in the case a drought permit is required.

#### **Puxton and Stourvale SSSI**

The site has been studied for some time following concerns over drying of habitats at various points. There are multiple groundwater abstraction licences operated by South Staffs Water and Severn Trent Water within the vicinity of this SSSI, but the site is also being impacted by other factors e.g. the Kidderminster Flood Alleviation scheme. The Environment Agency has therefore been leading on the Options Appraisal stage but will work with SSW and STW to deliver a solution to restore the SSSI back to favourable status. These options are likely to comprise surface water and/or habitat management rather than changes to abstractions.

#### **7.6.3 Future Investigations**

As discussed in Section 3.1 above, the Environment Agency is evaluating the requirements for further NEP investigations to meet its Sustainable Catchments initiative. This aims to ensure that there is no risk of further deterioration in WFD status over coming years. Discussions with the EA have highlighted the need to improve understanding of present and future impacts on a number of new water bodies not previously studied. These catchments are highlighted in Appendix B1.

As a consequence, as there is no data on their vulnerability to drought the Company cannot make any firm plans for monitoring or mitigation of any impacts. It is likely however in the event of a drought that these NEP investigations would be brought forward to ensure that key data on impacts is captured and opportunities for mitigation identified.

## **8 Drought Monitoring Plan**

### **8.1 Overview**

It is a requirement of the Water Industry Act 1991 for water companies to monitor the effect of drought and of the measures taken under the drought plan. In addition the Environment Agency Drought Plan Guidelines require an Environmental Monitoring Plan to monitor the impacts of drought actions and recovery following a drought.

This section outlines the monitoring in place and undertaken by both the Environment Agency and the Company to understand the effects of drought and the actions taken during a drought.

It is the responsibility of the Company to undertake any additional monitoring to understand the effects on the environment of any of the drought actions that we implement. We have concluded as a result of our assessments in Section 7 that these are mostly focussed on catchments where we intend to apply for drought permits/orders and those within the NEP.

### **8.2 Baseline Monitoring**

As a drought progresses, and prior to any formal drought measures being instigated by the Company, normal communications with the Environment Agency and Natural England will be escalated, as outlined in the Communications Plan. We will provide the Environment Agency with a detailed weekly and monthly update of our water resources situation, via email communications and monthly meetings. Any operational concerns (such as high outage levels) which may impact on resource availability will be highlighted in the updates, in addition to the impacts of the drought itself. This will also include reporting on drought triggers, customer demands, any communications campaigns that are being formulated and any other pertinent data or information.

### **8.3 Meteorological and Hydrometric Monitoring**

#### **8.3.1 Monitoring by the Environment Agency**

The Environment Agency maintains and reports on a comprehensive hydrometric and environmental monitoring network for the purposes of its duties to protect and improve the water environment. This information is made available to water companies by the Agency. This includes hydrometric, water quality and ecological data. This information is essential to South Staffordshire Water in the identification and monitoring of drought conditions, and in the identification of baseline conditions against which any impact assessments are measured. The Company believes that this baseline monitoring should continue to be the responsibility of the Environment Agency.

The Environment Agency has identified a number of specific monitoring sites within the West Midlands Area, which can be used to track the development of a drought and be used as indicators for determining drought status by the Environment Agency. These sites include river flows, groundwater levels, rainfall and reservoir levels. Details of each site relevant to South Staffordshire Water can be found in the Agency's Area Drought Plan. The Agency monitors these sites fortnightly, unless required weekly due to dry conditions. In addition to these sites, the Agency also

reports soil moisture deficits (a measure of how dry the soil is) calculated by the Met Office.

Baseline data is made available to South Staffordshire Water in the form of monthly water situation reports from the EA, and in response to specific data requests. In addition the Agency sends out notification (letters and or email) to the Company when abstraction licence conditions may be triggered by low river flows or by other triggers.

The key datasets are described below:

- The key river flow data that controls the Company's surface water abstraction at River Severn Works is at Bewdley on the River Severn. This information is measured by the Agency and provided by daily automated email to operators at the Works.
- River Trent flow at North Muskham (Newark) is a key control on the Pumpback and River Trent abstractions downstream of Blithfield reservoir. When the flow is approaching the trigger (when it reaches a nominal threshold of 3100 MI/d) the EA send a letter to the Company identifying that river flows are approaching the 'hands off flow' limit of 2650 MI/d. In order to help the Company manage abstraction at the Pumpback the Agency provides an automated flow alarm (sent via email) which informs the Company when flow on the River Trent is below 4,000 MI/d and below 2,800 MI/d and has the facility to send automated emails with flow data on a daily basis.
- Reservoir storage at Clywedog is recorded by Severn Trent Water (who maintain the reservoir) for the Environment Agency. This information is provided to the Company by the Agency as part of the regular water situation reports. Storage at Clywedog is the basis for one set of drought triggers in this plan.

### **8.3.2 Monitoring by South Staffordshire Water**

The Company maintains an automated groundwater level monitoring system at many of its groundwater sources, which is linked to telemetry. Information on abstraction rate and pumping water level is recorded, and can be compared to historical records when required.

The Company also maintains a network of 14 rain gauges at selected treatment works, groundwater sources, and service reservoirs. This information is also provided to the Environment Agency. Company rainfall statistics are based on the long term daily and monthly data from its gauge at Seedy Mill. In addition, weather stations are also located at Barr Beacon service reservoir, at Outwoods service reservoir, and at Cookley. These stations measure temperature, sunshine hours, and rainfall, and they are connected to the Company's telemetry system.

River flows are measured by the Company on the Blithe at the Pumpback, in order to manage the abstraction, and the supporting River Trent abstraction. Compensation releases from Blithfield reservoir are also recorded. This data is recorded by the Company's telemetry system. The Company also installed a river stage board at Newton Bridge upstream of the reservoir and records the River Blithe inflows at this location.

Reservoir storage at Blithfield is measured continuously, and is available via telemetry. Blithfield storage is the main drought trigger within this plan.

In addition to the collection of hydrometric data, the Company measures abstraction from all of its sources in order to ensure that abstraction licence limits are not exceeded and that any licence conditions are met. The Company also measures and reports on overall demand and its components as accurately as possible. Accurate measurement of demand is an essential part of drought management, and in the identification of the benefit from any demand saving measures.

## **8.4 Environmental monitoring plan for drought permits and orders**

### **8.4.1 Introduction**

The level of monitoring should be risk-based. Not all sites will require monitoring during the period of Drought Permit/Order implementation (in-drought) or after the Drought Permit/Order has been lifted/expired (post-drought). Where a water company can clearly show through its environmental assessment that an action has a low risk to the environment (due to the type of action or the lack of sensitive features) it is likely that no further monitoring is needed (Defra, 2015a). For sites with moderate to major significance, monitoring should focus on those features sensitive to the likely impacts from implementing drought management actions. The environment monitoring plan should include any surveys to support the environmental assessment, in-drought and post-drought data needs including:

- The feature(s) to be monitored and the methods used;
- The location of survey sites;
- The timing and frequency of monitoring; and
- Who will undertake the monitoring.

Therefore, any impacts assessed as being of moderate (or higher) significance have been considered for additional monitoring, either to better understand baseline conditions or during/after the implementation of a drought permit.

#### **Baseline**

Baseline monitoring is required to formulate a description of the existing ecological conditions, from which the impacts of drought permit operations over and above the effects of other pressures, such as natural drought, can be identified. Analysis of these data can highlight areas where further specific pre-drought permit monitoring may be required immediately prior to drought permit implementation.

#### **During Drought Permit Monitoring**

In-drought monitoring is required to assess the impacts from the implementation of the drought management action and for the management of mitigation measures during a drought.

It is recommended that during drought permit monitoring continue as per the baseline, in consideration of the evidence collected during the baseline and drought permit surveys, except where, in consultation with the regulator, it is deemed that such monitoring may be environmentally damaging.

Some periodic modification to the survey suite may be required, in terms of spatial coverage or frequency of sampling, depending on the outcomes of the baseline monitoring programme.

## Post Drought Permit Monitoring

Post-drought monitoring aims to assess a site's recovery and to check that there are no long-term effects on any environmental features. This is important as results are needed to assess the success of mitigation measures. It can also feed back into the assessment of sensitivity and likely impact and inform the management of future drought actions.

Following the cessation of a drought permit, monitoring is recommended at the same frequency and locations as employed during the baseline period. The duration of post drought permit / order monitoring will depend upon the severity of the natural drought, but will cover the period of recovery and will be carried out in consultation with the regulator.

The post-drought permit monitoring should be sufficiently flexible to concentrate on the key sensitive receptors of drought permit operations.

## 8.5 Environmental Monitoring Plan for River Blithe pumpback Drought Permit

### 8.5.1 Baseline monitoring

Since the last assessment update in 2012, considerable baseline monitoring has been carried out as recommended in ESI (2012). Data on macro invertebrates, cross sectional profiles, river morphology and water quality are now available, while EA monitoring has generated much useful data on fish populations. It is recommended that this monitoring is repeated with adequate frequency to ensure that the baseline information is kept up to date.

The following would also be of value in predicting potential impacts of a drought permit on the lower River Blithe.

#### Invasive non-native species

A crayfish survey of the River Blithe in reaches of the River Blithe up- and downstream of the intake is recommended to determine whether signal crayfish is present. A riparian invasive plant survey is also recommended to determine presence and location of key bankside plant species.

The extra baseline monitoring proposed is summarised in Table 9. Note that no further baseline monitoring is required for the River Trent.

### 8.5.2 During drought permit monitoring

In the event that the drought permit is implemented, environmental monitoring would be required to show that any impacts occurring during this time are as a result of the drought itself and are not caused by the operation of the drought permit.

There will be a need to undertake increased environmental monitoring during the drought permit period in addition to the baseline monitoring. It will serve two purposes:

1. To allow differentiation between the drought permit and the effects expected during a normal drought;
2. To allow early response should any problems or impacts occur as a result of the drought permit, with particular regard to fish.

The proposed monitoring during a drought permit is outlined in Table 9. The elements included are in response to specific potential issues and are focused on fish stress

and habitat loss, and on invasive species colonisation. Frequent observation of fish is recommended in the vicinity of the fish pass and downstream to determine whether there are signs of stress or inability to move, for which mitigation can then be applied. Note that this has been included even though impacts on fish are generally predicted to be no more than low significance, as fish showing stress would be a highly visible impact, and because there is some uncertainty as to the degree of impact on upstream populations of impacts in the vicinity of the fish pass.

### **8.5.3 Post drought permit monitoring**

Monitoring after the drought permit period will be necessary in order to determine that water quality returns to pre drought permit conditions. Repeats of baseline monitoring of macro invertebrates are also required to assess whether the implementation of the drought permit has any long-term effects on any environmental features. Following the cessation of a drought permit, monitoring will continue in each of the monitoring reaches at the same frequency as employed during the baseline period. The duration of post drought permit monitoring will depend on the severity of the natural drought, but will cover the period of recovery and will be carried out in consultation with the regulators.

**Table 9 Monitoring proposed for the River Blithe**

Receptor	Impact significance	Reasons for monitoring	Monitoring locations	Baseline monitoring				During DP monitoring			
				Method	Frequency	Timing	By	Method	Frequency	Timing	By
Stage	N/A	Weed growth may compromise current data	Hydraulic survey location					Automatic monitor	Daily or continuous	Throughout DP operation	SSW
Water quality	Minor -ve	Determine changes in phosphate	Current baseline locations					Water sampling	Monthly	Throughout DP operation	SSW
Water quality - 2		Determine effect of transfer from network	Blithfield Reservoir and R Blithe upstream					Water sampling	Min weekly – subject to level of transfer	Throughout water transfer	SSW
Macro-invertebrates	Minor -ve	Determine impacts and recovery	Current baseline locations	Standard (2)	Spring & autumn	As appropriate to keep baseline up to date	SSW	Standard (2)	Spring & autumn	Throughout DP operation	SSW
Fish habitat	Minor -ve	Assess siltation on spawning and juvenile habitat	Reach 1b					Walkover survey	Monthly	Spring, summer	SSW
Fish passage	Minor -ve	Fish pass efficiency						Observation	High (ideally daily)	Throughout DP operation	SSW
Signal crayfish	Unknown	Determine presence	Entire river below dam	Crayfish survey	Single survey	Summer	SSW	Crayfish survey <sup>(1)</sup>	Single survey	Summer	SSW
Zebra mussel	Unknown	Determine whether present	Entire river below dam	Visual survey	Single survey	Summer	SSW	Visual survey	Seasonal	Throughout DP operation	SSW
Invasive riparian plants	Unknown	Determine presence	Entire river below dam	Walkover survey	Single survey	Summer	SSW	Walkover survey	Annual	Summer	SSW

**(1) If shown to be present during baseline monitoring.**

**(2) 3 min kick sweep plus 1 min hand search**

Table (continued)

Receptor	Impact Significance	Reasons For Monitoring	Monitoring Locations	Post Dp Monitoring			
				Method	Frequency	Timing	By
Stage	N/A						
Water quality	Minor -ve	Determine changes in phosphate concentration	Current baseline locations	Water sampling	Monthly	Until concentrations return to pre DP levels	SSW
Water quality - 2							
Macroinvertebrates	Minor -ve	Compare with pre-DP baseline to determine impacts and recovery	Current baseline locations	Standard	Spring and autumn	Until one year after DP operation ceases	SSW
Fish habitat	Minor -ve	Assess siltation on spawning and juvenile habitat	Reach 1b				
Fish passage	Minor -ve	Fish pass efficiency					
Signal crayfish	Unknown	Determine presence	Entire river below dam	Crayfish survey(2)	Single survey	Summer	SSW
Invasive riparian plants	Unknown	Determine presence	Entire river below dam	Walkover survey	Annual	Summer	SSW
Zebra mussel	Unknown	Visual survey <sup>(2)</sup>	Single survey	Summer	SSW	Zebra mussel	Unknown

<sup>(2)</sup>If shown to colonise during DP operation.

## 8.6 Environmental Monitoring Plan for River Severn Drought Permit

### 8.6.1 Baseline monitoring

Baseline monitoring is required to ensure a full understanding of the ecological conditions in the River Severn, and to compare with conditions during and after River Severn Works (RSW) drought order implementation. The River Severn benefits from an extensive existing baseline dataset, collected by the EA and on behalf of STWL.

It is important for SSW to liaise with STWL over its ongoing monitoring programme – which is centred around effects of the proposed Trimpley drought order – to ensure the following:

- The data collected will be available for SSW to use.
- The monitoring includes reference sites that are upstream of the River Severn Works, and further sites that are between the Company works and that of Severn Trent Water downstream, to allow impacts of the two locations to be differentiated should the need arise.

Table 10 provides a summary of baseline monitoring required for the proposed RSW drought order. This is listed in full here, but it overlaps with STWL's monitoring requirements for its own proposed River Severn drought order. Therefore liaison with STWL is recommended to ensure that no unnecessary duplication of effort takes place.

It is recommended that eight riverine sites are monitored, covering areas upstream of the River Severn Works, between the Company and STWL sites, and downstream of the STWL site. These sites have been identified because each already has a substantial associated dataset, as they correspond to existing EA, SSW and STWL monitoring locations. Where these are used for EA monitoring this has been highlighted; otherwise STWL/SSW are identified as the responsible party. Frequent ongoing macroinvertebrate monitoring is recommended as macroinvertebrates are an important ecological indicator. A repeat habitat walkover is recommended approximately every five years, so that there is one within each drought order / drought permit EAR update cycle, to monitor changes in habitat. Water quality monitoring is currently well covered by the EA, but a supplementary site at the Company Works is recommended.

