DROUGHT PLAN 2027

Appendix
March 2026

ESSEX&SUFFOLK WATER living water

EXCLUSIONS ON THE GROUNDS OF NATIONAL SECURITY

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

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

DOCUMENT CONTROL SHEET

Report Title	Drought Plan 2027 Appendix
Authors	Claire Lorenc, Juliette Maxam, Katherine Fuller, Liz Corbett, Liz Wright, Matt Cook, Luke Robinson, Charl Roos, Rebecca Richards, Andrew Blenkharn, Ben Moore.
Previous Issues	Essex & Suffolk Water Drought Plan (2022) Essex & Suffolk Water Drought Plan (2018) Essex & Suffolk Water Drought Plan (2013) Essex & Suffolk Water Drought Plan (2011) Essex & Suffolk Water Drought Plan (2007)
Distribution List	**Internal:** Applicable Management & Affected Depts **External:** As per Drought Plan Guideline **Web:** www.nwg.co.uk/droughtplan

DOCUMENT CHANGE RECORD

Release Date	Version	Report Status	Change Details
31.03.2026	1	First Draft	Environmental Assessments incomplete
30.04.2026	2	Final Draft	Environmental Assessments complete
20.05.2026	3	Final Draft	Publication

DOCUMENT SIGNOFF

Nature of Signoff	Person	Date	Role
Reviewed by	William Robinson	20/03/2026	Water Resources & Supply Strategy Manager
Reviewed by	Katie Davis	21/03/2026	Head of Water Service Planning
Approved by	Kieran Ingram	27/03/2026	Water Director

CONTENTS

APPENDIX 1: PEAK DEMAND DURING DROUGHT

Water use in the public water supply exhibits seasonality, usually peaking in the summer. Several key factors drive water demand during the summer season. The period of hot dry weather triggers both an increase in outdoor water use, such as garden watering, and an increase in the frequency of personal showering and clothes washing[1].

The household type can also influence the level of water demand, as different metered property types have varying water use levels. However, peaks should occur for each household type at the same time through climatic variations. Measured customers may be subdivided into optants, selectives, new builds and existing metered as it has been shown that their overall demand and peak behaviour vary[2]. Occupancy and house type are also significant within the household groups. This report provides an update of the peak demand results for the current year.

1.1 Methodology

The sample selection uses all available smart metered data, split by NHH's and HH optants, selectives, existing and new builds. The unmeasured data also uses smart metered household data but uses those that are on an unmeasured tariff. The peak demand study has now incorporated non-household data, which is logged data from our largest NHH consumers[3]. All property types use daily consumption data, and the results are shown in litres per property per day.

1.2 Data Quality

106,990 properties across Essex are included in this study, which varies by day depending on data validity, of which:

- 11,128: New Build
- 14,011: Metered Optant
- 17,042: Metered Selectives
- 50,886: Existing Measured
- 13,144: Unmeasured properties
- 779: Non-Households

The data that could not be used was due to a variety of reasons, namely leaks found, loss of data for the time period, unrealistically high consumption values, negative flow values, and periods of inconsistent data. These were mostly due to connection problems between the meter and the logger. The time period for cleaned data ran from 01/05/2025 until 31/08/2025.

[1] Billings, R B, Vaughan Jones, C (2008) Forecasting Urban Water Demand
[2] UKWIR A framework Methodology for Estimating the Impact of Household Metering on Consumption (2003) and The Impact of Household Metering on Consumption: Further Analysis (2004)

[3] Large users defined as using >20,000M3 per annum.

2.1 Weather Summary

The Met Office[4] describes the summer of 2025 as the warmest summer on record, with an average temperature of 16.10°C, surpassing the previous record of 15.76°C from 2018. June, July and August all saw below average rainfall and above average temperatures. There were a number of heatwaves throughout, with temperatures reaching 35.8°C (recorded in Faversham, Kent) on 1st July.

2.2 Temperature and Rainfall

Table 1: The number of days each month that reached above 25°C in 2025 compared to previous years.

Table of number of days each month with temperatures greater than 25°C																	
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	**Average**
June	9	3	1	2	2	6	1	5	8	2	4	4	2	20	3	17	**5**
July	15	2	4	20	19	10	9	9	24	5	5	7	17	13	7	12	**11**
August	1	4	4	3	4	9	11	5	10	7	11	0	18	13	13	13	**8**
Totals	**25**	**9**	**9**	**25**	**25**	**25**	**21**	**19**	**42**	**14**	**20**	**11**	**37**	**46**	**23**	**42**	**25**

The daily maximum temperature over the summer is shown in Figure 1. High temperatures were experienced throughout the summer months in Essex, with a peak of 34.5 °C on 1st July (recorded at Writtle weather station).

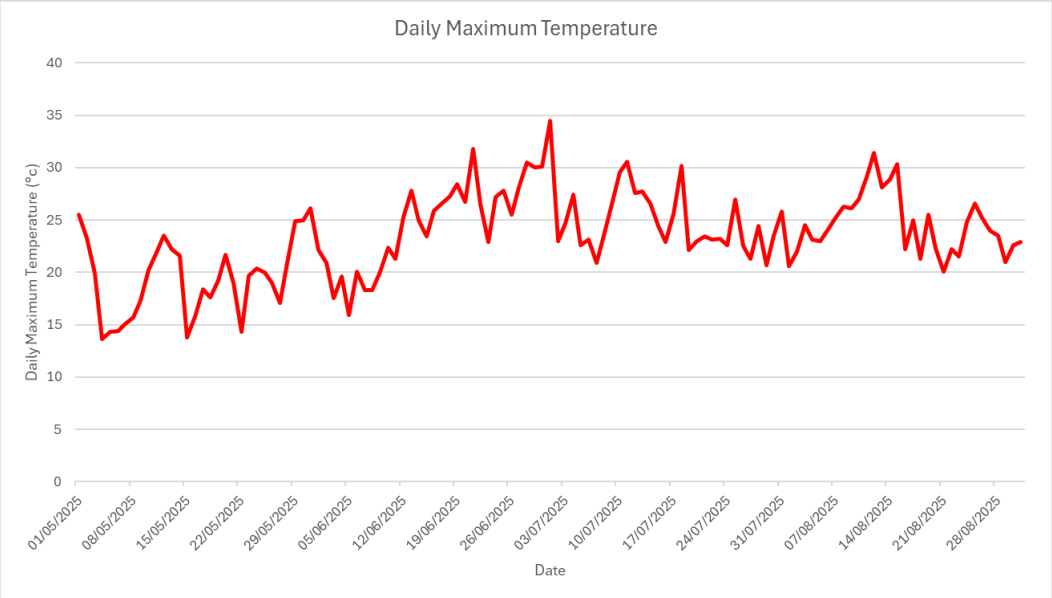


Figure 1: Maximum daily temperatures for Essex over the summer.

[4] MET Office (2025) https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/weather/learn-about/uk-past-events/summaries/seasonal-assessment---summer-25.pdf

Table 2: The total number of days each year during the summer months where the total rainfall (mm) is less than 2mm on any one day and the two preceding days

Total number of days where total rainfall is less than 2mm on the day and two previous days																	
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	**Average**
June	22	5	0	19	28	15	3	17	27	12	21	13	19	23	23	18	**16**
July	23	15	6	18	12	17	21	9	27	23	18	8	31	15	18	19	**17**
August	8	8	4	19	13	26	21	11	11	18	15	18	22	10	24	24	**16**
Totals	**53**	**28**	**10**	**56**	**53**	**58**	**45**	**37**	**65**	**53**	**54**	**39**	**72**	**48**	**65**	**61**	**50**

The temperature and rainfall for Essex during the summer period is shown in Figure 2. It has previously been found that average consumption related best to temperature and rainfall and so analysis has employed these two variables. It was dry for large periods of the summer with the highest daily rainfall was on 28th August seeing 10.6mm fall. Most peak days fell between mid-June through to mid-July and the second week of August.

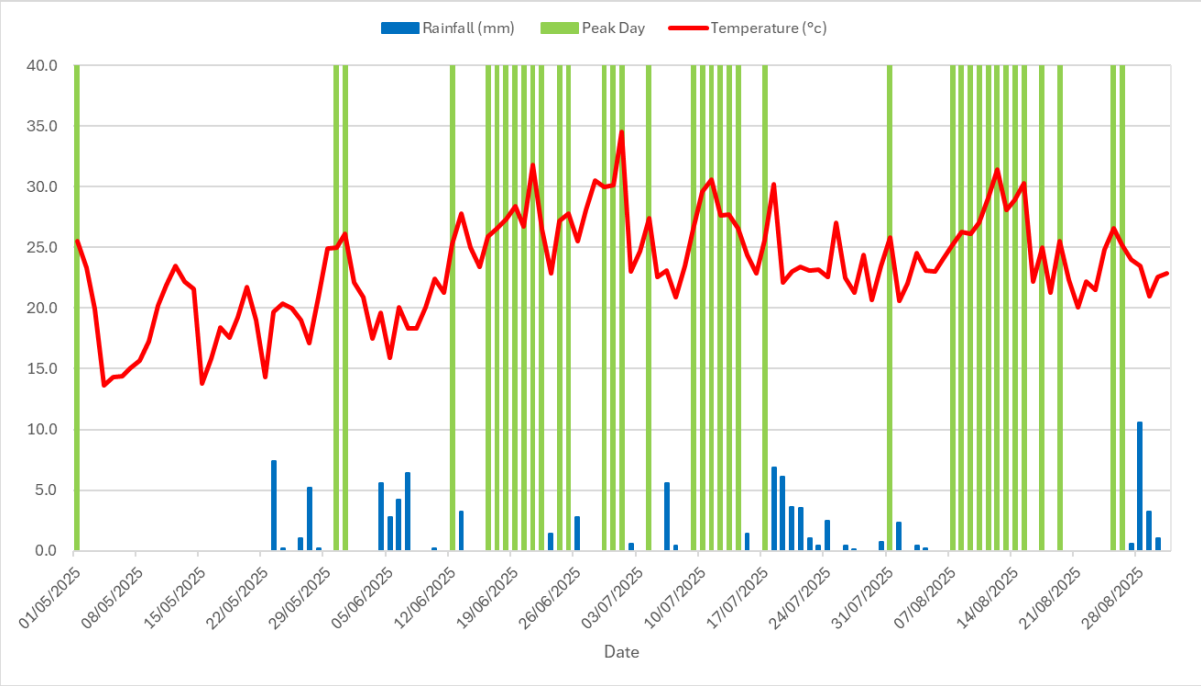


Figure 2: Total rainfall and maximum temperature experienced during the summer months and corresponding peak days.

3.1 Average Consumption

Water consumption peaked on the weekend leading up to the hottest day of the year as can be seen across all HH types in Figure 3. Average consumption is calculated from the average of sampled households. The highest consumption out of the measured billed household types is the Metered Selective, followed by Existing Metered, New Builds and lastly by the Metered Optant. As expected, unmeasured billed customers have the highest consumption of all metered HH types. Throughout the summer months, all HH types follow a similar trend but selective and unmeasured HH's consumption is impacted the most by hot weather. Whilst NHH consumption follows a similar trend, the peak demand day occurred further into the summer, which suggests other factors are influencing demand and possibly a prolonged period of warm and dry weather is needed to see a noticeable difference in NHH demand (Figure 4).

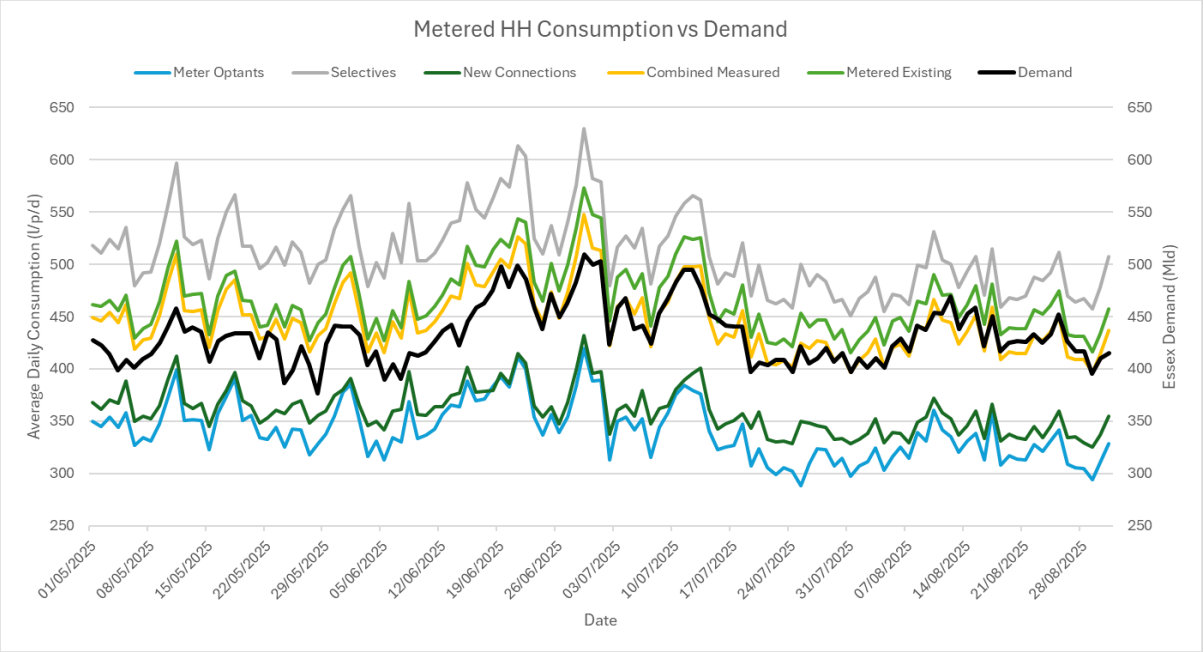


Figure 3: The relationship between the daily total demand for Essex and the measured HH types consumption over the summer period.

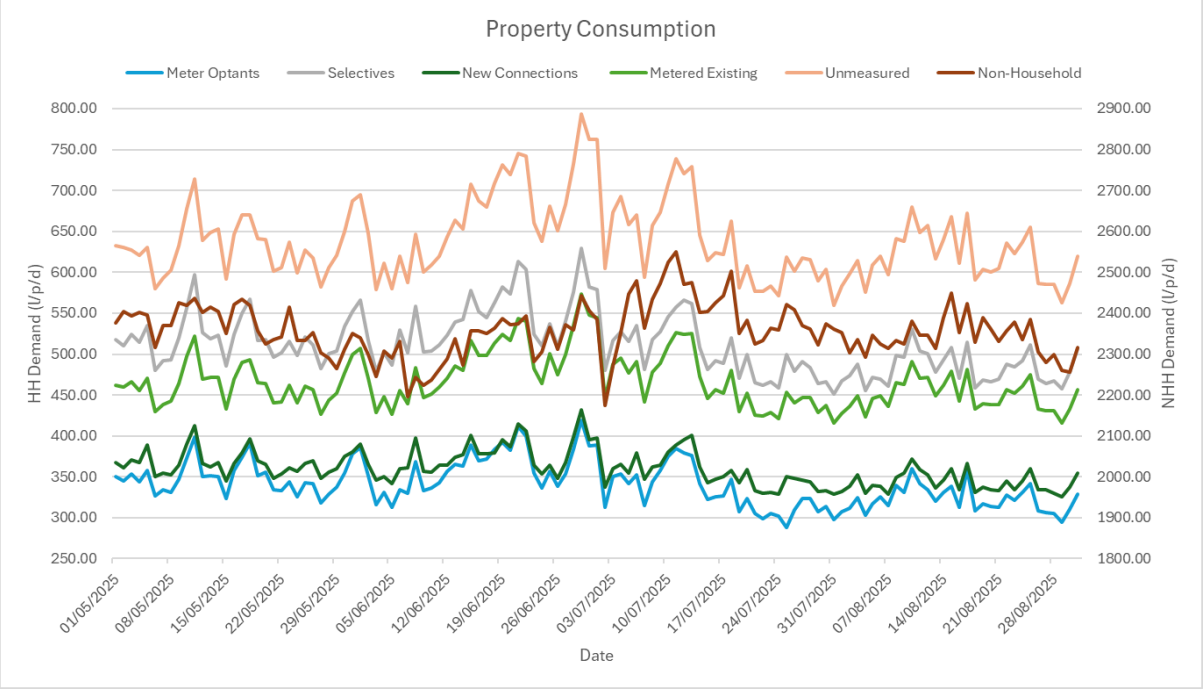


Figure 4: The relationship between unmeasured, measured HH types and NHH's

The peaks in total demand consumption corresponds well with the major peaks of the study data and points out the high consumption of selectives compared to the other household types.

3.2 Peak Demand

The peak demand for 2025 was 629.28 litres / property / day (l/p/day) which occurred on 29th June. The addition of smart meter data means that unmeasured billed customers have also been added, with a peak day of 793.92 l/p/day, which also fell on 29th June. Below is a table showing the peak demand yearly change since 2008. The 2025 peak demand is higher than last year and occurred in the selective category. All yearly peak demands previously have occurred in the selective metered category, except 2019 where new builds had the highest peak demand day. Although, before the addition of smart data the sample base was small.

Table 3: Peak demand summer yearly change since 2008. The average measured peak demand between 2008-2019 and 2024-2025 is 603.28 l/p/d.

Measured	
Peak Demand Yearly Change (l/p/d)	
2025	**629.28**
2024	623.37
2019	554.73
2018	588.15
2017	611.5
2016	558.27
2015	634.7
2014	646.19
2013	624.27
2012	478.98
2011	659.6
2010	610
2009	548.6
2008	678.3

Unmeasured	
Peak Demand Yearly Change (l/p/d)	
2025	**793.92**

4.1 Metered Selective

Throughout the peak demand studies, it has been consistently shown that metered selective customers have the highest consumption of the measured household types (see Figure 4). Figure 5 shows the relationship between metered selective average daily consumption and the rainfall and temperature data. The average consumption over the summer period for selectives was 511.25 l/p/d, 49.84% higher than metered optants average consumption. As the linear trend line shows in Figure 5, the consumption decreases through the season.

Selective consumption peaks compared to the other household types are higher and cover a greater time period. Peaks correspond well with periods of no rainfall and temperature increases over the summer, showing a direct relationship between temperature, rainfall and water consumption.

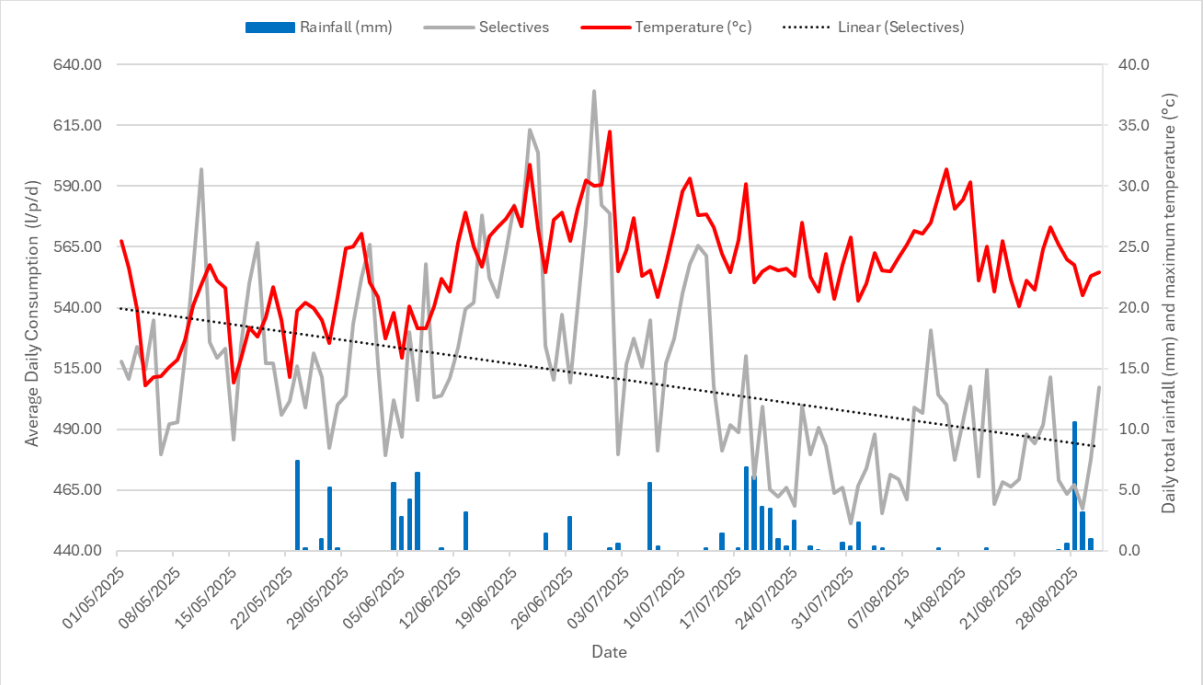


Figure 5: Selective metering average daily consumption in comparison to temperature and rainfall

4.2 New Builds

New Build water consumption tends to sit in the middle between metered optant and metered selective consumption. Figure 6 shows the relationship between summer rainfall and temperature and the new build demand. The average consumption for the new build household type is 359.85 l/p/d.

New Build consumption peaks are less pronounced and show less difference between the peak and the trough than selectives and also do not cover such a long period of time. Consumption follows a similar profile to meter optants and relates well to rainfall and temperature changes.

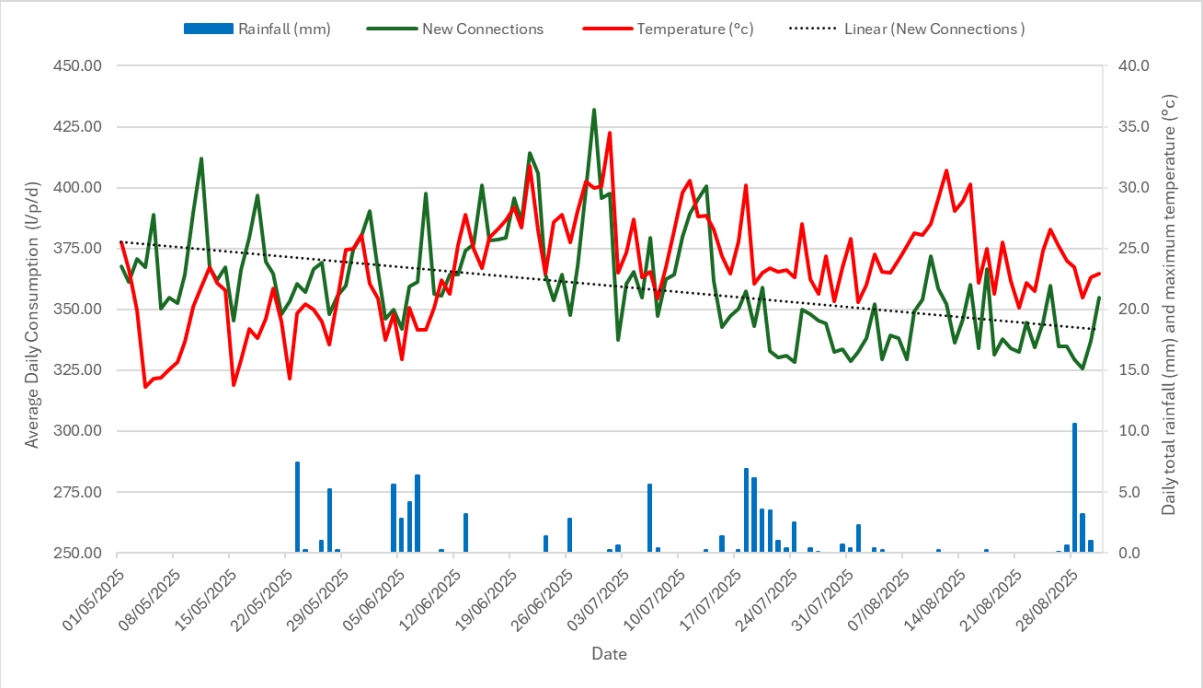


Figure 6: New Connections average daily consumption in comparison to temperature and rainfall

4.3 Metered Optants

Out of the various measured HH types, metered optants have the lowest summer water use. Figure 7 shows the metered optant consumption in relation to the rainfall and temperature data for this summer. The average consumption for this household type is 341.20 l/p/d. Optant water use is similar to that of New builds during peak demand but days with low consumption fall well below the lows seen for New builds.

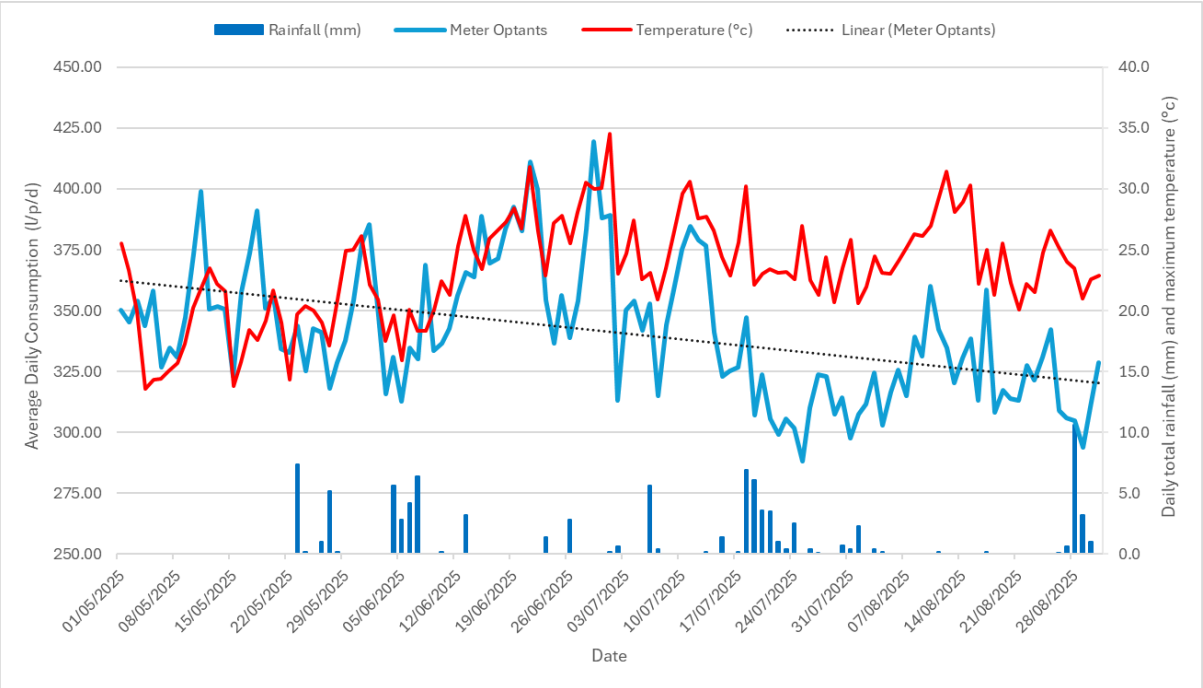


Figure 7: Metered Optant average daily consumption in comparison to temperature and rainfall

4.4 Metered Existing

Existing households are those that have been metered in the prior AMP. Metered existing has a similar profile to selectives consumption through the summer. The average consumption for metered existing is 466.21 l/p/d. This falls between selectives who have higher average consumption and meter optants and new builds who both have lower average consumption. Figure 8, shows that high temperatures and low rainfall have a greater impact on existing metered customers water use.

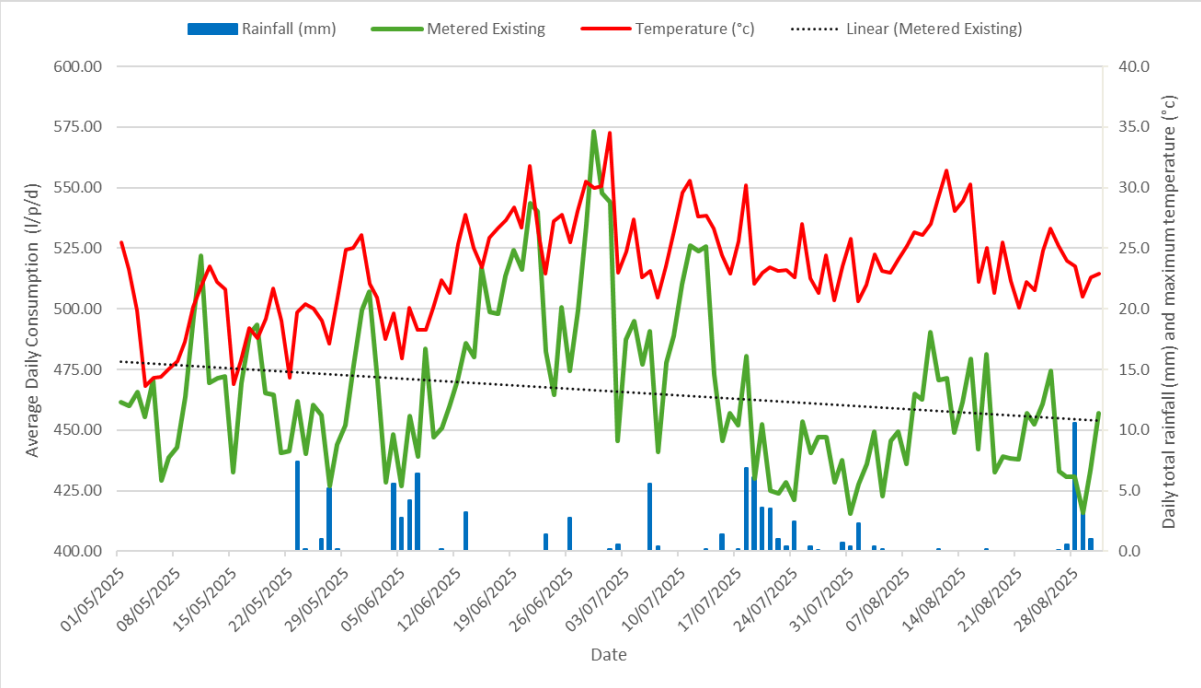


Figure 8: Meter existing daily consumption in comparison to temperature and rainfall

4.5 Unmeasured

It is interesting to also have a look at unmeasured consumption through the season as well. The sample is taken from our unmeasured billed customers, who have a smart meter installed but remain on an unmeasured tariff. There were 13,144 properties included in the sample with an average consumption for the period of 638.66 l/p/d, which as expected is higher than any of the measured meter types. The profile of consumption during the summer period shows much wider peaks and troughs showing the unmeasured customers are more reactive to high temperatures and low rainfall (Figure 9).

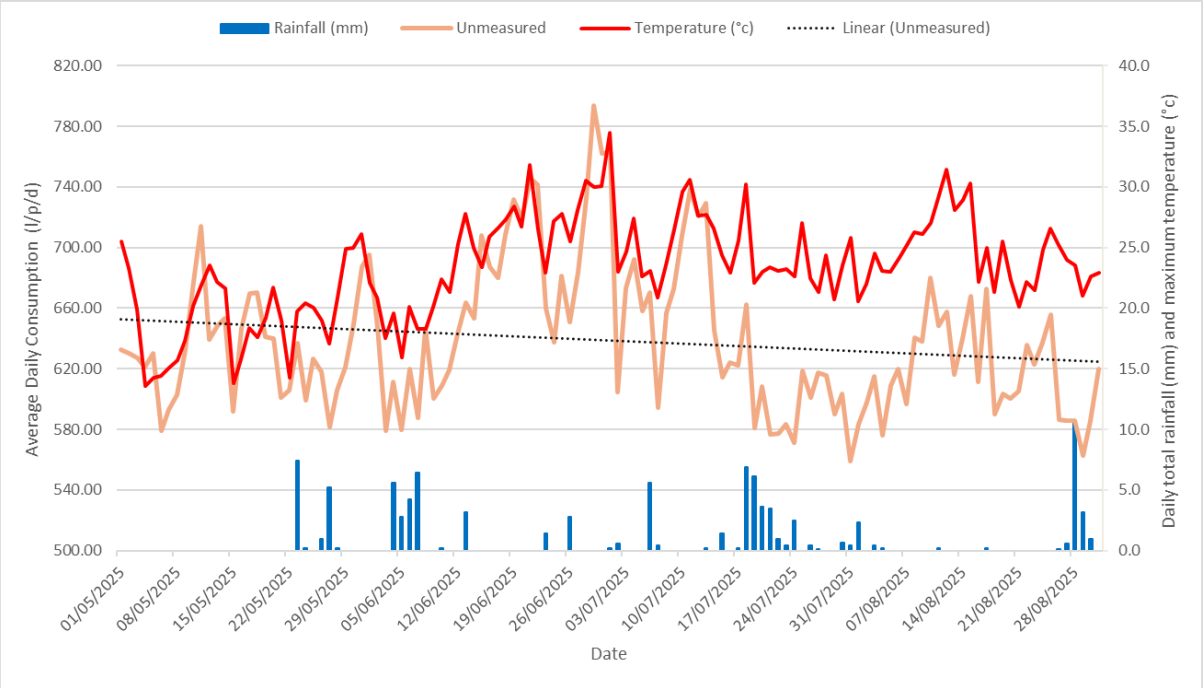


Figure 9: Unmeasured average daily consumption in comparison to temperature and rainfall

4.6 Non-Households

With more smart meters implemented across our Essex region, NHH's have been added to the study. Figure 10 shows that although there is some response to high temperatures and low rainfall, the trend remains relatively flat, which indicate that weather events impact NHH demand less. Peak day for NHH demand fell on Friday 11th July, where Writtle weather station recorded 30.6°C. This occurred after a prolonged period of low rainfall, high temperatures and numerous peak weather days. Although the peak demand day occurred on a hot day and the weather likely had some impact on high demand, the range of daily NHH demand is only 16% of the mean, which is less than half of the 34% for HH demand. Providing evidence that weather impacts NHH demand to a lesser extent. However, it is worth noting that the sample size of NHH's is much smaller, which may have impacted these results.

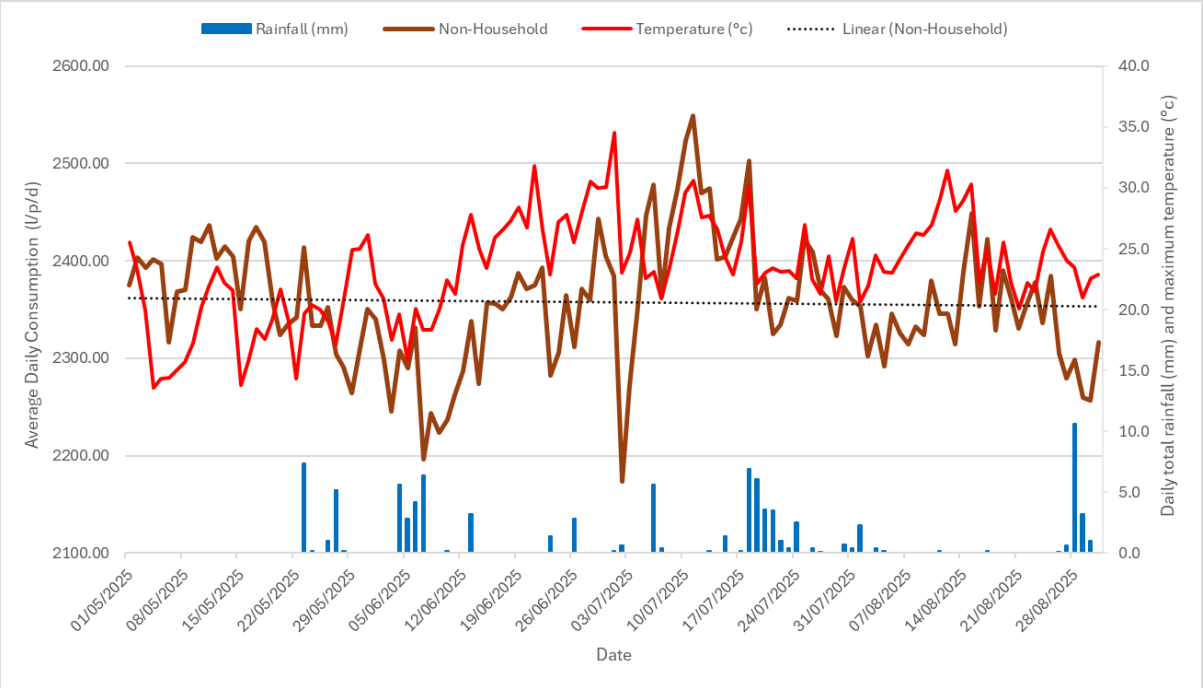


Figure 10: Non-Household average daily consumption in comparison to temperature and rainfall

In summary, each household type shows very similar peak demand response to previous years of this study, with unmeasured customers having the highest demand amongst all types and selectives amongst measured HH's, with optants the lowest. As expected NHH demand is less reactive to the weather but there is some correlation between peak days and peak demand.

5.1 Total Demand Change since 1987

It is interesting to compare this year's peak demand data with previous years demand. Figure 11 shows how the total demand and temperature have changed over the last 40 years, since 1987. Figure 12 shows the total demand and rainfall. Figure 13 shows rainfall over the last 10 years and how 2025 has been particularly dry.