No monitoring points have been recommended downstream of Bewdley because monitoring in these reaches is not considered solely the responsibility of SSW or STWL and any unforeseen impacts of the SSW or STWL drought orders alone would be expected to be most evident immediately downstream of these abstractions. It is, however, noted that impacts may be discernible downstream of Bewdley and it is therefore recommended that SSW confirms with the EA that appropriate monitoring is taking place at its monitoring locations further downstream.

**Table 10 Baseline monitoring**

Location, Responsibility, Frequency & Timing	Receptor / Method / Responsibility / Frequency / Timing				
	Spot Flow Gauging	Macroinvertebrates (See Footnotes For Method)	Fish Populations (Ea Wfd Classification Method (Tbc))	Habitat Walkover (Amended Hendry-Cragg-Hine, 1997)	Water Quality
<b>Upstream of RSW</b>					
S1. Coalport (u/s weak bridge) SJ 70065 02133	-	Annually - spring, summer, autumn (STWL/SSW) <sup>(1)</sup>	-	Every five years - spring (STWL/SSW)	As programmed (EA)
S2. Apley Forge (200m d/s of Apley Bridge) SO 70858 98074	-	Annually - spring, summer, autumn (STWL/SSW) <sup>(1)</sup>	-	Every five years - spring (STWL/SSW)	As programmed (EA)
New site to be determined, downstream of Bridgnorth			Every two years (STWL/SSW) – juvenile salmon survey	Every five years - spring (STWL/SSW)	
<b>Sites between RSW and STWL Works</b>					
S3a. Hampton Loade at Bridge SO 74651 87011	-	-	-	-	Monthly (SSW)
S3. Highley (1km d/s foot bridge) SO 75202 83331	Sufficient to improve rating (STWL/SSW)	Annually - spring, summer, autumn (STWL/SSW) <sup>(1)</sup>	Annually - autumn (STWL/SSW)	Every five years - spring (STWL/SSW)	As programmed (EA)
S4. Upper Arley (1km U/S car park) SO 75753 80416	-	Annually - spring, summer, autumn (STWL/SSW) <sup>(1)</sup>	Annually - autumn (STWL/SSW)	Every five years - spring (STWL/SSW)	As programmed (EA)
<b>Downstream of STWL Works</b>					
S5. Dowles Brook (D/S B4190 road bridge) SO 78988 75218	Sufficient to improve rating (STWL/SSW)	Annually - spring, summer, autumn (STWL/SSW) <sup>(2)</sup>	Every two years (STWL/SSW) – juvenile salmon survey	Every five years - spring (STWL/SSW)	-
S5a. U/S Bewdley SO 77989 76372	-	-	As programmed (EA)	Every five years - spring (STWL/SSW)	As programmed (EA)
B1. Bewdley SO 79642 71581	-	Annually - spring, summer, autumn (STWL/SSW) <sup>(2)</sup>	-	Every five years - spring (STWL/SSW)	-

<sup>(1)</sup> Three minute kick and one minute hand search recommended.

<sup>(2)</sup> Airlift sampling recommended.

(EA) SSW to undertake in the event that the Environment Agency discontinue existing survey programmes

### 8.6.2 During Drought Order monitoring

In the event that the proposed RSW drought order is implemented, environmental monitoring would be required to show that any impacts occurring during this time are as a result of the drought itself and are not caused by the operation of the drought order. Given the uncertainty associated with some aspects of the environmental assessment, during-drought order monitoring has also been recommended to detect any unexpected impacts, or impacts of greater severity than predicted, in order to trigger mitigation measures.

The proposed monitoring during a drought order is outlined in Table 11. It is similar to the baseline monitoring, with the following exceptions

- The need for macroinvertebrate surveys during drought order implementation should be discussed in advance with the EA; depending on the severity and timing of the drought, such ecological surveys may be inadvisable.
- Given the potential, under extreme circumstances, for low water velocities and associated development of algal blooms, if flows at Bewdley drop below 500 MI/d for longer than 5 consecutive days it is recommended that a repeat habitat walkover survey (to check for signs of ecological stress) and water quality sampling (collection of dissolved oxygen, pH and temperature measurements) be undertaken with the aim of identifying if unacceptable impacts are actually occurring, and if they are, determining their magnitude and recommending appropriate and effective mitigation measures.
- The repeat habitat walkover should include identification of critical fish habitats and bottlenecks to migration under extreme low flow conditions (e.g. barriers, shallow gravels, salmonid/shad/lamprey spawning locations, holding pools for salmon migration), and routine observation of these locations to identify issues and implement fish rescues, if necessary. These are not identified in Table 11, but it is recommended that the EA is consulted to identify critical locations, based on their local knowledge, as part of the EAR consultation.

Monitoring of the flow along the Gloucester Flow Split is not included here but it is recommended that this is carried out by the EA to ensure that adequate water passes along the West Arm and therefore directly to the Estuary during very low flows.

### 8.6.3 Post Drought Order monitoring

Monitoring after the drought order period will be necessary in order to determine that there are no long term impacts. The monitoring proposed is a continuation of that outlined for baseline monitoring in Table 10.

**Table 11 Proposed monitoring during DO implementation**

Location	Receptor / Method / Responsibility / Frequency / Timing			
	Spot Flow Gaug-ing	Macroinvertebrates <sup>(1)</sup> (See Footnotes For Method)	Walkover Survey (For Fish Habitat And Passage Assessment, Riparian Plant Inns, Other Habitat Characteristics Incl. Algal Blooms, Signs Of Poor Wq, General Ecological Distress, Etc) <sup>(2)</sup>	Water Quality <sup>(2)</sup>
<b>Upstream of RSW</b>				
S1. Coalport (u/s weak bridge) SJ 70065 02133	-	Spring, summer, autumn (STWL/SSW) <sup>(3)</sup>	-	-
S2. Apley Forge (200m d/s of Apley Bridge) SO 70858 98074	-	Spring, summer, autumn (STWL/SSW) <sup>(3)</sup>	-	-
<b>Sites between RSW and STWL site</b>				
S3a. Hampton Loade at Bridge SO 74651 87011	Monthly (STWL/SSW) <sup>(1)</sup>	-	Fortnightly (STWL/SSW)	Fortnightly (STWL/SSW)
S3. Highley (1km d/s foot bridge) SO 75202 83331	Monthly (STWL/SSW) <sup>(1)</sup>	Spring, summer, autumn (STWL/SSW) <sup>(3)</sup>	Fortnightly (STWL/SSW)	Fortnightly (STWL/SSW)
S4. Upper Arley (1km U/S car park) SO 75753 80416	Monthly (STWL/SSW) <sup>(1)</sup>	Spring, summer, autumn (STWL/SSW) <sup>(3)</sup>	Fortnightly (STWL/SSW)	Fortnightly (STWL/SSW)
<b>Downstream of STWL site</b>				
S5. Dowles Brook (D/S B4190 road bridge) SO 78988 75218	Monthly (STWL/SSW) <sup>(1)</sup>	Spring, summer, autumn (STWL/SSW) <sup>(4)</sup>	Fortnightly (STWL/SSW)	Fortnightly (STWL/SSW)
S5a. U/S Bewdley SO 77989 76372	Monthly (STWL/SSW) <sup>(1)</sup>	-	Fortnightly (STWL/SSW)	Fortnightly (STWL/SSW)
B1. Bewdley SO 79642 71581	Monthly (STWL/SSW) <sup>(1)</sup>	Spring, summer, autumn (STWL/SSW) <sup>(4)</sup>	Fortnightly (STWL/SSW)	-

<sup>(1)</sup> Unless recommended not to sample by EA

<sup>(2)</sup> If drought severity merits this assessment

<sup>(3)</sup> Three minute kick and one minute hand search recommended.

<sup>(4)</sup> Airlift sampling recommended

## 8.7 Drought Permit/Order Mitigation Plan

### 8.7.1 Introduction

Mitigation measures may be proposed in order to avoid, reduce or remedy any potential impacts resulting from the implementation of a drought permit/order. These measures may be identified in advance and incorporated into the design of the project or may be implemented during the operational phase of the project i.e. during the implementation of a drought permit, to address unexpected impacts.

Although only negligible or minor negative impacts have generally been identified for the riverine reaches in the Environmental Assessment reports for the Company's two drought permits/orders, appropriate mitigation measures have been proposed which aim to reduce unexpected impacts which may be detected during drought permit / order implementation.

South Staffordshire Water will discuss any necessary mitigation measures with the Environment Agency during the drought permit / order application process (i.e. during preparation for drought permit / order application), to determine the most appropriate monitoring and mitigation regime and would aim to have measures in place in advance of drought permit / order implementation.

It should be noted that situations may arise where not all of the mitigation measures described are required or appropriate during every drought permit / order. Should this be the case, those measures deemed not necessary or not appropriate will be discussed and agreed with the Environment Agency during the drought permit / order application process.

Where mitigation measures are proposed they will be appropriate for the level of impact predicted and the importance of the receptor. Measures proposed would be designed to minimise the impacts occurring as a result of maintained or increased abstraction during a drought and would therefore only be implemented for the duration of the drought permits / orders. Mitigation measures would be implemented to reduce the drought permit / order impacts and not the impacts of the drought itself.

### 8.7.2 Mitigation Plans for the Blithe/Trent Drought Permit

#### Measures to mitigate impacts on ecological receptors and WFD classification

While impacts on fish are currently considered to be minor or negligible, this assumes an appropriate release of water to enable upstream fish passage along the River Blithe. Operation of the fish pass on the River Blithe at the intake was highlighted in ESI (2012)<sup>22</sup>, as it was acknowledged that this would not function during a drought permit scenario. Subsequent structural modification and operation of daily periods without abstraction have been adopted, although because the Trent recirculation flow enters the Blithe downstream of the weir, the fish pass would not function during a drought permit. It is important that the one-hour shut-off period is maintained during a drought permit and further adaptation to the pattern of cessation of flow may be required if, for example, fish are recorded congregating in the affected reach. A possible mitigation may include longer or more frequent shut-off

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<sup>22</sup> ESI (2012) Review and Update of Drought Permit Environmental Assessment Report: River Blithe and River Trent. Final report, October 2012, 75 pp.

periods. If the fish pass does not operate even under such conditions then, depending on the time of year and the species affected, provision should be made for options including fish trapping and active transport. This in turn will require effective monitoring of fish activity. An appropriate flow regime with occasional releases at relatively high discharge would have the additional benefit of reducing potential for build-up of fine sediment and detritus that may impair habitat quality in Reach 1b (River Blithe between the intake and Trent confluence).

Therefore, the following mitigation actions are proposed:

- Ensure a water release protocol is in place, to enable daily movement of fish through the fish pass and, where feasible, to allow occasional variation in flow.
- Develop a protocol for fish monitoring and transfer, to be applied during drought permit operation.

While risk of transfer of INNS as a consequence of DP operation is not considered to be more than minor, it is important that any potential transfer of zebra mussels and other INNS from the River Trent is limited to the lower reach of the River Blithe below the fish pass. The only way that zebra mussels could move upstream of the fish pass is via accidental upstream movement, for example during maintenance activities.

Therefore, the following precautionary mitigation measure is proposed:

- Ensure that all South Staffordshire Water operatives and contractors adhere to biosecurity procedures that minimise risk of transfer of zebra mussel and INNS when moving between river reaches. This is to include awareness, understanding and requirement to follow check, clean, dry procedures, and to avoid movement of machinery and equipment from downstream to upstream locations without thorough cleaning. The biosecurity measures should be followed irrespective of whether zebra mussel is identified in the lower River Blithe.

The risk of transfer of INNS is present at all times, and it is recommended therefore that appropriate biosecurity is applied during normal operation and is not restricted to drought permit conditions.

Transfer of treated water to Blithfield Reservoir may potentially reduce water quality in the reservoir and increase phosphate concentrations in the River Blithe. The phosphate concentration of the lower reach of the river is currently categorised as Poor under WFD classification, and so further deterioration is undesirable.

Therefore, the following is recommended:

1. Investigate options for ensuring that water transfer from the network to Blithfield Reservoir is at volumes or levels of treatment that minimise impacts on phosphate concentration. The timescale for this is not confirmed and it will be subject to a discharge consent application.

### **Measures to mitigate impacts on socio-economic receptors**

The key receptor that may be influenced by drought permit operation is downstream abstraction. However, as impact significance is considered to be negligible, no further mitigation is proposed. Abstraction from Reach 1a (River Blithe between Blithfield Reservoir and the intake) is anticipated to be mitigated by release of the compensation flow from Blithfield Reservoir, in Reach 1b (between the intake and Trent) by recirculated Trent water which will maintain flows and levels in this reach.

Flows are anticipated to be adequate in Reach 2 (River Trent between Great Haywood and Trent at Yoxall gauge) however, as in the previous Environmental Assessment Report it is recommended that there is close liaison with abstractors so provision can be made to lower intakes as a precaution before drought permit implementation. Therefore, the following is recommended:

- Initiate liaison with agricultural abstractors in the vicinity of South Staffordshire Water abstraction assets, to develop a coordinated approach to water use during drought permit operation.

No further provisions for compensation are required.

### **8.7.3 Mitigation Plans for the River Severn Works Drought Order**

#### **Measures to mitigate environmental impacts identified by monitoring during River Severn Works Drought Order implementation**

The following mitigation measures are proposed should monitoring during a River Severn Works Drought Order indicate that significant impacts are occurring:

- Provision to reduce abstraction if maintained or increased abstraction is considered to be having serious detrimental environmental consequences on downstream watercourses;
- Rescue of fish trapped below impoundments or other barriers to movement;
- Funding of appropriate reasonable measures (e.g. habitat restoration) in the event of ecological damage occurring on watercourses affected by increased abstraction; and
- Provision of appropriate assistance and / or funding of reasonable additional measures to protect habitats and sites or species of special ecological interest affected by the Drought Order.

It may not be necessary to implement all these mitigation measures in order to reduce the observed impacts. Where these measures involve work within or adjacent to the river channel, additional approvals will be required (e.g. a Land Drainage Consent) and there will be a need to work closely with other stakeholders (landowners, local authorities and the EA). Measures to reduce abstraction will not require further approval.

#### **Measures to mitigate environmental impacts on downstream abstraction**

The impacts on the majority of downstream abstractions are predicted to be negligible with a high degree of certainty. Consequently no mitigation measures are proposed and no provisions for compensation are required. This also applies to the Gloucester and Sharpness canal abstraction where the River Severn Works Drought Order is applied in isolation. Measures required to mitigate in-combination effects are discussed below.

#### **Measures to Mitigate In-Combination Impacts including a River Severn Works Drought Order on the Severn Estuary**

Due to the potential for detrimental in-combination effects during droughts worse than modelled in the historical record, a joint approach is accepted between with the EA, the other major abstractors: South Staffs Water, Severn Trent Water, Bristol

Water and the Canals and Rivers Trust (CRT). This has the aim of enabling impacts to be minimised in a co-ordinated way.

As previously discussed in Section 7 above, the EA have proposed that this could be mitigated by imposition of an abstraction limit of 300 Ml/d on the CRT abstraction at Gloucester and Sharpness. However this proposal has yet to be agreed by CRT so there remains some uncertainty. The Company believes that final arrangements for mitigation will be negotiated at the initial Severn Drought Management Group meeting prior to application by the EA for a River Severn Drought Order. The Company has a number of options to contribute to any mitigation plan:

- Strict adherence to consistent and continuous net abstraction pattern to aid in reduction of regulation losses
- Further use of SSW bankside storage releases to help improve regulation efficiency
- Prompt response to downward changes in customer demand to reduce pressure on abstraction
- Additional release of groundwater from Stour valley sources

## **8.8 Environmental and Mitigation Plans for other Options**

### **8.8.1 Options Where Abstraction Will Remain Within Existing Abstraction Licence Limits**

The Company is legally entitled to abstract water from the River Severn, Blithfield Reservoir and 27 groundwater sources, up to the quantities defined in its abstraction licences. These licences are issued and regulated by the Environment Agency.

As discussed in Section 7.6 above there are a number of catchments where there is a concern over the impact of Company abstraction within these licence limits. These catchments have been studied through the National Environment Programme and its antecedent programmes (e.g. Low Flows). Since 2010 this environmental impact has been assessed against the requirements of the Water Framework Directive by means of their ecological status. Future investigations consider the risk of Company abstraction causing deterioration in ecological status and this has highlighted further catchments of potential concern, although the present status and mechanism of impact is currently unknown.

Mitigation actions have previously been outlined in Section 7.6 but can be summarised as follows:

- Past investigations: mitigation schemes put in place to augment river flows and pool levels in the Leamonsley Brook/ Stowe Pool and Blakedown Brook catchments. The schemes are monitored and administered by the EA and the Company operates augmentation boreholes in each catchment.
- Current Investigations: mitigation schemes are yet to be determined in 5 catchments (Rising Brook, Lower Blithe, Bourne-Black Brook, Blakedown Brook and Checkhill Bogs). The Company has intensive monitoring systems for groundwater levels and stream flows in place which will be in place for much of this drought plan, however these are likely to be rationalised once mitigation actions are agreed and implemented.

- Future Investigations: these are not due to commence until 2020 although may be brought forward In the case of a drought

### **8.8.2 Demand Management Options**

The environmental impact of the Company's demand management options is considered to be negligible, therefore no specific environmental monitoring or mitigation is proposed.

### **8.8.3 Monitoring the Impact of Abstraction on Amenity and Recreation**

No direct monitoring of the impact of licensed or drought permit/order abstraction on amenity and recreation value is undertaken, or is proposed. These issues are specifically covered in the drought permit/order environmental reports for the Blithe/Trent and the River Severn, and where necessary measurement of key parameters like flow, level and water quality can be used to assess impact.

## 9 Drought Management

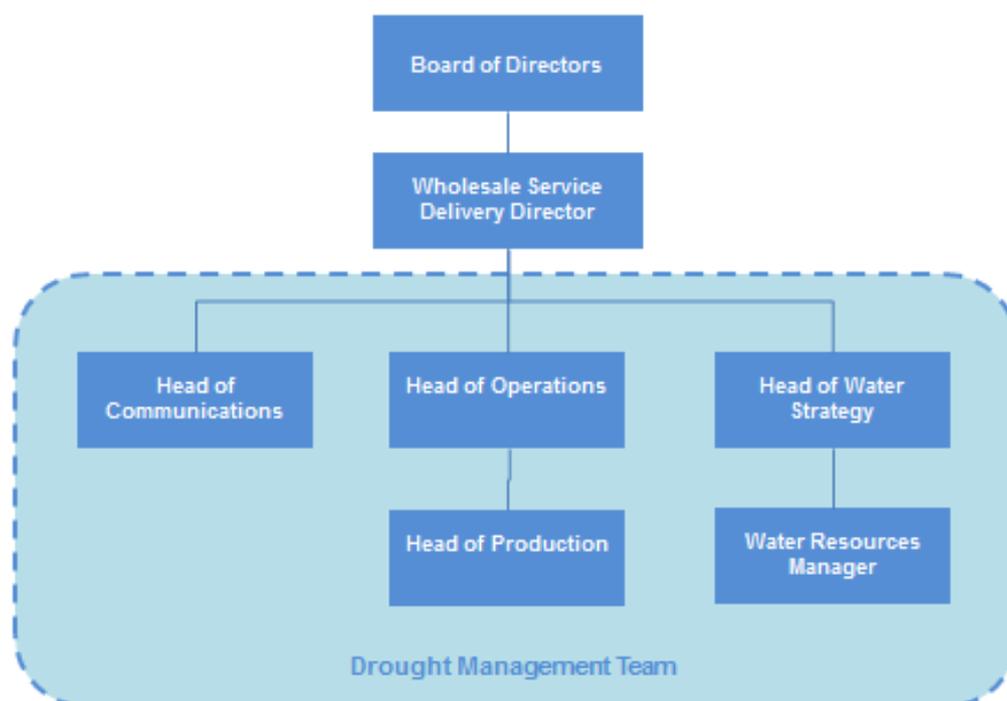
### 9.1 Management Structure

The management structure for formulating an action plan and approval of drought actions is shown below in Figure 18. The Drought Management Team may be convened prior to any formal drought proceedings, as deemed appropriate - for example, if the Environment Agency or other water companies in the region declare drought status - in order to provide a forum for drought related issues.

In the event of any drought action being contemplated the Company's Drought Management Team and Executive Director will consult with the Board of Directors to formulate an action plan which is appropriate for the specific circumstances. Key staff who may be required to implement any part of the plan will be briefed by the Drought Management Team at an initial joint meeting.

Regular weekly meetings will be convened as the situation develops, and a final debriefing held when normal operations resume. The Drought Management Team will decide at what point the drought has receded sufficiently for any imposed drought measures to be relaxed, and the timing and content of communications to customers and other stakeholders, advising that the situation has returned to normal.

**Figure 18 Drought Management Structure**



### 9.2 Drought Management Actions

The sequence of drought management actions, derived from experience of previous droughts, is set out in Figure 12 in Section 5 above, however the exact timing of individual actions will depend on the timing and interaction of drought indicators from the River Severn (Clywedog) and groundwater as well as Blithfield Reservoir. How

these actions will be combined into a communications strategy is described in Section 10.

A dry winter with exceptionally delayed or reduced inflow to Blithfield Reservoir is generally the trigger for initiating a meeting of the Drought Management Team (DMT). The DMT will set up a schedule of regular meetings and consider the implementation of a range of successive measures, which are summarised in Figure 12 in Section 5.2. Once a DMT has been convened, all actions, meeting minutes and communications will be fully documented and recorded.

### 9.3 Roles and Responsibilities

In broad terms, the roles and responsibilities of the Drought Management Team are indicated in Table 12 below. The team will be expected to draw upon expertise elsewhere as required, and the designated Drought Manager will act as lead for coordination of drought communications.

**Table 12 Drought Management Team Roles and Responsibilities**

Role in Drought Management	Usual Job Role	Responsibilities
<b>Head of Drought Management Team</b> Board Liaison	Wholesale Service Delivery Director	Overall responsibility for management of drought Reporting to the board of Directors Approval of messages to the public
Drought Strategy Manager	Head of Water Strategy	Implementing and developing the drought strategy Ensuring consistency with drought plan External stakeholder management (regulatory)
Drought Supply Manager	Head of Operations (supported by Supply Manager)	Control of the supply network Implementation of Supply side drought measures Integration of drought management and daily activity
Drought Resources Manager	Water Resources Manager	Technical Specialist to drought strategy Providing & recording data, drought monitoring and assessment
Drought Communications Manager & Public Relations Lead	Head of Communications	Co-ordination of internal and external drought communications Liaison with internal & external stakeholders – customers, media, public relations management Implementing the drought communications strategy
Production Drought Manager	Head of Production (supported by Production Managers of Northern and Southern Units)	Implementation of drought strategies at production sites Management of Production resources Enhanced maintenance response

## 10 Communications Plan

### 10.1 Overview

Effective communications is an essential part of drought management, and we recognise the importance of keeping stakeholders and customers informed at all times, before, during and after a drought. The timing, accuracy, content and tone all affect the way in which a message is received. Choice of medium will impact the penetration of a particular message, but it may also influence the recipient's view as to its importance.

To reduce the load on the customer contact centre, key communications will be made through the media, via newspapers, radio, television and via our own channels, online outlets such as the Company website, social media and other direct customer contact (email, sms and mailings). Along with other specialised events and campaigns, these communications will aim to raise awareness of the need to reduce water demand, and the status of the Company's supplies.

Different audiences may be consulted at different times, via different channels, and this list is not exhaustive. Key contact lists are held and updated by the Communications Team. The key stakeholders and audiences for drought communications are covered in section 10.3 below.

The key components considered for the communications plan are;

- Audience
- Channels
- Message
- Frequency & timing

In the event that the drought has widespread impacts there may be regional or national co-ordination of communications via the Environment Agency or Water UK. The Company is committed to ensuring clear and effective communication with customers and stakeholders and will fully engage with any regional or national lead in this area. The implementation of regional or national co-ordination may precede the triggers for the Company's own Drought Plan actions, however, the Company will commit to engage in the process nonetheless.

### 10.2 Objectives

The main requirement of the Communications Plan is to ensure all stakeholders and customers are aware of the drought situation, and our actions before, during and after a drought. A key message that the Company is committed to conveying at all times is the need to use water wisely and efficiently, and this message will be conveyed through increased engagement with stakeholders and customers as a drought progresses, using a variety of methods as deemed appropriate by the Drought Management Team.

The objectives of the communications plan are to:

- Make the public aware of a developing drought situation and keep them informed of the measures that we are planning, explaining the need to save water and our efforts to encourage customers to help.
- Provide information on, and promote escalated water efficiency messages to mitigate restrictions, and reduce demand, lessening the likelihood of further restrictions.

- Inform customers of any restrictions that we may deem necessary to implement during a drought situation
- Manage the timing and targeting of communications as stages of a drought progress.
- Demonstrate a concise and consistent message relating to drought for all water consumers in the affected area, by working with neighbouring water companies and national groups.

### 10.3 Target Audiences

#### 10.3.1 Key Regulatory Stakeholders

Under normal conditions the primary stakeholders for water resources related issues are Defra, the Environment Agency and Natural England, and contact takes place on a number of levels:

- ad hoc meetings between individuals at local level, to discuss specific topics (e.g. water resources plan, drought plan, business plan, media communications)
- quarterly meetings with other regional water companies' representatives, to discuss water resources planning at a strategic level
- six-monthly liaison meetings at Managing Director level

At these meetings any impending possibility of drought will be discussed as a matter of course, and the Environment Agency will be the initial organisation to announce any level of drought situation, both nationally and regionally.

These regular meetings are a forum for exchange of key information, and in the event of the possibility of drought, liaison is increased to an appropriate level. This may include increased regular updates between water resources and drought managers, the exchange of environmental data and liaison regarding key customer messages to ensure a consistent approach.

During a drought increased liaison will take place with the Environment Agency, including consultation over planned communication. The Company will provide the Agency with reports which detail trends in strategic borehole levels, pumped outputs, and peak demands, comparing them with previous drought sequences, along with its view of the current resource situation, and the future outlook.

#### 10.3.2 Other Stakeholders

In addition to communications with the key stakeholders, the Environment Agency and Natural England, other key organisations will be contacted at appropriate stages, as follows:

- Consumer Council for Water (CCWater): at early stages of a drought, consulted at the start of the drought monitoring process, prior to customer communication and kept updated
- Neighbouring water companies: Severn Trent Water
- Members of the River Severn Drought Management Group: Environment Agency, Severn Trent Water, Bristol Water, United Utilities, The Canal & River Trust,
- Local authorities: as a drought progresses, to communicate enhanced water efficiency messages, and to provide details of impact of water use restrictions

- Ofwat: updates on Company actions throughout a drought situation to manage the impact of drought on its customers, and post drought review report.
- Water UK: regular updates on the water resources situation, communication with customers, and future prospects, monthly updates as a minimum.
- Other groups particularly affected by water restrictions: throughout as appropriate.

Other specifically targeted audiences are listed below. These include specific customer groups who will be targeted to respond to appeals for restraint to help reduce peak demand through a reduction in garden watering e.g. private householders, local authorities, University Colleges, and sports clubs.

### 10.3.3 Staff

Company staff, especially those in customer-facing roles, will be briefed on the latest water resources situation, and management actions taken, as the drought develops so that they can provide accurate information to customers. The customer contact centre will be provided with a questions and answers template of likely enquiries when a drought appears to be imminent and this will be regularly updated by the Drought Management Team as a drought situation develops. Briefings will take place on a regular weekly basis, and the Company's Board of Directors will be kept informed through formal monthly reports. Regular updates on the situation will be posted on the Company intranet, and circulated in regular and bespoke Company mailings by the Communications Team.

### 10.3.4 Domestic Customers

In normal circumstances customers receive regular information from the Company in a variety of ways, and part of this includes regular promotion of water efficiency. In a drought situation, customer contact will become increasingly proactive, reflecting the current situation, and make increasing use of all media channels to emphasise the messages.

Customers can do much to help by taking simple steps, which together can save significant volumes of water, and as such it is important to obtain 'buy-in' of these stakeholders. Examples of savings include the installation of cistern devices in older style toilets, and garden watering by hand rather than by unattended hosepipe. The frequency of these 'save water' messages will be increased both through the usual routes such as mailshots and website updates, but in particular through increased use of media.

In the event that a temporary water use restriction is imposed additional communications will be made to ensure that customers understand what this means for them and know how to make representations.

### 10.3.5 Vulnerable Customers

The Company recognises that the implementation of certain drought actions may potentially cause hardship for vulnerable and sensitive customers. Vulnerable groups would particularly suffer if standpipes or rota cuts were introduced; however, this is considered to be a measure of last resort, with an expected frequency of less than 1 year in 100. Such a measure would entail a level of detailed planning similar to that set out under the Company's emergency planning procedures, for which a list of vulnerable groups is maintained. When considering drought actions, their likely

effects on vulnerable groups will be assessed, and appropriate mitigation measures put in place. Specific targeted communication with these customers will be undertaken.

### **10.3.6 Business Customers**

Business customers are encouraged to use water efficiently through the same communications as domestic customers; however, they generally have sound business incentives to use water wisely, and there is less scope for additional savings. During a drought situation, the Company would take the opportunity to engage with particular groups of business customers, including large users, to offer additional advice on how to mitigate the impacts of a drought through efficient use of water, thereby showing their own customers that they are 'doing their bit' whilst in a period of drought. The types of business customer considered for this type of activity would be:

- Garden centres
- Golf courses
- Market gardeners
- University colleges
- Large users of process water

We will encourage businesses to ensure they are as water efficient as possible in their own business activities, and to promote this both to employees and customers. Specific business activities that use water will be targeted with appropriate messages specific to areas of use, this may be for example for a garden centre to promote water butts, and low use irrigation or watering systems to their own customers.

Post April 2017, eligible non-household customers will be able to choose who provides their retail water services. At this time we do not know how many non-household customers and in which sectors, may choose an alternative retailer. However as a wholesaler, our duty to promote water efficiency will remain and we would expect our promotion of water efficiency to continue, with the addition that messaging would also be sent via known retailers operating in our area of supply. Retailers may also have their own process and reasons for promoting water efficiency.