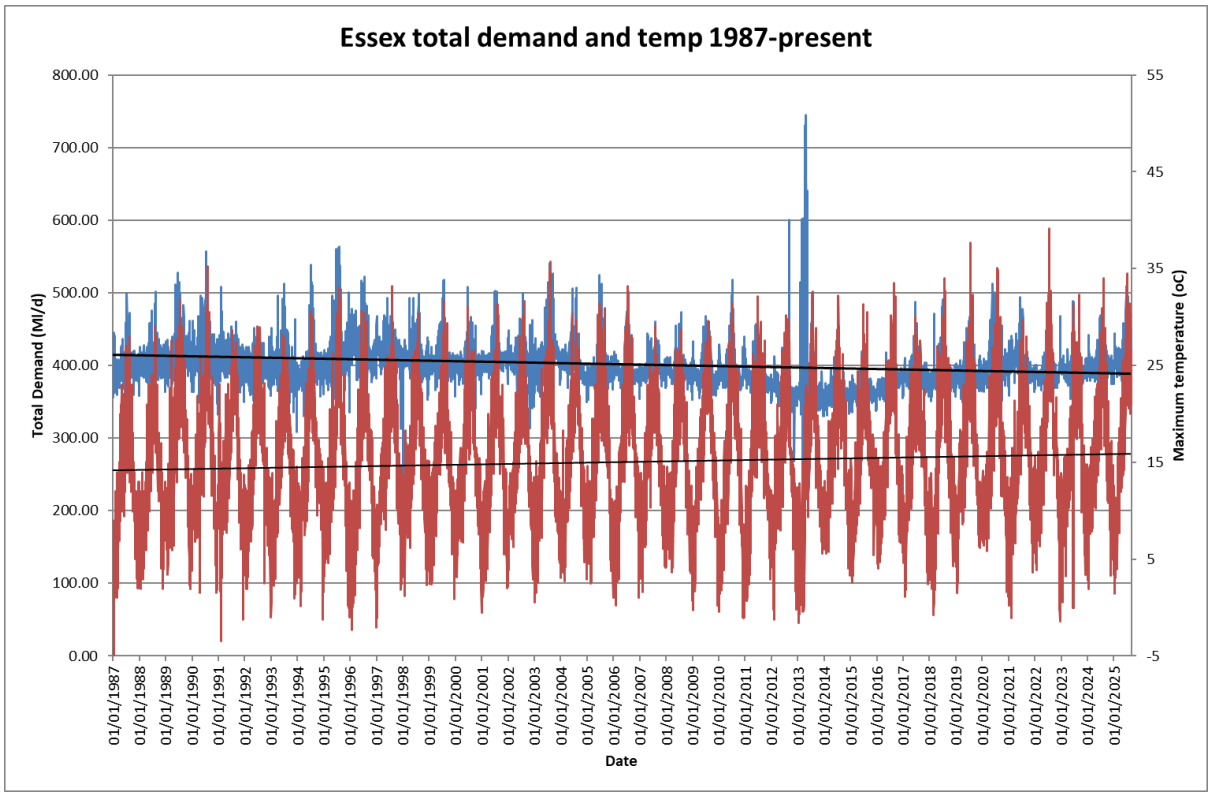


Figure 11: Total demand and monthly temperature (1987 – present).

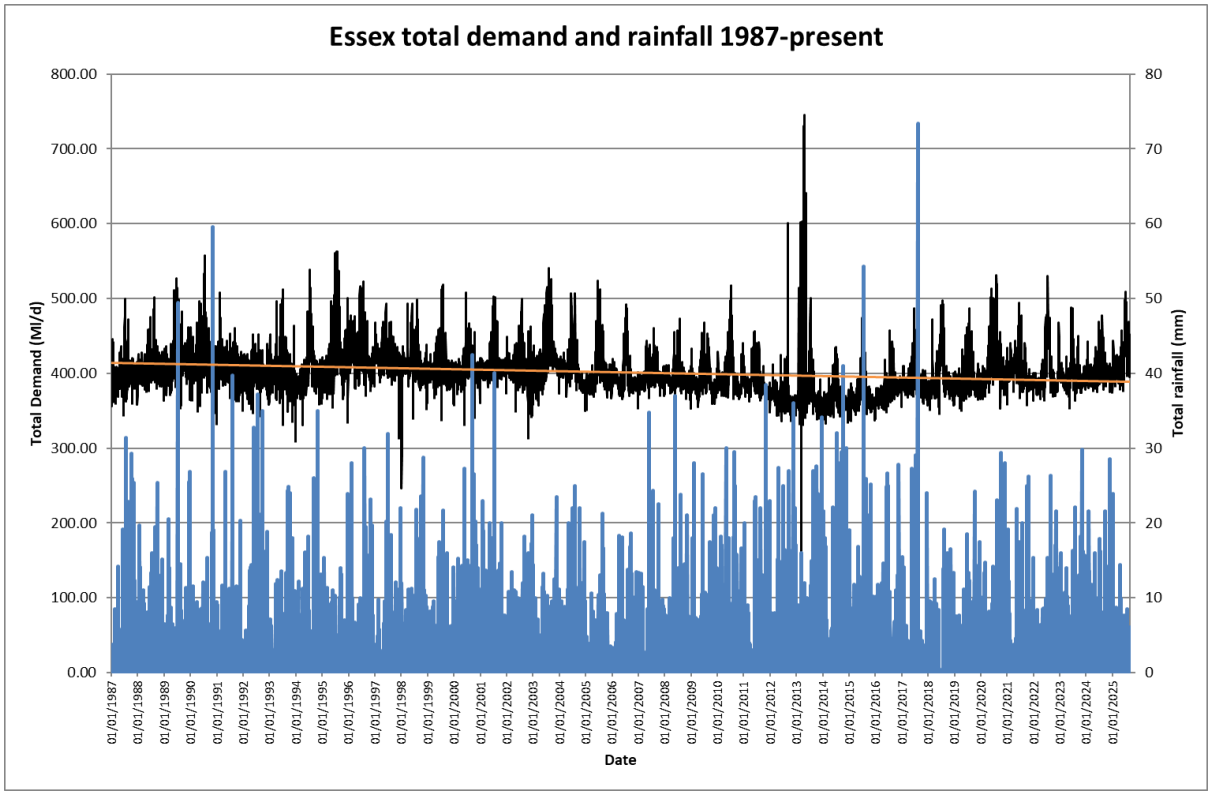


Figure 12: Total demand and monthly rainfall (1987 – Present).

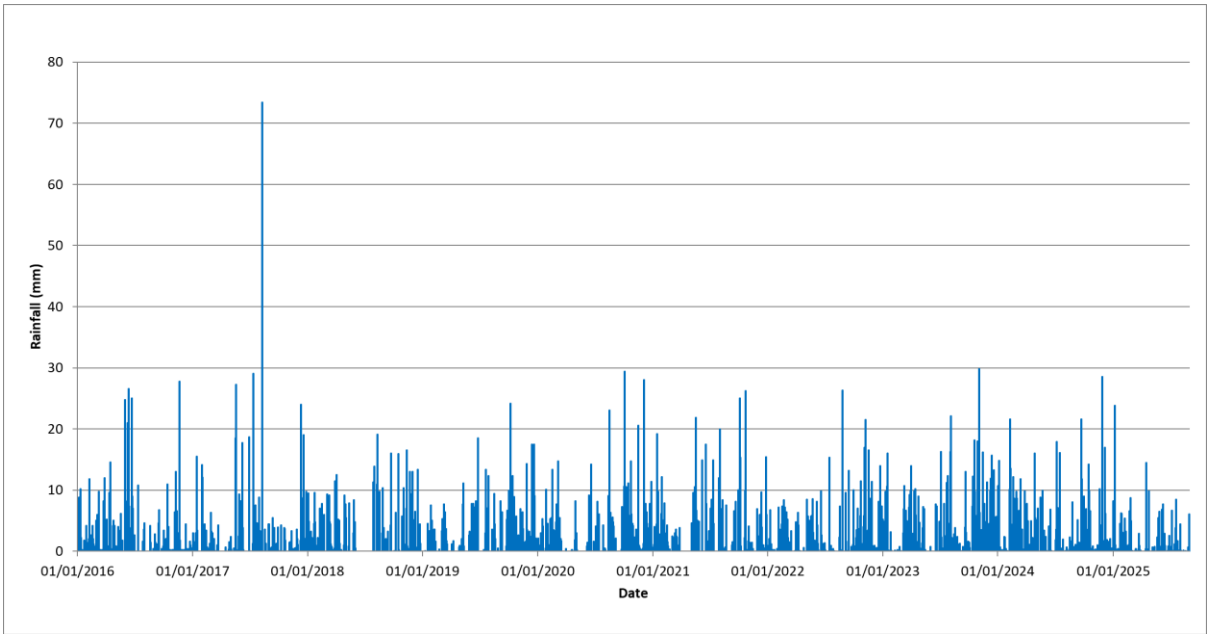


Figure 13: Total rainfall (2016 - Present).

6.1 Discussion

From this study on peak demands over the summer season, we have found the peak water consumption is best related to peak days[5] (Figure 14). It is interesting to see that peaks in demand match closely to peak days of dry weather. Optant and new connections water consumption have smaller peaks when compared to the high selective and unmeasured consumption. The highest peaks in consumption usually occur on or after a period of a few peak days. It is therefore assumed that the highest consumption arises when consecutive days of high temperatures and no rainfall occur.

Unmeasured billed customers consumed the most amongst all measured HH types, whilst for measured billed customers, metered selective customers consumed the most with metered optants the least, as has been found in previous studies. Metered selective customers reacted promptly to a change in climate whereas increased water consumption for optant and new connection customers took a longer amount of time to become noticeable.

[5] A day when the maximum temperature equals or exceeds 25°C and the daily total rainfall is less than 2mm on the day and the two previous days. MTP BNWAT06 (March 2011), Domestic water use in new and existing buildings, pp9, footnote 9.

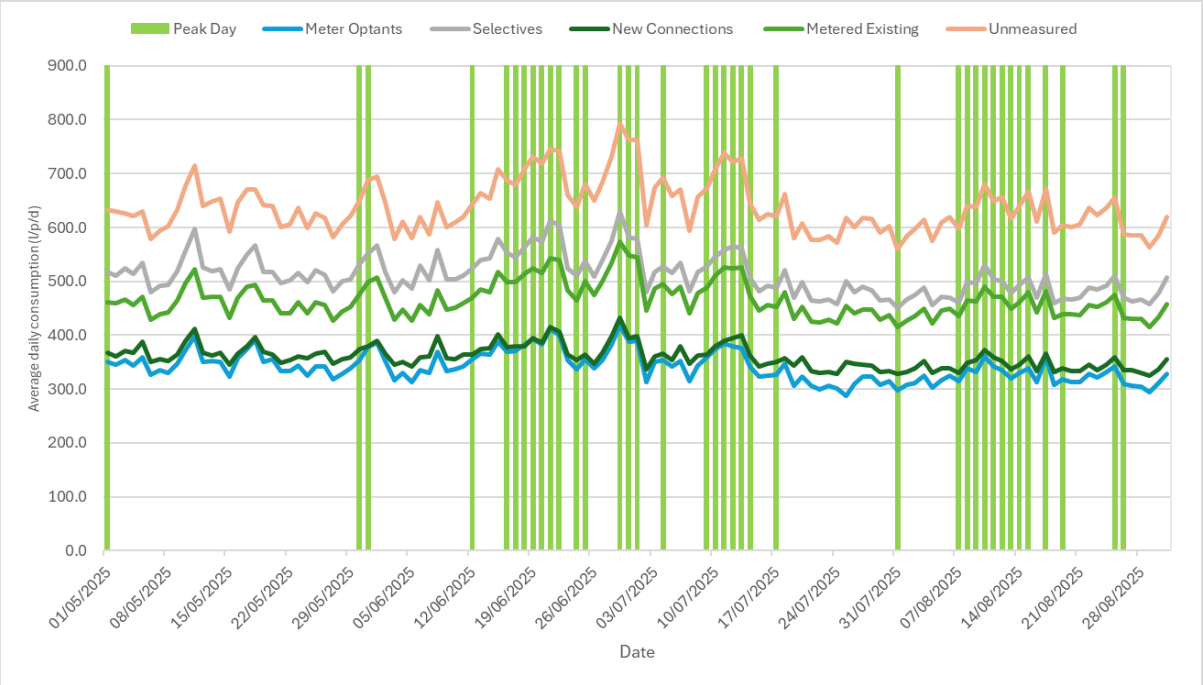


Figure 14: Relationship between 2025 peak days and measured consumption types.

Non-Household customer water consumption does show peak days impacting demand but it's more erratic. The period in May where no peak days fell shows demand relatively high and drops off during the peak at the start of June. Demand does increase but it took a considerable number of peak days to impact NHH demand. This can be seen in more detail in Figure 15.

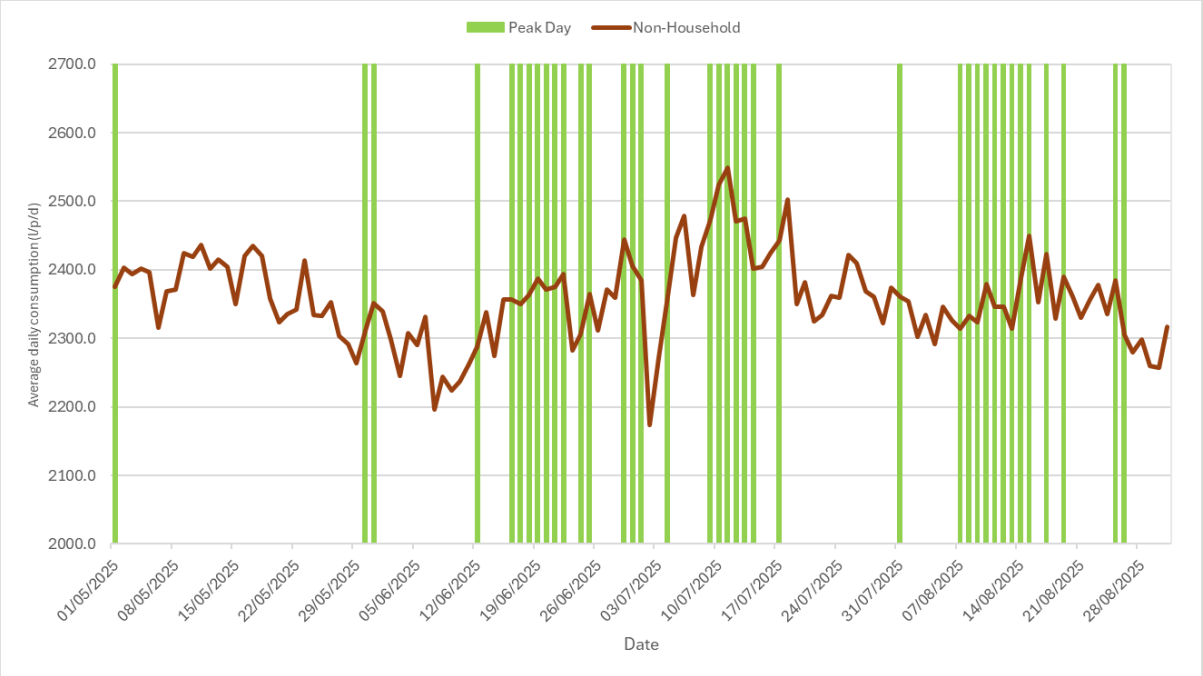


Figure 15: Relationship between 2025 peak days and NHH demand.

6.2 Representation

In order to check the representativeness of the data, the peak demand study data was compared to the total demand for the area (Figure 16). From this we can see that Essex total demand mirrors the peak demand monitored results, and major peaks correspond well. Overall, this indicates a representative sample of households used in the study.

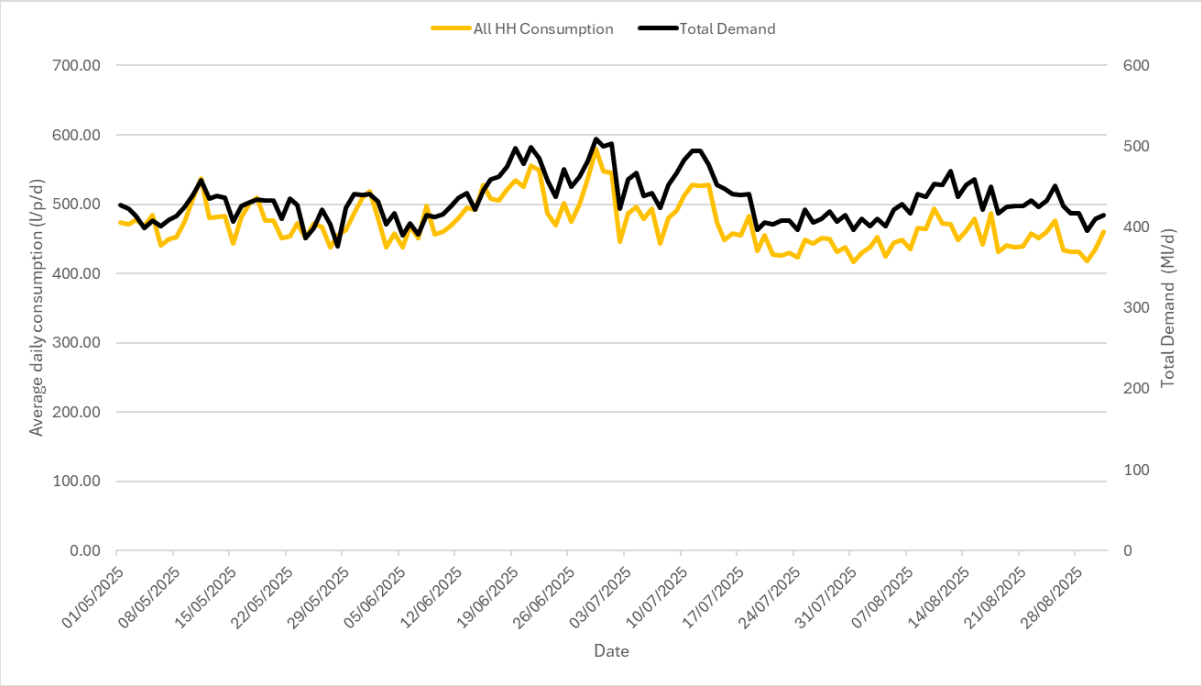


Figure 16: Relationship between total demand and all HH consumption

6.3 Data Cleaning

To ensure data quality, there was some property data that could not be used. This was for a variety of reasons, namely leaks found, loss of data for the time period, unrealistically high consumption values, negative flow values, and periods of inconsistent data. Whilst data has been cleaned, some erroneous data is likely to remain in the dataset. However, with the study now containing over 100,000 metered properties, the impact will be insignificant.

6.4 Conclusion

In conclusion the peak demand study yielded interesting and valuable results and the addition of further data from smart measured properties was beneficial. This summer had above average temperatures and lower than average rainfall. Consumption across the metered types peaked during days following no rainfall and high temperatures. NHH consumption does show signs of being impacted by peak weather days, especially if this is prolonged but from the data its clear other non-peak day weather events are also an influence.

APPENDIX 2: RELEVANT LEGISLATION AND GUIDANCE

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

- Drought permits and drought orders supplementary guidance, March 2025, Environment Agency.
- Environmental assessment for water company drought planning, March 2025, Environment Agency.
- Environmental Assessment of Plans and Programmes Regulations 2004.
- Flood and Water Management Act 2010 where s.36 amends the Water Industry Act 1991 by substituting a new s.76.
- Government expectation for water company drought plans, 22 July 2025.
- Hydrological guidance for the assessment of ESoR, March 2025, Environment Agency.
- "Managing through drought: Code of practice and guidance for water companies on water use restrictions – 2023 (Incorporating lessons from the 2022 drought).
- Position note on compensation-only reservoirs in dry weather, June 2019.
- Security and Emergency Measures Direction (SEMD) 2024.
- Spotlight on Drought 2022: Water companies in England, December 2023.
- The Conservation of Habitats and Species Regulations 2017.
- The Drought Plan (England) Direction 2025.
- The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017
- Water Act 2003 where s.63 inserts new sections 39B & 39C into the Water Industry Act 1991 and s.62 inserts new sections 37B-D into Water Industry Act 1991.
- Water Company Drought Plan Guideline 2025, LIT 74637, Environment Agency.
- Water Industry Act 1991.
- Water Use (Temporary Bans) Order 2010.
- Wildlife and Countryside Act 1981 as amended by the Countryside and Rights of Way Act 2000, Section 28G.

APPENDIX 3: WRE REGIONAL STATEMENT OF INTENT

Statement of Intent

WRE Drought Group

December 2025

1. Introduction

WRE Drought Group

Formed in response to the 2022 drought, WRE's Drought Group was established to facilitate opportunities for improved communication and drought management across sectors, seeking to provide support for abstractors and protect the environment during periods of dry weather across the region. The Group supports WRE's vision *'for Eastern England to have sufficient water resources to support a flourishing economy, a thriving environment and the needs of its population, and for the region to be seen as an international exemplar for collaborative integrated water resource management'*.

Drought Statement of Intent

The Environment Agency's Water Resources National Framework (WRNF25) published in June 2025 sets out an expectation for regional groups to:

"...develop a drought statement of intent. This statement will clearly explain the role each regional group will take in both drought planning and management. It will set out:

- the activities the regional group will undertake and collaborate on;
- what it won't do;
- how the regional group will work with member organisations and neighbouring organisations or regional groups;
- how it will link with existing drought governance and drought plans; and
- its role with other sectors."

"Initially, regional water resources groups should focus on building collaboration and alignment in how droughts are planned for and managed in their region. In the future, this may lead towards regional groups being encouraged to develop a drought plan."

"The key benefits of improved regional collaboration are:

- coordinating interaction and communication across the region, and across sectors;
- facilitating discussion and exploration of collaborative opportunities to share resources; and
- developing a consistent approach for implementing water use restrictions (by water companies)."

WRE's Statement of Intent, as set out in this document:

- Outlines the Terms of Reference of the WRE Drought Group.
- Sets out the actions the WRE Drought Group will take in a drought, and what falls outside our role.
- Demonstrates a commitment to ensure a good representation of all sectors alongside wider catchment needs in a drought scenario.
- Aligns with other regional groups, existing drought governance and plans.
- Will be reviewed and signed off annually by the WRE Drought Group.

2. WRE Drought Group: Terms of Reference

Drought definitions

- Please see Annex 1.

Purpose

- The extended period of dry weather in summer 2022 led to an environmental drought being declared in parts of Eastern England and severe water shortages for some farmers as their abstraction was curtailed. It did not result in a water supply drought as past investment in resilience by our member water companies meant thresholds in water company drought plans to trigger temporary and non-essential use bans were not met. The drought highlighted the gap in resilience for some sectors, as well as gaps in understanding between sectors. It also highlighted a need for increased transparency in drought decision making.
- WRE's Drought Group was established to facilitate opportunities for improved drought management and communication across sectors, seeking to both provide support for abstractors and protect the environment during periods of dry weather across the region.
- The Drought Group aims to improve East Anglia's resilience to drought across all sectors. It seeks to facilitate knowledge sharing and improve understanding of water and drought management across WRE's membership. It supports our members to plan for drought, and encourages alignment of drought response and communication.

Geographic scope

- WRE's Drought Group focuses on the catchments within the Environment Agency's East Anglia Area (Norfolk, Suffolk, Essex and Cambridgeshire) and the Lincolnshire, Bedfordshire and Northamptonshire Area.

Invited representatives

- The core invited representatives are water abstractors. These currently include: Water companies (Anglian Water, Essex & Suffolk Water, Cambridge Water, Affinity Water), sector representatives (energy, agriculture, manufacturing, navigation, leisure, horticulture), Association of Drainage Authorities (ADA) and relevant Internal Drainage Boards (IDBs), Defra, Environment Agency, Natural England and the Consumer Council for Water (CCW).
- Additional members not outlined above may be invited to attend meetings on an adhoc basis depending on their interests and the meeting agenda.

Meetings

- Virtual meetings will be organised:
    - Every other month between April and September during non-dry weather conditions, increasing to
    - Monthly once a period of prolonged dry weather has been declared in the region if the situation requires it, together with a

  - Early season planning meeting in late winter /early spring to review any needs and concerns for the year ahead, and agree on the WRE Drought Group's activities.

- Standing agenda items:
  - Update on current water situation, latest projections, potential for abstraction restrictions.
  - Update on sectoral water availability and drought related activities.
  - Knowledge sharing of relevant projects incl. short-term / small scale water sharing options.

3. Drought activities

Key responsibilities

The WRE Drought Group will:

- Have a pan-sectoral focus across the key abstracting sectors represented in the region.
- Enable increased visibility of areas of water stress across the region and members' dry weather / drought activities.
- Support and encourage all sectors to plan for drought, considering their risks, needs and actions before, during and after a developing drought situation.
- Support alignment on members' drought plans and drought-related communications across the region.
- Facilitate collaborative discussion within and between sectors to promote regional alignment on sharing water resources and implementing water use restrictions during drought.
- Identify and champion opportunities for improved water resources allocation and management across sectors, to explore ways to improve drought resilience and reduce the impact of drought conditions on key abstractors and the environment.
- Support WRE's wider efforts to help the agricultural sector to develop local resilience options.
- Promote drought knowledge sharing through the WRE Drought Group meetings, drought webpage and other channels as appropriate.
- Consider the needs of the environment, including water-dependent habitats and other sensitive environmental sites, in all drought management activities. The group commits to pursuing drought management options that protect and enhance the natural environment.
- Coordinate regional drought activities as outlined in the drought response framework below.

Drought Response Framework

Table 1 below presents a proposed Drought Response Framework outlining high level actions to be undertaken by the WRE Drought Group (WRE and group members) from normal to recovery water resource position, aligned with EA drought status (Figure 1).

Environment Agency drought status

The Environment Agency's drought status is determined by water resources position as displayed below. This is driven by a range of dry weather indicators including rainfall totals, soil moisture deficit, river, groundwater and reservoir levels.

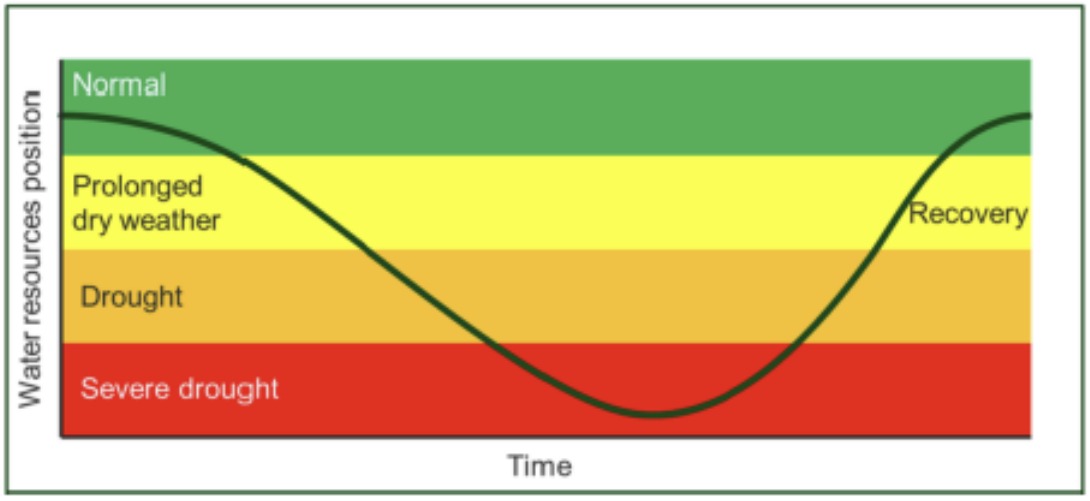


Figure 1. Typical water resources hydrograph during a drought plotted against the Environment Agency's drought status bands. Source: Environment Agency 2025

Table 1. Proposed WRE Drought Response Framework aligned with EA drought status (Figure 1)

EA drought status	Preparedness Phase	Response Phase		Recovery Phase
	Normal (Before Drought)	**Prolonged Dry Weather**	**Drought (including severe drought)**	**Recovery (Post Drought)**
Meeting frequency	Drought Group to meet every other month including a winter/spring planning session	Drought Group to meet monthly	Drought Group to meet fortnightly (likely with a reduced meeting duration)	Drought Group to meet as required
Drought response	Encourage all sectors to understand the risks of dry weather to their activities and plan their drought response	Encourage all sectors to review dry weather/ drought risk and identify key drought actions each sector should consider	Support members to enact their drought response in a consistent and coordinated way	Incorporate drought learning into medium and long-term water management planning across sectors
Resource situation	Monitor and share sector information on the current and forecast water situation	Identify emerging concerns over vulnerable abstractions, operational activities and areas at high risk of drought	Identify and track areas of low water availability and stress across the region during drought	Update on recovery position, outstanding risks, identify key vulnerabilities, and consider lessons learned
Drought options	Facilitate discussion to identify opportunities for water trading / sharing between abstractors in order to mitigate drought impacts		Support and facilitate member water sharing activities / drought response measures	Evaluate effectiveness of drought response measures and consider lessons learned
Comms	Identify key drought communication channels / contacts Share relevant drought and water management material through existing channels	Amplify members' messages Review comms contacts are up to date and channels are appropriate	Initiate a comms sub group to align communications and messaging between sectors, agree core messages, a strategic comms plan and WRE's role within it	Share comms lessons learned across sectors

Regional drought communication

- WRE Drought Group should act as independent voice to help provide background information on the scale of the challenge, educate stakeholders on what drought is, and share specific information on regional challenges. This can be done through:
    - Webpages, factsheets, webinars, sector specific training, stakeholder events.
    - Amplifying and coordinating member content and drought communication activities.
- It is important the group complements not duplicates individual member activity, and WRE does not speak on behalf of any organisation. At the request of Drought Group members, we will encourage a narrative of positive action including:
    - Sharing stories about resilience and demonstrating how member organisations are preparing for drought.
    - Sharing early drought/dry weather warnings.
    - Sharing drought planning knowledge between sectors.
    - Coordinating and sharing communications for the public and media to encourage efficient use of water.
- Over winter, the group could explore a wider non-drought educational role to increase water literacy and support landing of water efficiency messaging.
- A drought comms working group would be initiated as prolonged dry weather develops into drought. Core responsibilities include:
    - To report back to and take strategic steer from WRE Drought Group.
    - Aligning messages, sharing activities, agreeing priorities for WRE's own media and public engagement.
    - Identification of appropriate communications leads from member organisations to enable a comms group to be quickly established if drought status is declared in the region.

Links with existing drought governance and drought plans

This group adds to and complements other forums and processes including:

- Defra's National Drought Group (NDG), chaired by ministers and senior officials to coordinate drought management action across sectors. WRE is an NDG member.
- The Environment Agency's drought response (Drought: how it is managed in England - GOV.UK).
- The Environment Agency's monthly water situation reports and regular stakeholder engagement activity.

- Sectoral drought planning processes including water company Drought Plans and Water Resources Management Plans. Note, this SoI has been referenced in water company 2027 Drought Plans.
- Water Resources South East's Dry Weather Group.
- WRE's Board, should any issues need escalating for discussion to National Drought Group.

What sits outside of our remit

- The Drought Group does not have a formal decision-making role nor is accountable for how water supplies and drought options are managed.
- WRE does not intend to develop a regional Drought Plan, nor does it aim to override an organisation's own Drought Plans.
- The WRE Drought Group will not require members to fully align on activities. It will not require members to share information beyond a level they feel is appropriate for their organisation.
- We may develop a drought communications plan but this will be focused on federating and amplifying members' own communications plans. WRE will not proactively engage in drought-related communications unless requested by one or more Drought Group members.

Document control

Version	Changes	Date
1.0	First draft for DJ comment	19/06/2025
1.1	Revised draft for member comment	07/07/2025
2.0	Final version taking account of member comments	22/12/2025

Annex 1. Drought definitions

Types of drought

Droughts occur when a period of low rainfall and high evaporation and demand creates a shortage of water. They reduce water supplies to different users, depending on where and when the lack of rainfall occurs and how reliant they are on specific sources of water. WRE's region is at high risk of drought due to already low average annual rainfall. The Environment Agency defines three types of drought:

- **Environmental drought:** low rainfall causing reduced river flows, exceptionally low groundwater levels and insufficient moisture within soils. These conditions often result in signs of stress for wildlife, fish and habitats.
- **Agricultural drought:** low rainfall and reduced moisture in soils to support crop production or farming practices such as spray irrigation. Irrigation may also be constrained by environmental limits on abstraction licences or statutory restrictions.
- **Water supply drought:** low rainfall coinciding with potentially heightened demand during hot weather causing water companies concern about supplies for their customers. Water supply droughts tend to take longer to develop than environmental or agricultural drought because water companies have invested over successive investment cycles in additional water storage and transfer schemes which provide greater resilience to extended dry periods.

Duration

A number of factors such as rainfall, geology, meteorological pressure systems, time of year, population demands and water supply infrastructure, all combine to determine which areas are more vulnerable to periods of dry weather and how long a drought occurs for.

- **Short droughts:** more likely to affect rain-fed catchments with low baseflow contribution due to the nature of the geology. This is primarily the uplands of the north and west England. Water resources deplete relatively quickly after one dry season of below average rainfall but also tend to recover quickly. Note these areas often experience flooding during and after drought events due to high rates of rainfall runoff. These catchments are more susceptible to short intense droughts but less affected by longer droughts.
- **Multi-season droughts:** The east and south of England are most vulnerable to successive dry winters due to the dominance of groundwater to support river flows. These areas are normally able to cope with short, intense droughts but more likely to be affected by multi-season droughts which also take longer to recover from.
- **Heatwaves:** A heatwave is a short term period of abnormally high temperatures. This is most common in summer months when a slow-moving high-pressure system develops over an area. Whilst a heatwave alone does not classify as a drought, it can exacerbate the problem by causing a higher demand for water at a time when water is already scarce.

Annex 2. How droughts are managed

Drought planning takes place at several levels, from national government to local abstractor groups and individual licence holders.

- **Environment Agency drought plan:** This national framework outlines how drought affects England and how the Environment Agency works with government, water companies and others to manage the effects on people, business, and the environment. It aims to ensure consistency in the way the EA co-ordinates drought management across England.
- **Regional drought plans:** Regional groups have no formal role under EA's drought plan. However, the National Framework for Water Resources expects regional groups to have a Statement of Intent outlining their role during a drought. The expectation is they will support sectors within the region during dry weather, working across sectors to join up drought related communications and activities.
- **Sectoral drought plans:** At present only the water company sector is required to prepare a Drought Plan but other sectors should understand and prepare for dry weather risks to their activities.
- **Water company drought plans:** Like company Water Resources Management Plans, Drought Plans are statutory documents updated every five years, subject to public consultation, and approved by the Secretary of State. They set out the steps that water companies will take should extended dry weather and drought - often coinciding with elevated household demand - cause acute pressures on potable water supplies. Each type of action has a Level of Service (LoS) agreed with the Secretary of State, which defines the annual likelihood of measures being needed (see below).

Water Company Drought Measures

Our water company members have considered but rejected the option of increasing their reliance on drought measures to manage scarce water resources. This is a good outcome for water company customers, businesses and the environment in the region. It means Temporary Usage Bans (TUBs), Non-Essential Usage Bans (NEUBs) and drought permits that could compromise environmental safeguards will become no more likely than at present. This is despite water companies needing to step back significantly over time from their current sources of abstraction.

- TUBs are just one of many demand management actions a water company can take during a drought. First they will increase public communication about the potential for water shortages and encourage customers to use as little as possible (Level 1 measures), before Temporary Usage Bans (TUBs, Level 2) and Non-Essential Usage Bans (NEUBs, Level 3) are introduced.
- TUBs and NEUBs are a formal part of drought plans developed by each water company. TUBs impose restrictions on the use of domestic hosepipes, jet washers and sprinklers as well as domestic swimming pools to help manage demand and protect the environment during drought conditions. NEUBs impose similar restrictions on non-household users of the public water supply.

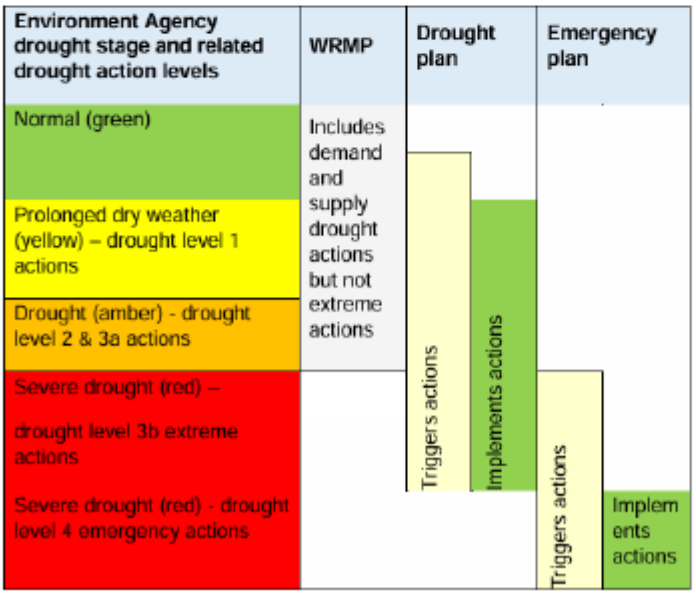
- The most severe restrictions are Level 4 measures, involving supplies to households being restricted at certain times of day (rota cuts). Water companies can also apply for drought permits and orders that allow them to temporarily override abstraction restrictions. As these activities put additional pressure on the environment all such requests must be approved by the Environment Agency (drought permits) or the Secretary of State (drought orders).

Table 2. Annual chance of drought response measures being needed

Level of Service (LoS)	Affinity Water	Anglian Water	Cambridge Water	Essex & Suffolk Water
Level 1: Appeal for restraint /enhanced communications	Not specified	Not specified	Not specified	10% average annual risk
Level 2: TUBs	10% average annual risk	10% average annual risk	5% average annual risk	5% average annual risk
Level 3: NEUBs	2.5% average annual risk	2.5% average annual risk	2% average annual risk	2% average annual risk
Level 4: emergency drought order (rota cuts)	Only for short duration, localised emergencies	<0.2% average annual risk	1% average annual risk	0.4% average annual risk

Table 3. How a water company's different plans work together to support its drought management. Source: Environment Agency 2025

Table 1: How a water company's different plans work together to support its' drought management.



Annex 3. Summary for inclusion in Water Company 2027 Drought Plans

The Environment Agency's Water Resources National Framework (WRNF25) published in June 2025 sets an expectation for regional groups to develop a drought Statement of Intent that clearly explains the role they will take in drought planning and management. As such, WRE's Statement of Intent:

- Outlines the Terms of Reference of the WRE Drought Group.
- Sets out the actions the WRE Drought Group will take in a drought, and what falls outside our role.
- Demonstrates a commitment to ensure a good representation of all sectors, including water companies, internal drainage boards, agriculture and horticulture, energy, industry and amenity stakeholders in a drought scenario
- Aligns with other regional groups, existing drought governance and drought planning arrangements,
- Will be reviewed and signed off annually by the WRE Drought Group.

Formed in response to the 2022 drought, the WRE Drought Group was established to facilitate opportunities for improved communication and drought management across sectors, seeking to both provide support for abstractors and protect the environment during periods of dry weather across the region.

The WRE Drought Group aims to improve East Anglia's resilience to drought across all sectors. It seeks to facilitate knowledge sharing and improve understanding of water and drought management across our members. It supports our members to plan for drought, and encourage alignment of drought responses and communications.

WRE's Drought Group focuses primarily on the catchments within the Environment Agency's East Anglia Area (Norfolk, Suffolk, Essex and Cambridgeshire) and the Lincolnshire, Bedfordshire and Northamptonshire Area.

The WRE Drought Group will:

- Have a pan-sectoral focus across member organisations represented in the region.
- Enable increased visibility of areas of water stress across the region and members' dry weather and drought activities.
- Support and encourage all sectors to plan for drought, considering their risks, needs and actions before, during and after a developing drought situation.
- Support alignment on members' drought plans across the region.
- Facilitate collaborative discussion within and between sectors to promote regional alignment on sharing water resources and implementing water use restrictions during drought.
- Identify and champion opportunities for improved water resources allocation and management across sectors, to explore ways to improve drought resilience and reduce the impact of drought conditions on key abstractors and the environment.

- Support WRE's wider efforts to work with the agricultural sector to develop local resilience options.
- Promote drought knowledge sharing through the WRE Drought Group meetings, drought webpage and other channels as appropriate.
- Consider the needs of the environment, including water-dependent habitats and other sensitive environmental sites, in all drought management activities. The group commits to pursuing drought management options that protect and enhance the natural environment.
- Coordinate regional drought activities as outlined in the drought response framework.

The WRE Drought Group will not:

- Have a formal decision-making role nor is accountable for how water supplies and drought options are managed.
- Develop a regional Drought Plan, nor does it aim to override an organisation's own Drought Plans.
- Require members to fully align on activities. It will not require members to share information beyond a level they feel is appropriate for their organisation.
- Proactively engage in drought-related communications unless requested by one or more Drought Group members.

The full Statement of Intent, along with other drought material, can be found on WRE's website here: WRE Drought Group - Water Resources East

APPENDIX 4: TEMPORARY USE BAN REGIONAL ALIGNMENT

The majority of Water Resources South East (WRSE) and Water Resources East (WRE) water companies, including Essex & Suffolk Water, have agreed the following universal TUB enforcement policy.

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

TEMPORARY USE BAN ENFORCEMENT POLICY

Introduction

Essex & Suffolk Water is the statutory water undertaker for an area covering approximately [add a broad descriptive geographical description e.g. 5000 square miles across London and the Thames Valley from Kent in the east to Gloucestershire in the west].

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

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

The TUB took effect from midnight on [date] following publication of the notice on the Essex & Suffolk Water website and in the London Evening Standard, The Times and the Daily Mail newspapers on [date]. The terms of the TUB are attached to this document as Appendix B.

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

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

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

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

Overall Aim

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

Guiding Principles

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

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

Standards

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

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

complainant. Any such identification will be treated in confidence but may need to be disclosed (with prior consent) should formal legal proceedings be taken against the person or persons to which the complaint relates. Anonymous complaints, however, will still be investigated.

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

Consistent Enforcement

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

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

Assessing Appropriate Action (in cases of infringement)

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

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

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

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

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

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

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

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

Both the evidential and public interest stages will be considered fairly and objectively by Essex & Suffolk Water.

[Date]

Appendix A Map of Essex & Suffolk water Region

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

Appendix B: Terms of the Temporary Use Ban

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

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

6. drawing water, using a hosepipe, for domestic recreational use;
7. filling or maintaining a domestic pond (excluding fishponds) using a hosepipe;
8. filling or maintaining an ornamental fountain;
9. cleaning walls, or windows, of domestic premises using a hosepipe;
10. cleaning paths or patios using a hosepipe;
11. cleaning other artificial outdoor surfaces using a hosepipe.

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

Exemptions
The following will be exempted from the restrictions:

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

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

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

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

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

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

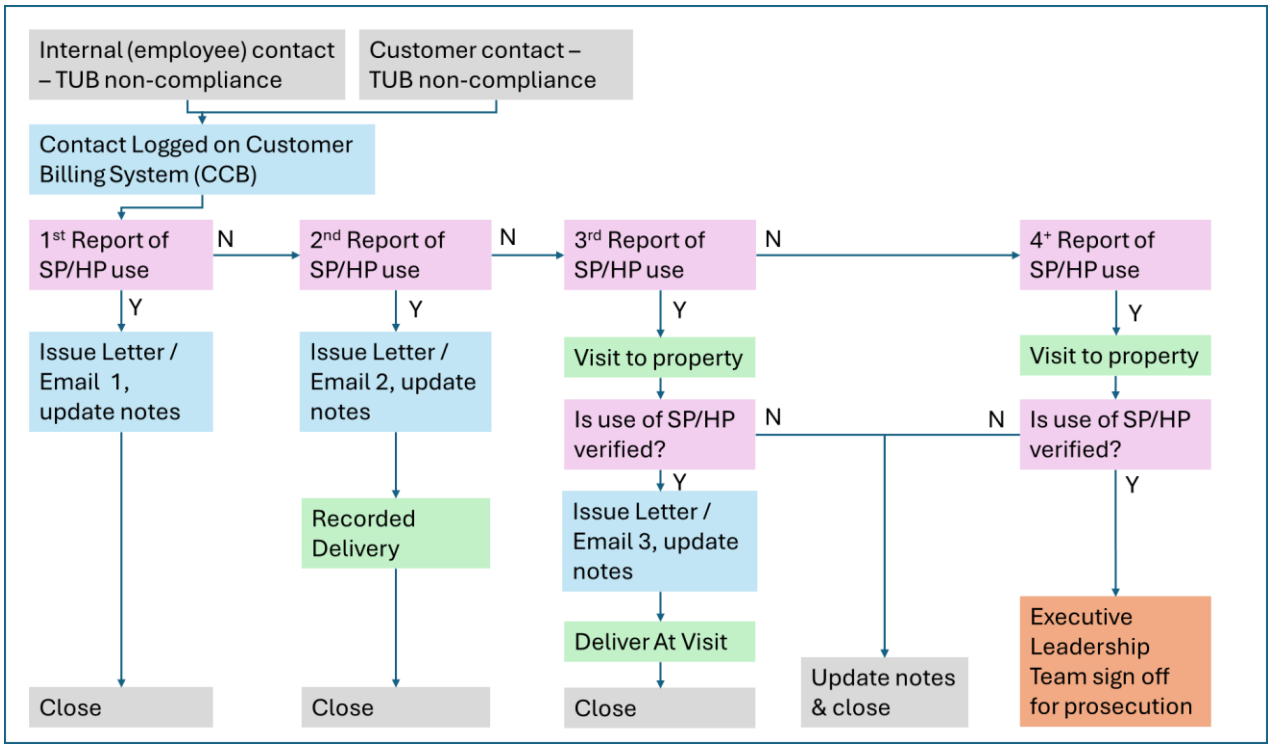


Figure 1: TUB Compliance Process

APPENDIX 5: POTABLE WATER BULK SUPPLIES AND EXPORTS

We have a number of potable water imports and exports, see below for details. For the purposes of this Drought Plan we have assumed that the full quantity outlined in our water supply agreements will be available during a drought. Requests to increase transfers (within the capacity of the transfer mains) will be considered against our own water resources position and would only be supported if our modelling confirmed no significant increase in risk to our own customers' water supplies.

We have a bulk supply arrangement with Thames Water Utilities (TWU) that provides up to 91 Ml/d of raw water to support our Chigwell Water Treatment Works. In 2015, we entered into a separate agreement enabling a 20 Ml/d raw water trade back to TWU. Under normal operating conditions, we retain the ability to utilise the full 91 Ml/d, but the agreement grants TWU the option to reduce our available bulk supply by 20 Ml/d when required. This arrangement aligns with the provisions and assumptions set out in the Essex & Suffolk Water WRMP24.

We have a bulk import from Anglian Water Services into Essex at Cressing which is 1Ml/d in the agreement. We also have two new imports from Anglian Water Services for WRMP24. One into Rickinghall WTW in our Hartismere WRZ at Hinderclay at 0.006Ml/d; and the other at Rising Way, Martham, which is in our Northern Central WRZ, of 0.01Ml/d.

In Essex we have seven bulk exports to Anglian Water Services which is 3.05Ml/d in the agreement. We also have one bulk export to Affinity Water which was 0.02Ml/d in 2024/25.

In Northern Central we have two bulk exports to Anglian Water Services which is 0.37Ml/d in the agreement.

New Appointments and Variations (NAV's) are increasing within our supply area with a current registered total of 23 in Essex and 6 in Suffolk. The contractual volume for the operational NAVs is 9.11Ml/d. An increase in the number of NAVs is driving a continued year-on-year rise in potable bulk exports.

APPENDIX 6: SECLI FIRM OFWAT INNOVATION FUND PROJECT

1.1 Background

This project intends to use the findings and intellectual property (IPR) from a Horizon 2020 funded project called SECLI-FIRM which looks at the added value of seasonal climate forecasting for integrated risk management. The SECLI-FIRM project successfully demonstrated that more reliable weather dependant decisions can be made out to 2-4 weeks if tailored sub-seasonal forecasts are utilised. The project used the Met Office IPR called 'Decider' along with historic demand data from Northumbrian Water to build a sub-seasonal water demand forecast model. The Decider forecasting tool (to be used as background IPR) developed by the Met Office, uses the predictability of large weather systems (or weather patterns), and the resulting model exploits the relationships between these weather patterns and water company's demand. The result was a demand forecast model that gives Northumbrian Water up to four weeks' notice of significant changes in weather, allowing them to be better prepared for large changes in water demand.

1.2 Aims and objectives

The project aimed to achieve an in-depth understanding of weather-related water demand. A forecast that can produce alerts to high customer demand events in the summer but also freeze thaw events that would increase demand through leakage. The model aims to provide alerts up to a month in advance, which would enable the business to plan further in advance to these high demand events but also to low demand events which would help in identifying the most appropriate time for maintenance. The forecast ensures the business can plan according to the low and high demand events to efficiently allocate production and maintenance costs, rather than rely on a worst-case scenario approach. With a greater lead time, leakage resources can be appropriately allocated, which would mean better control and quicker reduction during high leakage events. The model could be used as an indicator to the severity and length of time that extreme weather is likely to persist, which could be used to decide whether drought actions or any other demand reduction measures might be needed.

2.1 Methodology

This project builds on the insights, solutions and methodologies that were developed during the EU H2020 project SECLI-FIRM. The purpose of SECLI-FIRM was to demonstrate the added value of seasonal climate forecasting for integrated risk management in both the energy and water sector. Consequently, the project has built up a wealth of expertise on the best approach to develop and deliver industry-tailored forecast services that are designed to maximise the benefits to operational decision-makers at sub-seasonal (2-4 weeks) and seasonal (1-3 month) time frames. As part of the SECLI-FRIM project, a demand forecast that extends out to 30-day days ahead

has been developed and calibrated for Northumbrian Water. It demonstrates that by following the methodology developed in the SECLI-FIRM project, real-time tailored sub-seasonal forecast services can be successfully integrated into the water sector's operational decisions improving operational efficiency and resilience. The methodology to develop this forecast exploited, for the first time, the skill in forecasting broad-scale circulation patterns and the latest demand modelling approaches6.

At longer lead-times, broad-scale circulation types are more predictable than the actual weather itself. The water demand forecast was extended from 14+ days ahead to sub-seasonal lead times (1 month +) over the winter and summer using weather patterns which are representative of the variability in large-scale atmospheric circulation over the UK and surrounding area. There are 30 weather patterns (Figure 1) that are used in the model, ranked from most to least common.

Current weather conditions are used in the decider tool to predict the likely weather transitions based on historic weather data. This is shown in better detail in Table 1 where regimes are given a probability out of 100. As the period of the forecast increases, there is more uncertainty and so there is a chance that several outcomes may occur. However, the tool will give an indication of which weather regime is most likely to occur based on the historic data.

The decider tool provides quick and comprehensive advice to forecasting teams to ensure that decision makers working in weather-sensitive trades are fully informed. As an overview the tool aims to:

- Access an alternative view of weather conditions up to 32 days ahead that utilises the most accurate weather models in medium range weather forecasting.
- Review the confidence in the forecast and make risk-based decisions accordingly.
- Clearly identify changes and transitions over the forecast period.
- Quickly see how weather patterns will impact on climatologies for different regions.
- Summarise a broad range of information, including circulation biases, regime seasonality, distance and correlation values which supports decision making.
- Identify clear correlations between weather regimes and your own data, enhancing the quality and confidence of your decision making.
- Recognise impacts on energy generation and demand, as a result of several weather parameters, including wind, precipitation and temperature anomalies[7].

[6]Met Office
https://www.metoffice.gov.uk/services/business-industry/energy/decider
[7] The Added Value of Seasonal Climate Forecasts for Integrated Risk Management Decisions | SECLI-FIRM | Project | News & Multimedia | H2020 | CORDIS | European Commission

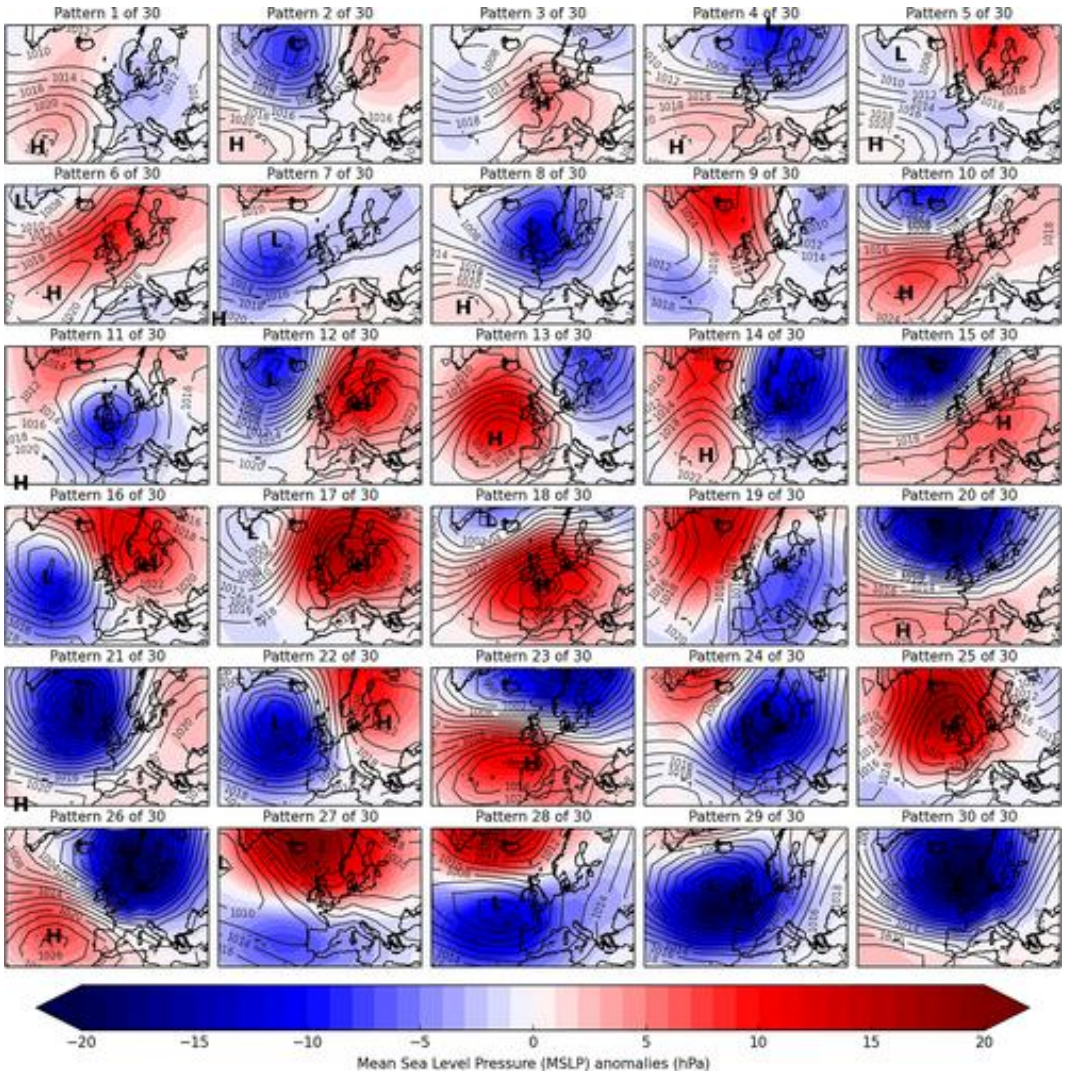


Figure 1: 30 weather patterns set out by the Met Office.

Table 1: Probability of each regime

INTERACTIVE TABLE: Probability of each regime occurring at each lead time (30 regimes) – UK

Click on probabilities to show regime climatologies. Hover over probabilities to show a list of members. Probabilities in bold contain the control member. Regime definitions are available by hovering over or clicking on the regime links in the first column.

	Wed 1 Dec	Thu 2 Dec	Fri 3 Dec	Sat 4 Dec	Sun 5 Dec	Mon 6 Dec	Tue 7 Dec	Wed 8 Dec	Thu 9 Dec	Fri 10 Dec	Sat 11 Dec	Sun 12 Dec	Mon 13 Dec	Tue 14 Dec	Wed 15 Dec	Thu 16 Dec	Regime Descriptions (UK)	Historic Occurrence N/DJ
Regime 1					**45**	16		3	6	3							Unblased NWly	2.0%
Regime 2						**13**	10		10	3	**6**						Cyclonic SWly, returning Pm airmass	2.8%
Regime 3															3		Anticyclonic SWly, ridge over N France	2.3%
Regime 4						6						3	10	3	3		Unblased Wly	2.6%
Regime 5						6	6	6									Unblased Sly, high over Scandinavia	2.6%
Regime 6					23	16											Anticyclonic, Azores high ext.	2.8%
Regime 7														3	3		Cyclonic SWly, low WNW of Ireland	2.2%
Regime 8			16		3	10	**19**	16	6		3						Cyclonic Wly, low near Shetland	3.1%
Regime 9																	Anticyclonic N-NEly, high near Iceland	2.6%
Regime 10					10	26	26	26	13	10	6		3	3			Anticyclonic W-SWly, slight Azores ridge	3.4%
Regime 11								3	3								Cyclonic, low centred over southern UK	2.4%
Regime 12						3			6	3	3	3	10	10	3	16	Anticyclonic Sly, high over Poland	4.2%
Regime 13					6											3	Anticyclonic NWly, high SW of Ireland	4.4%
Regime 14	**100**	**100**		**90**	3		3	3									Cyclonic N-NWly, low near S Sweden	4.1%
Regime 15						3	3	6	3	16	10	**19**	13	16	26	**16**	Unblased SWly, very windy NW Britain	4.6%
Regime 16													3	3			Anticyclonic S-SEly, high E of Denmark	2.7%
Regime 17										3	3	3			6	3	Anticyclonic E-SEly high over Denmark	4.2%
Regime 18								3	3		3		6	13	3	10	Anticyclonic SWly, high over N France	4.8%
Regime 19					10			3									Unblased Nly, low E of Denmark	4.1%
Regime 20			13				13	3	29	13	23	26	10	10	13	6	Cyclonic Wly, intense low near Iceland	4.1%
Regime 21									6	23	10	10	**6**	**6**	**3**		Cyclonic SWly, deep low S of Iceland	3.8%
Regime 22												3	3	3	3	6	Cyclonic Sly, low W of Ireland	3.2%
Regime 23							3	10		3	13	16	19	13	10	16	Unblased Wly, windy in N	4.1%
Regime 24								**6**	**3**	**3**							Cyclonic Nly, low in N Sea	3.2%
Regime 25													3	3	6	3	Anticyclonic Nly, high centre Irish Sea	3.7%
Regime 26			**71**	10			13	10	6	10	3	6	10	3	6	3	Cyclonic NWly, low near Norway, windy	3.5%
Regime 27																3	Anticyclonic Ely, high in Norwegian Sea	3.7%
Regime 28																	Cyclonic SEly, low SW of UK	2.8%
Regime 29										3	3	3			3		Cyclonic S-SWly, deep low W of Ireland	2.9%
Regime 30							3		3	6	13	6	3	10	6	13	Cyclonic W-SWly, deep low SE of Iceland	3.0%
Total Members	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	—	—

Sort regimes by 2m temperature (°C), precipitation (mm/day), 10m wind speed (knots), cloud cover (%) or snowfall (cm/day) anomalies.
View a list of members assigned to each regime

3.1 Phase 1 – Exploration and Data Collation

The first phase included the collation of demand data for our Essex area. This was an extensive task, where the Met Office required as much historic data as possible to ensure there was a high enough temporal frequency to assist with the accuracy of the model. Therefore, this phase was crucial in ensuring that the project provided reliable forecasts and met the initial aims and objectives we hoped to achieve.

This exploration stage was largely successful, where data was shared in a timely manner. In some instances, issues were identified with data through the application of the Met Office's quality control procedures and expertise in impact modelling. These were addressed with a final dataset created, ready to be used for the forecast model.

3.2 Phase 2 – Set Up Forecast Service

Phase 2 involved the development of a bespoke water demand model for Northumbrian Water from the data provided in phase 1. This process involved:

- Generating modelled impact time series, quantifying the performance of the model against the observed time series.
- Developing climatologies of the impact on demand with the 30 weather patterns.
- Showing the performance and potential of the forecast model using verification statistics.
- Developing prototype visualisations for a forecast service, showcasing the potential by generating forecasts 'as it would have looked' for known impactful events.

During the development stage, initial observations indicated that the model produced over and under confident forecasts dependent on seasonality, which meant further refinement to produce a tool that could provide accurate forecasts and reduce the risk of false alarms.

3.3 Phase 3 – Trial Forecast Service

The project entered phase 3 with the service going live. Weekly forecasts (Figure 2) were provided by the Met Office for the month ahead. Monthly stakeholder meetings with the Met Office and partnering water companies were held to dissect the forecasts in detail, provide feedback and opportunities for improvement to the service. During this phase the forecasts were compared against actual demand to evaluate the level of accuracy the model provided.

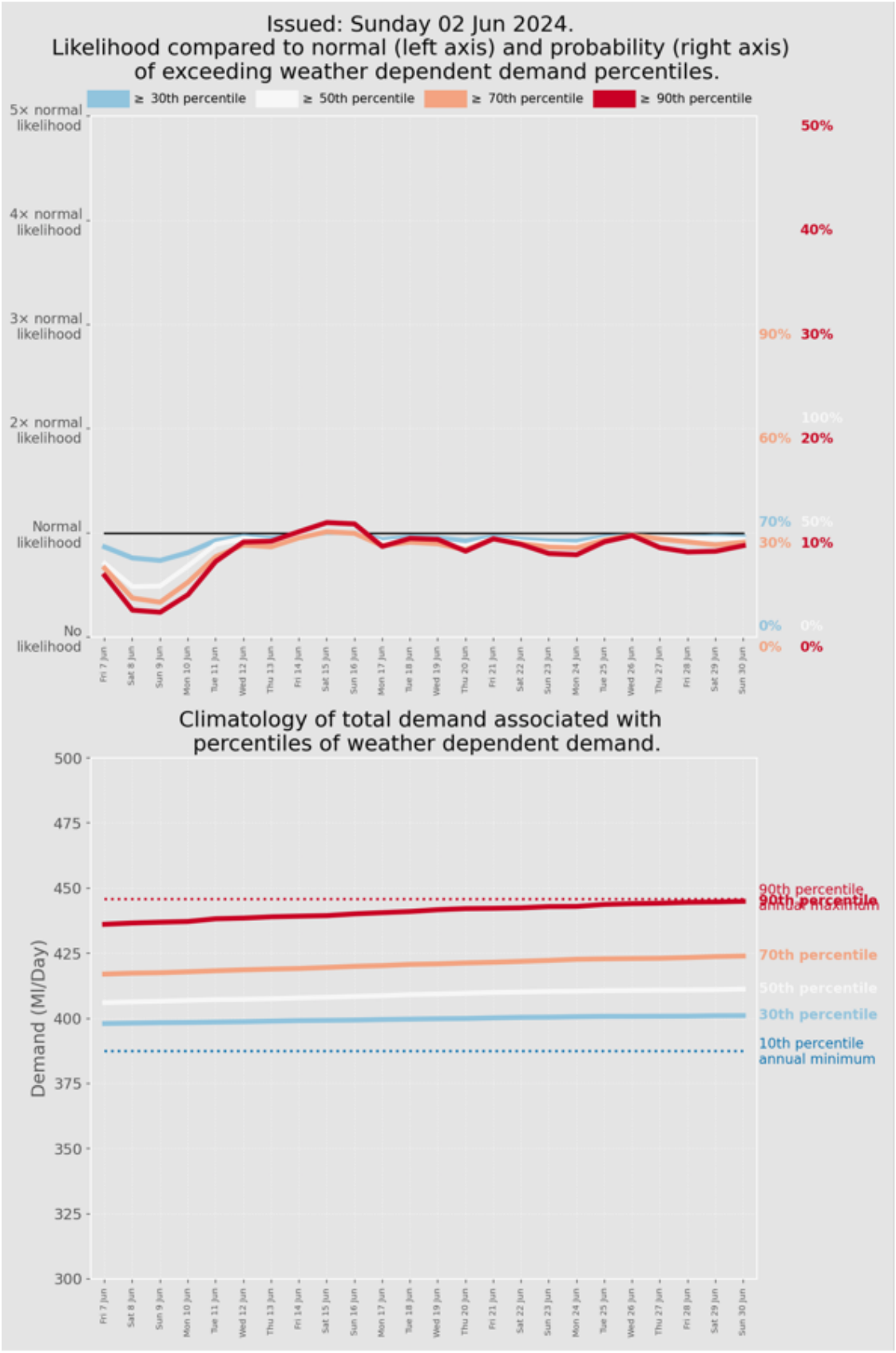


Figure 2: Weekly forecast issued on 2nd June 2024 by the Met Office for 7th June – 30th June, showing the likelihood of high or low demand and corresponding demand percentiles.

4.1 Results

The project analysis has been split into four parts, one for each season. With particular focus on the summer due to an increase in customer demand and winter periods, where leakage peaks due to freeze-thaw events as seen in Figure 3. This data was used throughout the trial to evaluate the performance of the model.

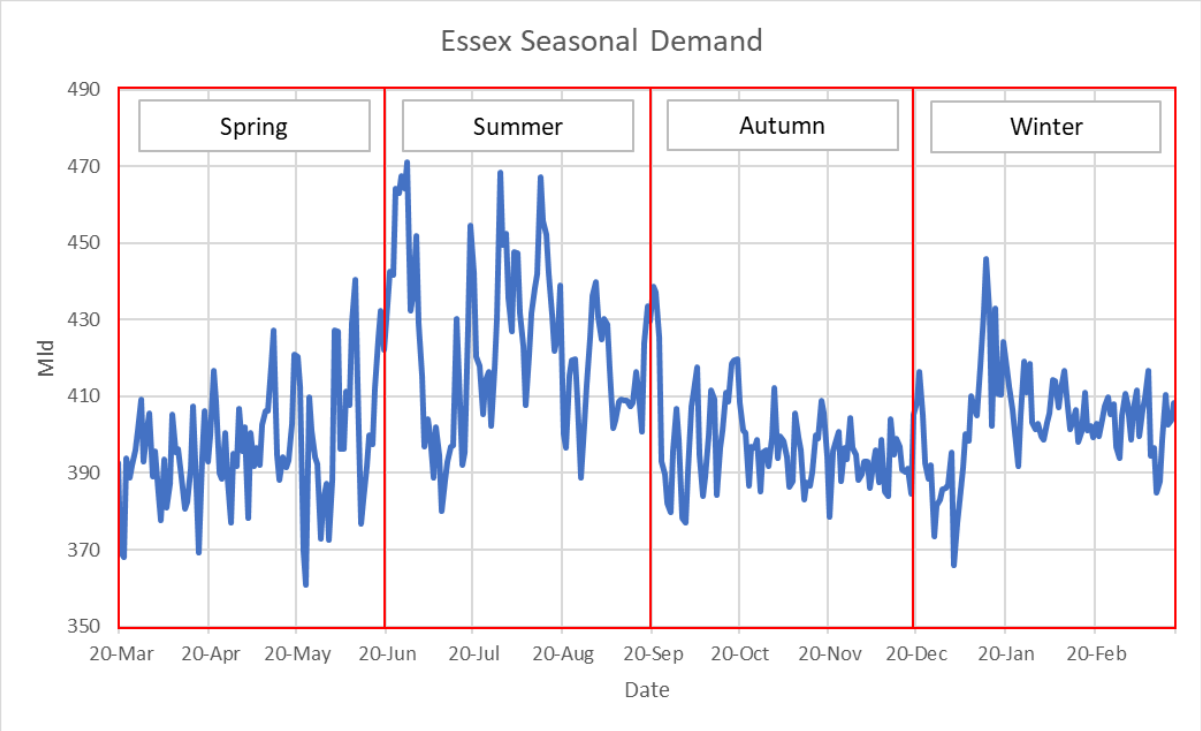


Figure 3: Daily demand in Essex 20th March 2024 – 19th March 2025 showing shifts in demand by season.

4.2 Spring 2024

The forecast was fairly accurate during this period at predicting the higher-than-average demand (Figure 4). It failed to identify the high demand at the start of the forecast, which fell between the 70th and 90th percentiles, where the model had predicted a lower-than-normal likelihood of high demand. However, it is worth noting that demand is less weather dependent during this period, and likely impacted by unrelated factors, especially given the average weather experienced.

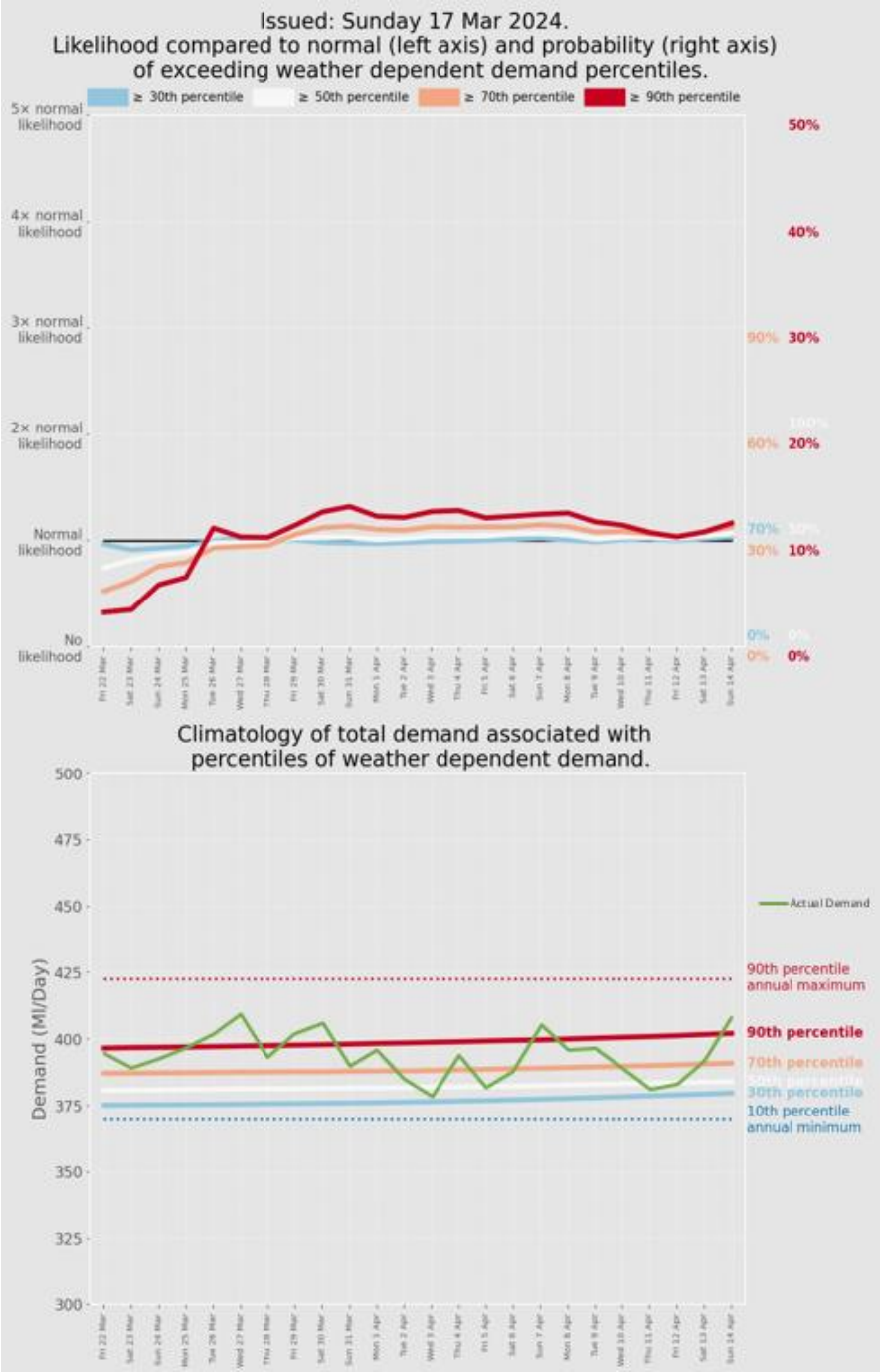


Figure 4: Forecast issued on 17th March 2024 for 22nd March – 14th April, with actual demand included for comparison.

4.3 Summer 2024

Entering the summer months is where we expected the forecast to be most beneficial as this is usually when customer demand peaks due to the weather. The forecast (Figure 5) correctly identified both the peak at the start of the period and the lower demand from the beginning of July onwards.