During a drought, and the requirement for enhanced communications, we would if necessary use the usual arrangements in place for data exchange between retailer and wholesalers to publicise and give notice of details of planned drought activities.

### **10.3.7 School Pupils**

Schools represent an effective route for influencing water efficiency behaviour, both in normal and drought situations. During a drought, increased awareness campaigns will be directed at schools to inform and provide the appropriate access to water efficiency and saving devices and advice. We will enhance our on-going schools engagement programme to impart these messages.

## **10.4 Messages and Activities**

The precise nature and format of communications will depend on the situation, and the use of the most appropriate method will be determined by the Drought

Management Team, in response to any Environment Agency advice, the regional situation and in conjunction with messages from other water companies.

Messages need to be clear, consistent and kept to a manageable number to ensure maximum understanding and impact with the audience. The messages will be primarily determined by the status of operations (as triggered by monitoring) and then tailored to the individual audience and channel.

A key message to be conveyed and reinforced is the need to use water wisely, and any or all of the methods defined below may be used to achieve this.

- General 'use water wisely' messages.
- 'Use water wisely in the garden' messages.
- Advice on using water wisely in the household.
- Free issue of hippo and hog water saving devices for use in toilet cisterns.
- Free issue of water saving packs.
- Promotion of water efficiency and free provision of water efficiency devices at superstores such as supermarkets, DIY stores and garden centres.
- Publicity events to raise awareness of water efficiency
- Water industry communications through Water UK.
- Joint initiatives with other organisations and water companies to promote water efficiency
- Issue of press releases to the local press.
- Focused features and articles
- Adverts and interviews, contributions to local television interviews and reports.
- Regular updates on the drought situation
- Information and updates on the current status of our water resources.
- Temporary water use restrictions notification and awareness
- Non-essential use restrictions communication and consultation
- Information on applications for drought permits and emergency drought orders.

## 10.5 Communications Channels

A significant number of channels are available to communicate with the key audiences. These are a mixture of owned, earned and paid for. A number of the channels are already routinely used by the water company to communicate with audiences – the frequency and timing of these would be altered to respond to the situation. Others are not regularly used and would be adopted to amplify the message being communicated.

The following list is an overview of the categories of channels the plan would use according to need. The individual details of channel are not listed as these will be constantly changing.

- Meetings/face to face/1:2:1
- Customer website - [www.south-staffs-water.co.uk](http://www.south-staffs-water.co.uk)
- Social media – the company has Twitter and Facebook profiles
- Editorial via traditional media – local newspaper print and radio or TV broadcast

- Advertising – local newspaper print, radio and TV broadcast, livery, outdoor,
- SMS/text messaging – using database of customer mobile phone details
- Email – using database of customer emails
- Direct customer contact via: Call centre; on the ground staff (customer liaison; specialist roles/teams (education, water efficiency, catchment management), etc)
- Mailings – regular billing cycle and bespoke mailings
- Events
- Stakeholder owned channels

## **10.6 Drought Communication Protocol**

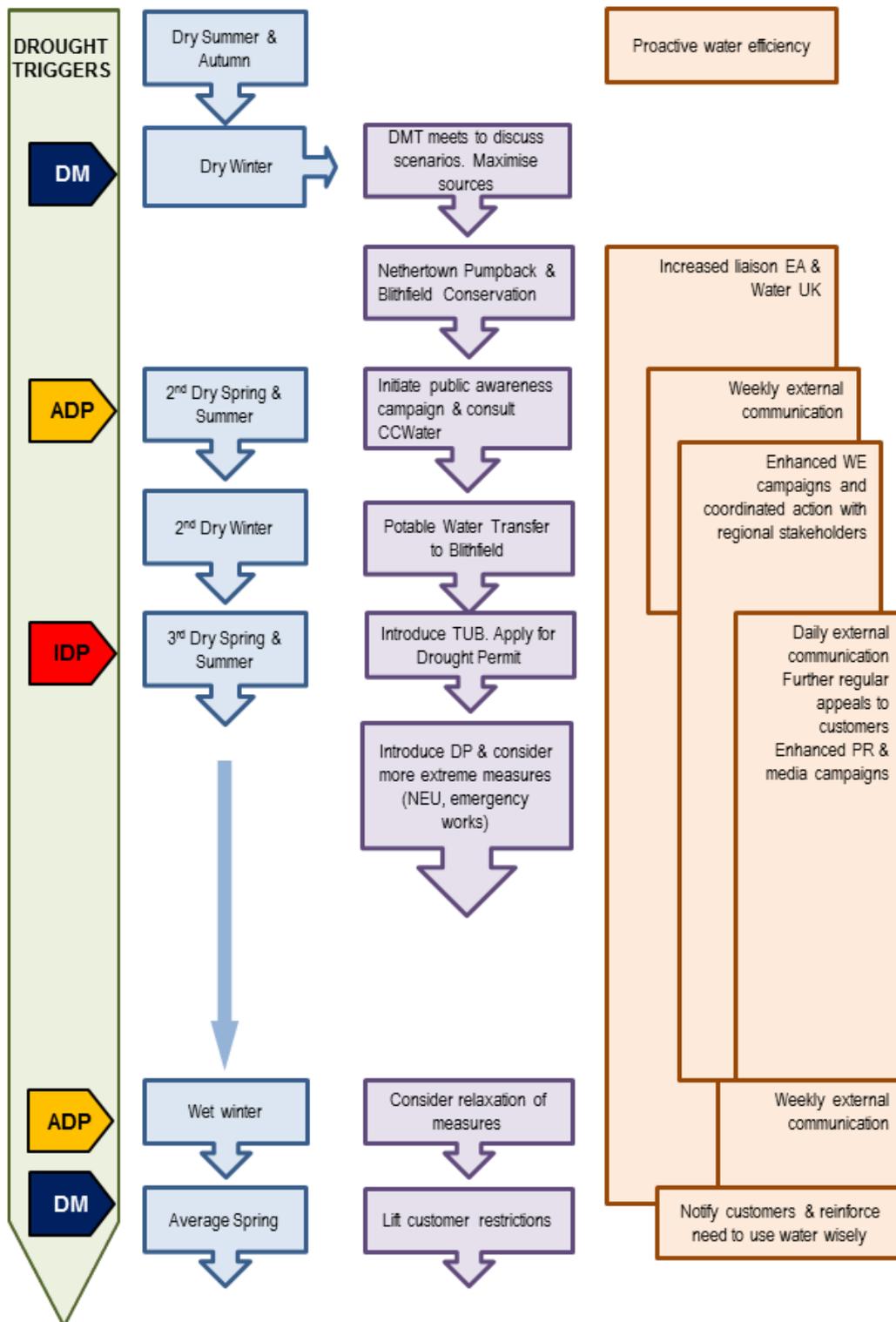
The drought triggers indicated in Section 5, link into the level of enhanced communications activity, the timing of which has been determined by the effective implementation of measures in historic drought events as they have progressed. The range of successive communications measures, messages and themes as a drought situation progresses is summarised in Table 13 below.

Once the Drought Management Team has been convened, the level of communications activity is progressively increased, as per Figure 19. The timing of communications and messaging is not prescriptive as it will be dependent on the actual nature of a drought sequence, and its geographical coverage, however the drought management triggers that link to consideration of communications activities are indicated.

**Table 13 Enhanced Communication Plan**

<b>Approx timing</b>	<b>Operational status</b>	<b>Message theme</b>
	<b>Normal</b> above drought monitoring triggers	Monthly updates on rainfall, reservoir levels, reservoir inflows and groundwater levels Proactive water efficiency awareness and education
<b>Just above Drought Monitoring Trigger</b>	<b>Drought monitoring</b> drought monitoring triggers approaching-downward trend	Weekly situation assessment and status – reporting at supply meetings, EA liaison commenced Proactive water efficiency awareness and education – website, media
<b>Drought Monitoring Trigger</b>	<b>Drought management</b> initial drought monitoring triggers breached	Weekly situation assessment and status updates – all available channels. Consideration of enhanced campaigns and options assessed by Drought Management Team. Joined up stakeholder messaging with regional stakeholders- EA, water companies, Water UK
<b>Apply for Drought Permit Trigger</b>	<b>Serious drought management</b> drought triggers breached, continuing downward trend and outlook	Daily situation assessment and status updates – consultation and liaison with appropriate stakeholders. Further regular appeals to reduce demand Enhanced public relations and media campaigns Communication and consultation on Temporary Use Ban
<b>Implement Drought Permit Trigger</b>	<b>Extreme drought management</b> Drought schemes in place, continuing downward trend and outlook	Daily situation assessment and status updates – consultation and liaison with appropriate stakeholders. Further regular appeals to reduce demand Enhanced public relations and media campaigns Communication and consultation on non Essential Use Ban
<b>Depends on recovery</b>	<b>Drought cessation</b> Drought triggers returned to normal levels, recovering trend	Situation assessment and status updates – consultation and liaison Express gratitude for customer’s efforts – reinforce use water wisely messaging. Relaxation/withdrawal of ban Proactive water efficiency awareness & education

**Figure 19 Drought triggers and communications activities**



## 10.7 Monitoring Communication Activities

The drought situation, and the effectiveness of communication measures, will be constantly monitored throughout the normal and enhanced communication process, and decisions to develop or modify successive actions will be made accordingly by the Drought Management Team. In particular the number of access hits on the relevant sections of the website will be used to determine the effectiveness of the online campaign, and requests for water efficiency services, packs and information will also be monitored.

Activity via social media accounts will also be monitored and use as an indication of the effectiveness of these channels of communication.

## 10.8 Lessons Learned From Previous Droughts

Communications activity during previous drought situations has proved to be both successful and effective. We will take on the learning points from previous droughts, together with the Environment Agency's general recommendations, and will incorporate these into subsequent action plans. In particular we undertake to:

- improve lead times to ensure all communications and updates are made in a timely fashion to stakeholders, and seek their feedback throughout the process.
- engage with the Environment Agency and neighbouring regional water companies to ensure consistent key messages throughout all drought-themed advertising, and wider communications.
- provide clarity and consistency regarding those uses of water covered by actual and potential restrictions.
- liaise with suppliers, contractors and other third parties to ensure a consistent and joined up approach to using water wisely.
- hold timely workshops or briefing sessions with key stakeholders to update them on actions and seek feedback.
- Ensure the flow of information for customer centre staff to appraise customers of the current situation and any likely effects of restrictions.

## 11 The End of a Drought

### 11.1 Identifying the End of a Drought

The end of a drought can be defined as when the risk of impacts from drought is no greater than during a normal year, and where normal conditions have continued for a period of time. Each drought sequence is different, and there can be no hard and fast rules by which to determine the end of a drought, but the Company will use the observations and data captured in its drought management tool to inform its decisions. This will be used to complement the Environment Agency position on drought status.

The relevant Company indicators will comprise; storage levels in Blithfield Reservoir, storage levels in Clywedog Reservoir, monthly inflows to Blithfield Reservoir, soil moisture deficit and the amount of effective rainfall, compared with long-term average (determined from the MORECS data provided by the Met Office); cumulative rainfall and pseudo groundwater levels at Company rain gauges (determined from our own observations and records at the Central and River Severn Works). We would expect the end of a drought to be when all of these indicators have returned to long term average levels, or that a sufficient number of key indicators are showing a trend approaching long term levels, supported by meteorological outlooks with some certainty attached.

The Company will not declare that a drought is over until it has consulted with the Environment Agency to confirm the latest water resources situation, and an agreed regional message from all other water companies involved can be communicated. It is important in a prolonged drought to ensure sufficient sustained recovery in resources can be determined prior to declaring the end of a drought. This will be communicated to customers in accordance with the Communications Plan described in Section 10. The cessation of drought management actions may be dependent on the stage to which they have progressed: in particular for supply side options with long lead times it may be appropriate for the action to continue to completion. However, we are committed to removing any restrictions on customer use through temporary use bans or ordinary drought orders as soon as is reasonably practical.

### 11.2 Post-Drought Actions

Should a drought event occur, the Company will carry out a timely post-drought review, which will examine the effectiveness of its drought plan in specific areas, including the following;

- Environmental modelling during and after drought – was it appropriate?
- Drought management actions – were they successful, and what was their cost?
- Performance of sources – did deployable output meet expectations?
- Demand measures – what was their quantifiable effect in reducing demand?
- Were any strategic investments made which might have a material effect on other plans (e.g. the WRMP)?

We will work closely with the Environment Agency and with other key stakeholders to produce our review. We will carry out our review within 3 months after the end of a drought, and we will produce a “lessons learned” report within 3 months after that. This will be followed, within a further 12 months, by a monitoring report on actions identified and taken.

The Drought Plan Direction 2016 prescribes the actions that water companies need to take to maintain and revise their drought plans, depending on the circumstances.

Under normal procedures the Company will review its drought plan annually, whether or not a drought has occurred within that time. If there has been a material change of circumstances, or where experience during a drought event has revealed inaccuracies in its plan – or, in any event, as directed by the Secretary of State or within 5 years – the Company will revise its plan, in line with the process and timetable set out in legislation and other guidance.

## 12 Conclusions

The occurrence of droughts is unpredictable. It requires water companies to be ever ready to manage the impacts. Climate change may also increase the risk of more frequent and severe drought events in the future, as rainfall quantities and patterns change. Balancing the needs of the environment and the public water supply during a drought is not easy and, before contemplating any actions they may wish to take to conserve supplies, water companies need to give due consideration to the consequences of those actions. This plan outlines the options that we can consider and the actions we would take in the event of a drought as severe as those on the historical record and demonstrates the plan is sufficiently robust to manage a more severe drought at least as extreme as a 1 in 200 year event.

### 12.1 Summary

A successful drought plan should be based on effective communications among stakeholders; not only in the formulation and structure of the plan itself, but also in the way any proposed drought actions are broadcast.

The proportionality and timeliness of any actions are also paramount, in order to minimise environmental effects: a drought management plan should therefore rely on robust trigger mechanisms for action.

The South Staffordshire Water drought plan is built on a sound knowledge of the Company's water resources, its key installations, and its customer base. We have a successful record of managing previous droughts, and our latest plan takes full account of those experiences, and of lessons learned. The process we have followed in preparing this plan aligns with the latest published guidance, including pre-consultation with regulators and other bodies, reviews of drought triggers and actions, environmental studies, and scenario planning.

We are confident that this is a robust drought plan, which proposes a timely and sustainable drought management approach, and thereby meets the expectations of all stakeholders.

To summarise, this plan

- Sets out the actions and measures that we will put in place to mitigate the effects of a range of possible future droughts. The actions and measures have been determined through experience gained, and lessons learned, in managing previous droughts. Full consideration has been given to the possible effects of any drought action on customers, and on the environment, and none of the actions proposed will be taken lightly.
- Recognises that no two droughts are the same, and offers a flexible approach to drought management that can be tailored to suit the prevailing situation, and adjusted as a drought sequence progresses.
- Offers a sustainable approach, which enables a supply demand balance to be maintained in the event of a drought with the least risk to the environment by fully utilising our licenced abstractions before resorting to drought orders or permits.
- Is underpinned by robust assessments of the potential environmental impact of proposed actions (particularly drought permits or orders) and proposes appropriate monitoring and mitigation.
- Identifies uncertainty in the future availability of our abstraction licences as a means to manage droughts. Once this uncertainty is addressed and the impact of

the Environment Agency Sustainable Catchments programme can be determined a revised Drought Plan will be developed if required.