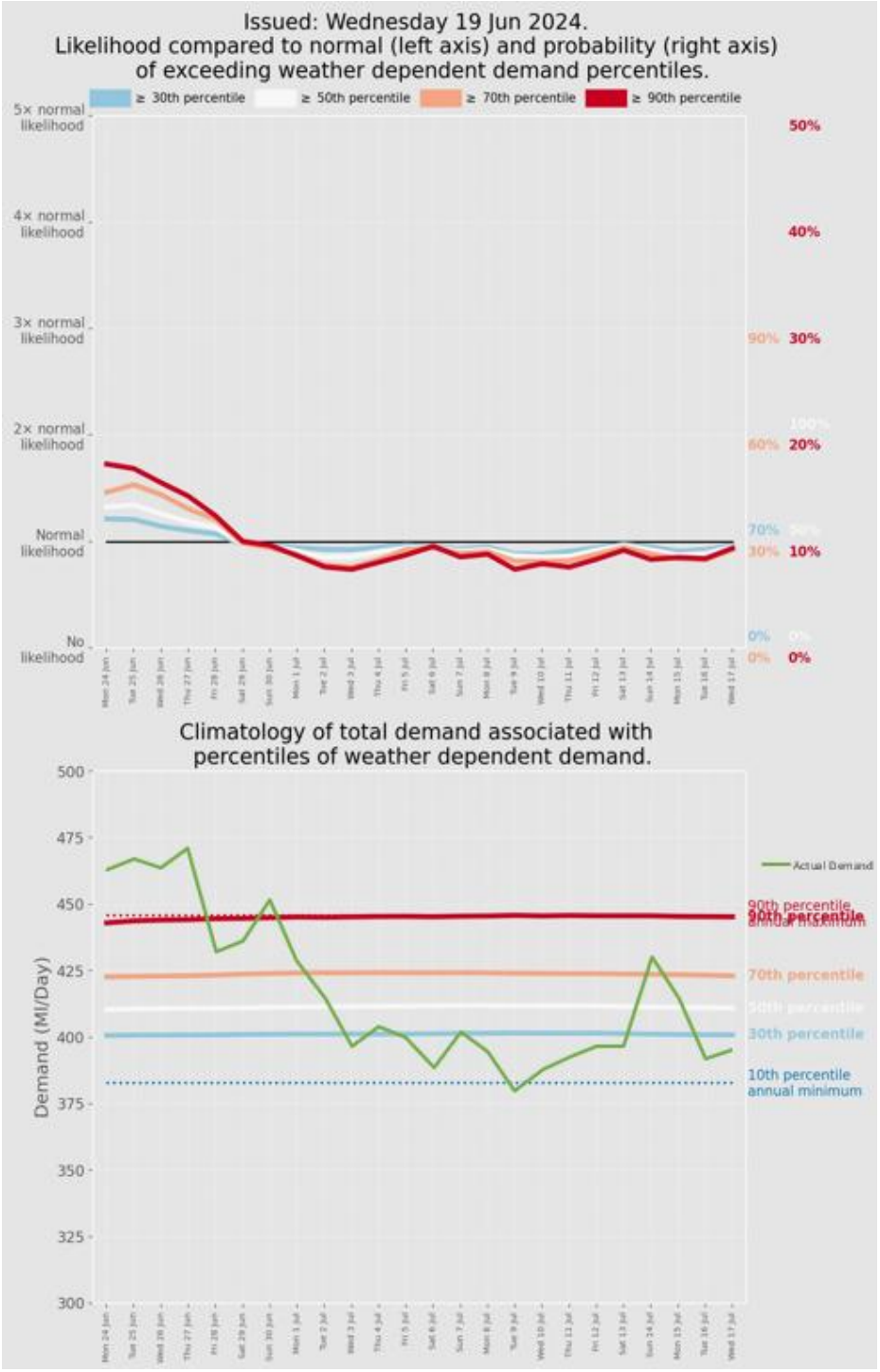


Figure 5: Forecast issued on 17th June 2024 for 24th June – 17th July, with actual demand included for comparison.

Although the summer of 2024 was largely uneventful in comparison to the extremes seen in the previous few summers, there was a period of warm and dry weather between 19th July and 12th August. Likelihood and actual demand in Figure 6 show that the model was accurate at predicting the peaks and troughs during this period with similar trend lines. However, when comparing actual demand against the corresponding percentiles, the model underestimated demand during this period with

only 2 days dropping below the 50th percentile. Therefore, further fine tuning and possible sensitivity increases are necessary to ensure that the model doesn't miss these events in the future.

Figure 6: Forecast issued on 14th July 2024 for 19th July – 11th August, with actual demand included for comparison.

4.4 Autumn 2024

As expected, there were a few peak demand days at the beginning of this period but smaller in comparison to the summer. However, the model predicted an increased

likelihood of demand reaching the 90th percentile throughout November, which was accurate when comparing the percentiles to actual demand (Figure 7). November saw temperatures only slightly above average but more importantly it was unseasonably dry (Figure 8), which is likely what the forecast used to predict high demand for this period. With continuous improvement ongoing, a RAG rating accompanying the forecasts was added in October, which showed the level of certainty of high or low demand event.

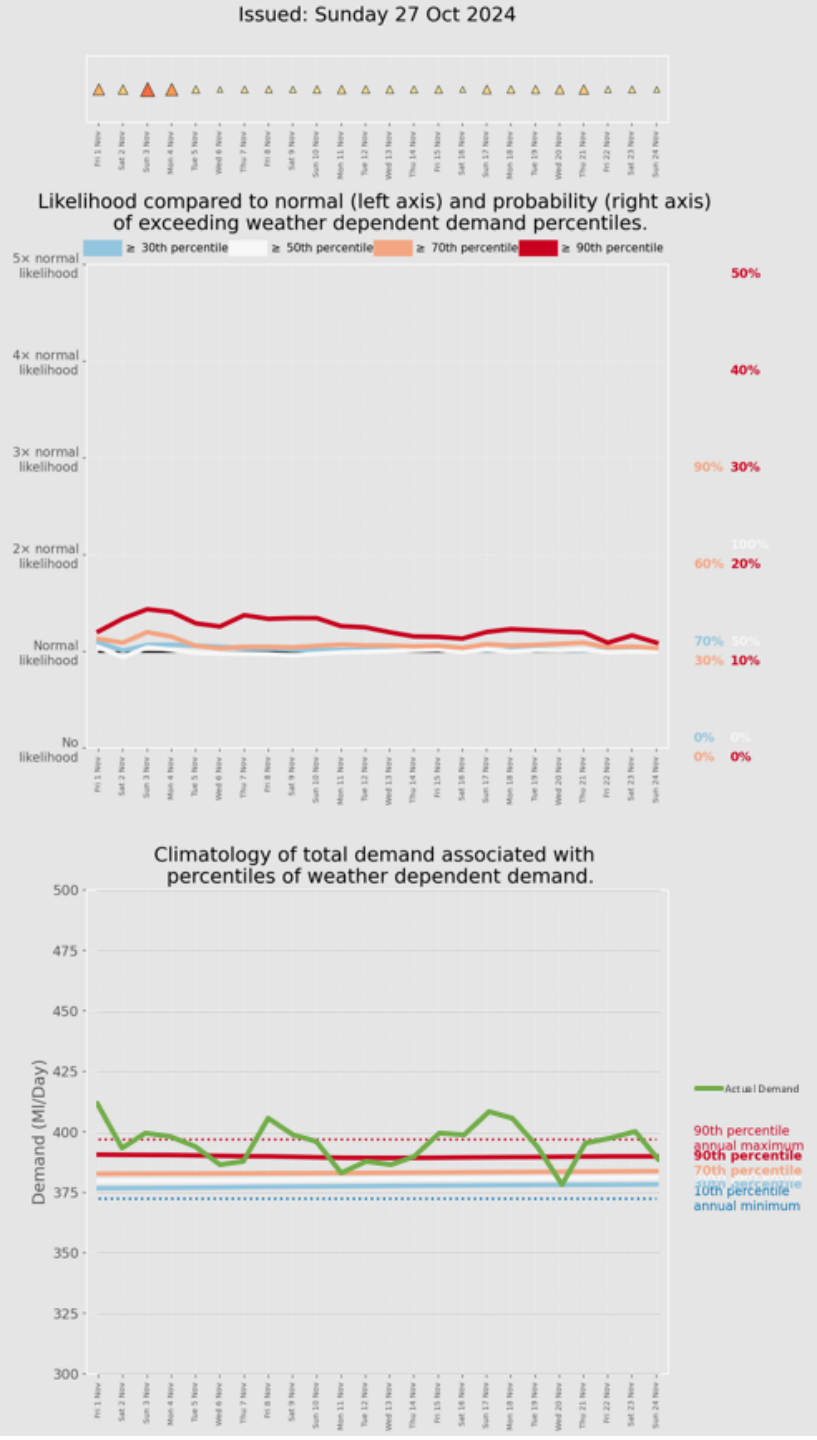


Figure 7: Forecast issued on 27th October 2024 for 1st November – 24th November with actual demand included for comparison.

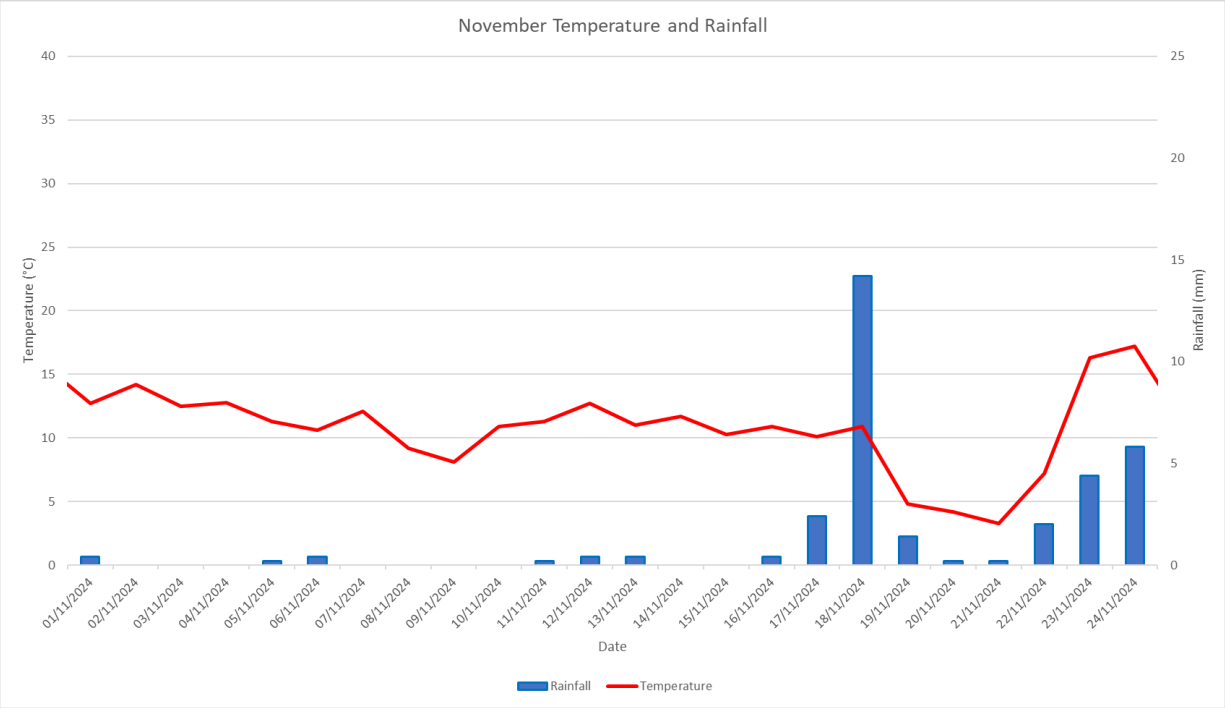


Figure 8: Temperature and rainfall for 1st November – 24th November.

4.5 Winter 2024 – 2025

Demand was relatively stable throughout the winter except for a spike at the start of 2025, resulting from increased leakage after a period of cold weather. The high demand event was first identified in the forecast issued on 22 December (Figure 9). The forecast was fairly accurate at identifying both high demand and the low demand between. However, the subsequent forecast (Figure 10), which was only issued a few days later seemed to underestimate the length and severity of the event. It was again picked up in the following forecast (Figure 11), which indicated a more significant high demand event.

In this instance, although the event was identified throughout, it seems that the model lacked confidence and showed a level of uncertainty in the forecast. This indicates that the model may need to be adjusted during the winter months to increase sensitivity to possible freeze thaw events.

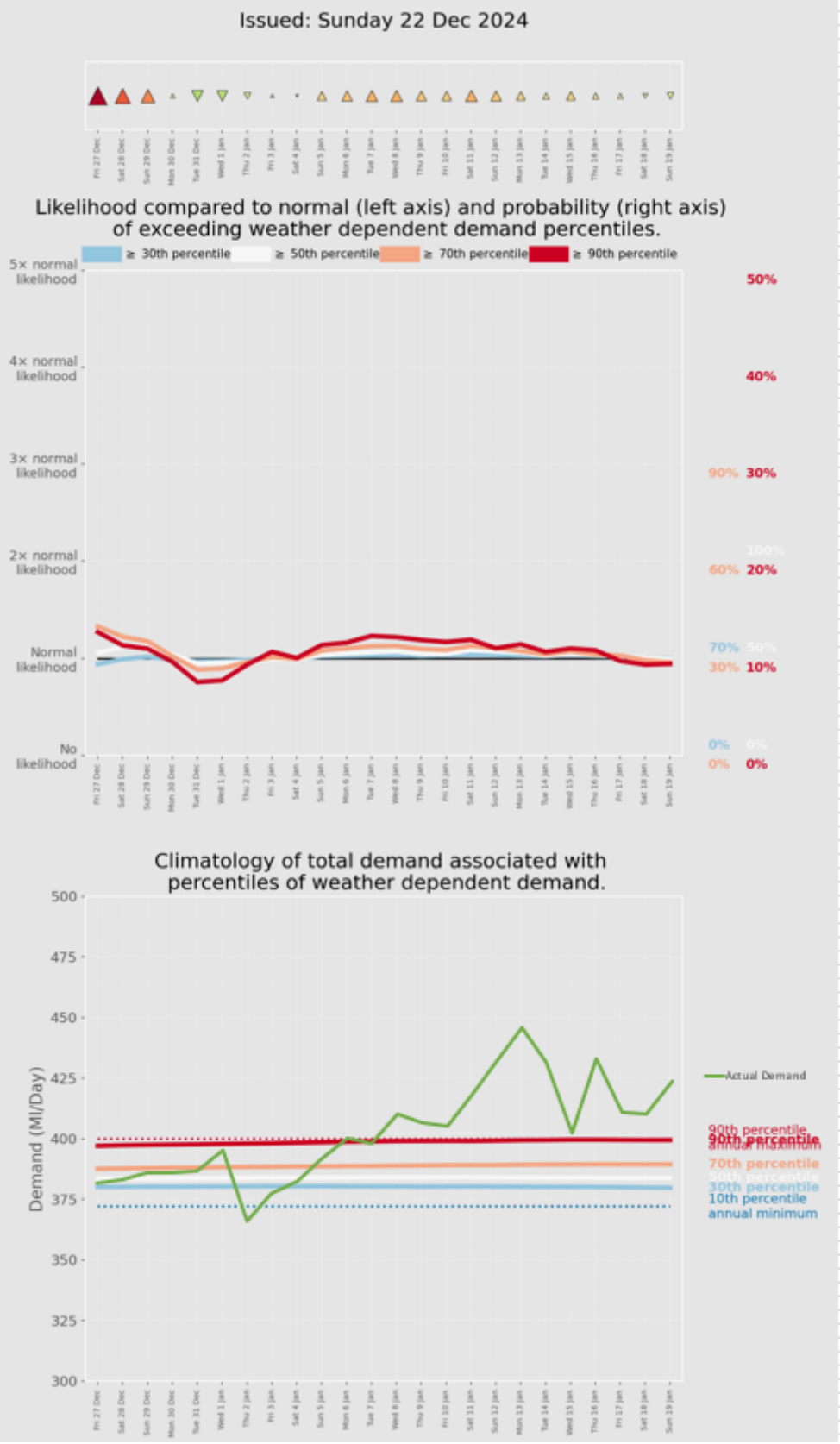


Figure 9: Forecast issued on 22nd December 2024 for 27th December – 19th January.

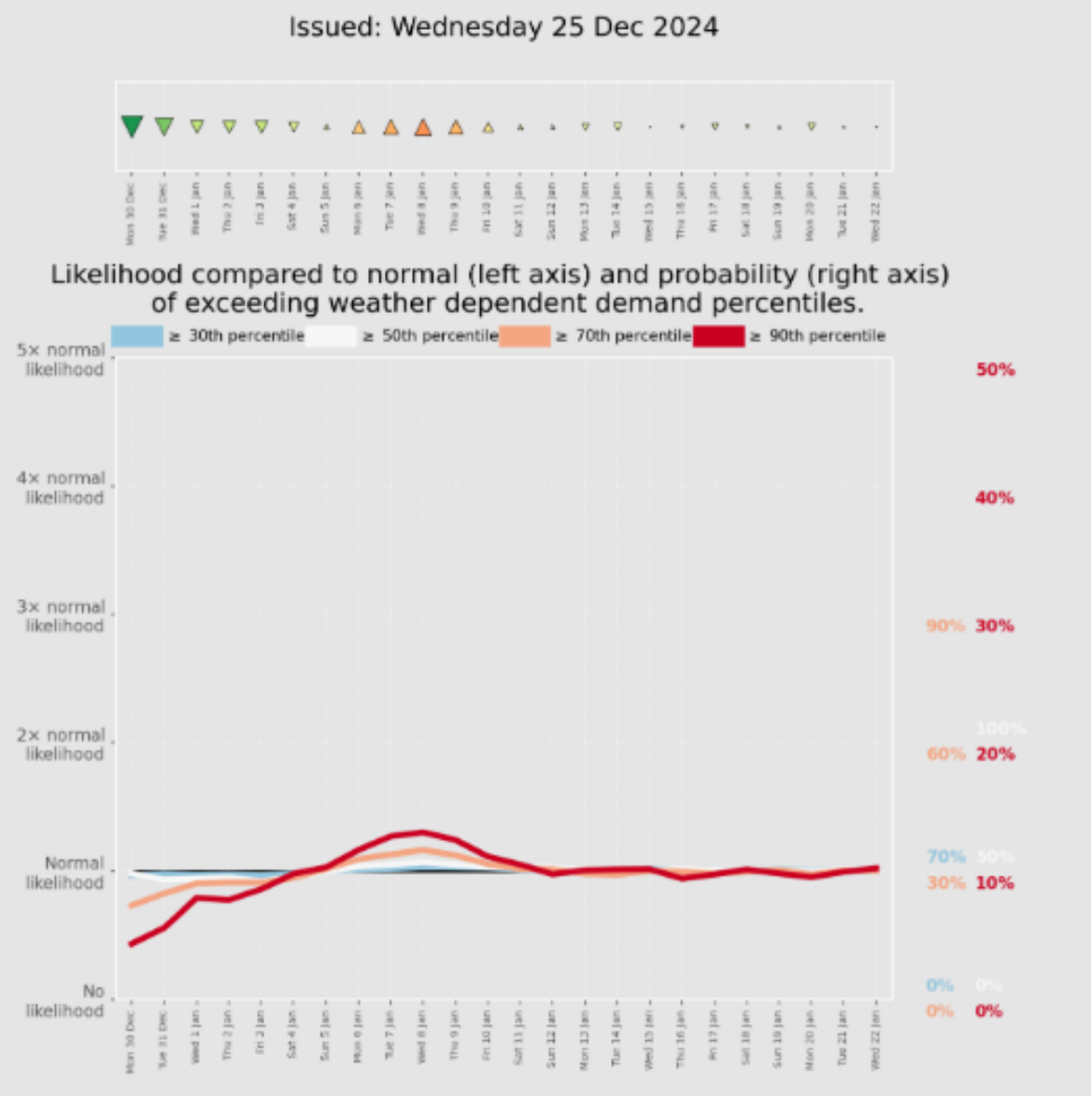


Figure 10: Forecast issued on 25th December 2024 for 30th December – 22nd January.

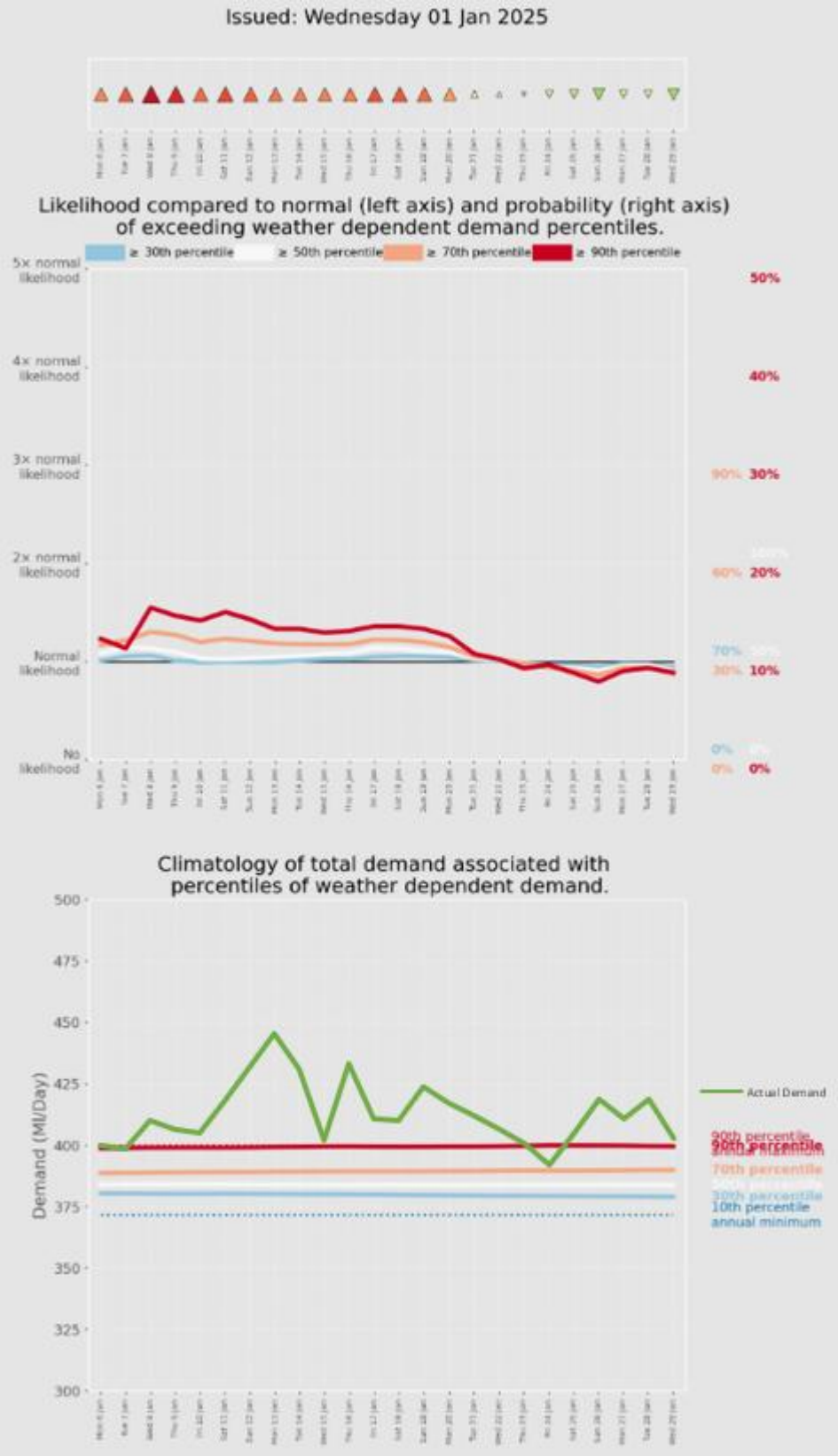


Figure 11: Forecast issued on 1st January 2025 for 6th January – 29th January with actual demand included for comparison.

4.6 Spring 2025

Although most of spring 2025 was generally mild, it was unusually dry, with less than half of the average rainfall for March to June (Figure 12). This meant an increase in demand compared to normal. The majority of forecasts during this period underestimated demand (Figures 13 and 14), where actual demand was nearing the 90th percentile for large parts of spring. The model was correct in predicting a spike in demand at the end of April (Figure 13), which gave 3 weeks of notice. With the forecast issued in May (Figure 14), demand was forecast to be lower than average for large parts of the month. However, actual demand only dropped below the 50th percentile for 2 days.

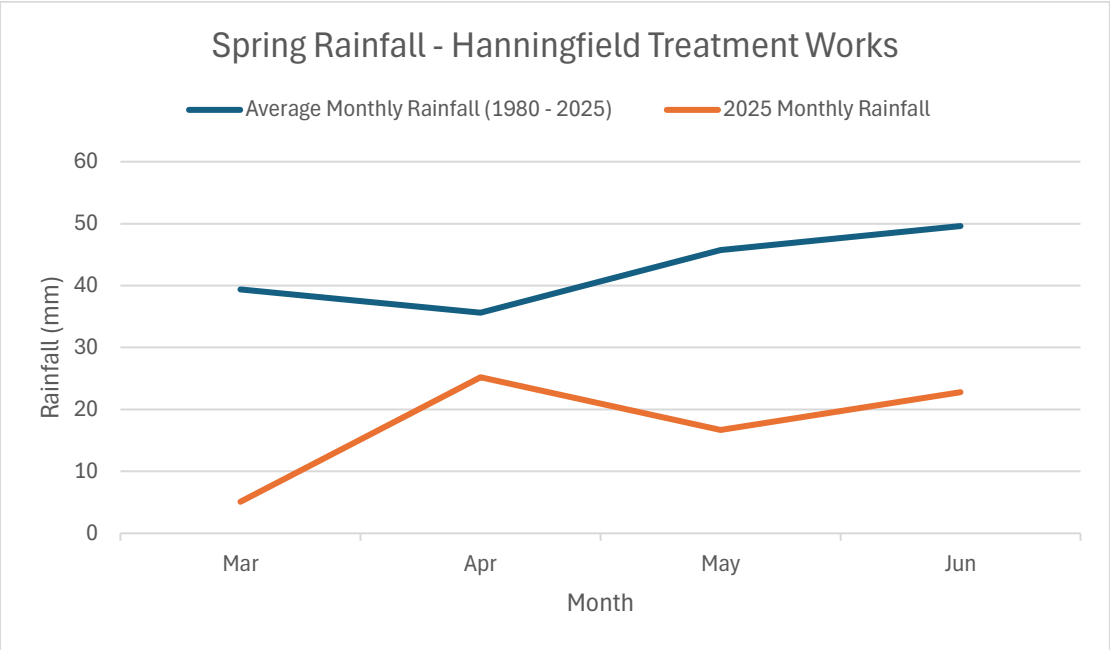


Figure 12: Rainfall for March – June 2025 and average between 1980 – 2025.

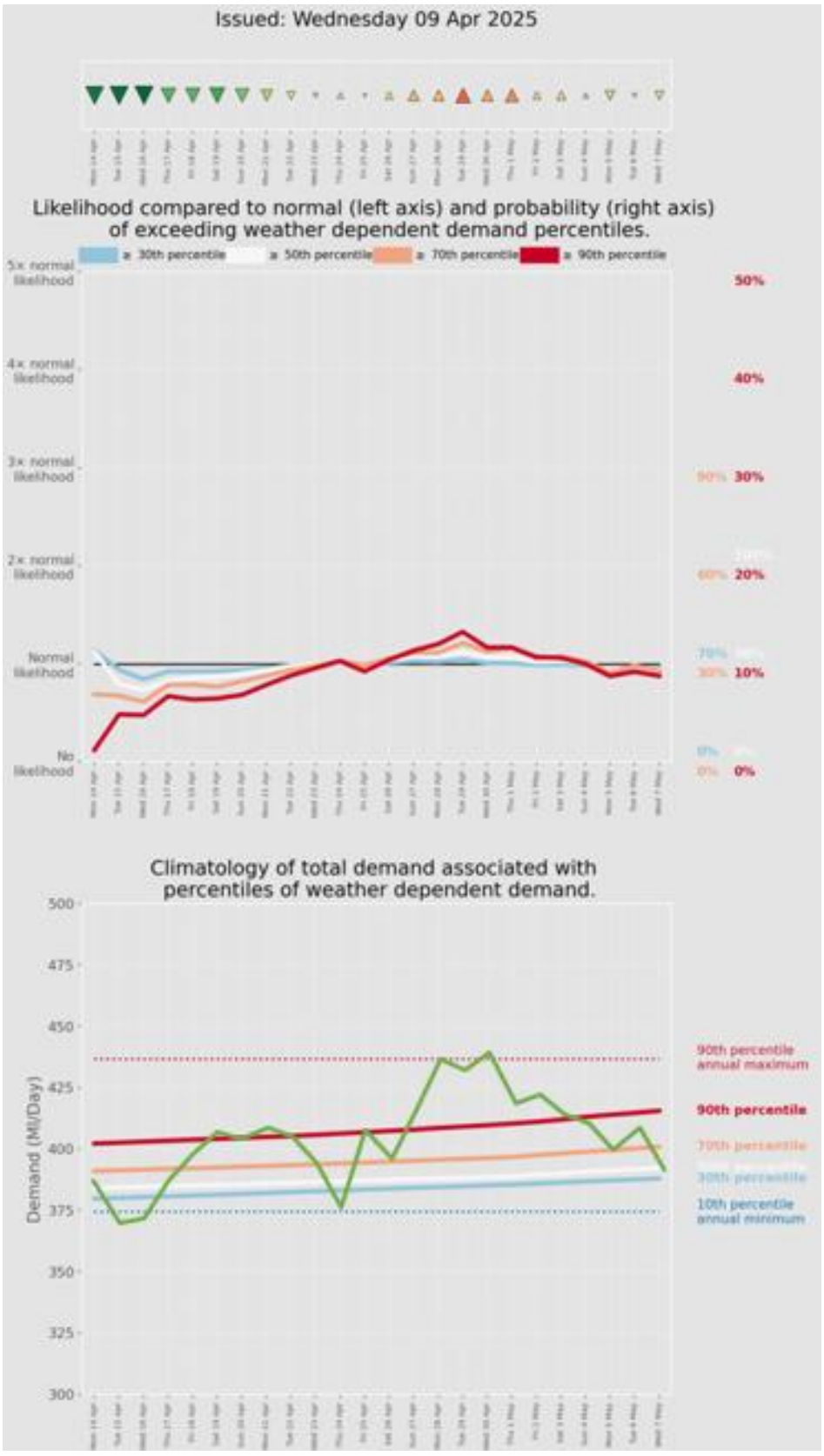


Figure 13: Forecast issued on 9th April 2025 for 14th April – 7th May with actual demand included for comparison.

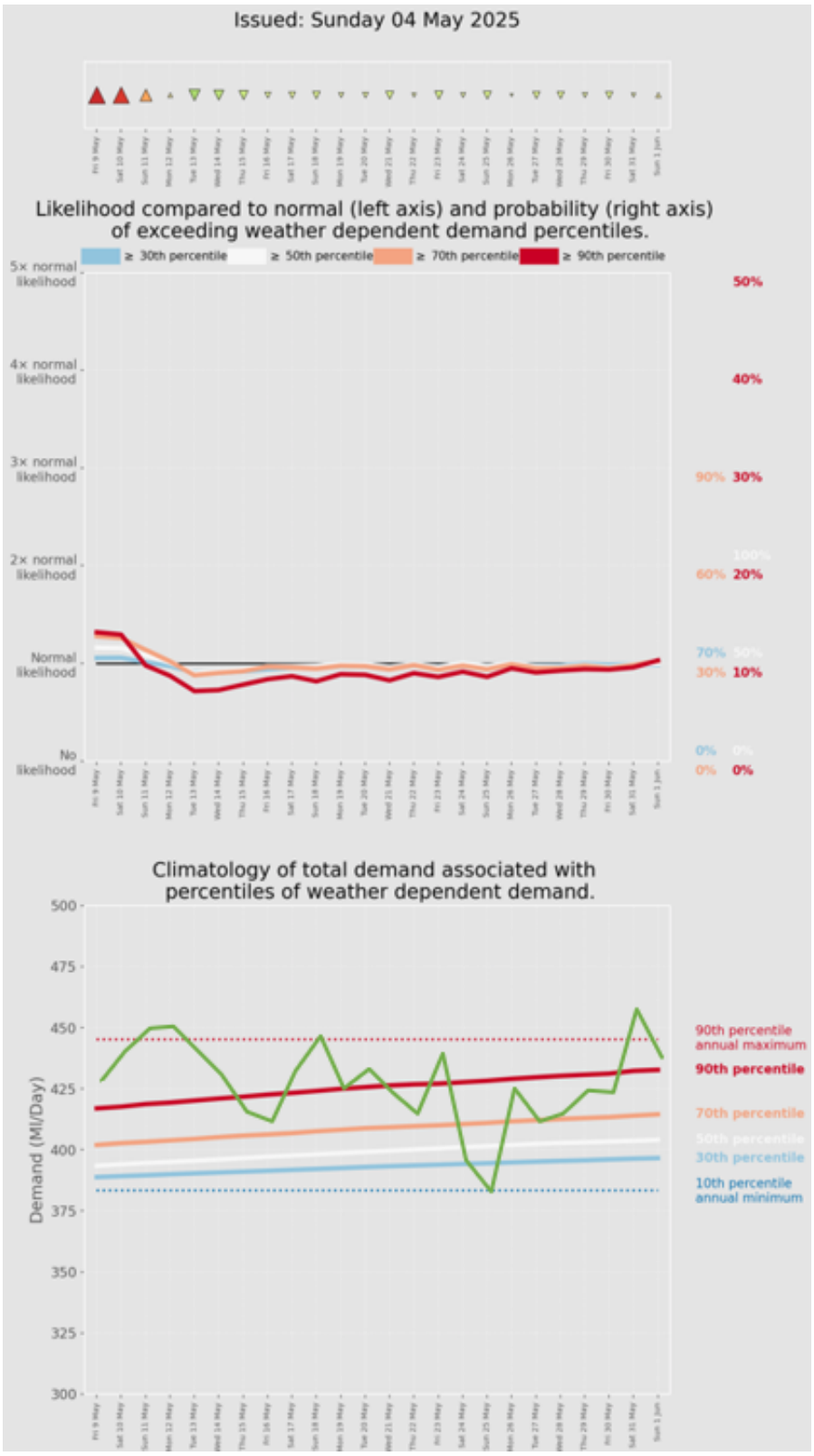


Figure 14: Forecast issued on 4th May 2025 for 9th May – 1st June with actual demand included for comparison.

4.7 Summer 2025

Dry weather continued into the summer months, where temperatures also started to increase as can be seen in Figure 15. The forecast issued at the beginning of June, suggested that high demand would be experienced, followed by lower-than-normal demand towards the end of the month. However, actual demand remained very high throughout the month. Subsequent forecasts throughout June were updated each time with increased likelihoods of high demand, which can be seen in Figure 16 where high demand was forecast, where originally it wasn't in the forecast provided earlier in the month (Figure 17).

The forecast provided at the beginning of July was far more accurate at predicting demand for the month than June's forecasts (Figure 18). There is clear correlation between actual demand and the forecast. In this instance, demand was slightly overestimated for the second part of the forecast. However, the forecast did well at identifying high and low demand events in a period of prolonged dry and warm weather.

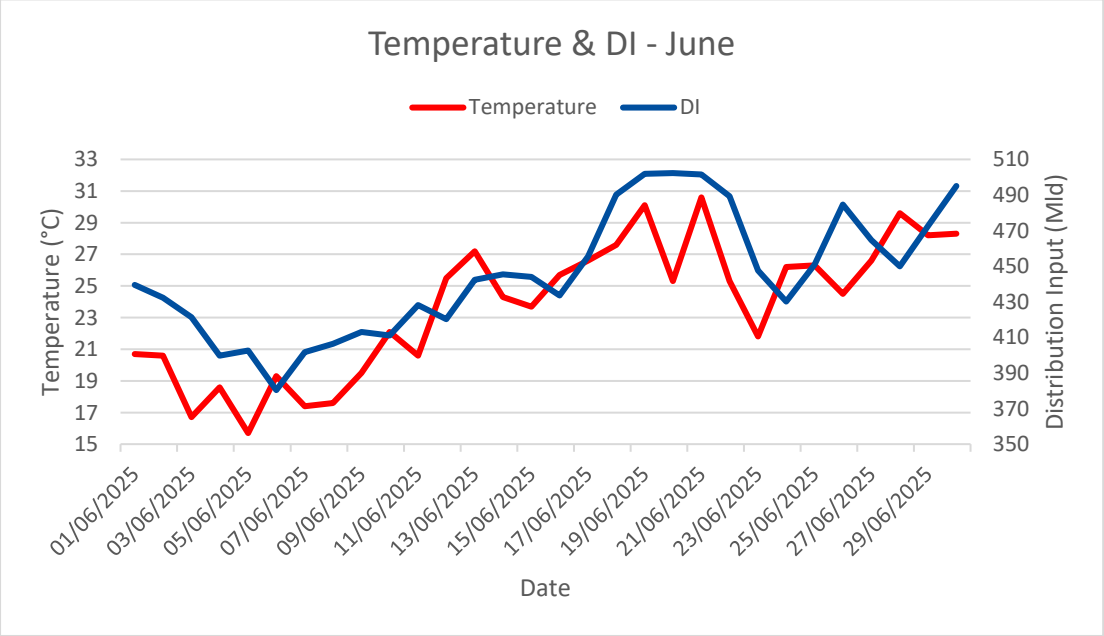


Figure 15: Temperature and DI for 1st June – 30th June.

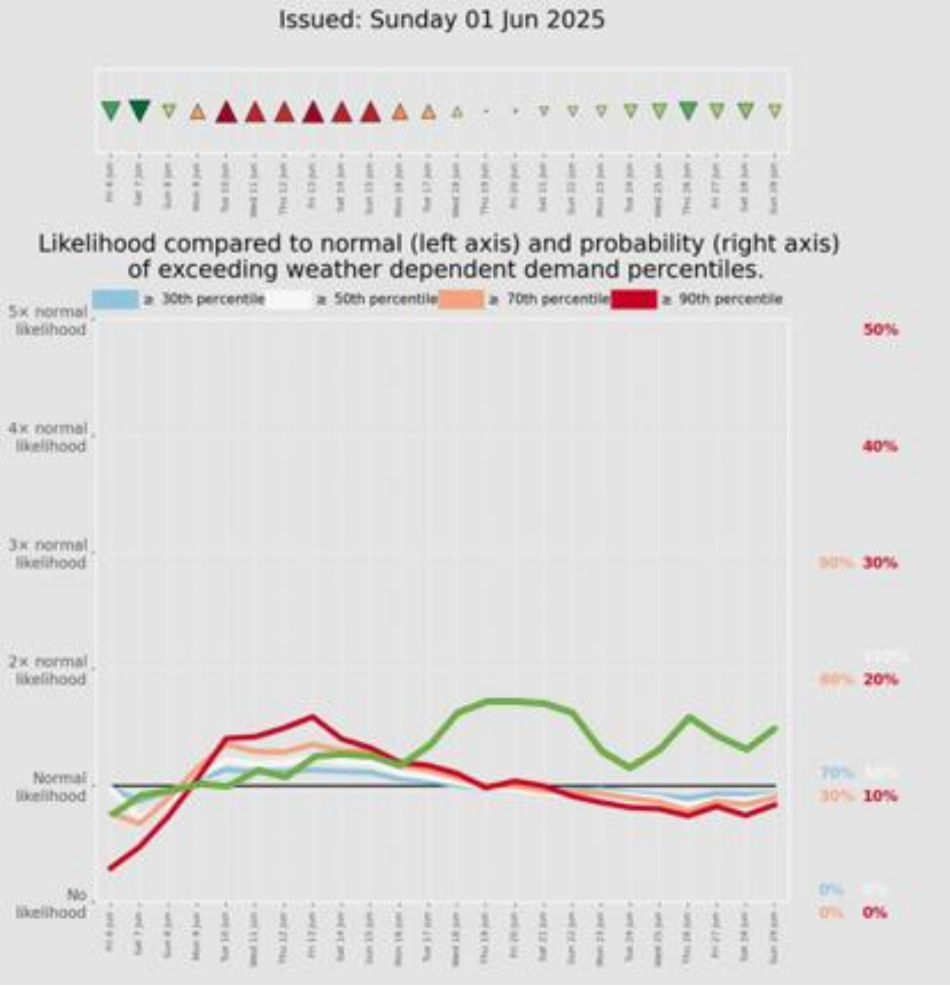


Figure 16: Forecast issued on 1st June 2025 for 6th June – 29th June with actual demand included for comparison.

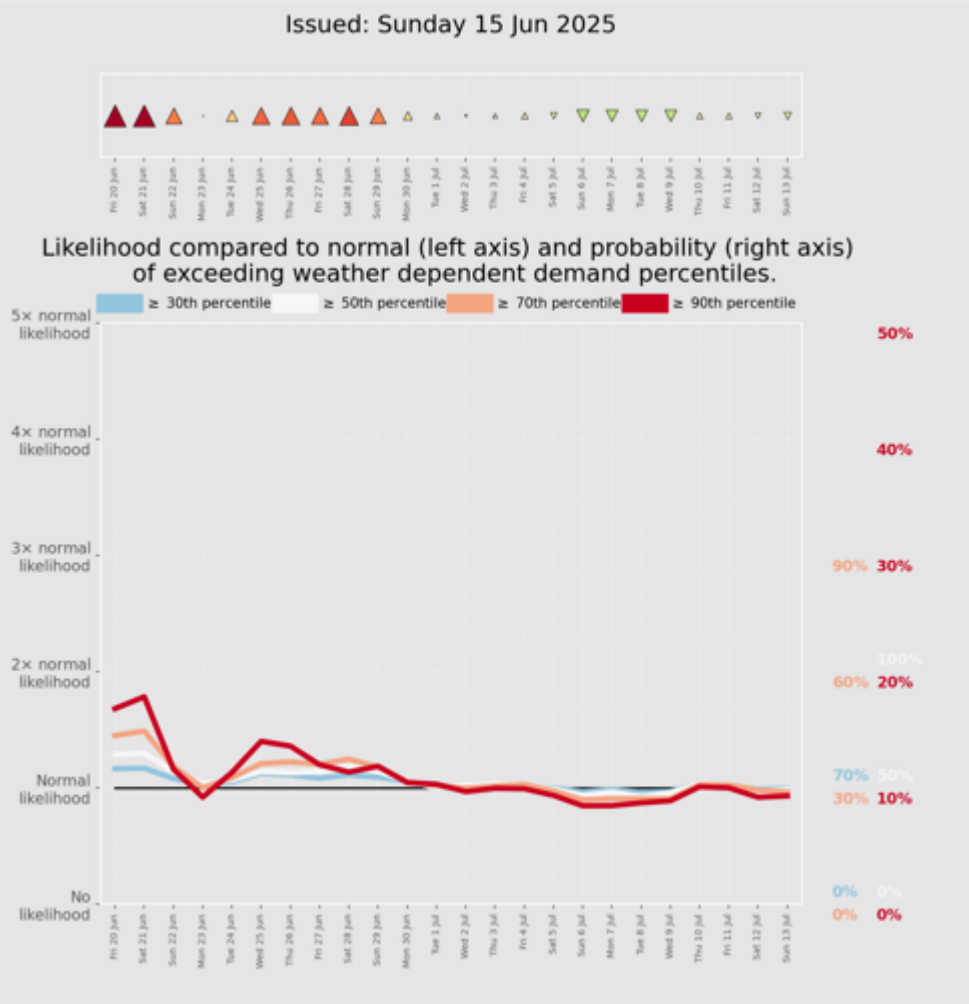


Figure 17: Forecast issued on 15th June 2025 for the 20th June – 13th July.

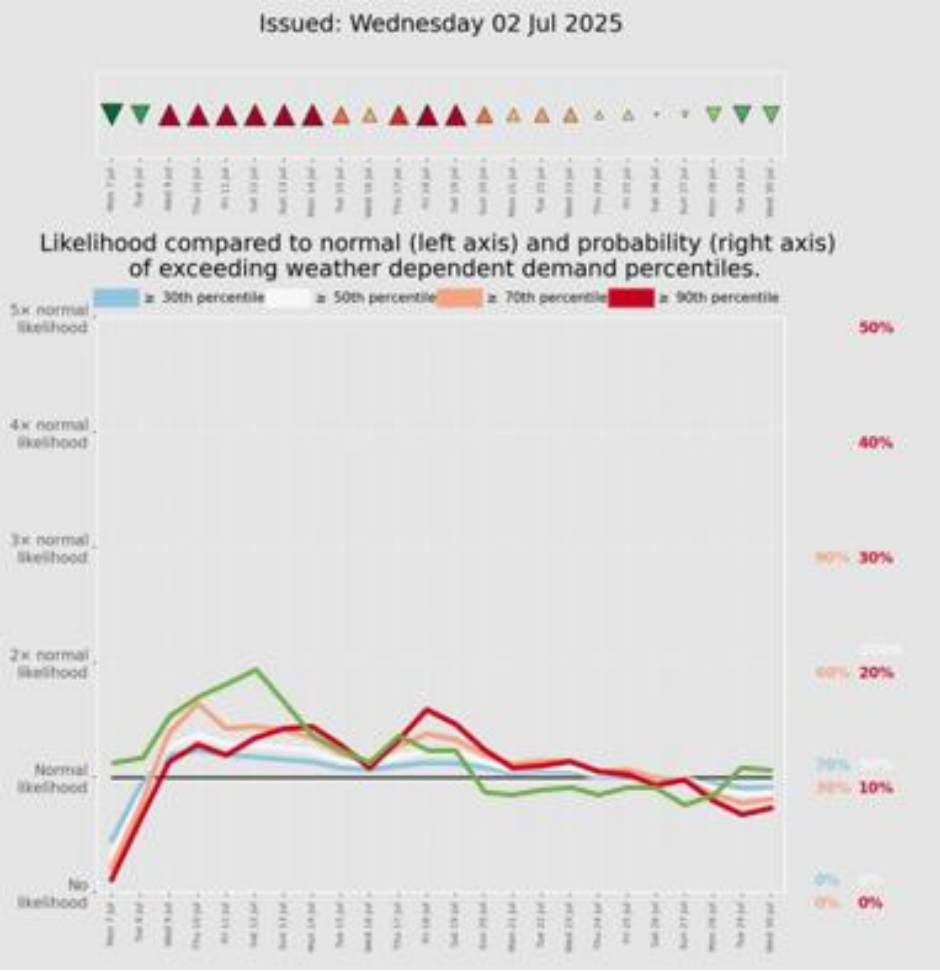


Figure 18: Forecast issued on 2nd July 2025 for 7th July – 30th July with actual demand included for comparison.

5.1 EVALUATION

The key benefit achieved from this project was up to 4 weeks' notice of high demand events, significantly longer than the normal 10 day. This has been useful to prepare in advance for potential leakage events during winter and high customer demand events during the summer. The advance notice can allow operational activities more time to prepare for an event to reduce the impact of the high demand on both our customers and the business. It also has the potential to reduce demand from these events, therefore benefiting the environment from lower abstraction. For example, sending out customer communications to encourage using water wisely prior to a hot and dry weekend in the summer.

The forecast has been fairly accurate at identifying weather events that will impact demand. Seeing high/low demand likelihood weeks in advance and plotting actual demand against this to see an accurate picture gives confidence and going forward this tool can be used with greater certainty, allowing for a measured response. From our comparisons of the forecast, this has been a useful tool for predicting demand.

Having this data, could prove useful during reporting periods when weather had a direct impact on water use.

The weekly forecasts issued were clear and easy to understand. Although no extreme weather events were experienced last year, having the ability to also see the likelihood and potential demand impact by using percentiles would be a useful tool in the future. This should allow for an appropriate level of preparedness.

We have adopted the project outputs into our daily workplan, whereby the weekly email outputs have been shared to teams impacted by high demand on a weekly basis. Where a significant high demand event is forecast further messaging to highlight the issue is shared around the business prompting action plans to begin to reduce the impact of these events.

Receiving weekly updates gave timely notice for weather events which would impact demand. The graphs enabled us to plot these events against our actual demand on a weekly basis and compare the accuracy as to whether we experienced high/low demand. Being in a water stressed area, we didn't experience any prolonged periods of high demand, but this would be a key source of information to prepare in the event of one.

5.2 RECOMMENDATIONS

Our next steps as a business are disseminating the full 12 months results to the wider business which compares actual demand to forecasted demand from this project. This will then inform the cost-benefit assessment of this project internally. We would like to continue using this Met Office service, especially in our southern operating area (Essex & Suffolk Water) as it has shown benefits from knowing of high demand events in advance.

There are some improvements that can be made with the data currently provided, such as the provision of the data in a CSV file, which can enhance the functionality and improve the usability of the current data, allowing to plot the data against actual demand as well as plot forecasted demand. Being able to plot all historic high demand weather events against historic demand would help in determining the demand we are likely to see. Overall, having data that is more transferable and easier to use will benefit us.

The sensitivity of the model could be adjusted, as some high/low demand events were missed. This would need further discussion as we wouldn't want to cause false alarms/reduce the values on the X axis so we can see with better accuracy whether an event will result in high or low demand. The graphs at times were too stable and unless there was a high impact weather event, high demand was missed.

5.3 CONCLUSION

The impact of this project has been the advanced warning of high impact high demand events up to 4 weeks in advance. This has been useful to prepare for potential leakage events during winter and high customer demand events during the summer. Although the summer was relatively temperate, the model shows promise in predicting high demand events much further in advance than previously available. Ultimately, the potential of the model wasn't truly tested over the last year. However, in the event of a sustained period of hot and dry weather, the model would prove useful in planning ahead and potentially assist in decision making during future droughts.

APPENDIX 7: DROUGHT TRIGGERS – WORKED EXAMPLES

Drought Plan Return Period Assessment

The Environment Agency's Drought Plan guidance requires that our Drought Triggers should be tested against a range of drought scenarios, to assess whether the drought actions and associated triggers ensure that planned levels of service are met.

As a minimum, the drought plan should be tested against the same severity of drought used in Essex & Suffolk Water's baseline planning assumptions for WRMP. The effectiveness of this Drought Plan is considered against both the worst historic droughts on record, and against a droughts with a return period of 1 in 200 years and 1 in 500 years.

There have been a number of historic droughts recorded in Essex and Suffolk as shown in Figure 1.

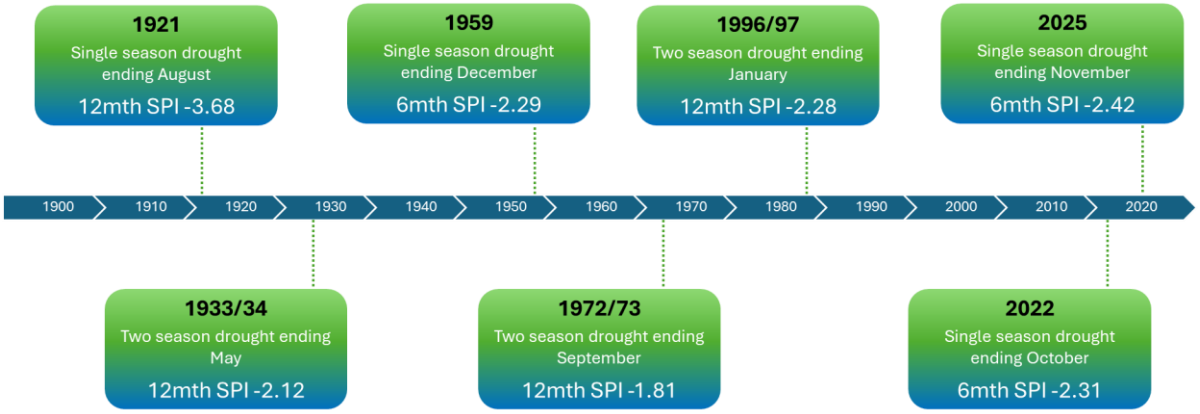


Figure 117. Historic droughts with 12 month or 6 month SPI.

Standardized precipitation index (SPI) has been calculated to identify long term rainfall deficits. SPI normalises precipitation making drought severity comparable across time while also capturing drought intensity. A 12 month SPI was calculated for the examples below as this reflects long-term precipitation patterns that are usually tied to streamflows, reservoir levels and groundwater levels which all impact the severity of a drought and implications on public water supply. A drought event is typically categorised when the SPI is continuously negative and reaches an intensity of -1.0 or less. The end of a drought event ends when the SPI becomes positive.

An example for the 12 month SPI during the late-1990s in Suffolk suggests a beginning dry period of October 1995 which continued to remain negative until April 1998 (Figure 2).

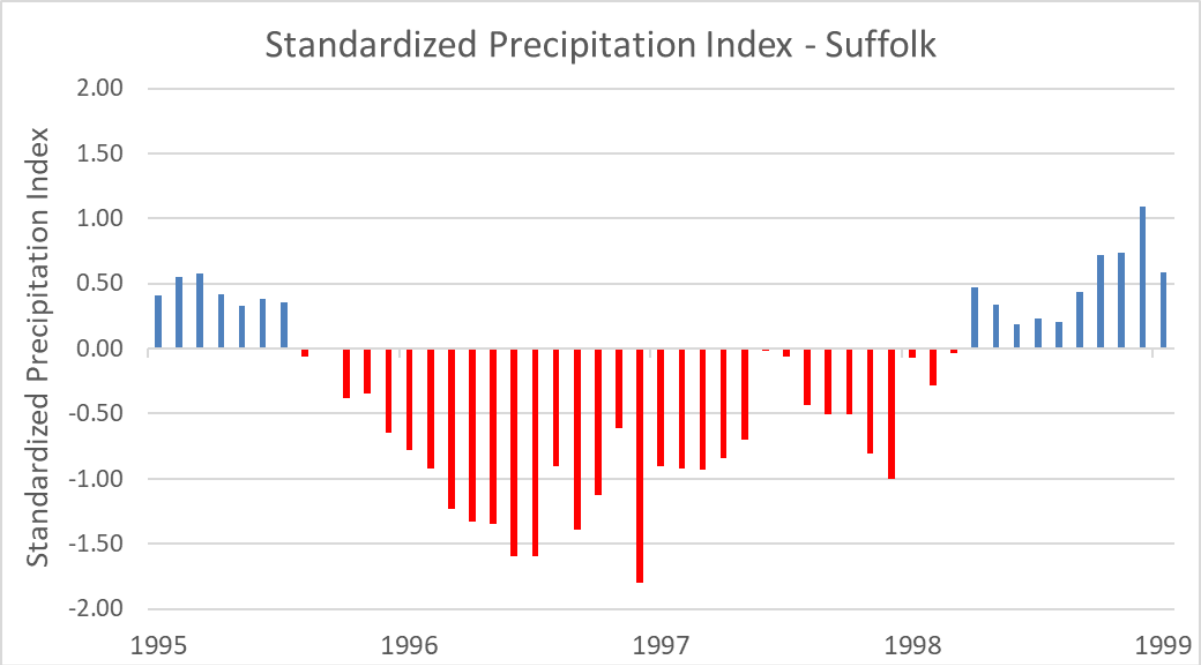


Figure 2. Standardized Precipitation Index for the late-1990s Suffolk drought

This drought is characterised by two dry winters, as illustrated in the rainfall deficit graph in Figure 2. Indicative return periods for durations of dry weather starting in October 1995, shown in Table 1, highlight a return period greater than 1 in 200 years for an 18 month duration drought (Bader, 1977).

Table 1. Indicative return periods for durations of dry weather starting in October 1995

Duration	Return Period (years)
6 months	15
12 months	175
18 months	>200
24 months	165
36 months	15

A number of historical droughts affecting the Essex & Suffolk supply areas have a return period greater than 1 in 200 years. For WRMP24 it is required for our supply areas to be resilient to a 1 in 500 year drought after 2039/40. Given that we don't have historical data in Essex or Suffolk recording a 1 in 500 year drought we assessed our resilience using stochastic modelling tools. Results from this piece of work reported in our WRMP24 confirmed that our groundwater sources in Suffolk are resilient under a 1 in 200 and 1 in 500 year return period. For Essex we are planning to provide 1 in 200 year drought resilience until 2030/31 and then 1 in 500 year drought resilience from 2031/32. Further information on this assessment can be found in our Water Resource Management Plan 2024 (WRMP24) and our WRMP24 Groundwater Deployable Output and Climate Change and our Supply Forecasting Technical Reports.

Worked Examples

Essex Water Resource Zone

Essex Drought Triggers 1 in 200 year and 1 in 500 year return period

Drought triggers for our Essex WRZ are defined by the performance of the Essex System, based upon our combined Essex reservoir storage in relation to Level of Service control curves. As described in Section 5 of our Drought Plan 2027, we have derived two sets of Essex control curves to be used from present to 2030 and once the Layer to Langford is fully operational, a set from 2030 onwards.

The following worked examples (Figure 3 and Figure 4) were modelled in our Essex System Aquator model for the Drought Vulnerability Framework analysis (see Appendix 1). The examples are a 1 in 200-year return period and a 1 in 500-year return period scenario, for a 24-month duration December-ending drought. The reservoir storage is based on the demand system used in the WRMP24 and storage is plotted alongside our Ely Ouse Transfer Scheme, Stour Augmentation Groundwater Scheme/Great Ouse Groundwater Scheme curves defined post-2030.

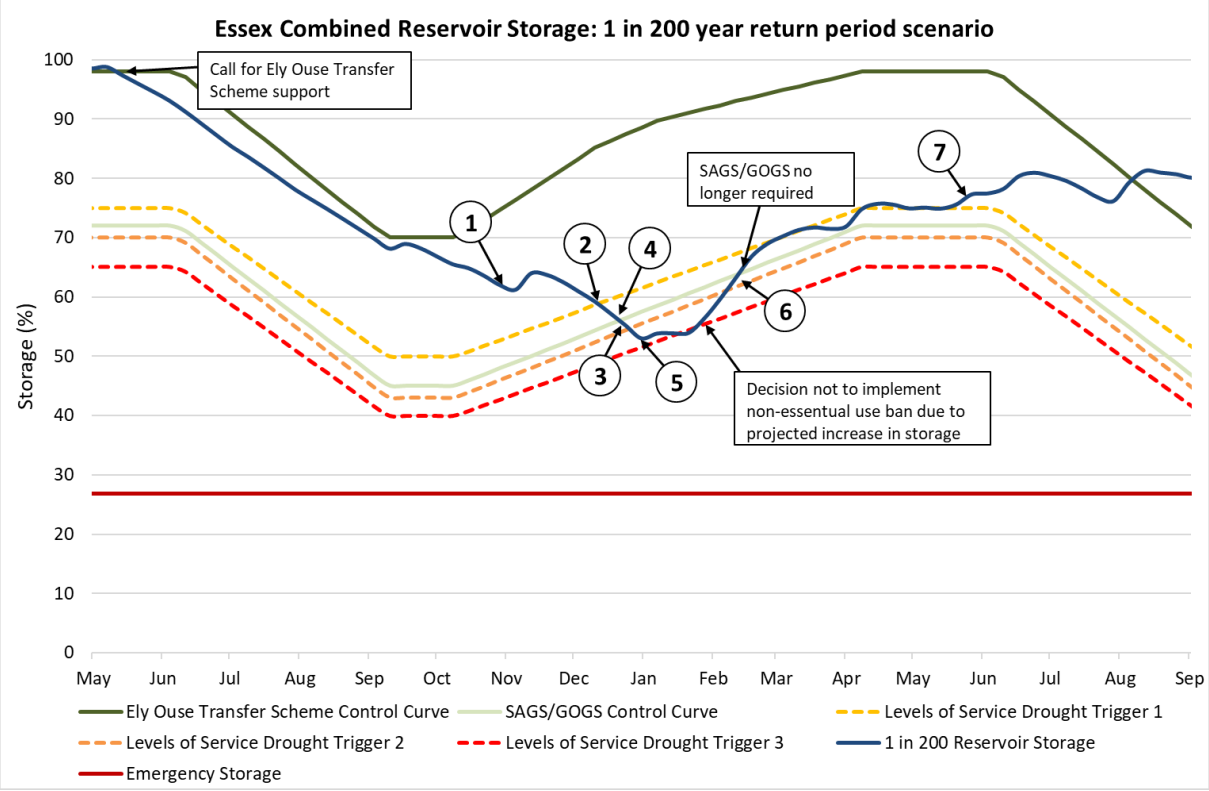


Figure 3. 1 in 200 year return period scenario of the drought actions in Essex.

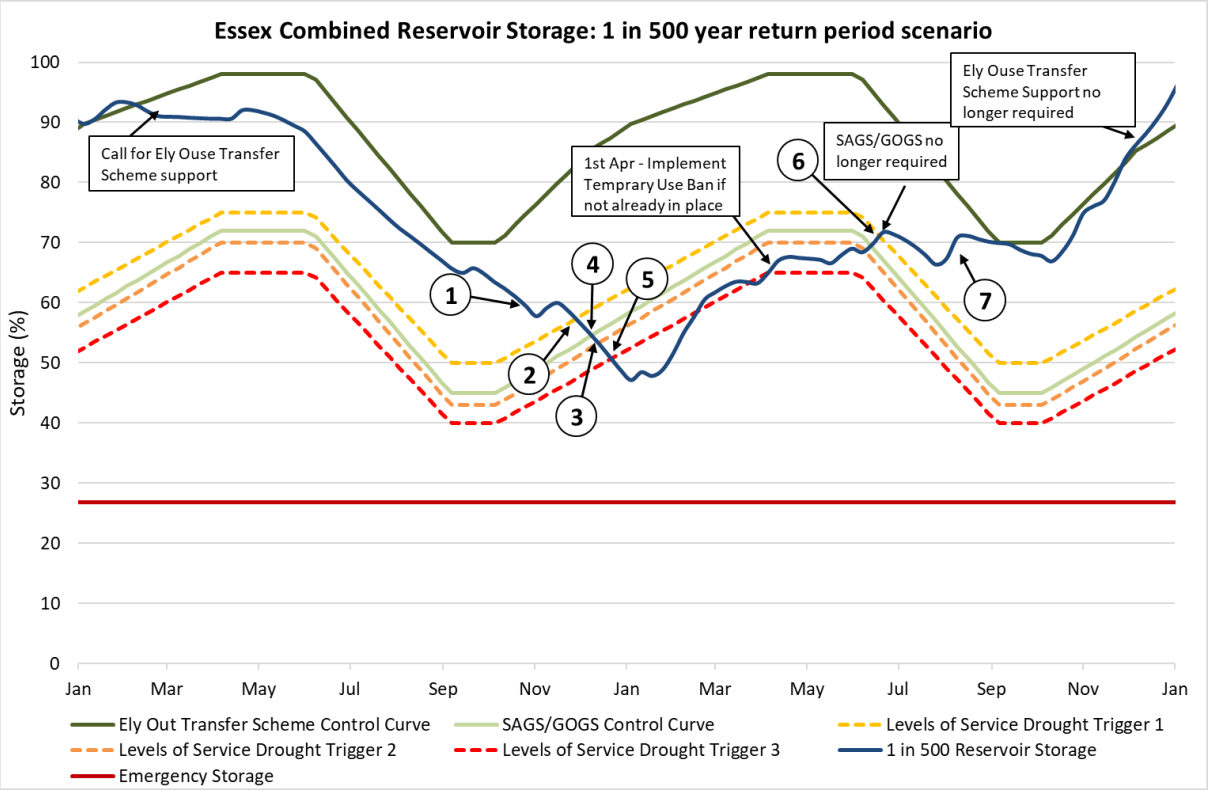


Figure 4. 1 in 500 year return period scenario of the drought actions in Essex

Figure 3 and Figure 4 are annotated with points at which we would implement drought actions within the modelled droughts. During the first autumn, with reservoir storage declining, we would forecast reservoir storage trajectory under a number of rainfall scenarios to estimate when reservoir storage is likely to reach the Levels of Service (LoS) 1 trigger. We would decide to start winter weather messaging around one month before forecasting to reach LoS1 (Figure 3 (1), Figure 4(1)).

A few weeks prior to crossing the LoS1 trigger we would plan to make a formal Appeal for Restraint, and this would be formally implemented if reservoir storage crosses the LoS1 curve (Figure 3 (2), Figure 4(2)).If we continue to forecast a decline in reservoir storage, we would prepare to implement a Temporary Use Ban (TUB) and other LoS2 demand side drought actions (Figure 3 (3), Figure 4(3)). However, depending on the time of year we may choose not to implement a TUB as typically outside of 1st April to 1st October, the demand saving is estimated to be minimal even if a measure is adopted. With our drought drawdown occurring in the winter months, we may therefore plan to implement drought restrictions in the spring, rather than implementing in the winter to little benefit.

Between Level 1 and Level 2 curves is the Stour Augmentation Groundwater Scheme (SAGS) and Great Ouse Groundwater Scheme (GOGS) trigger which requires the Environment Agency to augment the River Stour (Figure 3 (4), Figure 4(4)). through a series of pumped boreholes. During the winter months the schemes may not be required as natural or Ely Ouse supported river flow may meet the requirements of our Stour intakes and thus, the groundwater schemes would provide no additional benefit. However, when natural river flows are below our requirements and there is not enough water available at Denver to support via the Ely Ouse Transfer Scheme then we would look to call for SAGS/GOGS.

The SAGS/GOGS reservoir control curve also acts as a decision trigger for the Drought Management Group to apply for the Denver Hands off Flow (HoF) drought order. In both modelled scenarios, we would begin the application process for this drought order once reaching the SAGS/GOGS control curve (Figure 3 (4), Figure 4(4)).

Further decline in reservoir storage below LoS2 would lead us to prepare Level 3 drought actions such as a non-essential use ban (Figure 3 (5), Figure 4(5)). In a similar case to Level 2, we may choose not to implement a Level 3 outside of the 1 April to 1 October window to ensure we receive the greatest benefit. We would not implement Level 3 drought actions before first implementing our Level 2 drought actions.

As reservoir storage remains below LoS2 throughout the winter in both scenarios we would action the Denver HoF drought order. The 1 in 200 year example would likely lead to implementing a formal appeal for restraint and prepare to implement a TUB from the 1st April if reservoir storage is still below LoS2 at that point.

Reservoir storage in the 1 in 500 year example however remains below LoS2 in April and as such we would implement a TUB from the 1st April. At this point reservoir storage is above LoS3 and therefore we would monitor reservoir storage and implement a non-essential use ban if we cross into LoS3. As reservoir levels recover above LoS2 we would review reservoir storage projections and withdraw Level 2 actions once we are confident we would not return to LoS2 or require Level 2 actions soon after (Figure 3 (6), Figure 4(6)). We would follow this same assessment once recovery above LoS1 and withdraw the Denver HoF drought order when reservoir levels recover to above the LoS1 curve or are outside of the drought order operating window (1st March to 30th April).

We would return to Business as Usual (BAU) once we are above LoS1 for at least 2 weeks and forecast to remain above for the remainder of the typical seasonal recession (1st April to 1st October; Figure 3 (7), Figure 4(7)).

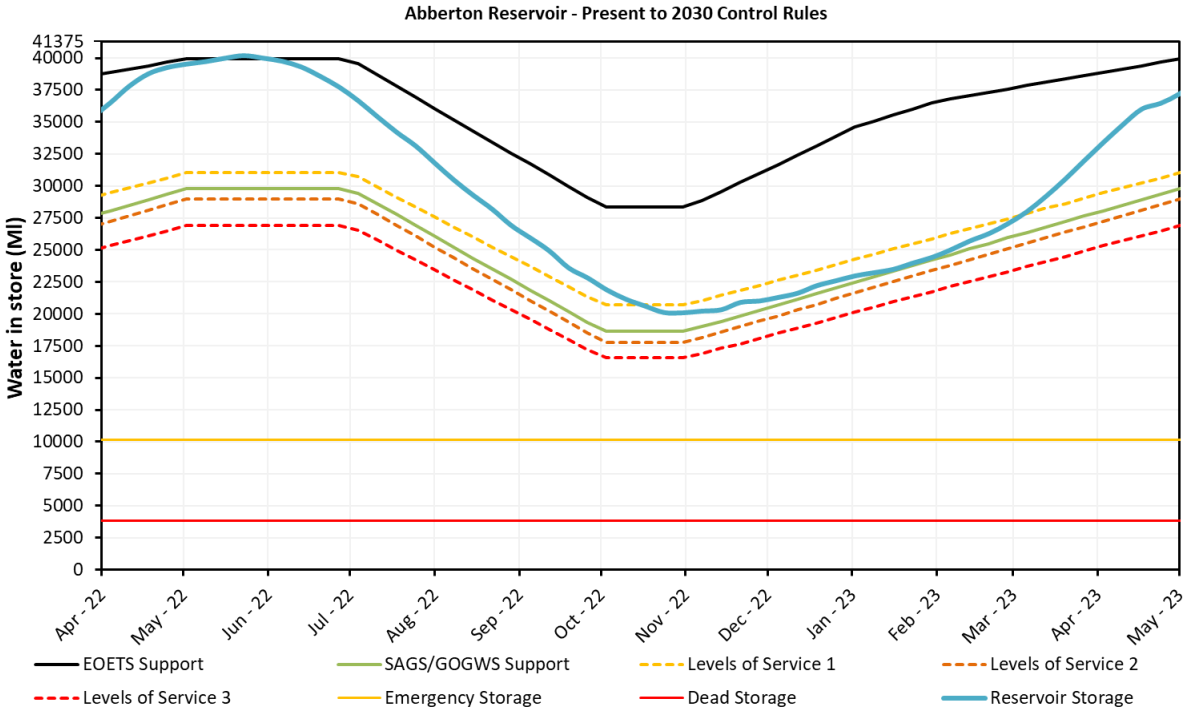
Essex Drought Triggers – Short Duration Drought 2022

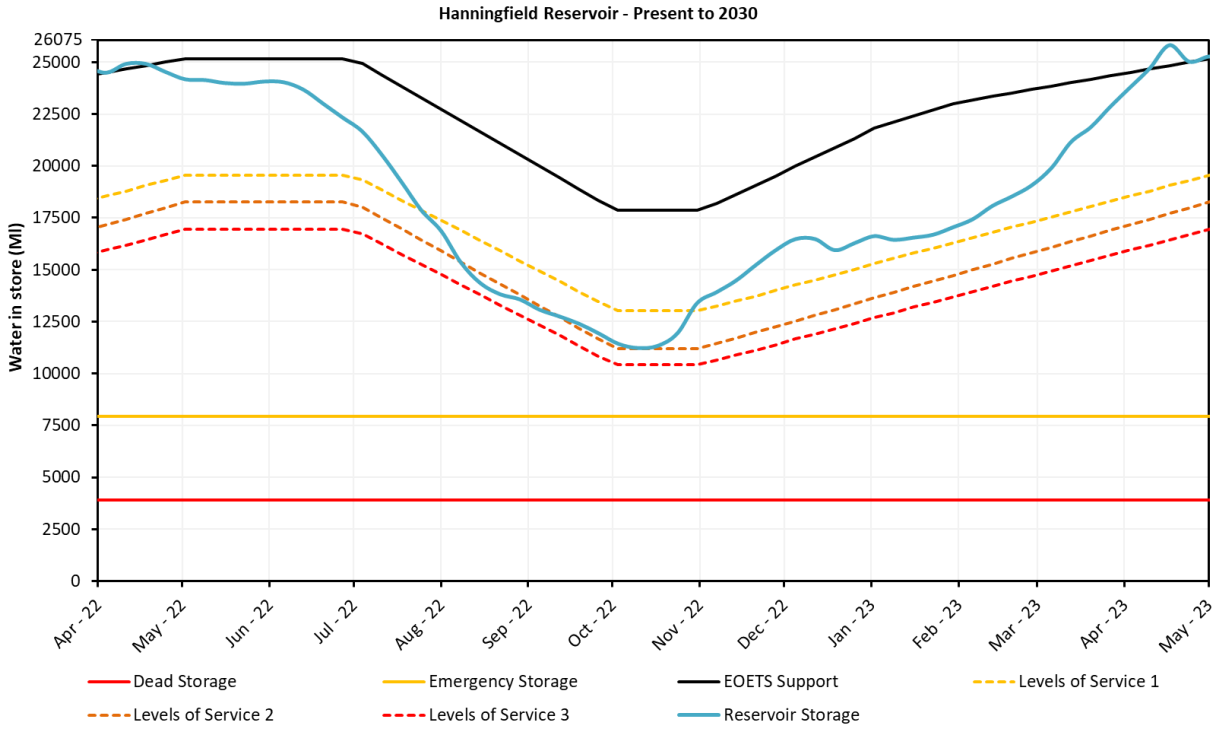
Short duration high intensity droughts such as the 2022 example in Figure 5 highlight how a reservoir imbalance can be impacted by such events. Throughout the Summer and Autumn 2022 Abberton reservoir continued to decline at a greater than average rate but remained above the Levels of Service Triggers. However, Hanningfield continued to decline below Levels of Service 1 (LoS1) and Levels of Service 2 (LoS2) throughout the Summer and Autumn.

The purpose of the Layer to Langford pipeline is to help rebalance the reservoirs, particularly Hanningfield as it is the smaller reservoir. Figure 6 highlights how Hanningfield begins to become unbalanced with Abberton and as such, we would increase the volume transferred through the Layer to Langford Pipeline. As reservoir storage at Hanningfield continues to decline below the Ely Ouse Transfer Scheme (EOETS) control rule, additional operational changes would trigger such as requesting support from the EOETS and operation of the Langford Recycling Plant.

If the reservoirs remain unbalanced throughout seasonal recession and Hanningfield dips below LoS 1 such as in Figure 6, we would implement a formal Appeal for Restraint which aligns with what we did in 2022. As Hanningfield continues to decline and reach LoS2 we would begin the process of applying for the Denver Drought Order however, given the time of year it is unlikely we would implement a Temporary Use Ban (TUB)

but instead look to implement a TUB from the 1st of April if reservoir storage remains below LoS2. However, as the Autumn/Winter of 2022/23 was very wet, reservoir storage recovered above the LoS curves and the Denver Drought Order would not be required. We would also lift Supply and Demand Side drought actions as we cross the control rules in a similar manner described in the 1 in 200 and 1 in 500 year example.