## **12.2 Uncertainty in the Drought Plan**

This drought plan provides a framework for managing a drought. We have assessed risks to the environment from the range of drought management actions proposed and believe these to be proportionate. Our plan makes use of the current available abstraction licences granted by the Environment Agency, and at the time of publication there is some uncertainty surrounding the outcomes of the EA Sustainable Catchments programme and subsequent review of licences where the recent historical use has been less than the full licenced volume.

We have produced this plan on the basis of maintaining the licenced volume currently available to us, and as published in the current WRMP14. Alongside an assessment of the risk of deterioration from using licences, we believe this plan provides a robust approach to drought management, with the least risk to the environment and least impact to customers.

At the time of publication, we are beginning pre consultation on our next WRMP. The revised WRMP will review the Company's Deployable Output figures, and will assess additional supply options, including the potential for these to be drought supply side options, or drought permit sites. This will include any change to the Company's abstraction licences arising from the Sustainable Catchments review. The publication of a revised WRMP may result in a material change to circumstances affecting this drought plan, which would in turn trigger a review of the plan.

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APPENDIX L: GLOSSARY

## APPENDIX A: DRAFT DROUGHT PLAN PRE-CONSULTATION RESPONSES



Peter Greenaway  
Water Resources Manager  
South Staffordshire Water  
Green Lane  
Walsall  
WS2 7PD

BY EMAIL ONLY

Date: 22 September 2016

Dear Peter

### Response to your drought management plan pre-consultation letter

Thank you for consulting the Environment Agency for information and advice regarding the preparation of your draft drought plan. This letter provides our formal response to your pre-consultation request for information. We will be pleased to continue any discussions on your draft drought plan as you develop it.

Water companies should follow the water company drought plan guideline when preparing their draft drought plans. This is available from: <https://www.gov.uk/government/collections/how-to-write-and-publish-a-drought-plan>. Further information is available in supporting guidance documents hosted on the Defra Huddle: <https://www.huddle.com/>. For login details or any problems with access, please contact Defra directly at [water.resources@defra.gsi.gov.uk](mailto:water.resources@defra.gsi.gov.uk).

We would also expect you to consider all relevant statutory requirements including the new Defra Directions, published 22 July 2016.

The key points we would like you to consider are:

- The sequencing of drought actions - you should plan to implement customer restrictions and demand interventions prior to any drought permit/order application, or clearly explain why you do not think this is appropriate.
- How you will engage in an effective way with your customers and stakeholders in a drought. You should consider how you will plan to avoid the risk of confusion for customers in neighbouring water operators' areas where drought actions may be different. It will be important for you to liaise with neighbouring water companies during the pre-consultation period to ensure communications in a drought are as coordinated as possible.
- An appropriate range of drought scenarios to ensure your plan is robust. Specifically, we strongly encourage you to plan for more severe drought events that are of longer duration and lower rainfall than those in the historic record. The *Drought Plan and WRMP Links* guidance has now been published on the Defra Huddle and provides further information on the interactions between the two plans and consideration of plausible droughts.
- An assessment of the effect that your plan will have on Water Framework Directive status or potential. You should consider the effects your actions

might have on environmental objectives and measures set out in River Basin Management Plans. Specifically, you should consider whether the increased use of any licence would cause deterioration under the Water Framework Directive.

- The requirements for environmental monitoring and assessment needed to support your draft plan. You should ensure that details of your environmental monitoring programme are included in your drought plan. Where gaps are identified you should liaise with us to confirm what additional monitoring is required and agree the best sites for further monitoring. Supplementary guidance on environmental assessment and WFD has now been published and is available on the Defra Huddle (*Environmental Assessment for Water Company Drought Plans*).
- Review of monitoring and mitigation actions detailed in your Hampton Loade Drought Order Environmental Report, following publication of our River Severn Drought Order Environmental Assessment in 2013 (<https://www.gov.uk/government/publications/river-severn-drought-order-environmental-report>). Your assessment needs to account for any in combination effects of all possible drought permits/orders in place at the same time on the River Severn.
- Natural England (NE) must be consulted if any of your proposed drought actions may affect a designated site. A Habitats Regulations Assessment (HRA) must be undertaken if a drought action could affect a SAC, SPA or Ramsar, even if the drought action occurs in the winter months. Early liaison with NE and ourselves is important to agree the requirements for environmental assessments at these sites.
- What bulk supply arrangements you have with other water undertakers and how these arrangements operate during a drought. You should ensure that there is a common understanding of their operation in both companies' drought plans.

We will ensure our own drought plans for the West Midlands area reflect the changes you make to your drought plan. These are currently still produced to the former area boundaries of: Staffordshire, Warwickshire and West Midlands and Shropshire, Herefordshire, Worcestershire and Gloucestershire.

We look forward to working with you as you develop your new drought plan. Please let us know if there is any data and evidence you need in order to write your drought plan and when it is required. Sarah Hainie will be your lead contact throughout this process.

Yours sincerely



**John Giles**  
River Basin Account Manager

**Peter Greenaway**

---

**From:** Tidridge, Helen [REDACTED]  
**Sent:** 25 August 2016 15:42  
**To:** Peter Greenaway  
**Subject:** South Staffs Regional Drought Plan

**Follow Up Flag:** Follow up  
**Flag Status:** Flagged

Dear Peter

Thank you for your letter concerning the pre- draft consultation for South-Staffs Water`s drought plan. I confirm that Natural Resources Wales (NRW) have no comments to make on your proposed approach. The management of Clywedog reservoir is agreed with the Environment Agency, whom will be inputting into your drought plan. Should you decide to alter any operation of Clywedog as part of your drought plan please consult with NRW.

Regards  
Helen

Helen Tidridge  
Principal Water Resources Planner  
Natural Resources Wales  
Email: [REDACTED]  
Phone: [REDACTED]

## **Customer Panel Pre-consultation Review of South Staffs Water Drought Plan: Summary text received on behalf of Panel Chair 12 September 2016**

The main issues for South Staffs that I think are important to the customer panel are:

- Whether or not the level of service is acceptable – and if it is not then what would be the consequences for it to be improved.
- The plan and its presentation, including evaluation of costs and benefits.
- The plans for customer communications in the event of a drought.

This pre-consultation is based on the 2013 South Staffs Drought plan.

### Level of service

South Staffs aims for a level of service of two hosepipe bans in 80 years; this is unchanged in the latest WRMP. This level of service is very good and quite acceptable. If this does not change then the customer panel will have no issues with it.

### The plan and its presentation

Overall the plan is presented well and coherently, especially given its complexity, with different water resources, some of them requiring collaboration with external agencies such as the Environment Agency, Severn Trent and others.

The graphs showing modelled impact of previous droughts with current demands were useful. However, page 23 shows modelled storage at Clywedog hitting the Emergence Storage level in September 1976 and it is not clear from the text how this would in practice be avoided.

Also, the presentation of supply side options is weak. The table of options on p52 does not match very well with the following text. In particular:

- The table mentions 'introduce nitrate treatment plants' but there is no mention of this anywhere else. Also it is not clear how long it would take or what impact it would have.
- The table mentions 'Transfer of potable water into Blithfield reservoir' but this is not obviously linked to anything in the text.
- The text has a section entitled 'Bulk Supplies' which is not mentioned in the table (unless this is what is meant by the transfer of potable water above).

Some of the options in this table sound as if they could be expensive, such as the pump back scheme and the nitrate treatment plants. However there is no discussion of costs or cost benefit analysis anywhere in this document. The guidance from Defra 'How to write and publish a drought plan' does not explicitly state that cost should be a consideration in supply side actions but I am quite sure that customers would expect that cost is taken into account when devising the action plan – so that high cost, low benefit actions could be rejected.

### Plans for customer communications

South Staffs Water give a comprehensive list of media groups they would target with press releases and advertising. However relying mainly on the website and print media is not good enough these days, because many people use online media and social media for most of their news.

South Staffs should encourage customers to sign up for social media, email or SMS services so that they can receive timely information on drought status advice. Also,

when ECHO has customer email addresses (for example for paperless billing) it ought to be possible to use that route to push important messages. Even when retail services are walled off from supply services, there must be a mechanism for the supply side to request messages to be sent to customers.



South Staffordshire Water, South Staffs Region Drought Plan - Pre-Draft Consultation

CCWater response - November 2016

Thank you for inviting us to comment on your current drought plan ahead of revising it for formal consultation and submission to the Secretary of State by 31 March 2017.

CCWater welcomes the current non-technical summary that accompanies your full plan. We hope that a similar, customer friendly, summary will be produced to go alongside your revised drought plan. When you revise these we would like them to:

- Follow the principles set out in the Water UK/UKWIR Code of Practice on Temporary Use Restrictions, demonstrating an understanding of the impact of any measures on different customer groups and how these impacts have informed its approach.
- Reflect customers' priorities and preferences in relation to the actions that you plan to carry out, including showing evidence of relevant research and how the results have been used.
- Explain the company's strategy for engaging with domestic customers, including strategies for both managing drought and promoting water efficiency in non-drought times. We would expect companies to be aware of the risks of communication during a drought and to utilise a wide range of methods of communication. We note the current method of communication when a drought trigger happens is via your website and through targeted media campaigns including the local press. Given the recent work you have carried out to improve your website and encourage customers to set up on-line accounts, we would expect that your new plan will demonstrate how you will utilise these more innovative approaches in order to maintain customer communication during drought. For example, contacting customers via SMS services and social media.
- Show evidence of engagement and reflect the views of relevant stakeholders, such as Government departments, other water companies, NGOs, business and the agriculture sector. We note that a wide range of stakeholders were

consulted previously and assume that this list will now expand to include other relevant stakeholders that have been identified since the drought plan was last published.

- Outline what would happen in an emergency drought situation, such as when supplies might be interrupted/subject to rota cuts or standpipes.
- Be clearly written and accessible. We note that previously customer leaflets and a document of FAQs were produced and published on your website to help customers access and understand the impact of temporary use bans and drought orders. We hope that you will repeat this exercise in order to keep customers fully briefed, and we would welcome the opportunity to review these documents.



South Staffordshire Water  
Green Lane  
Walsall  
WS2 7PD

Email to: petergreenaway [REDACTED]

26 August 2016

### **South Staffordshire Water, South Staffs Regional Drought Plan – Pre-Draft Consultation**

EDF Energy is one of the UK's largest energy companies with activities throughout the energy chain. Our interests include nuclear, coal and gas-fired electricity generation, renewables, and energy supply to end users. We have over five million electricity and gas customer accounts in the UK, including residential and business users.

EDF Energy welcomes this opportunity to respond to the South Staffordshire Water, South Staffs Regional Drought Plan – Pre-Draft consultation. We fully support the government policy that gives the highest priority to ensuring security of electricity supply. To achieve this, it is important that thermal power stations are able to generate electricity to meet demand when necessary; this requires clear access to a reliable source of water for cooling purposes and other power station processes, even during an aquatic system stress event.

To ensure that there is adequate reliable capacity to meet demand and thus to safeguard security of electricity supply, the Government introduced the electricity Capacity Market in the Energy Act 2013. Capacity is procured through auctions, mainly for annual capacity agreements procured four years ahead. This capacity is provided mainly by electricity generators and, to a lesser extent, by interconnectors and providers of electricity demand side response. Capacity providers enter into agreements to deliver electricity when needed and are subject to financial penalties if they are unable to do so at times of electricity system stress (when there is a risk that electricity generation will not be sufficient to meet electricity demand).

Even in drought conditions, river based power stations will require access to sufficient volumes of water to run their plant and enable them to meet their capacity market obligations should they be required to run. Significant financial penalties apply in the event that a generator fails to meet its capacity obligations.

This means that river-based thermal power stations participating in the capacity market require:

1. Reliable abstraction rights upon which to base their ability to provide future capacity commitments in the year of delivery;



2. Reliable access to sufficient volumes of water through abstraction when called upon to meet their Capacity Market obligations within the year of delivery.

We are aware that during aquatic system stress events drought plans provide a framework within which a water company can seek to:

1. Relax restrictions on their own abstractions and discharges; and
2. Impose restrictions on the abstractions and uses of water by others, including electricity producers.

This is a serious concern as it has the potential to compromise the ability of electricity producers to deliver their contribution to national electricity security. This could impose costs and risks on both electricity consumers and electricity producers during such aquatic system stress events.

We believe that it is necessary to ensure that the potential effects on national electricity security of supply is not compromised and that electricity producers are fully considered and consulted by water companies in the drought planning process.

We look forward to appropriate engagement within the South Staffs Regional Drought Planning process.

Should you wish to discuss any of the issues raised in our response or have any queries, please contact me on [REDACTED]

I confirm that this letter may be published on the South Staffordshire Water website.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'Guy Buckenham'.

**Guy Buckenham**  
Head of Generation Policy & Regulation



Peter Greenaway  
Water Resources Manager  
South Staffs Water  
Green Lane  
Walsall  
WS2 7PD

Name Neil Edwards  
Phone [REDACTED]  
E-Mail [REDACTED]

Environment & Chemistry Dept  
RWE Generation UK  
Windmill Hill Business Park  
Whitehill Way  
SWINDON  
SN5 6PB

26 August 2016

**SSW Drought Plan - Pre-Draft Consultation Response RWE Generation UK**

Dear Peter,

RWE Generation has one of the largest power portfolios in the world, with around 40 GW of generating capacity. The company is a wholly-owned subsidiary of RWE AG. RWE Generation UK owns and operates a mix of modern and efficient coal, biomass and gas-fired power stations across the UK, with the capacity to generate around 8,000 MW of electricity, a significant proportion of the UK's needs. On the river Trent we own and operate Staythorpe power station.

Since the last water company drought planning round, in order to deliver national security of electricity supply, Government has developed the electricity Capacity Market. In this, individual electricity producers enter into contracts with Government which obligate producers to meet demands on them; significant financial penalties apply in the event that a producer fails to meet its contractual obligations. In order to provide capacity, which is contracted through auction 4 years ahead of time, electricity producers need both:

- reliable abstraction rights upon which to base their future capacity commitments in the auction and
- reliable access to sufficient volumes of water through abstraction when called upon to meet their Capacity Market commitments.

We note that drought plans provide a framework within which a water company can both seek to:

- relax restrictions on their own abstractions and discharges and
- impose restrictions on the abstractions and uses of water by others, including electricity producers

This could compromise the ability of electricity producers to deliver their contribution to national electricity security of supply by affecting access to, and use of, water by electricity producers during drought.

It is therefore necessary to ensure that potential effects on electricity producers are fully considered by water companies in the drought planning process with a view to ensuring national electricity security of supply is not compromised. We look forward to appropriate engagement within the drought planning process to safeguard this, particularly with respect to the contribution of Staythorpe power station.