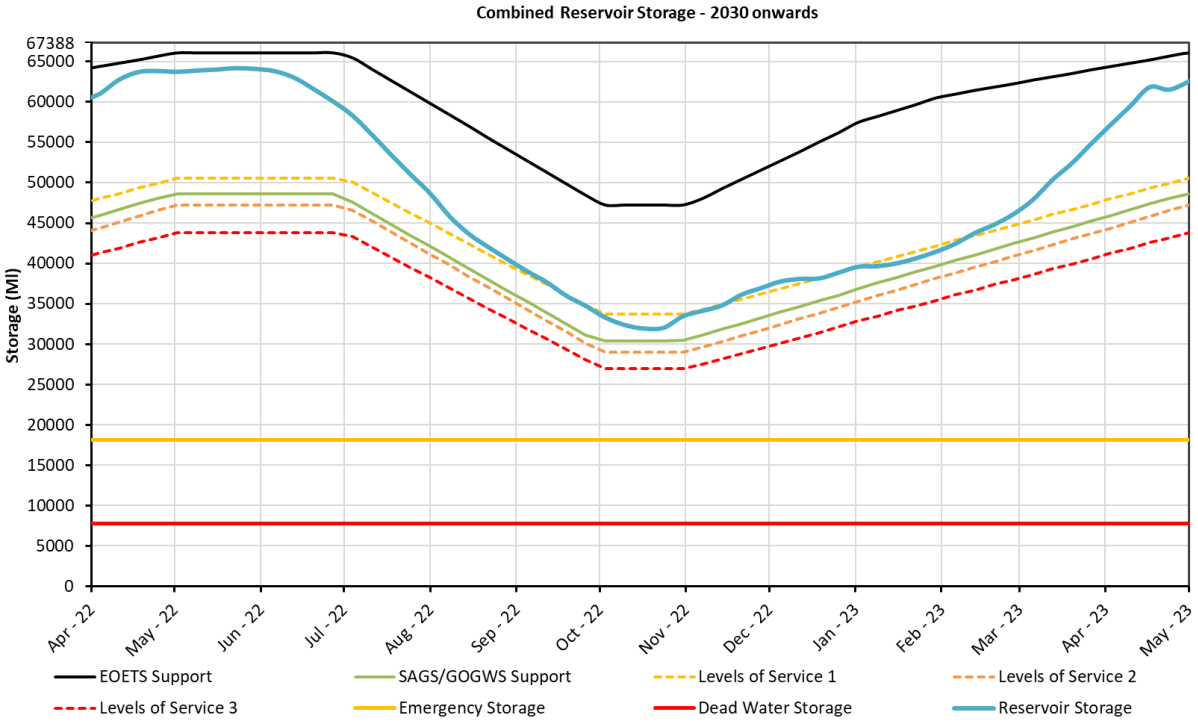


Figure 5. Abberton, Hanningfield and Combined Reservoir Storage in 2021 – 2022

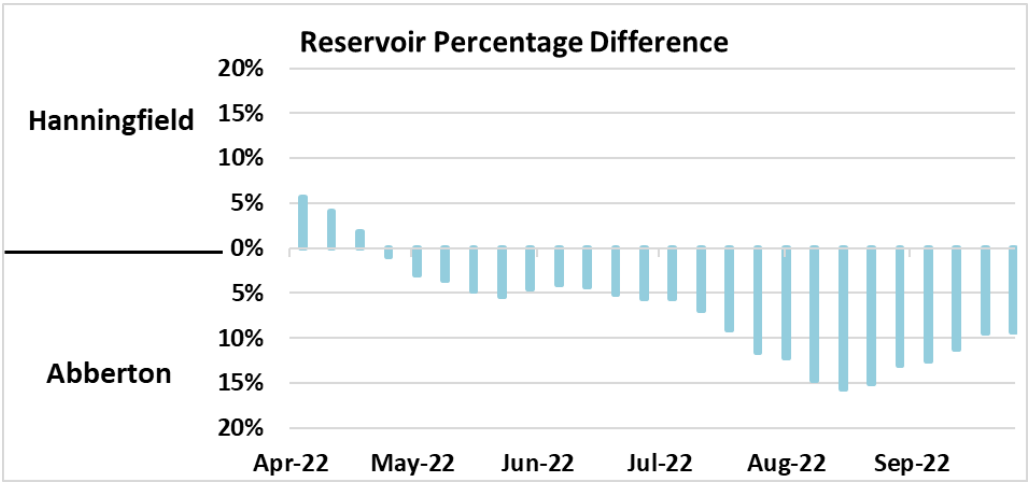


Figure 6. Reservoir percentage difference between Abberton and Hanningfield

Suffolk Water Resource Zones

Groundwater Triggers – 1 in 200 year return period

The drought triggers for the Suffolk groundwater sources have been defined based on our experience from the 1995/1996 drought. As described above, this drought was equivalent to at least a 1 in 200 year drought. The following worked example of the Rook Hall drought observation borehole in **Error! Reference source not found.**7 highlights the actions that would be undertaken.

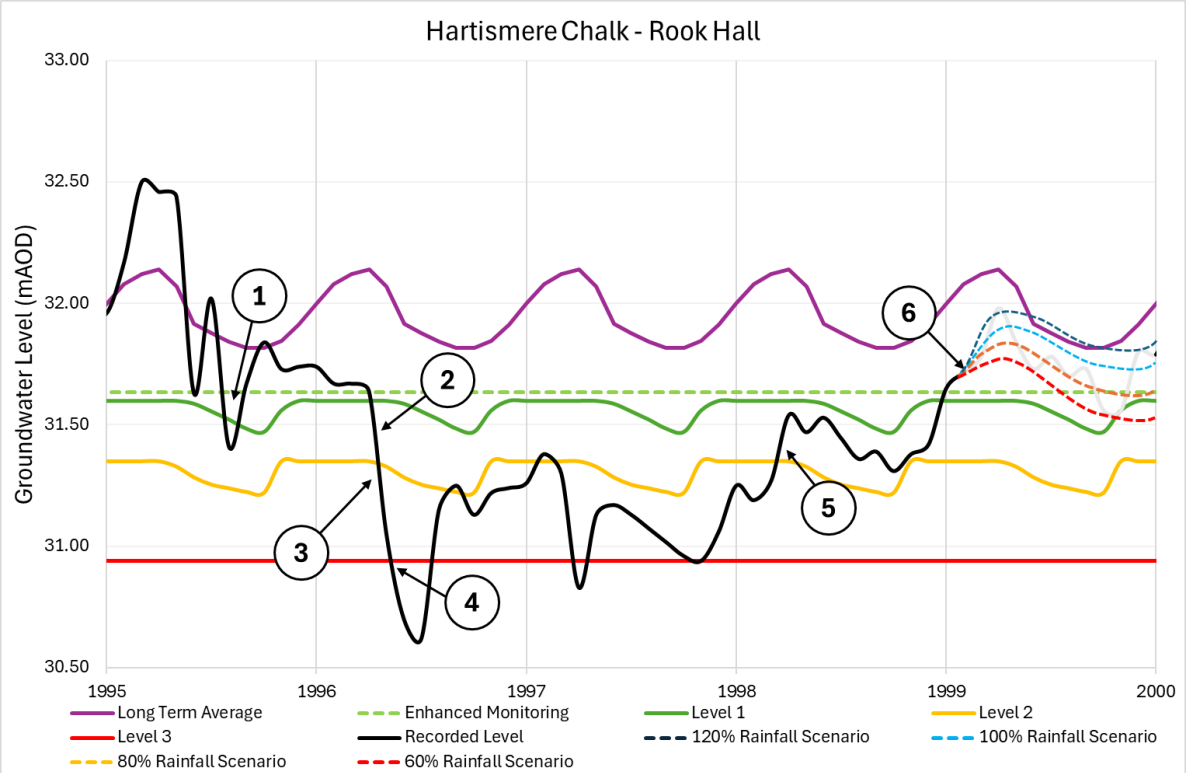


Figure 7. Late 1990s (>1 in 200 year return period) drought action example

Once groundwater levels reach the enhanced monitoring trigger (Figure 7(1)) we would increase the frequency that we assess pumped water level depth to deepest advisable pumped water level (DAPWL), a limitation set on all of our sources whereby further drawdown of water in a borehole may damage the pump or structure of the borehole itself. If we find that the pumped water level is less than 1m above the pump intake we would consider adjusting abstraction patterns, prioritising more resilient boreholes or source water from elsewhere within the WRZ. Continued groundwater level decline below the level 1 trigger (Figure 7(2)) is where we may start to observe some production boreholes become constrained and further assessment of pumped water level may highlight constrained treatment works and therefore output. If this is the case and we forecast failing to meet certain levels of demand, we would consider implementing an appeal for restraint.

Continued decline into level 2 further constrains our raw water network in all of the Suffolk WRZs and at this point we may consider implementing a TUB (Figure 7(3)). As mentioned above, historically in Suffolk we implemented a TUB from 13 June 1997 to 14 May 1998 due to high demand (not necessarily resource constrained). This aligns with **Error! Reference source not found.**7 (3) remaining below the level 2 trigger until April where in this example, we would look to withdraw the TUB. A number of times groundwater levels dip below level 3 but soon recover above (Figure 7(4)). In this case we would continue to assess pumped water level with DAPWL and forecast groundwater levels under different rainfall scenarios to determine the likelihood of continued decline into level 3 to decide if a non-essential use ban should be implemented.

The historic record of the observed groundwater data reaches the level 3 trigger in two droughts, 1991 and 1996. We have also established in our WRMP24 that our

groundwater sources are resilient to drought. Because of this, we will continue to review the groundwater triggers and adjust if deemed appropriate as we understand our system more in future droughts.
As groundwater levels recover above drought triggers we would monitor projections under a number of scenarios and lift TUBS (Figure 7(5)) and return to BAU (Figure 7(6)) once we have forecast (under a range of rainfall scenarios) and are confident that we would not return for the remainder of a typical seasonal recession.

Groundwater Triggers – Short Duration Droughts – 2018, 2022

The following examples in Figure 8 and Figure 9 highlight when our abstraction boreholes start to become constrained and as such require further action. In the case of **Error! Reference source not found.**, Hartismere 2 contains two abstraction boreholes, one of which can become constrained in a drought. For example, following the 2022 drought, low groundwater levels in 2022 and 2023 were recorded at Rook Hall observation borehole are also present in the Hartismere 2 borehole (Figure 8). In the case of Hartismere 2, we actioned to reduce abstraction at this borehole and utilise the other borehole on site which can be observed in late 2023/early 2024 where groundwater levels increased above the 1m above pump level trigger.

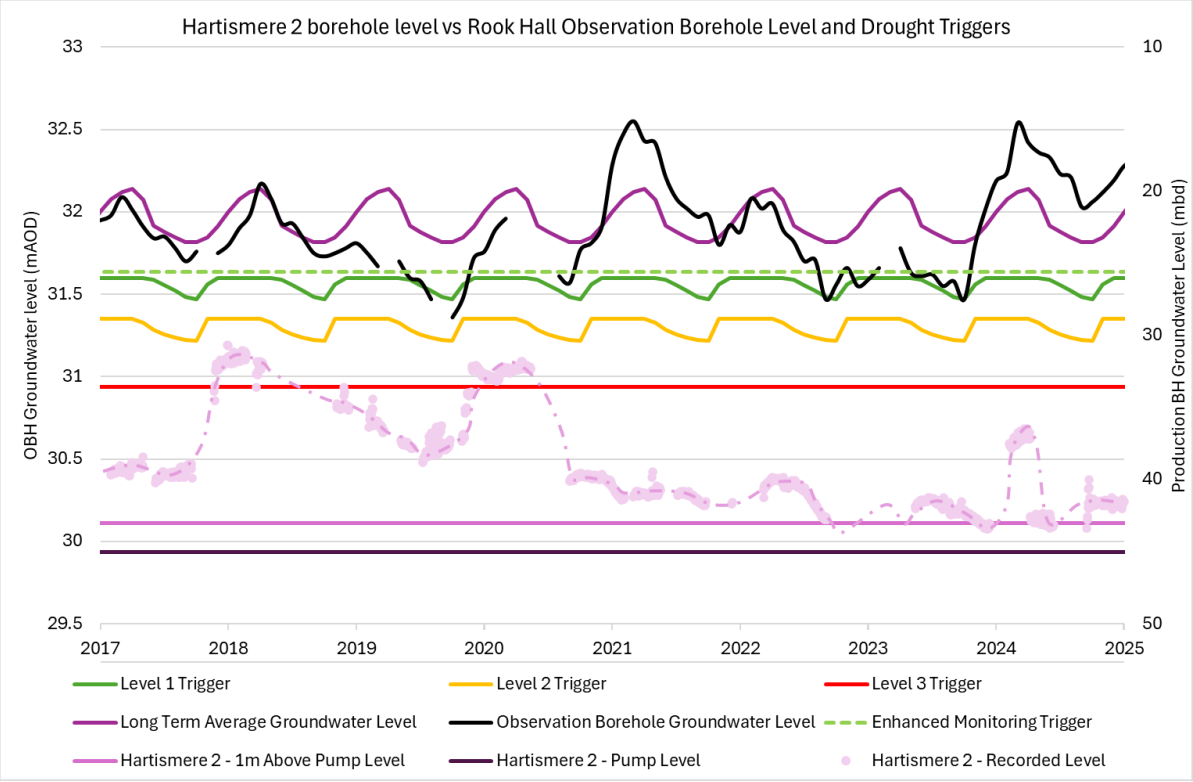


Figure 8. Hartismere 2 borehole comparison with Rook Hall Observation Borehole

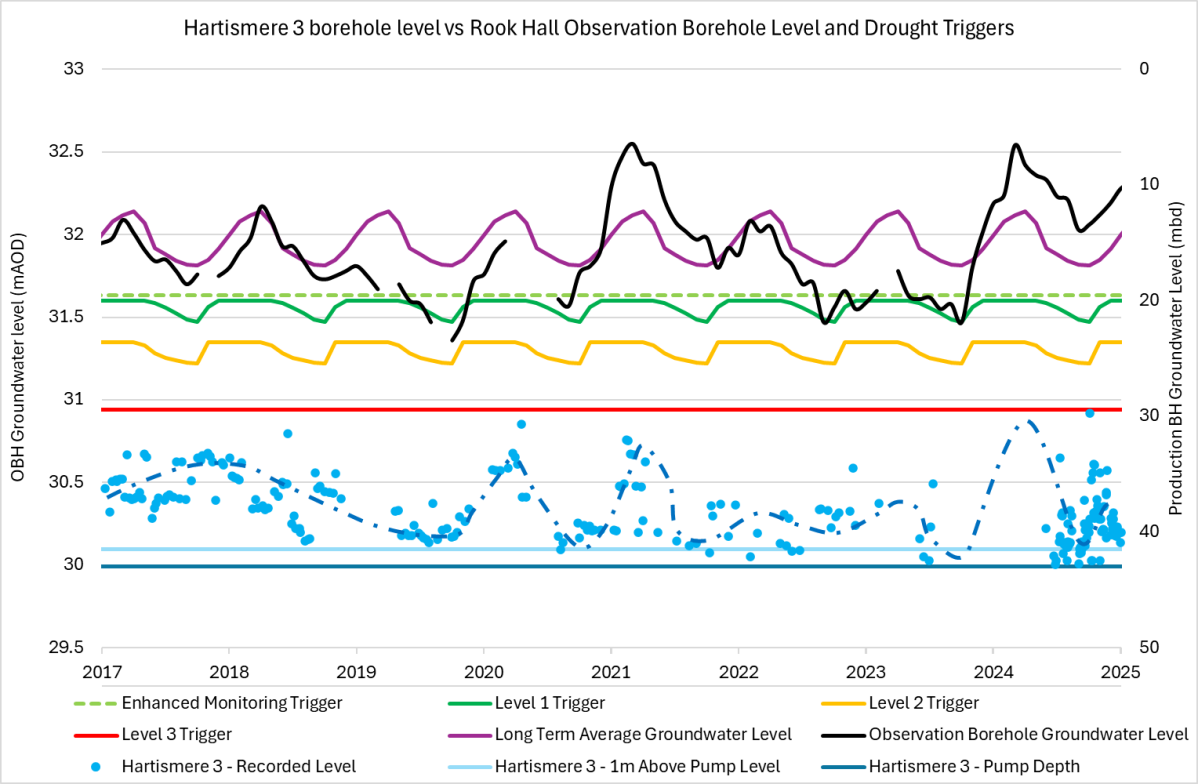


Figure 9. Hartismere 3 borehole comparison with Rook Hall Observation Borehole

Hartismere 3 recorded a similar pattern in 2022/23 but overall shows a clearer relationship to Rook Hall (Figure 9). Hartismere 3 only has one borehole on site and as such, we would typically reduce abstraction to allow water level to recover. Hartismere 3 is also an intermittent source that typically shuts down overnight. Therefore, in order to maintain the same output we would choose to reduce abstraction but keep the borehole running for longer or increase the output from other treatment works.

Groundwater Level Forecasting

Part of the preparation for understanding when our groundwater triggers would be reached involves forecasting projected groundwater levels based on a number of rainfall scenarios. Aquimod models have been created for our drought observation boreholes Rook Hall, Ilketshall A and Ilketshall B which along with historical data are being used as a forecasting tool.

AquidMod is an open source lumped-catchment groundwater model developed by the British Geological Society that simulates groundwater-level time series by linking soil drainage, unsaturated-zone flow and groundwater flow. The inputs into the model are rainfall and potential evapotranspiration which output a time series of groundwater level when simulated. As such, we can use this tool to model groundwater level under a number of rainfall scenarios. This is supported with historic groundwater levels to help us understand when groundwater levels may reach drought triggers allowing our drought management group to plan and act accordingly. One example in Figure 10 shows groundwater level projection for Rook Hall under 60%, 80% and 100% rainfall scenarios following the prolonged dry weather in 2025.

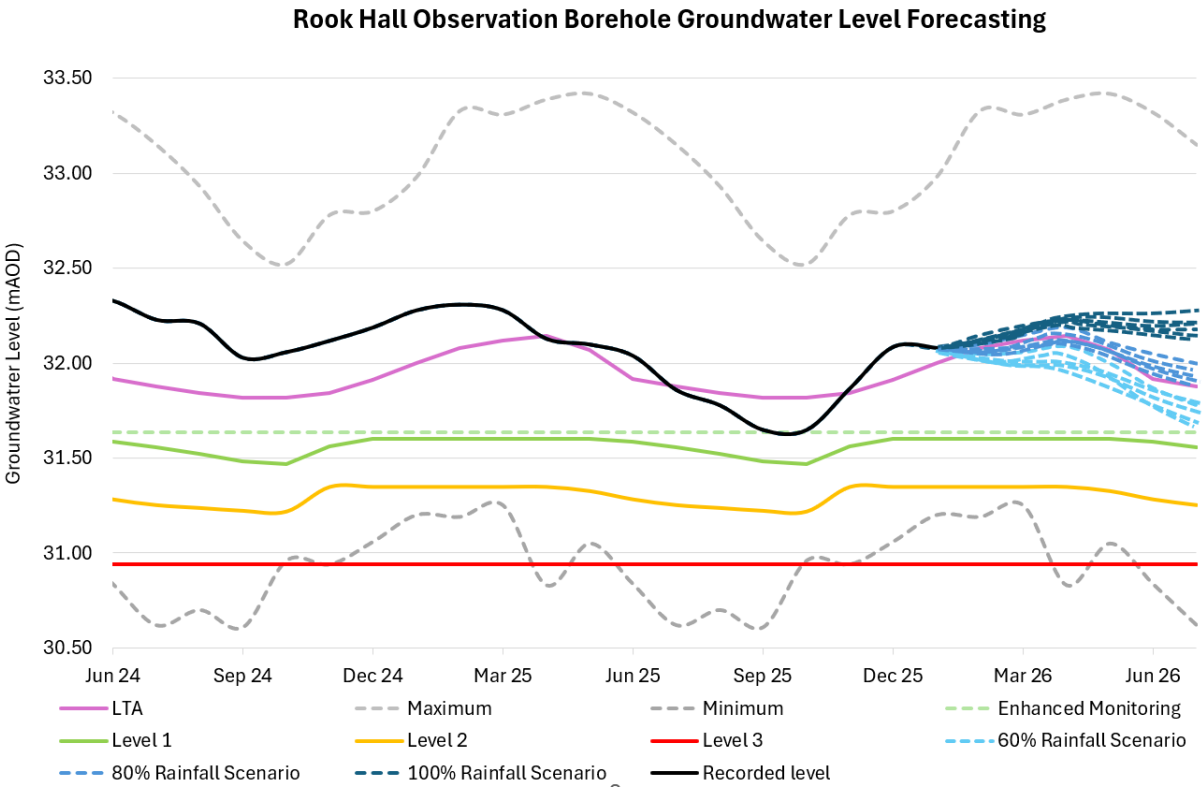


Figure 10. Rook Hall observation borehole groundwater level forecasting under 60%, 80% and 100% rainfall scenarios.

Demand vs Supply monitoring for Northern Central Water Resource Zone

As highlighted in our section 5.5 of our Drought Plan, the Northern central is a complex system whereby network restrictions, supply availability and licence constraints all impact on the Water Resource Zone (WRZ) deployable output (DO). As such, tracking and forecasting changes to WRZ DO against different levels of demand helps us understand when we may struggle to meet certain levels of demand and thus, investigate if operational changes and/or demand reduction measures are required.

The example in Figure 11 presents the period between 1st October 2021 and 1st October 2022 which includes the 2022 drought. Throughout 2021 and into Spring 2022 the Northern Central WRZ remains above all demand categories and thus, we are able to meet demand, and no significant operational changes or demand restrictions are required. The only concern was in late Summer when our river Waveney intake was supported by WAGS. If WAGS was not able to support our river Waveney intake, then we would have struggled to meet historic maximum demand.

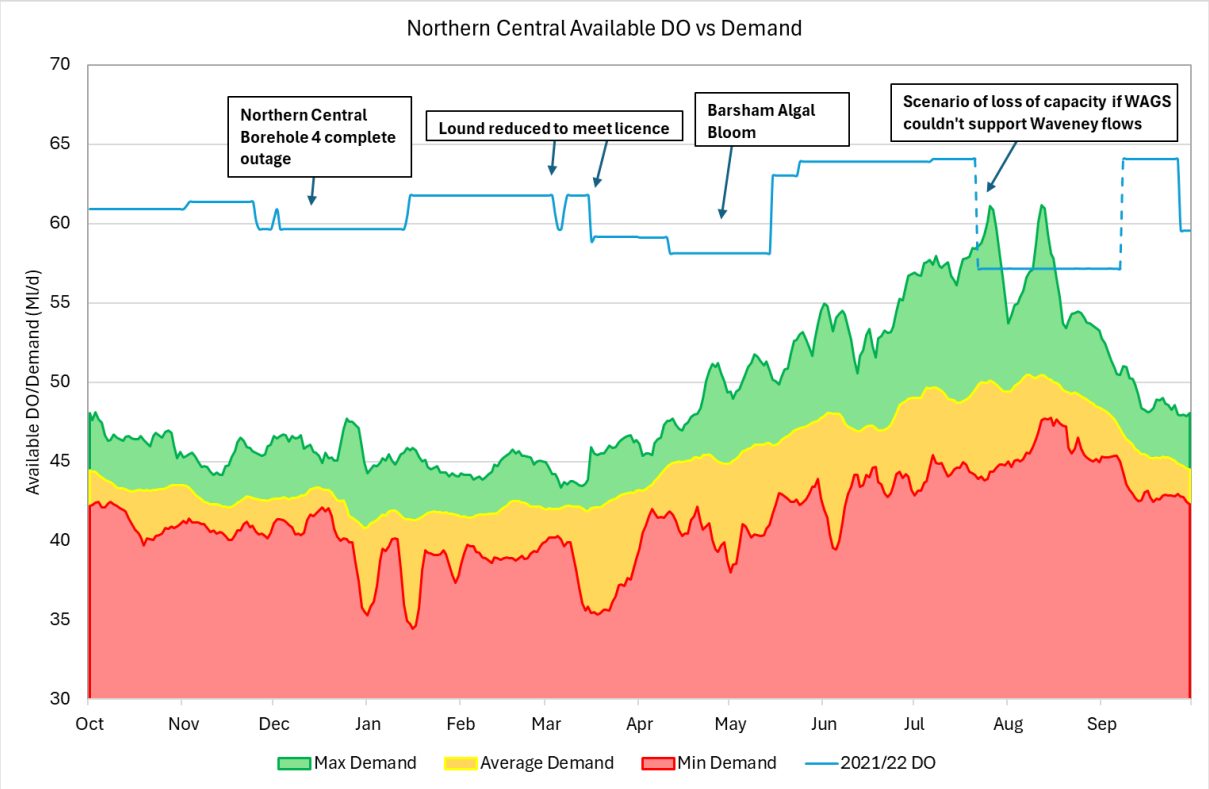


Figure 11. Northern Central Demand Scenarios vs Deployable Output 2021/22 Scenario

A theoretical example in Figure 12 highlights potential scenarios when we would need to make operational changes and/or implement demand restriction measures. By Mid to late summer, we typically reach our highest demand and as such may call for WAGS to support our Waveney River intake if natural flows are below the licence Hands off Flow (HoF). However, if WAGS is not available then we would struggle to meet higher demand scenarios and therefore call for operational changes such as further reliance on our Barsham boreholes or support from Lound WTW. A further restriction such as the river Bure licence HoF would further constrain our DO whereby only average or even minimum demand could be supported. In this scenario we would look for further operational changes and demand restriction measures. The Bure HoF triggering later in the is more realistic (hashed red line). In this case our DO is restricted but we would still be able to support the maximum demand for that time of year.

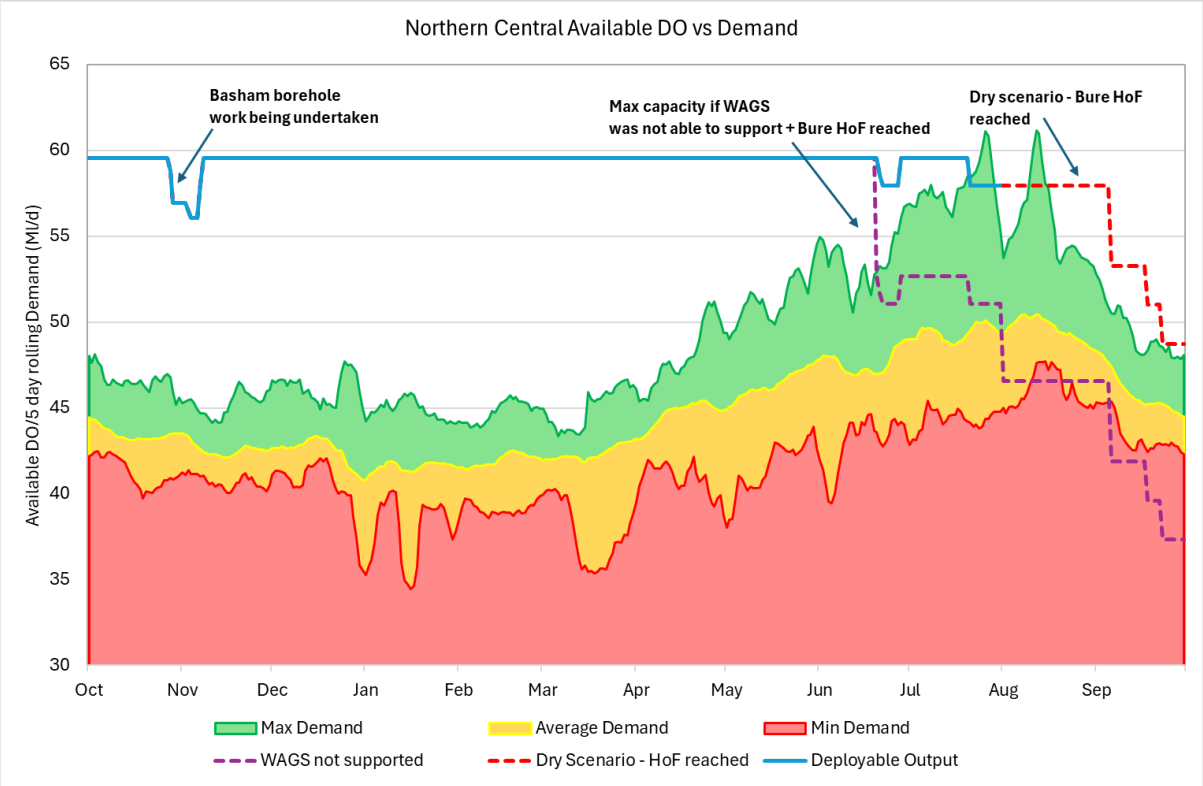


Figure 12. Northern Central Demand Scenarios vs Deployable Output Theoretical Scenario

Effectiveness of the Drought Plan

Essex Water Resource Zone

Worst Historic Drought on Record

Our PR24 Essex Aquator model has been used to test the resilience of our Essex system with 106 years of historical data from 1910 to 2016. The model is set up to include our supply and demand side drought actions to demonstrate the effectiveness of meeting our planned Levels of Service (LoS). When our resources cannot meet demand or abstraction licence quantities are used up then the model fails and the highest output to meet demand while maintaining licence values is acknowledged as our systems Deployable Output (DO). Our Essex model becomes the most constrained (but does not fail to meet our WRMP24 forecast demand) during the 1920-22 drought making this the worst historic drought we can model.

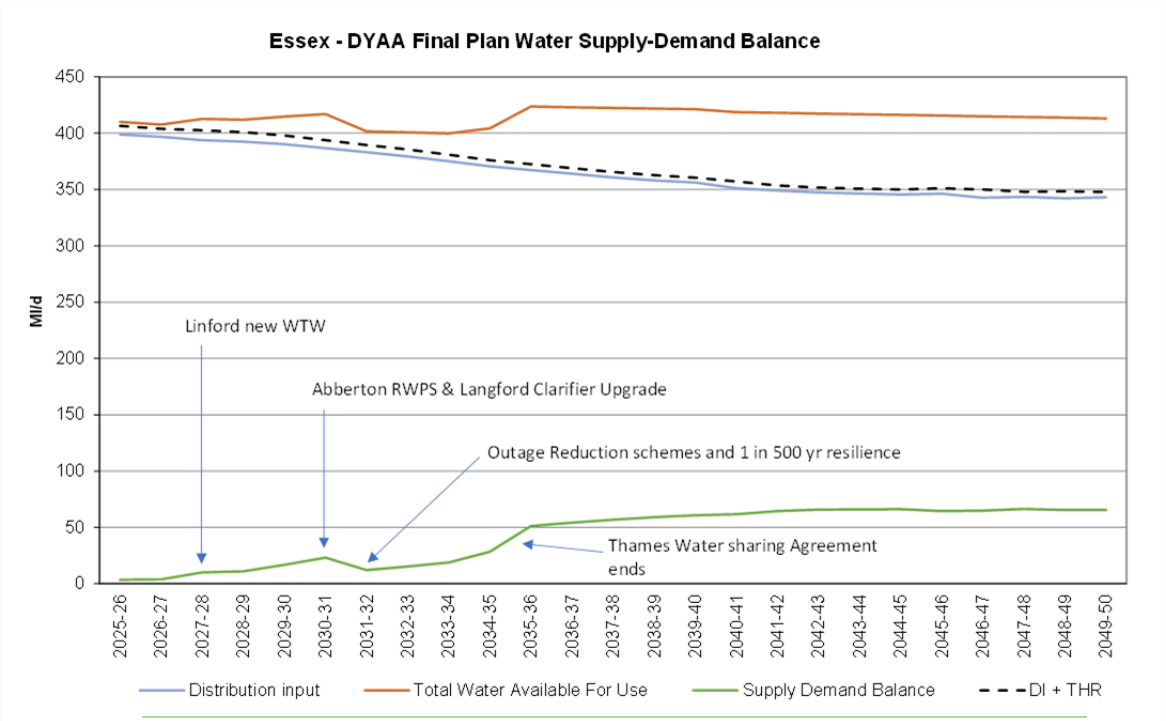
1 in 200-year and 1 in 500-year Return Period Droughts

The WMP24 guidance states that our baseline Deployable Output (DO) should be resilient in a drought with a 1 in 200-year return period until 2039/40, and then a 1 in 500-year return period thereafter. As mentioned above, historic droughts have fallen within the 1 in 200-year return period. However, the 1 in 500-year return period required stochastic modelling. Further information on our DO assessment can be found in our Water Resource Management Plan 2024 (WRMP24) and our

Groundwater Deployable Output and Climate Change and our Supply Forecasting Technical Reports for WRMP24.

Our baseline stochastic model runs for the Essex system 1 in 200 year and 1 in 500 year DOs with demand reductions from levels 1, 2 and 3 drought actions included were 460.2Ml/d and 444Ml/d respectively. The DO value is then used to determine Water Available For Use (WAFU) across the planning period.

Outage, process losses, sustainability reductions and environmental destination are subtracted from the DO to give WAFU. Imports and exports are then added/subtracted to give the Total WAFU value for the WRZ. WAFU is then plotted against the demand forecast of Distribution Input (DI) to give an indication of the supply demand balance. Where WAFU is higher than DI (i.e. supply demand balance is positive) then the WRZ is in surplus and therefore able to meet demand (in the case of the WRMP24, in a 1 in 200-year and/or 1 in 500-year return period). An example of our Dry Year Annual Average Final Plan Water Supply Demand Balance can be seen in Figure 13. Further information on our Supply Demand Balance can be found in our Water Resource Management Plan 2024 (WRMP24).



ESSEX WATER RESOURCE ZONE	END OF AMP8	END OF AMP9	END OF AMP10	END OF AMP11	END OF AMP12
	2029/30	2034/35	2039/40	2044/45	2049/50
Supply Demand Balance	16.99	16.99	16.99	16.99	16.99

Figure 13 Best Value Plan Dry Year Annual Average Supply Demand Balance Graph for Essex WRZ

Suffolk Water Resource Zones

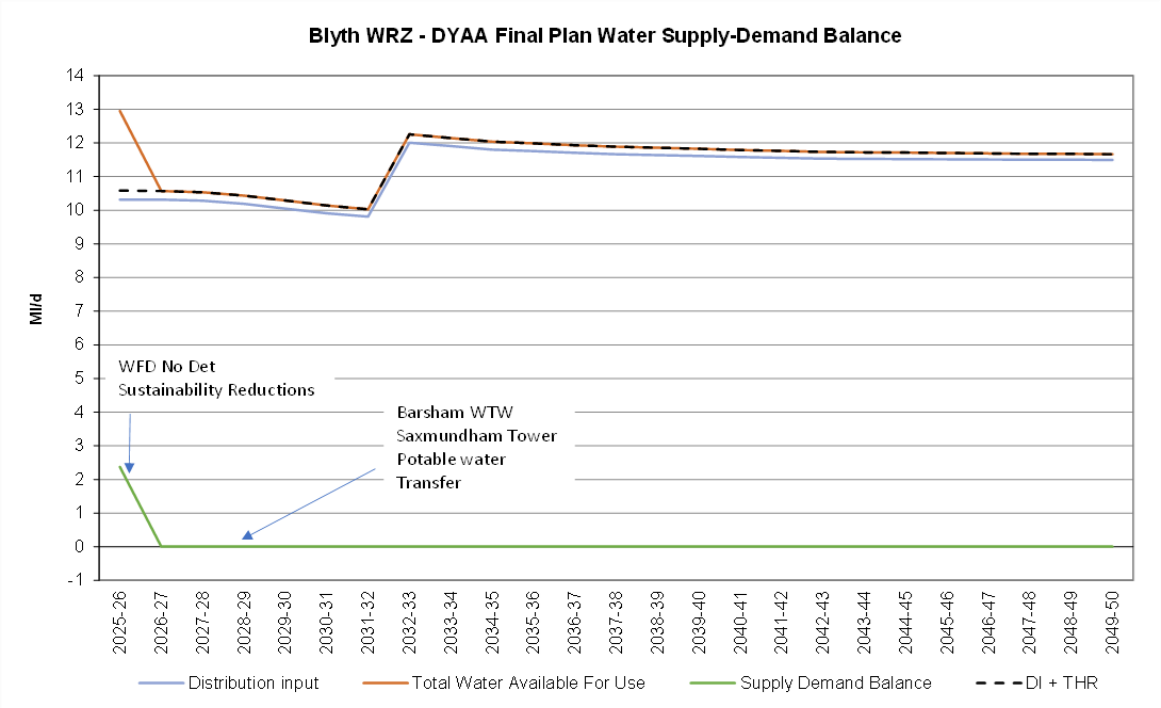
Worst Historic Drought on Record

Historically Suffolk has been resilient to a number of critical droughts on record with the only Temporary Use Ban being used during the 1997/98 drought. Even during this period our supply sources were not restricted themselves but instead it was the unprecedented high demand that could not be met. However, the design drought year for Suffolk is the 1995-97 drought, which was described earlier in this Appendix as having a return period of greater than 1 in 200 years.

1 in 200-year and 1 in 500-year Return Period Droughts

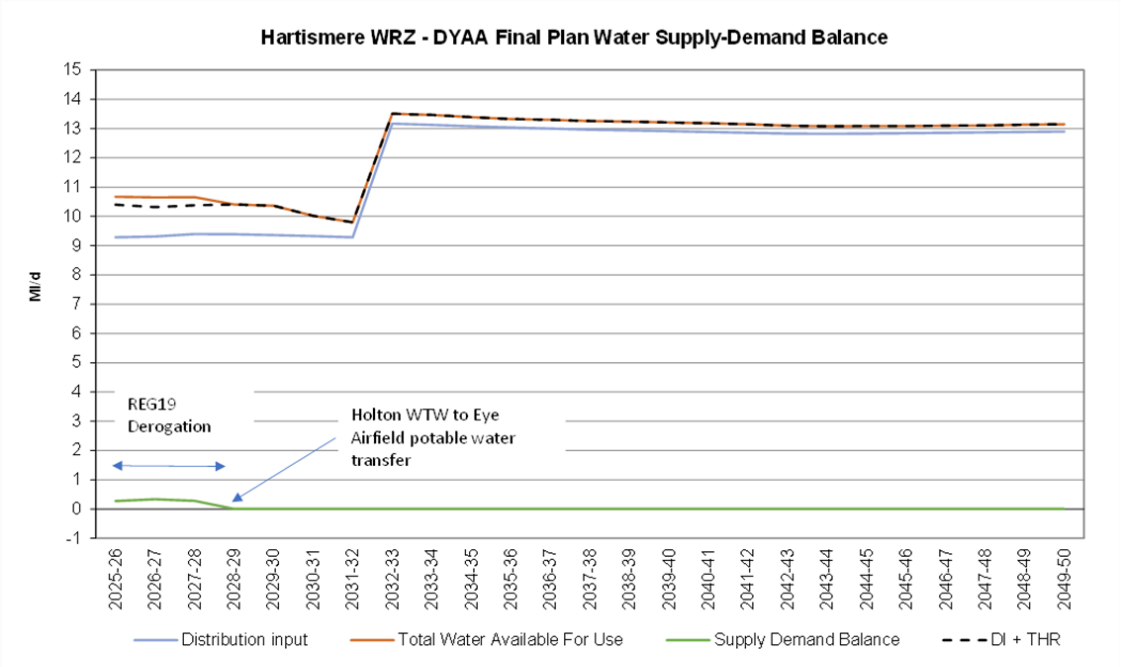
The WRMP24 DO for Suffolk was assessed using a combination of Aquator modelling for surface water sources and an analytical approach for groundwater sources that followed the Water Resource Planning Guidelines and UKWIR determination of outputs of groundwater sources methodology (UKWIR, 1995).

The WRMP24 DO and WAFU assessments have also been used for the Suffolk Water Resource Zones (Blyth, Hartismere and Northern Central) to demonstrate that the Drought Plan ensures that our Planned Levels of Service are met. Supply Demand Balance graphs for each of the Suffolk Water Resource Zones are illustrated below (Figure 14, Figure 15, Figure 16).



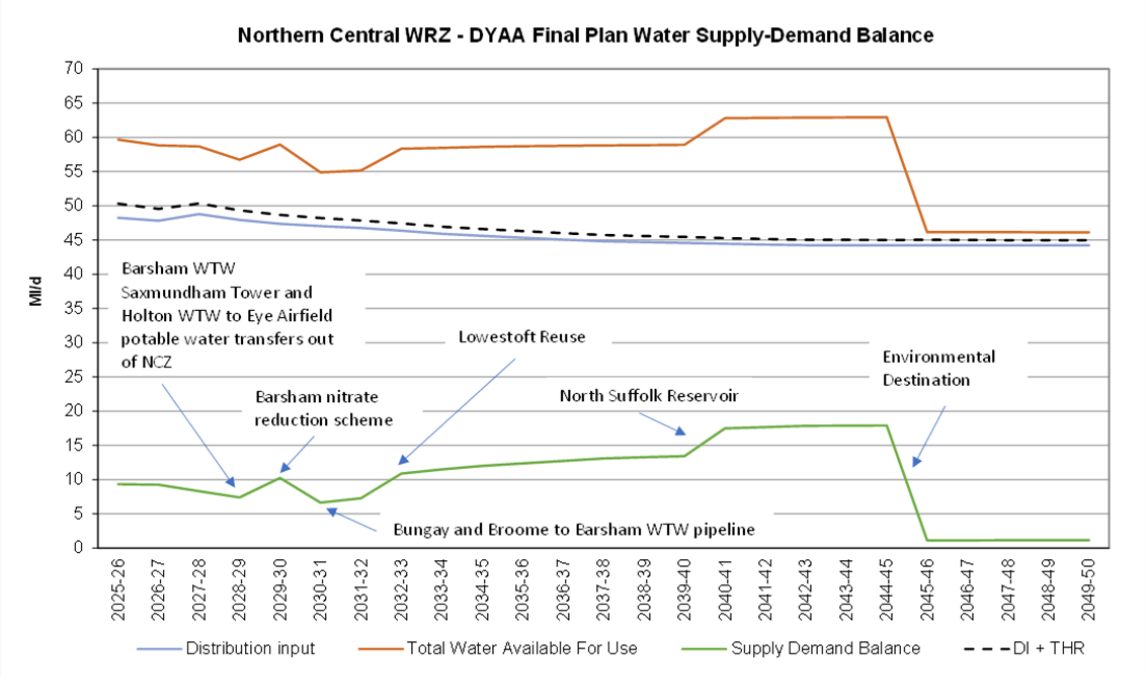
BLYTH WATER RESOURCE ZONE	END OF AMP8	END OF AMP9	END OF AMP10	END OF AMP11	END OF AMP12
	2029/30	2034/35	2039/40	2044/45	2049/50
Supply Demand Balance	0	0	0	0	0

Figure 14 Best Value Plan Dry Year Annual Average Supply Demand Balance Graph for Blyth WRZ



HARTISMERE WATER RESOURCE ZONE	END OF AMP8	END OF AMP9	END OF AMP10	END OF AMP11	END OF AMP12
	2029/30	2034/35	2039/40	2044/45	2049/50
Supply Demand Balance	0	0	0	0	0

Figure 15 Best Value Plan Dry Year Annual Average Supply Demand Balance Graph for Hartismere WRZ



NORTHERN CENTRAL WATER RESOURCE ZONE	END OF AMP8	END OF AMP9	END OF AMP10	END OF AMP11	END OF AMP12
	2029/30	2034/35	2039/40	2044/45	2049/50
Supply Demand Balance	10.26	12.01	13.45	17.93	1.17

Figure 16 Best Value Plan Dry Year Annual Average Supply Demand Balance Graph for Northern Central WRZ

Experience from Historic Droughts and Drought Measures

Background

The most recent droughts to have affected the Essex and Suffolk supply areas were during the 1990s. During the droughts in 1990-92 and 1995-97, we gained extensive experience of drought management. In the later drought (1995-97), we implemented drought measures, including a hosepipe ban (now known as a Temporary Use Ban), in both supply areas. A summary of how previous drought measures were implemented in recent droughts affecting Essex and Suffolk is presented below.

Essex

Hosepipe bans imposed in Essex during the 1990s occurred in the period from 29 July 1990 to 13 October 1992 inclusive, and 13 June 1997 to 3 April 1998 inclusive.

The 1990-92 drought was characterised by a prolonged period of below average rainfall that led to a lowering of groundwater levels throughout the southeast and parts of East Anglia, thereby impacting on baseflows to rivers. By contrast the 1995-97 drought was more directly impacted by the lack of rainfall, in terms of the absence of runoff to support the rivers in clay catchments.

The 1995-97 drought is worthy of further note in terms of the conditions that affected Essex and Suffolk Water and the actions we took to address supply concerns. Rainfall during 1995-97 in Essex was significantly lower than the long term average. (Figure 17) displays monthly rainfall for 1995 to 1997, against the long term average for Hanningfield rain gauge.

A lack of winter rain, particularly in 1995 and 1996 resulted in incomplete reservoir refill. This is illustrated in the reservoir storage profile for Hanningfield Reservoir (Figure 17). It was this cumulative effect which made 1997 a particularly severe drought in East Anglia and necessitated the convening of our Drought Management Group (DMG), and the eventual imposition of drought restrictions.

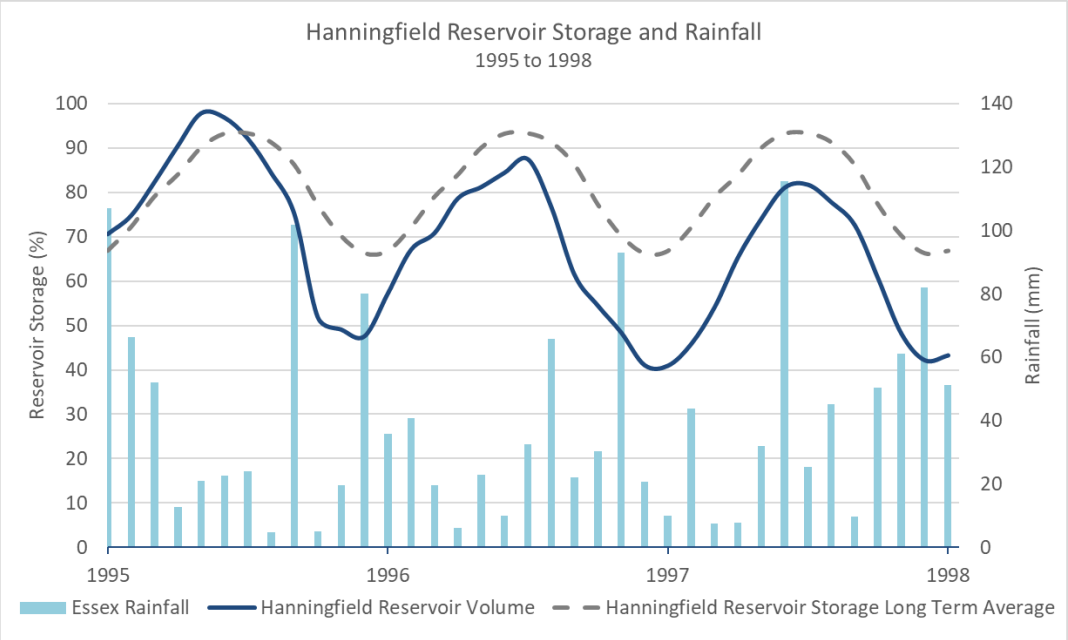


Figure 17. Hanningfield Rainfall and Reservoir Levels from 1995 to 1997 (inclusive).

Drought actions were first implemented in 1997 and were included in our Drought Contingency Plan released in March of that year. The DMG considered a wide variety of options, some of which were rejected for a variety of reasons, mainly related to timing and feasibility. Drought actions that were implemented in Essex in 1997/98 included the following:

- Public relations campaigns (including press releases & radio advertising, fact sheets for opinion formers, posters & stickers, talks to local groups);
- Water efficiency initiatives (water conservation leaflets/newspapers etc);
- Hosepipe bans;
- Commissioning of abandoned sources (e.g. well in south Essex);
- Pumping capacity upgrades;
- Temporary effluent Recycling Scheme near Maldon; and
- Improving abstraction potential at Abberton reservoir via dredging.

A press conference took place on 11 June 1997 to announce the current water resource situation and the hosepipe ban. A press release was circulated beforehand to invite local press. A company-wide hosepipe ban was introduced with effect from midnight on 12 June 1997. It remained in force until we were reassured that there was no need for restrictions during the summer of 1998. The hosepipe ban ended in Essex on 3 April 1998, following a significant improvement in the water resources situation.

We successfully operated a temporary recycling scheme between July 1997 and December 1998. The scheme involved abstracting up to 23 Ml/d of wastewater from the Chelmsford Sewage Treatment Works pipeline and disinfecting with ultraviolet light, prior to mixing with water abstracted from the rivers Chelmer and Blackwater. The water was then pumped into Hanningfield Reservoir. The scheme was applied for through normal discharge consent procedures as opposed to a drought order. A permanent Effluent Recycling Scheme was commissioned in 2002/03.

Suffolk

The only hosepipe ban imposed in Suffolk during the 1990s occurred in the period from 13 June 1997 to 14 May 1998 inclusive.

Although the decline of groundwater levels during the 1995-97 drought had the potential to impact public water supplies sourced from groundwater in the Suffolk Hartismere and Blyth water resources zones, this was not the reason that restrictions were required. In reality, borehole yields held up extremely well with the exception of one Chalk source (Hartismere Borehole 6). It was the unprecedented high demand fuelled by a long hot summer, that meant that a hosepipe ban was necessary.

Drought actions that were implemented in Suffolk in 1997/98 included the following:

- Public relations campaigns and water efficiency initiatives (as for Essex);
- Hosepipe bans;
- Hartismere Borehole 4 environmental drought order;
- Development of a new groundwater source and treatment works (Hartismere Borehole 1);
- Hartismere Borehole 3 licence variation (increase in daily licence); and
- Road tankering.

A drought order to permit increased abstraction from Hartismere Borehole 4 to supply Redgrave and Lopham Fen with 8 l/s of water was implemented during the summer. This action safeguarded the breeding conditions required by the Great Raft Spider, and freed resources enabling the company to use the full licensed quantity for public supply. Hartismere Borehole 4 was later closed and its replacement, Hartismere Borehole 5 was commissioned on 7th July 1999.

A successful tankering operation was implemented in Suffolk during 1997. Water was transported from a treated water reservoir near Lowestoft to discharge facilities in the Hartismere Water Resource Zone.

With an improving water resources situation in early 1998, hosepipe restrictions were finally lifted on 14 May 1998.

Experience from Recent Prolonged Dry Weather

2018

Based upon analysis of cumulative rainfall and the number of days where temperature exceeded 25°C, 2018 was classified as a Dry year in both Essex and Suffolk. Average Distribution Input (DI) was 25Ml/d higher than the 2018/19 DI forecasted in WRMP14. Hanningfield reservoir storage was below average from June 2018, reflecting the dry summer and elevated customer demand. Abberton reservoir remained close to the post-enlargement average storage for most of the summer. Given our combined Essex reservoir storage, we did not need to introduce any formal customer restrictions on the use of water although we did escalate our dry weather messaging.

The average available headroom for 2018/19 based upon outturn data was 23.54Ml/d in Essex and 22.27Ml/d in Suffolk. We did not impose any customer restrictions on the use of water.

The Drought Vulnerability Framework assessment for the Essex System (Appendix 8) was modelling using actual DI from 2018/19, as it was our most recent classified Dry year to test our system with.

2019

Based upon analysis of cumulative rainfall and the number of days where temperature exceeded 25°C, 2019 verged on being a Dry year in Essex, and was classified as a Normal year in Suffolk. Average distribution input was 4Ml/d lower than 2018/19.

Combined reservoir storage started the summer slightly below average reflecting the conditions of the previous dry year. Due to a notably warm, dry summer in 2019, combined reservoir storage remained below average throughout the summer although we did not need to introduce any formal restrictions on use but we did enhance our dry weather messaging. River flows were low, with the River Stour measuring the second lowest river levels since the 1976 drought, and demands were higher than in 2018 at some points of the summer. Both reservoirs recovered to over 90% storage by the end of March 2020.

The average available headroom for 2019/20 based upon outturn data was 16.56Ml/d in Essex and 25.11Ml/d in Suffolk. We did not impose any customer restrictions on the use of water during 2019/20, and so our planned Levels of Service continued to be met.

2022

Based upon analysis of 6 month SPI with a peak value of -2.31 in August and a number of days where temperature exceeded 25°C. 2022 was classified as a dry year. Average distribution input was 14.35Ml/d and 5.39Ml/d higher than our WRMP19 forecast DI in Essex and Suffolk.

Combined reservoir storage in Essex was above average (close to post-enlargement historic maximum) at the start of the seasonal recession but declined at a greater rate than average meeting post-enlargement historic minimum in August 2022. We activated our Drought Management Group in June and implemented our Level 1 drought actions in the Summer although did not need to implement a Temporary Use Ban. Both reservoirs recovered to above average by the end of April 2023.

In Suffolk our surface water storage (Fritton Lake and Ormesby Broad) started the seasonal recession above average but declined at a steeper rate than average due to the dry weather however remained above the historic minimum. Despite the below average reservoir stocks, in addition to drought measures, we managed our raw water network, and treatment works so that restrictions on customer's water use were not needed and there was a low risk to security of supply.

APPENDIX 8: DROUGHT VULNERABILITY ASSESSMENT

For PR24 we were required to understand and demonstrate the resilience of our systems to a range of droughts. The UKWIR guidance (*Drought Vulnerability Framework*, 2017) provides an approach that water companies can use to improve the understanding of the vulnerability of their systems to drought and demonstrate this graphically by producing 'drought response surfaces' (DRS) for their water resources zones (WRZs).

The guidance recommends several different calculation approaches based on the data availability and the level of modelling available for each WRZ. These approaches are detailed in table 1.

Table 1. UKWIR guidance approach based on available data and modelling

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

The Essex WRZ represents a highly integrated network connecting the Essex rivers and their associated intakes, to the pumped storage reservoirs at Abberton and Hanningfield and the associated treatment works. Drought and hydrological modelling is undertaken in an Aquator model representing the Essex WRZ, along with rainfall-runoff models for the rivers within the system.

On the basis of surface water dominated and modelling with rainfall-runoff models, approach 3a was appropriate for carrying out this assessment for the Essex WRZ as part of the PR24 process. The calculation steps for approach 3a as set out in the UKWIR guidance are detailed here:

1. Carry out Extreme Value Analysis (EVA) to determine the probability of each deficit/duration cell.

2. Generate synthetic events (intensity & duration) using rainfall-runoff models for a selection of deficit/duration cells using the historic record.

3. Run the synthetic events through the behavioural model for the selected level of demand.

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

5. Compare the EVA plot of minimum levels or flows against the critical duration drought outputs, to scale the DRS inputs.

6. Plot DRS.

The resilience of the Essex System was assessed for the drought durations and return periods as show in table 2.

Table 2. Essex System drought duration assessment

Return Period/ Duration	100 yr	200 yr	500 yr	1000 yr
6 months	X	X	X	X
12 months	X	X	X	X
18 months	X	X	X	X
24 months	X	X	X	X
36 months	X	X	X	X

Selection of 'month end' of drought events

The guidance recommends that for a WRZ with a high level of storage driven by the annual average demand, the month end of the droughts is set three months apart. Historically the lowest storage levels experienced have been in October, and given the large amount of storage available within the WRZ the system is more vulnerable to a dry winter than a dry summer, therefore the month ending parameters have been set three months apart in October and December.

Level of demand used

The behavioural modelling is carried out for a single specified level of demand. The guidance suggests a few options, including:

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

The guidance states that the primary analysis for regulatory returns should be run at DI plus Target Headroom. For PR24 we therefore chose to run the analysis at this level of demand, using the actual DI and target headroom allowance for 2018/19.

Rainfall data analysis

The rainfall datasets used for this study were originally derived from the CEH-GEAR gridded daily rainfall dataset. The rainfall series were averaged for all sub catchments to produce a single daily rainfall time series for the whole Essex System area, which was deemed an appropriate assumption given that the mean annual rainfall for each individual sub catchment lay within 5% of the regional mean.

The guidance requires rainfall frequency analysis for different drought durations to be based upon the same end-months as the selected drought end-month for the water resources system. Therefore, as October and December were deemed to be the critical end-months for reservoir drawdowns, rainfall analysis should be based upon the rainfall totals up to the end of October and December for every year of record.

To assess if the October and December end-month durations were representative of the population rainfall distribution, a Kolmogorov-Smirnov (K-S) test was carried out for all month ends, for each duration. This tests whether the rainfall totals for various durations at a given end-month are significantly different from the daily running 6-month rainfall total for the entire record, which was taken as the parent population distribution.

This assessment demonstrated that there is no significant difference between end-month rainfall totals for whole-year periods (Figure 1a), therefore all whole-year period rainfall totals should be included in any assessment of frequency of occurrence, regardless of end-month. The situation for durations that include half-years is more complex, as there is a degree of seasonality demonstrated at this level (Figure 1b). For the purpose of this study, the sampling regime was therefore extended to include month-end durations that were not significantly different from the central duration of interest.

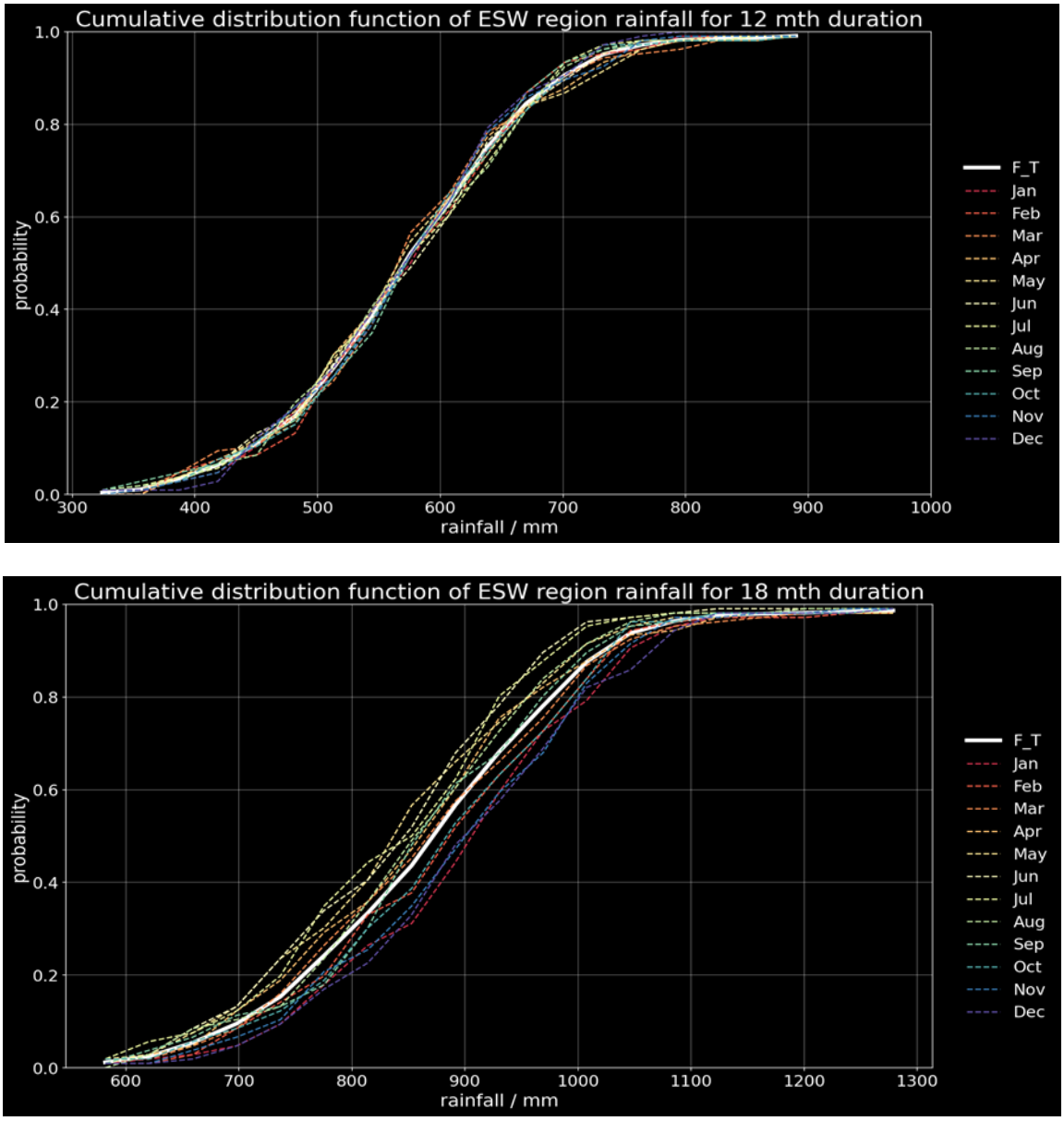


Figure 1. Cumulative distribution function for Essex regional rainfall a) 12-month and b) 18-month duration droughts for different month endings

Rainfall series of various durations were tested against several extreme value distributions, and overall, they fitted best with a three-parameter GEV distribution. All rainfall depths were divided by the regional standard annual average rainfall (SAAR) for the period 1971-2000, to allow standardised rainfalls from each duration to be easily compared.

GEV factors were derived for the rainfall datasets as a ratio of the SAAR to calculate the rainfall required for each return period and duration. The resulting rainfall depths in mm for each duration and return period are presented in table 3.

Table 3 Rainfall requirements for return period and duration

Duration	6 months	12 months	18 months	24 months	36 months
1 in 100	119.7	342.1	561.6	827.6	1362.9
1 in 200	109.4	322.5	532.0	788.4	1311.9
1 in 500	97.7	301.8	504.6	746.6	1265.8
1 in 1000	90.4	285.1	489.7	740.2	1243.0

Creation of artificial drought rainfall sequences

Approach 3a requires the creation of artificial drought rainfall sequences, for use in rainfall-runoff modelling. In order to generate droughts with a realistic daily rainfall pattern, the guidance states that an existing historic year close to the average should be used. A rainfall year with a low monthly mean squared error (MSE) to the overall average monthly values, and with a mean close to SAAR, was selected to be the "warm-up" and "cool-down" year.

At least two "warm-up" years were attached before each drought event, and then four years of "cool down". We have several 5-year rolling abstraction licences, which can hold the 'memory' of a drought in the licence utilisation total for an extended period. The long duration between drought events is necessary in order to avoid one drought impacting on the next. The droughts for each of the four return periods were stitched together to create a continuous time series containing all the drought events for each individual duration.

Rainfall sequences for each sub catchment rainfall-runoff model were then generated. The ratio of each sub catchment's rainfall to the SAAR was calculated, and this factor was applied to the regional average to generate sub catchment artificial rainfalls for each drought length, return period and month-end.

Derivation of river flows

The generated rainfall sequences for each sub catchment were used as rainfall input to the rainfall-runoff models. The models also require an input for potential evapotranspiration (PET). After the artificial rainfall sequences had been created, the regional PET was matched from the entire record for each drought. PET values were left as regional averages across all catchments. Pycatchmod, a Cython implementation of a Catchmod rainfall-runoff model, was utilised to generate the flows for all catchments in the Essex System Aquator model.

Aquator modelling

The drought scenarios were run through the Essex System Aquator XV model with demand set at 2018/19 DI plus Target Headroom allowance, and the number of days of failure of the system were recorded for each October- and December-ending

drought. Failure occurred when the demand could not be met, or the emergency storage level of a reservoir was reached.

Only the December-ending 24-month 1000-year return period drought scenario caused failure (24 days).

Drought Response Surface

An alternative plot to the DRS in the form that it was recommended in the guidance is provided below, that we hope offers clarity whilst conveying the relevant information. Figure 2 displays the number of days of failure on the left-hand axis as a bar chart, and the rainfall as a ratio of SAAR on the right-hand axis as a line plot. Drought durations are along the x-axis, with colours representing the different return periods.

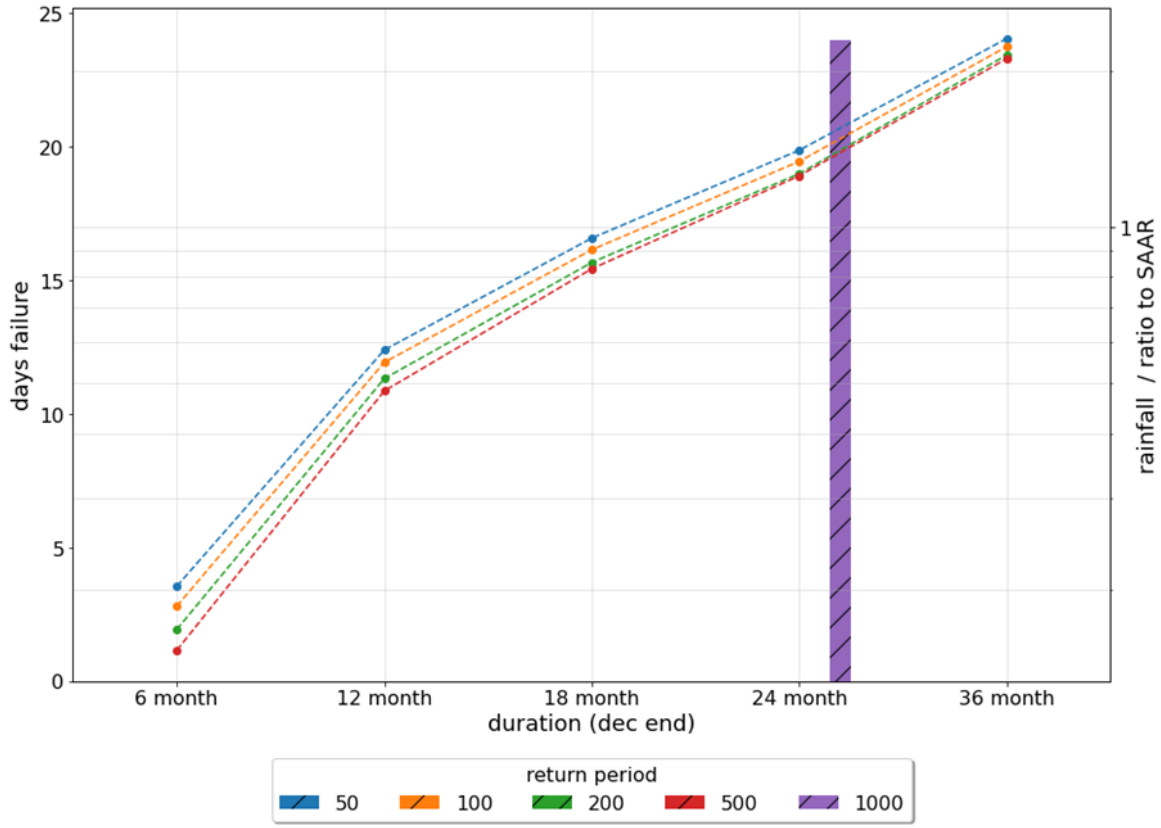


Figure 2. Days of failure and rainfall as a ratio of SAAR

Since carrying out the drought vulnerability assessment we have published our WRMP24 that shows the Essex Water Resource Zone is forecasting baseline supply deficits in our Essex and Suffolk supply areas so we have identified demand management and supply options to restore a supply surplus. For Essex, we are planning to provide 1 in 200 year drought resilience until 2030/31 and then 1 in 500 year drought resilience from 2031/32. Further information on our supply forecast can be found in our Water Resource Management Plan 2024. We will review our drought vulnerability assessment as part of the WRMP29 process and provide an update within the WRMP29 report.

Groundwater Drought Vulnerability Assessment

Regional Groundwater Modelling

In PR24 we assessed the resilience of our groundwater sources to 1 in 200 year and 1 in 500 year droughts as part of the Water Resources Planning Guideline (Agency, 2021). The approach included using a combination of operational and observed data and modelled scenarios to define drought curves and borehole response in a drought.

A new approach was used for WRMP24 which involved using the Atkins stochastic rainfall and potential evapotranspiration (PET) dataset with 12 climate scenarios. Our consultant (Wood, 2022), then ran 12 scenarios through regional groundwater models representing the potential impacts of droughts and climate change on groundwater levels in Essex and Suffolk boreholes. The drought scenarios use pseudo-historic rainfall and PET timeseries which include representation of 1 in 200 year and 1 in 500 year droughts.

Due to the nature and resolution of the groundwater models, the modelled groundwater levels cannot be directly related to the water levels in our production boreholes. Therefore, individual source analysis was carried out to determine the average seasonal rest water level in the production boreholes using nearby observation boreholes as reference. Each scenario produced estimates of aquifer drawdowns providing differences in rest water levels that were mapped onto drought curves. The outputs highlighted when the drought curve reaches a groundwater level constraint before a licence constraint (i.e. pump level or deepest advised pumped water level (DAPWL)) a source becomes constrained. More information on the approach and modelling can be found in the WRMP24 technical note: Groundwater Deployable Output and Climate Change (Essex and Suffolk Water, 2024)

Using Source Reliable Yield Assessment Graphs to Determine Deployable Output for Drought Scenarios

Modelled groundwater heads for all our groundwater sources were determined using the methodology mentioned above and drought curves were generated. The following graph in Figure 3 presents an example of South Essex Well 2 which reports the modelled change in groundwater level for a 1 in 200 year and 1 in 500 year drought event, to determine whether this would affect the DO of the source. In this example the modelled drought curves reaching the pumped water level and DAPWL before licensed value highlighting the source becoming constrained in a drought.

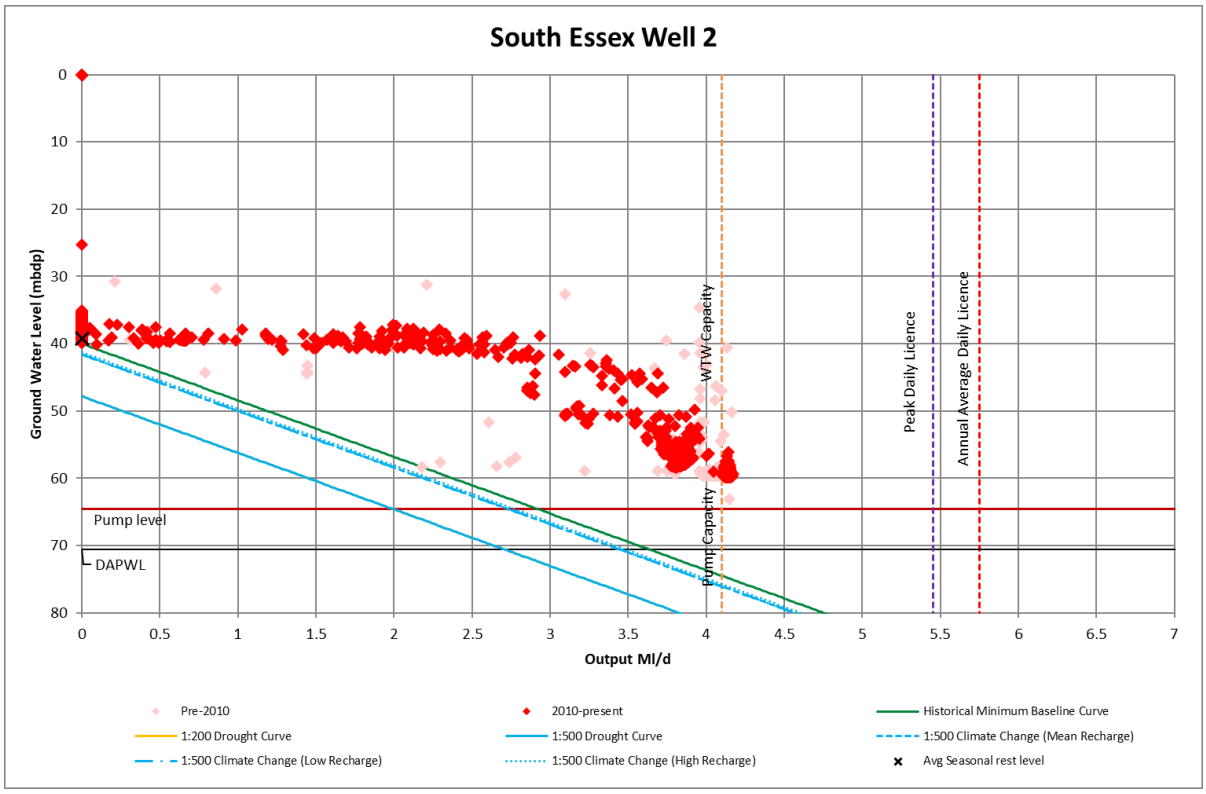


Figure 3. South Essex Well 2 drought curve.

Results

From the groundwater modelling assessments all Essex and Suffolk groundwater sources were found to be resilient to a 1 in 200 year and a 1 in 500 year drought, with the exception of two boreholes (Northern Central BH 11 and South Essex Well 2). The deployable outputs determined from the groundwater modelling and source reliable yield assessments are presented in Table 4.