Yours Sincerely

Neil Edwards  
Principal Policy Advisor (Water)  
RWE Generation UK

cc Andrew Mosley,  
Station Chemist & Environment Lead  
Staythorpe Power Station

## APPENDIX B1: LIST OF KEY ENVIRONMENTALLY SENSITIVE SITES

Code	Designation	No. (14 sites have multiple designations)
LNR	Local Nature Reserve	107
SSSI	Site of Special Scientific Interest	129
NNR	National Nature Reserve	10
SAC	Special Areas for Conservation	9
SPA	Special Protection Areas	0
RAMSAR	Wetland of International Importance	2

Map Label	Name	Area (ha)	Designation (s)
1	Abbey Green	2	LNR
2	Alcott Wood	6	LNR
3	Allestree Park	88	LNR
4	Allimore Green Common	3	SSSI
5	Alvecote Pools	129	SSSI
6	Alveley Grindstone Quarry	1	SSSI
7	Aqualate Mere	214	NNR; SSSI
8	Ashby Canal	15	SSSI
9	Astonfields Balancing Lakes	4	LNR
10	Babbs Mill	36	LNR
11	Badgers Hollow, Coton Park	10	LNR
12	Baggeridge Country Park	56	LNR
13	Balaams Wood	6	LNR
14	Ballidon Dale	51	SSSI
15	Barlaston and Rough Close Common	21	LNR
16	Barrow Hill And Tansey Green	15	SSSI
17	Barrow Hill, Dudley	37	LNR
18	Baswich Meadows	13	SSSI
19	Bath Pasture	9	SSSI
20	Beechcroft	4	LNR
21	Bees Nest & Green Clay Pits	15	SAC; SSSI
22	Belvide Reservoir	89	SSSI
23	Bentley Park Wood	105	SSSI
24	Big Hyde Rough	11	SSSI
25	Birches Barn Meadows	11	SSSI
26	Bittell Reservoirs	66	SSSI
27	Blakemarsh	4	LNR
28	Blithfield Reservoir	464	SSSI
29	Boulton Moor	4	SSSI
30	Bradbourne Mill Meadows	7	SSSI

31	Braken Hurst	25	SSSI
32	Branston Water Park	24	LNR
33	Breadsall Railway Cutting	5	LNR; SSSI
34	Breedon Cloud Wood and Quarry	63	SSSI
35	Breedon Hill	5	SSSI
36	Brewin's Canal Section	1	SSSI
37	Broad Meadow	25	LNR
38	Brocton	41	LNR
39	Bromsgrove Road Cutting, Tenterfields	0	SSSI
40	Bromwich Wood	4	LNR
41	Brownend Quarry	2	SSSI
42	Brown's Close Meadow	3	SSSI
43	Buckpool and Fens Pool	63	LNR
44	Bumble Hole	9	LNR
45	Burcot Lane Cutting	0	SSSI
46	Burlish Top	39	LNR
47	Bush Wood and High Wood	100	SSSI
48	Caldon Dales	14	SSSI
49	Caldon Low	1	SSSI
50	Calke Park	80	NNR
51	Calke Park	71	SSSI
52	Cannock Chase	1279	SAC; SSSI
53	Cannock Extension Canal	5	SAC; SSSI
54	Carver's Rocks	17	SSSI
55	Cauldon Railway Cutting	2	SSSI
56	Cecilly Brook	7	LNR
57	Chaddesden Woods and Lime Lane Wood	10	LNR
58	Chaddesley Woods	60	NNR
59	Chartley Moss	107	NNR; SSSI
60	Chasewater And The Southern Staffordshire Coalfield Heaths	530	SSSI
61	Checkhill Bogs	13	SSSI
62	Chellaston Brickworks	12	LNR
63	Chelmsley Wood	6	LNR
64	Chorley Covert and Deserts Wood	74	SSSI
65	Christian Fields	7	LNR
66	Churnet Valley	349	SSSI
67	Claverley Road Cutting	0	SSSI
68	Clayhanger	27	SSSI
69	Codsall Coppice	3	LNR
70	Cole Bank	14	LNR
71	Cole End	2	LNR
72	Coleshill and Bannerly Pools	38	SSSI
73	Combes Valley	113	SSSI
74	Consall	93	LNR
75	Cotwall End	56	LNR

76	Coyney Woods	30	LNR
77	Crown Meadow	3	LNR
78	Cuckoo's Nook and The Dingle	13	LNR
79	Darley and Nutwood	10	LNR
80	Daw End Railway Cutting	8	SSSI
81	Devil's Spittleful	99	SSSI
82	Dimmings Dale & The Ranger	23	SSSI
83	Dimminsdale	37	SSSI
84	Doley Common	17	SSSI
85	Donington & Albrighton	5	LNR
86	Donington Park	39	SSSI
87	Dosthill Park	8	LNR
88	Doulton's Claypit	3	SSSI
89	Dove Valley and Biggin Dale	690	SSSI
90	Dovedale	682	NNR
91	Doxey and Tillington Marshes	129	SSSI
92	Ecton Copper Mines	100	SSSI
93	Edgbaston Pool	16	SSSI
94	Elm Wood	2	LNR
95	Elmdon Manor	3	LNR
96	Elvaston	15	LNR
97	Eymore Railway Cutting	0	SSSI
98	Feckenham Forest	230	SSSI
99	Fens Pools	38	SAC; SSSI
100	Forest Banks	45	SSSI
101	Forge Mill Lake	105	LNR
102	Four Ashes Pit	1	SSSI
103	Froghall Meadow and Pastures	11	SSSI
104	Gentleshaw Common	80	SSSI
105	Goat Lodge	12	SSSI
106	Gorse Farm Wood	6	LNR
107	Gospel End Road Cutting	0	SSSI
108	Habberley Valley	25	LNR
109	Hales Hall Pool	3	LNR
110	Hamps and Manifold Valleys	1010	SSSI
111	Hay Head Quarry	5	SSSI
112	Hay Head Wood	6	LNR
113	Hazel Slade	13	LNR
114	Hednesford Hills Common	107	LNR
115	Hewell Park Lake	21	SSSI
116	Highgate	116	LNR
117	Highgate Common	95	SSSI
118	Hill Hook	8	LNR
119	Hilton Gravel Pits	31	SSSI
120	Hipley Hill	22	SSSI
121	Hoar Park Wood	29	SSSI

122	Hobs Moat	4	LNR
123	Hodge Lane	5	LNR
124	Hoften"s Croft Meadows	1	LNR
125	Hollywood	5	LNR
126	Hopwood Dingle	7	SSSI
127	Hulland Moss	3	SSSI
128	Hulme Quarry	41	NNR; SSSI
129	Hurcott and Podmore Pools	22	SSSI
130	Hurcott Pasture	5	SSSI
131	Hurcott Wood	37	LNR
132	Hurst Farm Pasture	2	SSSI
133	Illey Pastures	4	SSSI
134	Jockey Fields	18	SSSI
135	Kedleston Park	94	SSSI
136	Ketley Claypit	2	SSSI
137	Kettle Brook	62	LNR
138	Kingfisher	52	LNR
139	Kingfisher Trail	2	LNR
140	King's Norton	25	LNR
141	Kingsbury Brickworks	0	SSSI
142	Kingsbury Meadow	3	LNR
143	Kingsbury Wood	60	SSSI
144	Kingsford Forest Park	81	LNR
145	Kingsmead Marsh	8	LNR
146	Kingston Pool Covert	5	LNR
147	Kinver Edge	124	SSSI
148	Kirkham's Silica Sandpit	30	SSSI
149	Little Royal Farm Pastures	3	SSSI
150	Lount Meadows	9	SSSI
151	Madeley Heath Pit	3	SSSI
152	Marston Green Millenium Wood	4	LNR
153	Marston Green Park	11	LNR
154	Mercaston Marsh and Muggington Bottoms	14	SSSI
155	Merrion's Wood	10	LNR
156	Mickleover Meadows	10	LNR
157	Middleton Pool	13	SSSI
158	Midland Meres & Mosses - Phase 1	513.35	RAMSAR
159	Midland Meres & Mosses Phase 2	1593.1	RAMSAR
160	Milford Quarry	6	SSSI
161	Mill Lane	8	LNR
162	Moira Junction	3	LNR
163	Moorcroft Wood	12	LNR
164	Moseley Bog	11	LNR
166	Mottey Meadows	44	SAC; SSSI
165	Mottey Meadows	43	NNR
167	Mousesweet Brook	4	LNR

168	New Lount	21	LNR
169	Newton Burgoland Marshes	9	SSSI
170	Oakland Pasture	1	SSSI
171	Old River Dove, Marston on Dove	2	SSSI
172	Olton Jubilee Woodland	4	LNR
173	Park Lime Pits	9	LNR
174	Parwich Moor	16	SSSI
175	Pasturefields Salt Marsh	8	SAC; SSSI
176	Peak District Dales	915	SAC
177	Pelsall North Common	42	LNR
178	Penorchard & Spring Farm Pastures	15	SSSI
179	Plantsbrook Reservoirs	11	LNR
180	Priory Woods	82	LNR
181	Puxton Marshes	13	SSSI
182	Rawbones Meadow	21	SSSI
183	River Blythe	18	SSSI
184	River Mease	23	SAC; SSSI
185	River Stour Flood Plain	18	SSSI
186	Roberts Primary School	1	LNR
187	Romsley Hill	14	SSSI
188	Romsley Manor Farm	9	SSSI
189	Rough Wood	29	LNR
190	Rough Wood Chase	98	LNR
191	Rubery Cutting	1	LNR
192	Rue Hill	16	SSSI
193	Saltersford Lane Meadows	4	SSSI
194	Saltersford Wood	6	LNR
195	Saltwells	89	LNR
196	Scalpcliffe Hill	8	LNR
197	Sheepwash	39	LNR
198	Sheepy Fields	5	SSSI
199	Shire Oak Park	25	LNR
200	Shoal Hill Common	75	LNR
201	Sinfin Moor	24	LNR
202	Sling Gravel Pits	1	SSSI
203	Smestow Valley	51	LNR
204	Smiths Wood	4	LNR
205	Sot's Hole with Bluebell Wood	10	LNR
206	South Staffordshire Railway Walk	32	LNR
207	Spennells Valley	15	LNR
208	Stafford Brook	7	SSSI
209	Stanton Pastures & Cuckoocliff Valley	109	SSSI
210	Stone Meadows	14	LNR
211	Stourvale Marsh	9	SSSI
212	Stowe Pool and Walk Mill Clay Pit	8	SSSI
213	Stubbers Green Bog	3	SSSI

214	Sunnydale Park	13	LNR
215	Sutton Park	877	NNR; SSSI
216	Swan Pool & The Swag	6	SSSI
217	Swineholes Wood and Black Heath	46	SSSI
218	Tameside	20	LNR
219	Tenterfields	0	LNR
220	Thatchers Wood and Westwood Covert	36	SSSI
221	The Sanctuary	12	LNR
222	The Wilderness & Vermin Valley	5	SSSI
223	Ticknall Quarries	30	SSSI
224	Turner's Hill	2	SSSI
225	Upton Warren Pools	18	SSSI
226	Waddens Brook, Moose Lane	13	LNR
227	Wall Lands	9	SSSI
228	Warren's Hall Country Park	35	LNR
229	Warwickshire Moor	5	LNR
230	Waseley Hills Country Park	61	LNR
231	West Midlands Mosses	107	SAC
232	West Park Meadow	4	LNR
233	Whiston Eaves	10	SSSI
234	Whitacre Heath	45	SSSI
235	Wilden Marsh and Meadows	41	SSSI
236	Wollaston Ridge Quarry	0	SSSI
237	Wom Brook Walk	15	LNR
238	Woodgate Valley	163	LNR
239	Woodlands Quarry	1	SSSI
240	Wren's Nest	34	LNR; NNR; SSSI
241	Wyre Forest	1483	NNR; SSSI
242	Wyrley & Essington Canal	15	LNR
243	Yorks Wood	12	LNR

## APPENDIX B1: LIST OF KEY WATER FRAMEWORK DIRECTIVE AND ASSOCIATED RIVERS

### WFD Rivers

IDI	EA Waterbody ID	EA Waterbody Name	Downstream Waterbody ID	River Basin District	Current (5) & Future (6) NEP
1	GB104028046440	Tame from R Blythe to River Anker	GB104028047050	Humber	
2	GB104028046450	Footherley Brook from Source to Black-Bourne Brook	GB104028047000	Humber	AMP6
3	GB104028046480	Crane Brook - source to Footherley Brook	GB104028047000	Humber	AMP6
4	GB104028046491	Blithe - Tad Bk to R Trent (same as before?)	GB104028047290	Humber	AMP6
5	GB104028046560	Mease from Hooborough Brook to Trent	GB104028047180	Humber	
6	GB104028046570	Mease from Gilwiskaw Bk to Hooborough Brook	GB104028046560	Humber	
7	GB104028046580	Hooborough Brook from Source to River Mease	GB104028046560	Humber	
8	GB104028046590	Gilwiskaw Brook from Source to River Mease	GB104028046570	Humber	
9	GB104028046680	Penk from Source to Saredon Brook	GB104028047122	Humber	AMP7
10	GB104028046740	Saredon Brook from Source to River Penk	GB104028047122	Humber	AMP7
11	GB104028047000	Black-Bourne Bk from source (confluence) to R Tame	GB104028046440	Humber	AMP6
12	GB104028047050	Tame from River Anker to Tiver Trent	GB104028047180	Humber	
13	GB104028047121	Penk - Whiston Bk to R Sow	GB104028047190	Humber	
14	GB104028047122	Penk - Saredon Bk to Whiston Bk	GB104028047121	Humber	
15	GB104028047180	Trent - R Tame to R Dove	GB104028047420	Humber	
16	GB104028047250	Pyford Brook Catchment (trib of Trent)	GB104028047290	Humber	AMP7

IDI	EA Waterbody ID	EA Waterbody Name	Downstream Waterbody ID	River Basin District	Current (5) & Future (6) NEP
17	GB104028047280	Rising Brook	GB104028047290	Humber	AMP6
18	GB104028047290	Trent from Moreton Brook to River Tame	GB104028047180	Humber	
19	GB104028047300	Trent from River Sow to Moreton Brook	GB104028047290	Humber	
20	GB104028047420	Trent from R Dove Conf to River Derwent	GB104028053120	Humber	
21	GB104028052290	Blithe from Source to Tad Brook	GB104028046491	Humber	
22	GB104028052420	Dove - R Churnet to R Trent	GB104028047420	Humber	AMP7
23	GB104028052652	Churnet from Consall to River Dove	GB104028052420	Humber	AMP7
24	GB104028052670	Dove - conf R Manifold to conf R Churnet	GB104028052420	Humber	AMP7
25	GB104028053271	Trent from Fowlea Brook to Tittensor	GB104028053272	Humber	
26	GB104028053272	Trent from Tittensor to River Sow	GB104028047300	Humber	
27	GB109054044710	Stour (Worcs) - conf Smestow Bk to conf R Severn	GB109054049144	Severn	
28	GB109054044750	Stour (Worcs) source to conf Smestow Bk	GB109054044710	Severn	
29	GB109054044781	Smestow Bk - Wom-Penn Bk to conf R Stour	GB109054044710	Severn	AMP7
30	GB109054044811	Wom-Penn Bk - source to conf Smestow Bk	GB109054044781	Severn	
31	GB109054044830	Bobs-Holbeche Bk - source to conf Smestow Bk	GB109054044781	Severn	
32	GB109054049143	Severn conf M Wenlock-Farley Bk to conf R Worfe	GB109054049145	Severn	
33	GB109054049145	Severn - conf R Worfe to conf R Stour	GB109054049144	Severn	
34	GB109054049340	Smestow Bk - source to conf Wom-Penn Bk	GB109054044781	Severn	

IDI	EA Waterbody ID	EA Waterbody Name	Downstream Waterbody ID	River Basin District	Current (5) & Future (6) NEP
37	GB109054044570	Blakedown Bk - source to conf R Stour	GB109054049144	Severn	AMP6
38	GB109054044740	Spittle Bk - source to conf Smestow Bk	GB109054044710	Severn	AMP6
39	GB104028047270	Bourne-Bilson Brook Catchment (trib of Trent)	GB104028047290	Humber	AMP7

### **Non-WFD Rivers**

Label	Name	River Basin District	Current (5) & Future (6) NEP
35	Little Hay Brook	Humber	AMP6
36	Darnford Brook	Humber	AMP7

## APPENDIX C: DROUGHT MANAGEMENT OPTIONS – DEMAND

Option Name	Trigger(s)	Savings - Average	Savings - Peak	Location	Implementation timing	Permissions Required & Constraints	Risks
D1: Extra promotion of water efficiency	Drought Monitoring Curve	1 MI/d	3 MI/d	Whole Supply Zone	2 weeks lead time Effective spring to summer	None	None. Limited scope for savings
D2: Increased Leakage Detection and Repair	Drought Monitoring Curve	1.5 MI/d	1.5 MI/d	Whole Supply Zone	4 weeks lead time	None	Limited scope for savings, but depends on antecedent conditions. Acquisition of required resource, maintaining savings over longer term
D3: Appeals for restraint	Apply for Drought Permit	2 MI/d	10 MI/d	Whole Supply Zone	2 weeks lead time Effective spring to autumn	None	Savings are against worst case summer peak
D4: Temporary Use Ban	Just before Implement Drought Permit	4 MI/d	21 MI/d	Whole Supply Zone	5 weeks lead time Effective spring to autumn	Board Approval; stakeholder consultation, consideration of representations	Savings are against worst case summer peak
D5: Enhanced Pressure Management	Implement Drought Permit	1.5 MI/d	1.5 MI/d	Whole Supply Zone	2 months lead time	Board Approval	Limited scope for savings Customers may experience low pressure
D6: Restrictions on non-essential use	Implement Drought Permit and imposition of temporary use ban	up to 4 M/d	up to 20 MI/d	Whole Supply Zone	3 months lead time including 28 days for SoS decision following date of application, duration up to 6 months with 6 monthly extensions available.	Board Approval; application to Secretary of State, stakeholder consultation, consideration of representations	Savings highly uncertain because of poor data on proscribed uses. Difficulties in enforcement due to retail separation

## APPENDIX D: DROUGHT MANAGEMENT OPTIONS – SUPPLY

Option Name	Trigger(s)	Savings - Average	Savings - Peak	Location	Implementation timing	Permissions Required & Constraints	Risks
S1: Operation of River Blithe Pumpback	Drought Monitoring Curve	Existing DO	Existing DO	Whole Supply Zone	No lead time	None	Subject to hands off flow on River Trent
S2: Ensure existing sources are fully operational	Drought Monitoring Curve	Existing DO	Existing DO	Whole Supply Zone	4 weeks for most sources	None	
S3: Conserve Blithfield Reservoir	Drought Monitoring Curve	Existing DO	Existing DO	Whole Supply Zone	No lead time	None	
S4: Maximise use of enhanced groundwater treatment sites	Drought Monitoring Curve	Existing DO	Existing DO	Whole Supply Zone	2 weeks	None	
S5: Transfer of Potable Water to Blithfield Reservoir	Drought Monitoring Curve	Existing DO	Existing DO	Whole Supply Zone	up to 6 months for award of environmental permit; 4 weeks for operational checks and valve changes	Board Approval; requires new environmental permit from Environment Agency	Option only available in winter months when supply surplus over demand
S6: Review the potential for bulk supplies between Severn Trent and South Staffs	Apply for Drought Permit	up to 5 MI/d off peak	0 MI/d	Whole Supply Zone	Up to 3 weeks	Board Approval; agreement of Severn Trent Water	Likely that import would be limited to 1 month duration if water available. Unlikely to be available in summer peak

Option Name	Trigger(s)	Savings - Average	Savings - Peak	Location	Implementation timing	Permissions Required & Constraints	Risks
S7: Drought permit on the River Blithe/Trent.	Implement Drought Permit		20 MI/d	Whole Supply Zone	At least 5 weeks lead time including 14 days for board approval and 19 to 21 days for permit advertisement, hearings and award decision from date of application, duration up to 6 months with 6 monthly extensions available.	Board Approval; requires award of drought permit from Environment Agency	
S8: Drought order on the River Severn 192 MI/d	Implement Drought Permit at Clywedog Reservoir		9.6 MI/d	Whole Supply Zone	2 to 3 months lead time including 14 days for board approval and 35 days for advertisement, hearings and SoS decision following date of application, duration up to 6 months with 6 monthly extensions available.	Board Approval; requires award of drought order from SoS	
S9: Drought order on the River Severn 215 MI/d	Implement Drought Permit at Clywedog Reservoir		24 MI/d	Whole Supply Zone	2 to 3 months lead time including 14 days for board approval and 35 days for advertisement, hearings and SoS decision following date of application, duration up to 6 months with 6 monthly extensions available.	Board Approval; requires award of drought order from SoS	
S10: Operation of Blithfield Reservoir at Low Levels	Implement Drought Permit	6 MI/d	30 MI/d	Whole Supply Zone	None	Board Approval; requires award of environmental permit from EA	Yield is measured against total shutdown of abstraction Uncertainty over water quality at low levels means that there is risk that treatment may have to be shut down periodically

## APPENDIX D1: DROUGHT SUPPLY OPTIONS – MITIGATION MEASURES

Option Name	Mitigation Measure	Permissions Required & Constraints
S7: Drought permit on the River Blithe/Trent.	<p>Water release protocol to enable daily movement of fish through the fish pass and, where feasible, to allow occasional variation in flow</p> <p>Develop a protocol for fish monitoring and transfer, to be applied during drought permit operation.</p> <p>Ensure biosecurity procedures followed</p> <p>Liaison with agricultural abstractors</p>	<p>None</p> <p>May require licence to handle fish</p> <p>None</p> <p>None</p>
S5: Transfer of Potable Water to Blithfield Reservoir	Management of phosphate loading (concentration and rate)	These are likely to be conditions of any discharge consent
S8: Drought order on the River Severn 192 Ml/d & S9: Drought order on the River Severn 215 Ml/d	<p>Abstraction management to limit serious detrimental environmental consequences on downstream watercourses</p> <p>Rescue of fish trapped below impoundments or other barriers to movement</p> <p>Reasonable measures (e.g. habitat restoration) on watercourses in the event of ecological damage occurring</p> <p>Additional measures to protect habitats and sites or species of special ecological interest affected by the Drought Order.</p> <p>Strict adherence to consistent and continuous net abstraction pattern to aid in reduction of regulation losses</p> <p>Use of Chelmarsh storage releases to help improve regulation efficiency</p> <p>Prompt response to downward changes in customer demand to reduce pressure on abstraction</p> <p>Additional release of groundwater</p>	<p>None</p> <p>May require licence to handle fish</p> <p>Land Drainage Consent or equivalent for non Main River</p> <p>May require licence to handle fish and other protected species</p> <p>None</p> <p>None</p> <p>None</p> <p>Where via existing discharge main used "Duty of Care" under WIA 1991</p>
Existing abstraction within licence (note these schemes will already be operating under normal conditions so no change required for drought)	<p>Augmentation boreholes:</p> <ul style="list-style-type: none"> <li>• Hanch Tunnel (existing)</li> <li>• Broome Lodge (existing)</li> <li>• Checkhill Bogs (in design)</li> <li>• Crane Brook (in design)</li> </ul>	Abstraction licence and Section 20 Agreement (in place for existing sites and anticipated to be agreed for those sites in design)

## APPENDIX E: ENVIRONMENTAL IMPACT ASSESSMENT OF DROUGHT MANAGEMENT OPTIONS

Abstraction Licence	Supply Options	Est. GW abstraction increase between Recent Actual and Drought Output (Mld)	Likelihood of Need	Potential Damage Caused	Level of Environmental Assessment Required	Comments
	<b>Operation of River Blithe Pumpback</b>		Regular	Moderate	Standard	Current NEP scheme to achieve Good Ecological Potential for River Blithe. Further measures to improve fish passage, compensation flow regime and sediment management under review
	<b>Ensure existing groundwater and surface water sources are fully operational</b>					
	<i>Stour Valley Groundwater sources</i>	11.5	Regular	Moderate	Standard	Current NEP schemes to achieve Good Ecological Status for Blakedown Brook and Spittle Brook and Favourable Status for Hurcott and Podmore Pools SSSI and Checkhill Bogs SSSI. Further measures to improve existing flow augmentation schemes on Blakedown Brook to improve water quality and to install flow augmentation and other habitat improvements at Checkhill Bogs/Spittle Brook.
	<i>Blithfield Reservoir</i>	0 (Drought limited)	Regular	Low	Reduced	
	<i>Bourne Brook groundwater sources</i>	5.9	Regular	Moderate	Standard	Current NEP schemes to achieve Good Ecological Status for Bourne-Black Brook and its tributaries. Measures underway to install flow augmentation on Crane Brook and to identify need for mitigation of flows on Little Hay Brook.
	<i>CIPW</i>	1.5	Regular	Low	Reduced	AMP4 study indicated no impact on River Mease SAC. Short term increases not thought to have impact on surface water bodies
	<i>CRPW</i>	0.4	Regular	Low	Reduced	Impact on River Churnet and River Dove poorly understood and may be subject of further investigations from 2020
	<i>FRPW</i>	0.9	Regular	Low	Reduced	
	<i>River Severn Works</i>	0 (Drought limited)	Regular	Low	Reduced	
	<i>HOPW</i>	0.4	Regular	Low	Reduced	
	<i>MB-SEPW (PWS)</i>	2	Regular	Low	Reduced	Impact on Bourne Bilson Brook WFD status poorly understood and may be subject of further investigations from 2020
	<i>MAPW1</i>	0	Regular	Low	Reduced	Impact on River Dove poorly understood and may be subject of further investigations from 2020
	<i>Rising Brook Sources</i>	0 (Drought limited)	Regular	Moderate	Standard	Current NEP scheme to achieve Good Ecological Status for Rising Brook. Measures underway to restore flow to middle reaches of catchment.
	<i>SH-SOPW</i>	-5 (sites mothballed)	Regular	Low	Reduced	

Abstraction Licence	Supply Options	Est. GW abstraction increase between Recent Actual and Drought Output (Mld)	Likelihood of Need	Potential Damage Caused	Level of Environmental Assessment Required	Comments
	<i>Trent Valley</i>	0	Regular	Low	Reduced	Impact on Leamonsley Brook mitigated by flow augmentation scheme operated by EA and Company. Impact on Darnford Brook poorly understood and may be the subject of further investigations from 2020
-	<b>Conserve Blithfield Reservoir</b>		Regular	Low	Reduced	
various	<b>Maximise use of enhanced groundwater treatment sites</b>	see above	Various	Various	Various	
-	<b>Transfer of Potable Water to Blithfield Reservoir</b>		Infrequent	Moderate	Reduced	
-	<b>Review the potential for bulk supplies between Severn Trent and South Staffs.</b>		Infrequent	Low	Reduced	
	<b>Apply for drought permits/orders</b>					
-	<i>Implement drought permit for River Blithe Pumpback.</i>		Infrequent	High	Comprehensive	Proposal subject of full environmental report
-	<i>Implement drought order at River Severn Work</i>		Infrequent	High	Comprehensive	Proposal subject of full environmental report
-	<b>Operation of Blithfield Reservoir at Low Levels</b>		Exceptional	Low	Reduced	

Appendices F1 to F12 have already been provided to the Environment Agency- copies of these reports are available on request

**APPENDIX F1: ASSESSMENT OF ENVIRONMENTAL RISK FROM USE OF DROUGHT SUPPLY SCHEME AT RIVER BLITHE PUMPBACK****APPENDIX F2: ASSESSMENT OF ENVIRONMENTAL RISK FROM USE OF DROUGHT SUPPLY SCHEME AT RIVER SEVERN WORKS**

**APPENDIX F3: CHECKHILL BOGS ENVIRONMENTAL MONITORING PLAN 2018**

**APPENDIX F4: RISING BROOK ENVIRONMENTAL MONITORING PLAN 2018**

**APPENDIX F5: KINVER ENVIRONMENTAL MONITORING PLAN 2018**

**APPENDIX F6: LITTLE HAY BROOK ENVIRONMENTAL MONITORING PLAN 2018**

**APPENDIX F7: LEAMONSLEY BROOK ENVIRONMENTAL MONITORING PLAN 2018**

**APPENDIX F8: RIVER STOUR ENVIRONMENTAL MONITORING PLAN 2018**

**APPENDIX F9: BOURNE BROOK ENVIRONMENTAL MONITORING PLAN 2018**

**APPENDIX F10: BLAKEDOWN BROOK ENVIRONMENTAL MONITORING PLAN 2018**

**APPENDIX F11: BOURNE POOL FOOTHERLEY BROOK ENVIRONMENTAL MONITORING PLAN 2018**

**APPENDIX F12: BOURNE BILSON BROOK ENVIRONMENTAL MONITORING PLAN 2018**

**APPENDIX F13: RIVER MEASE ENVIRONMENTAL MONITORING PLAN 2018**

**APPENDIX F14: PUXTON STOURVALE ENVIRONMENTAL MONITORING PLAN 2018**

## APPENDIX G ENVIRONMENT AGENCY RIVER SEVERN DROUGHT ORDER PROCESS

After Table 4 River Severn Drought Order Environmental Report (Working Draft) - December 2013

<p><b>Alert Curve</b></p>	<p><b>Drought order preparation:</b></p> <ul style="list-style-type: none"> <li>• The Environment Agency will form the River Severn Drought Management Group. Mitigation options to be discussed and feasibility identified.</li> <li>• The Environment Agency prepares the drought order application in discussion with other groups (including water companies, the Canal &amp; River Trust, Natural England, Natural Resources Wales, National Farmers Union (NFU), Country Landowners Association, Farmers Union of Wales (FUW), Defra and Welsh Assembly Government) and considers:             <ul style="list-style-type: none"> <li>• The requirement/nature of a Section 57 irrigation licence restriction;</li> <li>• Whether to include emergency storage drought order conditions as part of the application.</li> <li>• Whether the drought order needs to include varying the Shropshire Groundwater Scheme (SGS) Licence.</li> </ul> </li> <li>• The Environment Agency circulates and discusses reservoir refill prospects.</li> </ul> <p><b>Communications:</b></p> <ul style="list-style-type: none"> <li>• The Environment Agency organises a meeting with the River Severn Drought Management Group (plus appropriate stakeholders/partners) to discuss the developing drought situation and implications on the Severn and wider catchments. Further meetings may be required.</li> <li>• The Environment Agency will engage with Natural England and Natural Resources Wales, in particular reference to management of the River Severn Estuary.</li> <li>• The Environment Agency will meet with the NFU, and FUW and Country Landowners Association as required, to discuss the possible need and implications of S57 Spray irrigation restrictions and how best to manage their implementation.</li> <li>• The Environment Agency intensifies its public water conservation appeals in the media. The communication plan will be followed in liaison with water companies, to ensure a consistent message is delivered.</li> </ul>
<p><b>Application Curve</b></p>	<p><b>Drought order application:</b></p> <p>The Environment Agency formally applies for a drought order to the Secretary of State for environment, food and rural affairs (Defra) in England, and the Welsh Government for Wales.</p> <p><b>Communications:</b></p> <ul style="list-style-type: none"> <li>• The Environment Agency will seek opportunities for a Lake Vyrnwy overdraft with United Utilities<sup>17</sup>.</li> <li>• The Environment Agency will organise a meeting of the River Severn Drought Management Group to discuss:</li> <li>• Voluntary reductions in abstraction that could be implemented immediately.</li> </ul>

	<ul style="list-style-type: none"> <li>• Abstraction reductions that will be applied once the drought order is granted.</li> <li>• Using mitigation options in section 14 as appropriate.</li> <li>• The Environment Agency will inform other external groups of the application and what it means for the River Severn and how it may affect them.</li> <li>• The Environment Agency will decide what S57 restrictions are appropriate and begin the process of implementation (expectation is for S57 to be in place before the drought order is activated).</li> <li>• The Environment Agency and Natural Resources Wales will decide whether temporary restrictions on fishing activities are appropriate and begin the process of implementation.</li> <li>• The Environment Agency will continue public appeals for water conservation in accordance with the West Midlands Drought Plan.</li> </ul>
<p><b>Enforce Curve</b></p>	<p><b>Drought order conditions become live, if not already implemented:</b></p> <ul style="list-style-type: none"> <li>• Section 57 restrictions on surface water irrigation Licences should be in force where appropriate.</li> <li>• Prescribed flow at Bewdley reduced to 730 MI/d 5 day mean (daily 650MI/d minimum remains in force).</li> <li>• Max releases at Llyn Clywedog capped to 300 MI/d.</li> <li>• 5% daily licence reduction in non-spray irrigation abstraction licences enforced for the River Severn.</li> <li>• The 5% reduction will be pro rata to the remaining available licence during the first 100 days of regulation and pro-rata thereafter.</li> <li>• The 5% reduction will be on top of existing constraints during Maximum Regulation.</li> <li>• Canal &amp; River Trust abstraction reductions to be enforced;</li> <li>• Montgomery Canal restrictions in accordance with the 1988 Operating Agreement and Operating Rules for the River Severn Resource/Supply System.</li> <li>• Gloucester &amp; Sharpness Canal abstraction cap of 300 MI/d when flows at Deerhurst drop below 1200 M/d.</li> <li>• When appropriate, activate the Shropshire Groundwater Scheme drought order to vary the annual or five-year rolling licence quantities.</li> </ul> <p><b>Additional non-drought order actions to be taken:</b></p> <ul style="list-style-type: none"> <li>• If agreement in place – Lake Vyrnwy water bank overdraft used to support flows along the River Severn (subject to need).</li> <li>• If agreement in place - Chelmarsh bankside storage used for short term releases to support the lower River Severn (subject to need).</li> </ul> <p><b>Timing of Drought Order Conditions:</b></p> <ul style="list-style-type: none"> <li>• It is anticipated that it will take at least 28 days for the drought order to be granted, assuming a public hearing is required. This lead-time is built into the curves.</li> </ul> <p><b>Communications:</b></p> <ul style="list-style-type: none"> <li>• The Environment Agency will organise a joint meeting with external groups to discuss the drought situation and drought order conditions. Further meetings may be required.</li> </ul>

	<ul style="list-style-type: none"> <li>• The meeting should look ahead to possible implementation of emergency storage conditions and amendments to the drought order if not included in original application.</li> <li>• The Environment Agency will continue public appeals for water conservation in accordance with the West Midlands Drought Plan.</li> </ul> <p>External groups could include: Severn Trent Water, South Staffordshire Water, Bristol Water, United Utilities, The Canal &amp; River Trust, Natural England, Natural Resources Wales, Farmers Unions, Water UK, Defra, Welsh Assembly Government, CC Water.</p>
<b>Emergency Storage</b>	<p>By this stage in a drought event, unavoidable region and/or country wide drought impacts are expected to be occurring due to the natural shortage of rainfall.</p> <p><b>Options considered to enhance drought order conditions: (will depend on the extent and timing of drought).</b></p> <ul style="list-style-type: none"> <li>• Prescribed flow at Bewdley removed, best endeavours will be made according to remaining resources and weather forecasts.</li> <li>• Releases from Llyn Clywedog reservoir capped to 1.5% of remaining useable storage.</li> <li>• Consider reductions in daily licensed quantities of non-spray irrigation licences of greater than 5% (reductions up to 20% to be considered).</li> </ul> <p><b>Communications:</b></p> <ul style="list-style-type: none"> <li>• The Environment Agency organises a meeting with the River Severn Drought Management Group to discuss the drought situation and enhanced drought order conditions. Further meetings, with other groups may be required within this drought zone.</li> <li>• Ongoing engagement with Natural England and Natural Resources Wales (plus other appropriate external groups).</li> <li>• The Environment Agency will continue public appeals for water conservation in accordance with the West Midlands Drought Plan.</li> </ul>
<b>Dead Water Curve</b>	<p><b>Llyn Clywedog Reservoir</b></p> <p>Best efforts will be made to prevent storage falling below 5% capacity, into the 'Dead Water' zone. Water physically cannot be abstracted from Llyn Clywedog below this point and all releases (including compensation flow) will stop, putting the immediate watercourse at great risk of drying up.</p>
<p><b>Drought Order Cessation</b></p> <ul style="list-style-type: none"> <li>• Consider withdrawing drought order application if storage rises above alert curve.</li> <li>• Consider relaxing drought order conditions once storage rises 10% above enforce curve. (Note: Drought order powers are in place for six months after date granted. Conditions could be implemented again without another application if storage subsequently drops below enforce curve).</li> <li>• Consider relaxing emergency storage drought order once storage rises 5% above emergency storage.</li> </ul> <p>Note: Drought order powers can be extended within the last 28 days of the agreement. The Environment Agency will discuss with the River Severn Drought Management Group if it intends to apply for an extension to the River Severn drought order.</p>	



## APPENDIX M: EXAMPLE OF AN APPEAL FOR CUSTOMER DEMAND SAVINGS

### **South Staffordshire Water asks customers to use water wisely:**

The recent hot spell has come at the end of a very dry period and has resulted in unprecedented demand for water throughout the whole of the Company's area.

Some customers have been affected by reductions in pressure, particularly in isolated areas and the Company has taken positive action to improve the situation.

Although the Company currently has adequate resources to provide sufficient water for domestic use, we are asking customers not to use hosepipes or sprinklers, but to use a garden watering can instead. We are also asking that non-essential uses of water are postponed, for example car washing and patio pressure-washing.

A spokesperson for the Company said: "With the continuing hot weather and little prospect of prolonged rain, unless customers avoid the unnecessary use of water, reservoirs will be depleted and customers may find themselves without water. Common sense use of water will ensure that all customers will receive an adequate amount of water for their essential domestic use".

We would like to thank customers in anticipation of their help and co-operation.

Phil Newland  
Managing Director  
South Staffordshire Water PLC  
Tel: 01922 638282

## APPENDIX N: EXAMPLE OF A HOSEPIPE BAN NOTIFICATION

**SOUTH STAFFORDSHIRE WATER PLC**  
**WATER INDUSTRY ACT 1991 & FLOOD AND WATER MANAGEMENT ACT 2010**  
PROHIBITION OF THE USE OF WATER THROUGH HOSEPIPES AND SIMILAR  
APPARATUS

Notice is hereby given that a serious shortage of water available for distribution by South Staffordshire Water PLC exists or is threatened in the area specified in the Schedule hereto.

Under powers conferred by Section 36 of the Flood and Water Management Act 2010, South Staffordshire Water PLC therefore prohibit the use of water supplied by the Company in the area specified in the Schedule below and drawn through hosepipe or similar apparatus for the purpose of:

- a) watering a garden using a hosepipe;
- b) cleaning a private motor-vehicle using a hosepipe;
- c) watering plants on domestic or other non-commercial premises using a
- d) hosepipe;
- e) cleaning a private leisure boat using a hosepipe;
- f) filling or maintaining a domestic swimming or paddling pool;
- g) drawing water, using a hosepipe, for domestic recreational use;
- h) filling or maintaining a domestic pond using a hosepipe;
- i) filling or maintaining an ornamental fountain;
- j) cleaning walls, or windows, of domestic premises using a hosepipe;
- k) cleaning paths or patios using a hosepipe;
- l) cleaning other artificial outdoor surfaces using a hosepipe.

This prohibition shall take effect from XXXXX until further notice. Customers wishing to make representations should contact the Managing Director at the address below by YYYY.

#### AREA AFFECTED BY THE PROHIBITION

Those customers supplied by South Staffordshire Water PLC in the following areas:

East Staffordshire Borough Council (including Burton, Abbots Bromley, Uttoxeter, Mayfield)  
Cannock Chase District Council (including Rugeley, Cannock)  
South Staffordshire District Council (including Penkridge, Kinver)  
Lichfield District Council  
Tamworth Borough Council  
Birmingham City Council (Sutton Coldfield)  
Walsall Metropolitan Borough (including Aldridge)  
Sandwell Metropolitan Borough (including West Bromwich, Smethwick, Blackheath)  
Dudley Metropolitan Borough (including Halesowen)  
Bromsgrove District Council (Romsley)  
South Derbyshire District Council (Castle Gresley, Overseal)  
North West Leicestershire District Council (Chilcote)

Phil Newland  
Managing Director  
South Staffordshire Water PLC  
Green Lane  
Walsall  
West Midlands  
WS2 7PD

## APPENDIX O: EXAMPLE OF A HOSEPIPE BAN CESSATION NOTICE

### **SOUTH STAFFORDSHIRE WATER PLC**

#### **WATER INDUSTRY ACT 1991 & FLOOD AND WATER MANAGEMENT ACT 2010**

#### **REVOCATION OF PROHIBITION OF THE USE OF WATER THROUGH HOSEPIPES AND SIMILAR APPARATUS**

Recent weather conditions and a positive response to our appeals have meant a substantial reduction in our peak demand and a significant increase of our reservoir levels. Subsequently, South Staffordshire Water is pleased to announce to our customers the relaxation of the ban on the use of hosepipes and garden sprinklers.

We would like to take this opportunity to thank customers for their help and co-operation during this difficult time and remind them that if they do operate a garden watering system, such as a sprinkler or hosepipe running unattended, they must have a water meter fitted to their property.

#### **AREA AFFECTED BY THE REVOCATION OF PROHIBITION**

Those customers supplied by South Staffordshire Water PLC in the following areas:

East Staffordshire Borough Council (including Burton, Abbots Bromley, Uttoxeter, Mayfield)  
Cannock Chase District Council (including Rugeley, Cannock)  
South Staffordshire District Council (including Penkridge, Kinver)  
Lichfield District Council  
Tamworth Borough Council  
Birmingham City Council (Sutton Coldfield)  
Walsall Metropolitan Borough (including Aldridge)  
Sandwell Metropolitan Borough (including West Bromwich, Smethwick, Blackheath)  
Dudley Metropolitan Borough (including Halesowen)  
Bromsgrove District Council (Romsley)  
South Derbyshire District Council (Castle Gresley, Overseal)  
North West Leicestershire District Council (Chilcote)

Phil Newland  
Managing Director  
South Staffordshire Water PLC  
Green Lane  
Walsall  
West Midlands  
WS2 7PD

## APPENDIX P: EXAMPLE OF A NOTICE TO APPLY FOR AN ORDINARY DROUGHT ORDER

### **SOUTH STAFFORDSHIRE WATER PLC WATER INDUSTRY ACT 1991 & DROUGHT DIRECTION 2011 PROHIBITION OF NON ESSENTIAL USES OF WATER**

Notice is hereby given that, because of exceptional shortage of rain South Staffordshire Water plc are applying to the Secretary of State for Environment, Food and Rural Affairs for an Order under section 74(2)(b) of the Water Resources Act 1991. The general effect of the Order will be to prohibit or limit until XXXX within the area described below supplied with water by the Company the use of water for any or more of the purposes set out below being purposes included within the Direction made by the Secretary of State on 29<sup>th</sup> March 2011.

#### AREA AFFECTED BY THE REVOCATION OF PROHIBITION

Those customers supplied by South Staffordshire Water PLC in the following areas:

East Staffordshire Borough Council (including Burton, Abbots Bromley, Uttoxeter, Mayfield)  
Cannock Chase District Council (including Rugeley, Cannock)  
South Staffordshire District Council (including Penkridge, Kinver)  
Lichfield District Council  
Tamworth Borough Council  
Birmingham City Council (Sutton Coldfield)  
Walsall Metropolitan Borough (including Aldridge)  
Sandwell Metropolitan Borough (including West Bromwich, Smethwick, Blackheath)  
Dudley Metropolitan Borough (including Halesowen)  
Bromsgrove District Council (Romsley)  
South Derbyshire District Council (Castle Gresley, Overseal)  
North West Leicestershire District Council (Chilcote)

The uses of water it is proposed to prohibit or limit are as follows:

- a) Watering outdoor plants on commercial premises;
- b) Filling or maintaining a non-domestic swimming or paddling pool;
- c) Filling or maintaining a pond;
- d) Operating a mechanical vehicle-washer;
- e) Cleaning any vehicle, boat, aircraft or railway rolling stock;
- f) Cleaning non-domestic premises;
- g) Cleaning a window of a non-domestic building;
- h) Cleaning industrial plant;
- i) Suppressing dust; and
- j) Operating cisterns.

Any objections to the proposed Order may be made in writing to the Secretary of State for Environment, Food and Rural Affairs, Water Supply and Regulation Division, 2<sup>nd</sup> Floor Area 2C, Ergon House, Horseferry Road, London SW1P 2AL, within the period of 7 days from the date of publication of this notice.

Phil Newland  
Managing Director  
South Staffordshire Water PLC  
Green Lane  
Walsall  
WS2 7PD



## APPENDIX L: GLOSSARY

<b>Term or acronym</b>	<b>Definition</b>
BAP	Biodiversity Action Plan
CCWater	Consumer Council for Water
CoP	Code of Practice
DAPWL	Deepest Advisable Pumping Water Level
Defra	Department of Environment, Food and Rural Affairs
DMA	District Meter Area
EA	Environment Agency
FWMA 2010	Flood and Water Management Act 2010
HRA	Habitats Regulations Assessment
LNR	Local Nature Reserve
MI/d	Megalitres per day
MORECS	Meteorological Office Rainfall and Evaporation Calculation System
NE	Natural England
NEP	National Environment Programme
Ofwat	The Water Services Regulation Authority (formerly the Office of Water Services)
PY	Peak Yield
RSA	Restoration of Sustainable Abstraction
RWL	Rest Water Level
SAC	Special Area of Conservation
SEA	Strategic Environmental Assessment
SoS	Secretary of State
SRO	Source Reliable Output
SSSI	Site of Special Scientific Interest

UKWIR	United Kingdom Water Industry Research
WFD	Water Framework Directive
WIA 1991	Water Industry Act 1991
WRA 1991	Water Resources Act 1991
WRGIS	Water Resources Geographical Information System
WRMP	Water Resources Management Plan