Table 4. Groundwater Deployable Output for Baseline, 1:200-year and 1:500-year droughts

Groundwater Source	PR24 Average Deployable Output (Ml/d)	1:200-yr Drought Scenario Deployable Output (Ml/d) (Pre-licence caps)	1:500-yr Drought Scenario Deployable Output (Ml/d) (Pre-licence caps)
Essex			
South Essex Well 1	2.61	2.61	2.61
South Essex Well 2	3.64	2.71	2.71
Colchester Borehole 1	1.93	1.93	1.93
Essex System (North Essex Borehole 1)	20.18	20.18	20.18
Suffolk Blyth			
Blyth Borehole 1	3.17	3.17	3.17
Blyth Borehole 2	2.21	2.21	2.21
Blyth Borehole 3	2.27	2.27	2.27
Blyth Borehole 4	3.11	3.11	3.11
Blyth Borehole 5	0.29	0.29	0.29
Blyth Borehole 6	0.78	0.78	0.78
Blyth Borehole 7	2.85	2.85	2.85
Suffolk Hartismere			
Hartismere 1	0.55	0.55	0.55
Hartismere 2	0.63	0.63	0.63
Hartismere 3	0.45	0.45	0.45
Hartismere 4	0.00 (Emergency Use Only)		
Hartismere 5	3.02	3.02	3.02
Hartismere 6	1.25	1.25	1.25
Hartismere 7	2.75	2.75	2.75
Suffolk Northern Central			
Northern Central Borehole 1	7.12	7.12	7.12
Northern Central Borehole 2	2.84	2.84	2.84
Northern Central Borehole 3	2.00	2.00	2.00
Northern Central Borehole 4	2.25	2.25	2.25
Northern Central Borehole 5	0.47	0.47	0.47
Northern Central Borehole 6	1.35	1.35	1.35

Northern Central Borehole 7	1.49	1.49	1.49
Northern Central Borehole 8	0.54	0.54	0.54
Northern Central Borehole 9	1.90	1.90	1.90
Northern Central Borehole 10	2.28	2.28	2.28
Northern Central Borehole 11	1.23	0.00	0.00
Northern Central Borehole 12	0.00	0.00	0.00

1 in 200 year and 1 in 500 year Groundwater Modelling and Proposed Updates for the Revised Draft Drought Plan

The difference between the 1 in 200 year and 1 in 500 year drought scenarios was not significant, with no reduction in deployable output. The only exception was South Essex Well 1, which showed a reduction of <0.1 Ml/d between the 1 in 200 year and 1 in 500 year scenarios.

APPENDIX 9: DEMAND SIDE DROUGHT ACTIONS

This appendix provides detail of the demand side drought actions that we may employ to address potential water supply shortages during a drought. It includes the estimated demand savings, implementation timetables and risk assessments for the demand side actions which fall into three categories; water efficiency actions, leakage and network actions and other demand side actions.

Please refer to the following spreadsheets for our unconstrained and constrained lists, risk assessments and implementation timetables.

Demand Side Drought Actions_Table of Actions: which is a table of all our demand side drought actions including our unconstrained list and constrained list of actions.

Demand Side Drought Actions_Implementation Timetables: which includes the implementation timetables for all our demand side drought actions.

Demand Side Drought Actions_Risk Assessments: which includes all the risk assessments for all the demand side drought actions.

Error! Reference source not found. gives a summary of all the demand side drought actions. It is split between actions that are already included in our current plan and new actions we are proposing for this plan and includes the average saving per action at the respective drought level.

Table 2 gives the savings for drought actions at a WRZ level. Certain drought mitigation actions may yield varying levels of savings across different zones, depending on differences in population density, property characteristics, and geographic conditions.

Error! Reference source not found. provides the process flow for initiating demand side drought actions through the levels of drought.

Table 1: Demand Side Drought Actions

Drought Stage	Drought Level	DP22 Demand-side actions	New actions for DP27	Average Saving per action in drought level Ml/d
Normal	Level 0 (BAU)	**BAU** Network optimisation to reduce output of Water Treatment Works (WTWs) which are supplied by a stressed water resource Customer communications As per our WRMP24 demand management selected options: • Leakage detection and repair suite of options • Water efficiency activity (non-household and household) • Smart metering installations • Government led interventions		**Please see WRMP24**
Prolonged dry weather	Level 1	**APPEAL FOR RESTRAINT** Enhanced dry weather messaging Additional resource for find & fix leakage teams Encourage reporting of leaks Stop proactive flushing Optimising water supply and network to reduce output of Water Treatment Works (WTWs) which are supplied by a stressed water resource; as well as increased control over potable water storage levels.	High water use alerts to customers Water saving calculator promotion Target 15m head at the critical point in each pressure managed area	**1.17**
Drought	Level 2	**TUB** Further additional resource to find and fix leaks Offer to repair the highest volume customer-side leaks (CSLs).	Challenge illegal use Water Efficiency Home Audits to targeted areas Education workshops - community and schools Community Outreach & business funding Tourism support	**1.68**
	Level 3a	**NEUB** Minimise WTWs outflows at all water stressed sourced WTWs and maximise elsewhere Manage the network to use potable water stored as resilience for changeable demands, managing our network storage levels at low levels, increasing risk of maintaining supply to customers.	Hard hitting communications Target 10m head at the critical point in each pressure managed area Installation of flow regulators to Household's (HHs) Shower device offering Flow restrictors to Non-Households (NHHs)	**2.42**
Severe drought	Level 3b	**EXTREME DROUGHT ACTIONS** Reduce Ships Watering Removal of Statutory Exceptions on TUBs and NEUBs Manage Strategic Operational Plan (SOP) storage to low-low alarm levels, increasing risk of maintaining supply to customers.	Seasonal Tariffs for smart metered customers	**0.28**

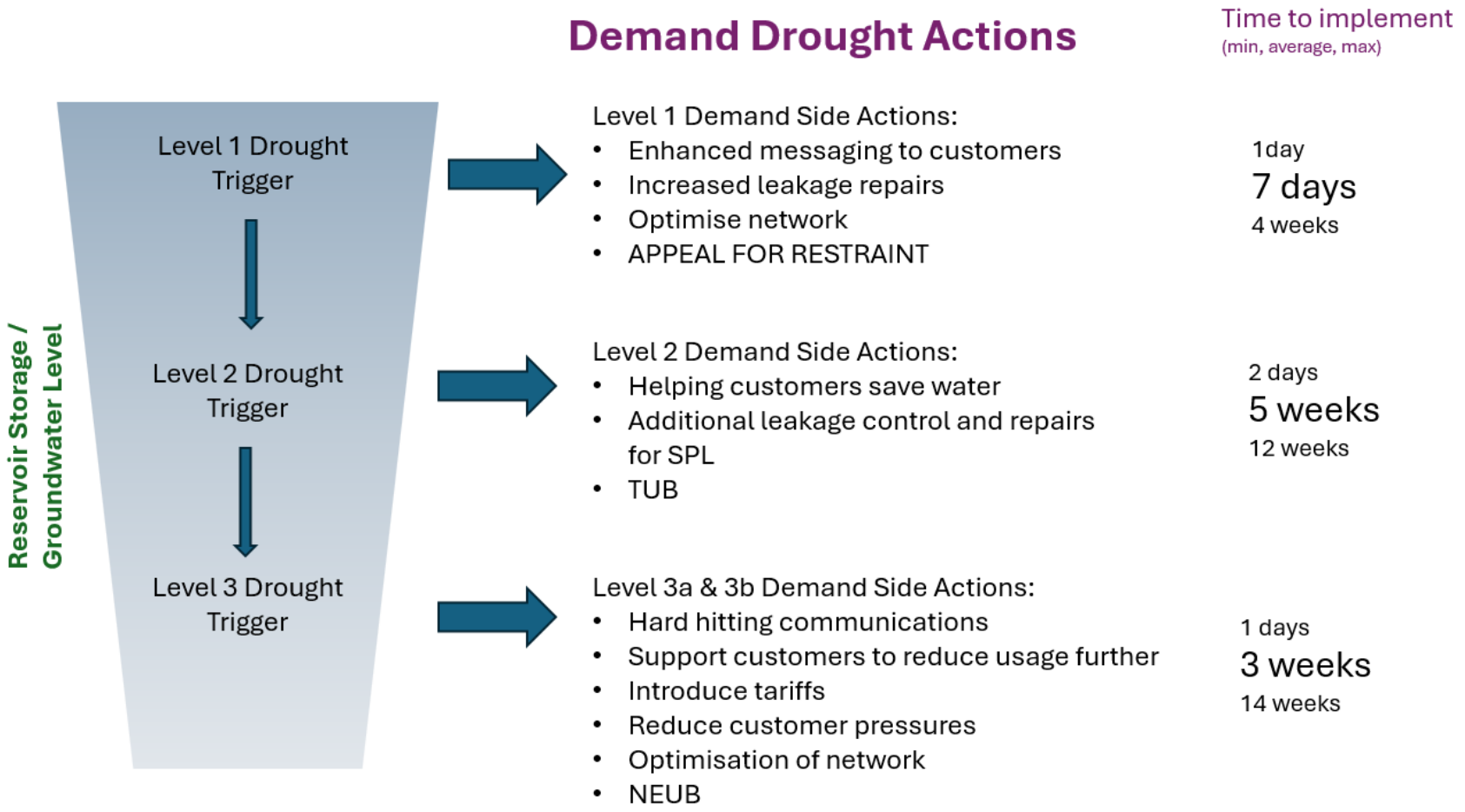


Figure 1: Demand side drought actions process flow

Table 2: Demand Side Drought Actions Savings per WRZ in Ml/d

Drought Level	Drought Severity	Demand Actions	Essex	Blyth	Hartismere	Northern Central
1	Prolonged dry weather	Appeal for Restrains	6.86	0.19	0.16	0.83
		Water Efficiency Drought Actions	7.18	0.21	0.58	1.06
		Leakage & Network Drought Actions	8.70	0.34	0.25	1.40
		Demand (Other) Actions	2.27	0.06	0.04	0.33
		SUM	**25.02**	**0.81**	**1.03**	**3.62**
2	Drought	TUB	18.18	0.32	0.25	1.91
		Water Efficiency Drought Actions	0.63	0.04	0.04	0.14
		Leakage & Network Drought Actions	0.15	0.07	0.07	0.07
		Demand (Other) Actions	0.01	0.00	0.00	0.00
		SUM	**18.98**	**0.42**	**0.36**	**2.11**
3a		NEUB	8.08	0.23	0.19	0.98
		Water Efficiency Drought Actions	0.01	0.00	0.00	0.00
		Leakage & Network Drought Actions	8.65	0.26	0.17	1.42
		Demand (Other) Actions	3.51	0.10	0.06	0.51
		SUM	**20.25**	**0.59**	**0.42**	**2.91**
3b	Severe drought	Removal of Exceptions on TUBs and NEUBs	0.56	0.03	0.04	0.12
		Leakage & Network Drought Actions	0.00	0.00	0.00	0.00
		Demand (Other) Actions	0.09	0.00	0.19	0.09
		SUM	**0.65**	**0.03**	**0.23**	**0.21**

Demand Side Actions Rejection Register

The table below details those demand-side drought actions included in our unconstrained list, but which were screened out as being infeasible. The drought action is described and the rejection reason given.

Type of demand-side action	Summary of action	Time to implement	Rejection Reason
Demand	Refocus smart meter installation on replacements to specific area	2 weeks	Not a fast enough demand saving for use in drought as relies on network being in place.
Demand	Refocus smart meter installation for compulsory metering to specific area	2 weeks	Not a fast enough demand saving for use in drought as relies on network being in place and customer's receiving bills.
Demand	Encouraging more customers to opt for a meter	5 days	Not a fast enough demand saving for use and technicians to install would be diverted to leakage reduction
Demand	Relocate farm stock / businesses	28 days	Extreme drought action, would require government intervention
Leakage	Use smart meter data to identify customers with high usage or continuous flow and contact them about reducing their consumption	1 day	Action is already included under the water efficiency drought actions.

Water Efficiency	Office visits	4 weeks	Already at full capacity
Water Efficiency	Restaurant visits	4 weeks	Already at full capacity
Water Efficiency	Shop visits	4 weeks	Already at full capacity
Water Efficiency	Hairdresser visits	4 weeks	Already at full capacity
Water Efficiency	Educational Building retrofit and reviews (University/College)	4 weeks	• Already at full capacity • Already to be delivered
Water Efficiency	Water Efficiency Training to Retailers	6 weeks	Already to be delivered
Water Efficiency	Water Reuse inc Rainwater Harvesting	20 weeks	Too long of a delivery timeframe.
Water Efficiency	Free Water Efficiency Assessments for NHHs (identification of opportunities for NHH to take action on)	8 weeks	No guaranteed water savings.
Water Efficiency	Find & Fix - Leaky Loos (NHH)	6 weeks	Already to be delivered.
Water Efficiency	Water Saving Kits for Businesses	10 weeks	Already to be delivered.
Water Efficiency	Nationwide Challenge - Water in Business Week	N/A	May not fall during a drought event.
Water Efficiency	Golf courses	25 weeks	• Already restricted by TUBs/NEUBs • Too long of a delivery timeframe.

Water Efficiency	Water Warden	16 weeks	• Would require engagement to see water saving benefit. • Would require recruitment. • More of a long-term solution.
Water Efficiency	Business-level Water efficiency rankings	6 weeks	Permissions to implement are uncertain.

Water Efficiency Drought Actions

Overview

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

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

We have reviewed our strategy as part of our Water Resources Management Plan 2024 and our strategy continues to be based on a process of reviewing effectiveness, making improvements and responding to new opportunities to trial new products, evaluate new methods of working, work with new partners and improve our measurement and analysis techniques.

During drought conditions, we will continue with our AMP8 projects as outlined in the WRMP24, in addition to activities summarised in the table below.

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

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

Table 3: Water efficiency drought actions

Drought level	Drought severity	Water Efficiency Drought Actions
0	**Normal**	AMP 8 projects as outlined in the WRMP24 for both household and non-households.

1	**Prolonged dry weather**	**Household** • High water use alerts that for both area and customer specific • Promote water saving calculator • Continuous flow messaging from smart meters • Behaviour change: internal Water Efficiency awareness **Non-Household** • High water use alerts for non-household properties, this could be either area or customer specific • Reduce NWGs water consumption across sites • Visible water efficiency / drought awareness messaging for visitors to NWG sites
2	**Drought (TUB in place)**	**Household:** • Targeted areas for Water Efficiency Home Audits • Educational workshops delivered through the Ripple Effect • Community outreach – Water Warrior **Non-Household:** • Community funding. • Home away from home support.
3a	**Drought (NEUB in place)**	**Household:** • Installation of flow regulators (NRV2s) – install rate 1 in 10 • Shower use intervention – digital device for customers **Non-Household:** • Installation of flow regulators (NRV2s)

Forming the constrained list

For the WRMP24, a list of unconstrained Water Efficiency activities was identified. This list gave us a head start for potential drought actions. We sifted through this initial list and removed actions that were not appropriate for drought scenarios, for example Rainwater Harvesting. A new list of unconstrained options was then created. In total there were around 69 options in the unconstrained list, that took into consideration household (HH), non-household (NHH) and activities that would fit better with Internal and External Communications.

For HH actions, originally there were 38 actions, now there are 19 to take forward. Similarly, for NHH, there were originally 39 options, and now there are 10 options. The primary reason for options to be removed was that they are already planned to be delivered in AMP 8; therefore, wouldn't be feasible to increase capacity or are very similar to actions already proposed.

Next, the constrained list was assessed against the following criteria:

- Drought level action implementation, Trigger for action, and plan and prepare for action in which drought level
- Time to implement action
- Estimated demand savings
- How will effectiveness be monitored? How can it be tracked?
- Location of action? Where is it most effective? Company, region, resource zone, DMA, town, and street?
- Time of year action is most effective. Spring, Summer, Autumn, or Winter?
- Justification of time of year selected
- Permissions required? Or Constraints that apply? If yes, provide information.

- Risk assessment completed + link to risk assessment
- Impact on drought levels of service
- How can you fast track the action? Or how can you scale up the action if the drought gets worse?
- How will you engage with NAVs and / or water retailers to implement the action?
- Require Comms Team Support?
- Include in Drought Plan Yes/No

The assessment was a beneficial tool to analyse which options were suitable and feasible in the event of a drought. This assessment allowed the opportunity to remove further options, based on the outcome of the assessment. We removed 14 options, some of these were due to unquantifiable savings, challenging for scaling up and time constraints. The refreshed constrained list consists of 17 options, which will be explored below.

Level 1 Drought Actions

WE002 Promote Water Saving Calculator

Time to implement action:	1 week
Estimated saving:	Negligible

In the event of a Level 1 drought, there will be external communications about the promotion of the Water Saving Calculator and tips on saving water. This action can be fast tracked via escalated communications. Effectiveness will be monitored through google analytics, clicks and visits to websites etc. This promotion is at a regional level and would be most effective during spring/summer as it would help raise awareness of water use in the lead up to summer. The biggest risk would be the lack of customer engagement; to help mitigate this, external communications would effectively raise awareness of the water saving calculator.

WE025/ WE026 High water use alerts for households

Time to implement action:	**2 weeks**
Estimated saving:	3% of PCC target

This is a new activity for Drought Plan 2027 that has emerged. High water use alerts can be for either customer or area specific using smart meter data. It can be implemented in a Level 1 drought.

Alerts that are customer focused (WE026): "we have noticed your use is higher than normal" based on a 3-month average. The alert could make customers consider other actions they could do to prevent their consumption increasing, "Do you have a leak?" and to also encourage them to tell us if circumstances have changed, bettering the data we hold. Alerts that are area focused (WE025): "There is high demand in your area. Please consider reducing your water use". The alert could make customers consider other actions they could do to prevent consumption increasing.

Effectiveness would be monitored through tracking engagement and responses to how people reduced water use. There is no current scope to fast track this activity due to the work involved. The key risks associated with this activity are complaints and the

wrong customer or area is targeted, which could impact C-MeX. To mitigate this, targeted areas and data to be reviewed by multiple people.

WE065NHH/ WE066NHH High water use alerts for non-households

Time to implement action:	**4 weeks for NHH**
Estimated saving:	2% of use NHH

This is a new activity for Drought Plan 2027 that has emerged. High water use alerts can be for either customer/business or area specific, by using smart meter data. It can be implemented in a Level 1 drought.

Alerts that are customer focused (WE066NHH): "we have noticed your use is higher than normal" based on a 3-month average. The alert could make customers consider other actions they could do to prevent their consumption increasing, "Do you have a leak?" and to also encourage them to tell us if circumstances have changed, bettering the data we hold. Alerts that are area focused (WE065NHH): "There is high demand in your area. Please consider reducing your water use". The alert could make customers/businesses to consider other actions they could do to prevent consumption increasing.

Effectiveness could be monitored by DMA reads, can be implemented all year round at a company scale. For NHH customer high use alerts, effectiveness would be monitored by tracking meter reads at each site.

There is no current scope to fast track this activity due to the work involved. The key risks associated with this activity are complaints, BR-MeX and the wrong customer or area is targeted. This could impact BR-MeX scores and potential savings. To mitigate this, targeted areas and data to be reviewed by multiple people.

WE005 Continuous flow messaging

Time to implement action:	**1 week**
Estimated saving:	24 l/prop/d

Remind customers to act if their smart meter identifies a continuous flow. Can be implemented in Level 1. The effectiveness of this activity can be measured through engagement and continuous flow changes. This activity will also be at a regional level and can be implemented at any time of the year. Additional resources on fixing leaks to be shared, aiding customers to get leaks repaired.

This activity can be fast tracked by escalating external communications, encouraging customers to repair any leaks identified by the smart meter. The biggest risk to this activity is that data on continuous flow is not available due to technical reasons. There are no recommended actions to mitigate this.

WE015 Behaviour change: Internal Water Efficiency awareness

Time to implement action:	**1 week**
Estimated saving:	0 l/d

Offering employees water saving tips and easy ways to reduce water consumption, have a stall in offices raising awareness of this. A water efficiency lunch and learn or an e-learning module. Can be implemented in Level 1 and effectiveness can be monitored by engagement with internal posts or emails. This activity is at a company level and sharing water efficiency messaging can happen at any time of year.

This activity can be fast tracked/scaled up through escalated communications via internal saving water posts and articles on our internal intranet. The key risk to this activity is if there is a lower impact than expected.

WE037 Clear information for visitors at NWG sites

Time to implement action:	**3 weeks**
Estimated saving:	0 l/d

Posters, information on screens around offices to raise awareness of drought status and share saving water tips. Can be implemented in Level 1 and the effectiveness can be measured by the number of visitors at the various sites or offices. Implementation of activity likely to be in the summer months. Lack of engagement would be the biggest risk associated to this action. This activity can be fast tracked by focusing on information on screens within offices to share water saving tips.

WE049 Reduce NWGs water consumption across all sites

Time to implement action:	**4 weeks**
Estimated saving:	2% of office use

NWG focus on own water use across all sites including treatment works; therefore, it is a companywide activity. Can be implemented in Level 1. We would monitor the effectiveness of the activity by tracking meter reads at each site. This could be implemented all year round. The biggest risk would be backlash from employees, asking why this action is not already implemented; however, to mitigate this we could share what the company has done to help reduce wasting water.

Level 2 Drought Actions

WE001 Water's Worth Saving Home Audits

Time to implement action:	**8 weeks**
Estimated saving:	60 l/prop/d

This project in the WRMP24 is known as the "Top 5% Highest Users Visits". For consistency, with internal and external communications, the project is now referred to as the "Water's Worth Saving" project. This project involves plumbers, via a contractor, to undertake an audit at the customer's property. The plumber will check for any dripping taps, showers or leaky loos and will repair where possible. Ideally the customer joins the plumber whilst they are carrying out this audit to increase engagement. There is also a survey done to help understand the customer's water uses, and any behaviours that might explain the high use. Water saving devices are installed and left where appropriate. Meter reads are taken two weeks before the audit,

at the audit and two weeks after the audit to measure the change in water consumption from pre and post audit.

This project is already running at full capacity, so we would be unable to increase the volume of visits in the event of a drought. However, with enough warning, we would be able to adjust the areas/postcodes that are sent invitations. Due to the planning time and dependant on customer uptake of the offer this has been placed as an option if we entered a Level 2 drought.

As mentioned above, we can be flexible with the postcodes that receive invites for visits. Therefore, if certain areas needed increased activity we could fast-track certain postcodes. The biggest risk with this activity is lack of customer engagement and uptake of visits, which can impact savings.

WE010 The Ripple Effect

Time to implement action:	**8 weeks**
Estimated saving:	6 l/prop/d

The Ripple Effect is our Water Efficiency education programme initiative: www.nwg.co.uk/responsibility/working-with-schools/the-ripple-effect/

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

We promote this initiative all year round and can increase promotion during prolonged dry weather to provide an educational resource to schools in order to change the water using behaviours of future generations at a large scale, known as The Ripple Effect.

The effectiveness of the promoting the scheme would be measured by the number of schools and children taking part. It is more about engagement and learning rather than direct savings. There is a limitation to this activity, it has to take place during term time and often requires being booked a couple of months in advance. The biggest risk related to this activity is lack of engagement from schools, resulting in the programme not being delivered.

WE052NHH Community funding

Time to implement action:	**12 weeks**
Estimated saving:	1%

Establishing Business fund to offer financial support to businesses to enable water saving, this is a Level 2 option and estimated to take three months to implement. Success of the activity would be monitored by tracking engagement and responses to how people reduced their water use. This activity could be implemented all year round

and there is no method currently in place to fast-track this activity. Again, lack of engagement is a key risk to this activity, if businesses do not engage with the funding opportunity then this activity will be unsuccessful.

WE019 Community Outreach

Time to implement action:	**4 weeks**
Estimated saving:	0 l/d

Invest in/recruit a reputable, well liked and well-known water warrior – someone to become our own influencer or community lead. Education, support, liaising with contacts in businesses and recruiting water saving champion customers to support with our water saving activity as integral members of communities which are hard to reach or disengaged from ESW. This could take 4 weeks to implement and is measured via engagement or number of events and could be implemented all year round. The outcome of this activity leads to increased awareness and engagement on saving water; however, there are no current methods to fast track this activity.

One risk is that the identification of the champion might be ineffective, causing lower delivery. To overcome this, more than one champion within a community could be recruited.

WE051NHH Home away from home support

Time to implement action:	**12 weeks**
Estimated saving:	10% (similar to home audits)

Working with Airbnb, holiday homeowners etc to reduce water use. Billboard equivalent at local tourist attractions with drought messaging. Success of this activity would be measured by monitoring engagement from Airbnb and holiday-home owners. We have estimated this might take around twelve weeks to implement this activity and could happen all year round, although would be most effective in holiday seasons.

Similar to other actions, lack of engagement is one of the biggest risks, followed closely by the impact is lower than proposed. Both risks will impact the potential savings.

Level 3a Drought Actions

WE003 / WE067 NHH Installation of flow regulators

Time to implement action:	**4 weeks**
Estimated saving:	21 l/prop/d (HH) 21 l/NHH

Installation of flow regulators on HH properties which fit a certain criterion (based on propensity to save water based on data model which is periodically refreshed). The effectiveness can be monitored via reduced water consumption on properties where they have been installed. This will take four weeks to implement and is stock dependent. There is an associated saving of 21 l/prop/d and can be installed any time of year, as this is already business as usual.

Where possible, if a NHH property fits criteria a flow regulator would be installed to reduce consumption by reducing water flow. This activity would be measured by taking meter reads at each site at time of installation and will take four weeks to implement. There is an associated saving of 21 l/NHH/day. Like HH properties, there is opportunity to implement this activity all year round.

There are two key risks associated with this activity. The first risk is lack of product for delivery; to mitigate this, drought risk will be monitored and adjust stock requirements as necessary. Similarly, the second risk is complaints and refusal of installation which could impact both C-Mex and BR-Mex. To mitigate this risk, ensure information about product and installation process is available to the customer or business.

WE028 Shower use intervention – digital device

Time to implement action:	**12 weeks**
Estimated saving:	5% of shower use

Digital devices for customers. Promoting reducing amount of time spent in the shower by providing customers with e.g. Aguardio shower sensor devices. During a level 3 drought, these devices could be distributed during the Water's Worth Saving audits. There Is a 12-week lead on this as we would need to order the devices, distribute to plumbers in areas of drought. Reporting within the project scope may need adapting to flag which properties have received an Aguardio shower sensor. This activity can be monitored by keeping record of which properties received a device and to see if consumption has changed over time with use of device.

Lack of product for delivery is a risk for this activity too; to mitigate this, drought risk will be monitored and adjust stock requirements as necessary.

Leakage and Network Drought Actions

Overview

Prolonged periods of drought may result in soil shrinkage and increased ground movement causing mains to fracture and leakage values to increase. We have made significant progress in reducing leakage from our network and already have some of the lowest levels of leakage in the country. However, we recognise that we must reduce leakage further and have agreed with our regulators that we will reduce leakage 40% by 2050 compared to our 2017/18 baseline. We will achieve this through the use of innovative technologies to find leaks, through additional resource for find and fix and through mains renewal.

Our supply network is divided up into District Metered Areas (DMAs) which are small managed areas of the network with flow meters monitoring inlet flows. All of our DMAs are reviewed on a weekly basis to prioritise the areas for leakage detection activities. This period can be shortened during drought or severe weather events and can be prioritised to address specific issues and areas of severe drought. We will also use historic data to understand the most likely part of a DMA to be leaking based on the weather conditions which will help us to find the problem quicker.

Increased Leakage Find and Fix during Drought

We know that during drought, when we are asking customers to reduce their own water use, our customers will rightly expect us to promptly repair any burst pipes. During prolonged dry weather, the number of burst water mains can increase by 60% over a month. Consequently, we will ensure that workloads are prioritised and if necessary, resources are increased, in order to repair all visible leaks as soon as possible, often the same day. This is a key aspect of working with our customers to reduce overall water demand during a drought.

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

Reduce Mains Pressure

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

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

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

Applying for a drought permit and demonstrating control of demand through leakage

We have a number of supply side drought actions which, if needed, will require us to apply for a drought permit. If we ever need to apply for a drought permit we will need to demonstrate to our customers and to our regulators that we have taken all reasonable action to control demand through leakage reduction. The requirements of this are covered in Appendix G of the Environment Agency's Droughts Permits and Drought Order Supplementary Guidance. This states that,

> "…during a normal year, a water company is expected to achieve leakage targets set by Ofwat and that during a year when there is prolonged dry weather, leading to a drought, the water company is expected to follow its published drought plan and increase work to reduce the amount of water lost via leakage".

In the event we need to apply for a drought permit, we will provide detailed information on how we have controlled leakage in the period of time before submitting the drought permit application together with details of how we have controlled demand. We would determine the period of time enhanced leakage reduction is required prior to a permit application during pre-application talks with the Environment Agency. As a minimum, we will:

- provide an estimate of how leakage has been reduced as a result of drought action measures;
- confirm how we have increased resources to reduce leakage;
- benchmark pre and post-drought action find and fix rates;
- provide details of leakage reduction public awareness campaigns.

Operational Water Usage: Flushing of water mains

Regular flushing of our water mains is a necessary requirement to ensure compliance with drinking water quality regulations. However, during a drought, this may send out the wrong message to our customers.

During a drought, we will consider suspending our flushing programme. This could save 0.04 Ml/d and will support our water efficiency messages. Some flushing may always be necessary for hygiene purposes and we would never compromise on this.

On top of these BAU activities we have looked at what additional actions we could take at the different drought levels to try to reduce leakage further.

Table 4: Leakage and network drought actions

Drought level	Drought severity	Leakage and Network Drought Actions
0	Normal	BAU including leakage network optimisation and WRMP24 leakage reduction strategy for leakage detection and repair suite of options.
1	Prolonged dry weather	Extended working hours for LT's and crews Redeploy internal teams Adapt DMA prioritising process for leakage Use mains risk modelling to identify pipe failure hotspots Prioritise leak repairs Encourage reporting of leaks Stop proactive flushing Optimising water supply and network. Reduce all customer pressures to 15m high at critical point in pressure managed areas.
2	Drought	Additional resource to find leaks (contractors, sniffer dogs, satellites, noise loggers) Offer to repair the highest volume customer-side leaks (CSLs).
3a		Reduce customer pressures to 10m high at critical point in pressure managed areas. Minimise minimum flows at WTW Optimising water supply and network.
3b	Severe drought	Minimise minimum flows at WTW Optimising water supply and network.

Forming the constrained list

All of the unconstrained actions were reviewed to understand whether they would be possible to implement, how quickly they could be started and how much they would cost against the potential benefit. Anything that wasn't a viable option was removed from the final constrained list.

Level 1 Drought Actions

L001 & L010 Extended working hours for LT's and Crews

Time to implement action: 1 day

Estimated saving: 0.5m3/d/person or 8m3/d/job

We will maximise the work time of our existing experienced technicians, particularly on night shifts when the network is quieter. This could be implemented quickly but is dependent on the willingness of staff to work overtime. The benefit would be tracked through the LT performance dashboard which monitors leak jobs raised and night line reduction.

L002 Redeploy internal teams

Time to implement action: 1 day
Estimated saving: 0.5m3/d/person

We can mobilise people from other business units to support leak detection activities, although this is not as effective due to a lack of skill and equipment, they are most likely to identify visible leaks. This could be implemented quickly but is dependent on the willingness of staff to carry out activities different to their normal role. It would be difficult to track individuals' performance but there should be a general uplift in leakage jobs raised.

L007 Adapt DMA prioritisation process

Time to implement action: 1 day
Estimated saving: 0Ml/d at a company level

Normally DMAs are targeted based on the highest excess of leakage across the whole region but in drought conditions there might be some areas at a higher risk than others, so these need to be prioritised accordingly. This can be implemented quickly, and communication channels remain open between the control room and leakage analysts to update on the key areas of focus. There is a risk that targeting the highest risk areas rather than the highest leakage, could be detrimental to the leakage performance at a company level but this will be closely managed. The benefit could be tracked by monitoring the impact on the reported leakage and DI figures in the area of concern.

L008 Mains risk model utilisation

Time to implement action: 1 day
Estimated saving: 8m3/d/job

Use historic failure data and weather models to predict the most likely part of the network to leak based on the current weather conditions. This will help to reduce survey times by finding leaks quicker and so Leakage Technicians can get through more areas. There is a risk that the leaks occur on a different part of the network than highlighted and there is limited time saved compared to a full survey. We would be able to monitor the actual survey times against the expected for each DMA to see if they are being completed quicker, the number of DMAs surveyed per LT should increase as well.

L009 Prioritisation of leak repairs

Time to implement action: 1 day
Estimated saving: 8m3/d/job

Prioritise leak repairs over all other work in the job basket to ensure they are fixed as quickly as possible, reducing the water lost during this time. This can be implemented quickly within the planning and scheduling team but will put the performance of other service level agreements at risk. Performance can be tracked through dashboards that monitor the number of outstanding leakage jobs and average leak repair times.

L014 & L015 & L016 Encourage customers to report leaks

Time to implement action: 1 day to 1 week

Estimated saving: 8m3/d/job

Encourage customers to look out for leaks and report any issues into the leakage portal on our website. Easy to implement but could generate lots of additional contacts that need investigation and potentially a lot of false positives (ie. Not leaks). Can be monitored through analysis of customer reported leaks compared to the average expected.

L018 Stop Proactive Flushing

Time to implement action: 1 day

Estimated saving: 0.1Ml/d

Temporarily pause proactive flushing of the network to reduce the amount of potable water wasted. This can be stopped immediately and the flushing technicians put onto other work to support leakage activities (L002). There is a risk that this could have a detrimental impact on our water quality contacts performance but as this is a proactive programme, a short break shouldn't be significant. A reduction in water use will be seen on the standpipe meters which are used to record the volume used for flushing.

L023 Optimise Water Supply

Time to implement action: 1 day

Estimated saving: 0Ml/d at a company level

Minimise impounding reservoirs sourced Water Treatment Works and maximising river sourced Water Treatment Works, subject to the conditions of the water course. This is likely to be more expensive to treat the water as we move away from the optimised production plan and is still limited by the treatment capacity at each WTW. Benefits can be monitored through the DI figures at each WTW.

L024 Optimise Water Network

Time to implement action: 1 day

Estimated saving: 0Ml/d at a company level

Remotely and manually change sections of the network to be supplied by river sourced Water Treatment Works. Any valve operations or network changes pose a risk but with the right mitigations in place the impact to customers can be minimised. Benefits can be monitored through the DI figures at each WTW.

L025 Manage customer pressures to 15m high

Time to implement action: 2 weeks

Estimated saving: 15% in PMAs

Reduce pressure managed areas to 15m at the highest point which is the minimum target pressure in the mains to achieve our minimum standards to customers. Analysis will need to be done to identify the target pressure for each PRV in order to deliver 15m at the highest point. Where PRV controllers are installed, these can be remotely changed, and the settings will be implemented the next time the device communicates. For fixed outlet PRVs, these will need to be visited by an engineer and the settings manually adjusted, which will take longer to get around all the sites. Customers are likely to notice a drop in pressure and may have issues with some of their appliances, like showers and boilers not working. These will need to be managed individually to see if they can be resolved locally or if the pressure needs to go back up slightly. This will need to be supported with customer comms to make it clear that a supply of water at lower pressure is required to prevent running out of water in future. The impact can be monitored through the DMA night lines once a pressure reduction has been carried out.

L026 Optimise Network Storage

Time to implement action: 1 day
Estimated saving: 0Ml/d at a company level

Manage large size grouped area (SZ) storage to below normal target levels (low alarm). The water in storage will be allowed into the network to be consumed by customers, this would put us at a higher risk of an interruption to supply if there are any issues on the network, like a significant burst, because there is less water in reserve to cope with a demand spike. The extra water made available could be calculated from the drop in service reservoir storage.

Level 2 Drought Actions

L003, L004, L005, L006, L011 Additional resources

Time to implement action: 4 to 6 weeks
Estimated saving: 5m3/d/person

Work with our contract partners and supply chain to bring in additional find and fix short term resources to help us to find and repair more leaks. We can speak to contractors to find out what resources they have available but there is often a lead time to bring people in from other projects. Other water companies are normally in a similar position so there is a high demand and limited availability. It is also expensive to bring in experienced resources on a short-term basis. We may look to use technologies, like satellite imagery or acoustic noise loggers, to help make our existing technicians more productive rather than getting additional people. Benefits can be tracked through additional leaks raised/repaired and the impact on DMA night lines.

L012 Repair the highest volume CSL's

Time to implement action: 2 weeks
Estimated saving: 5m3/d/job

Our current supply pipe repair policy supports customers to fix their own pipes which on average takes about 30 days. We could repair all the outstanding CSL jobs we are

aware of to get a quick reduction in leakage. We would need to have the resource available to repair these jobs ourselves and we would need the customers permission to carry out the repair on their pipe. This would be a temporary change to policy which could be seen as an enhanced service to some customers. Leakage reductions would be calculated through DMA night lines once the repair has been done.

Level 3a Drought Actions

L027 Optimise Water Supply

Time to implement action: 3 days
Estimated saving: 0Ml/d at a company level

Minimise below normal Water Treatment Works' minimum flows at all impounding reservoirs sourced Water Treatment Works and maximising river sourced Water Treatment Works above normal parameters. This is likely to be more expensive to treat the water as we move away from the optimised production plan and is still limited by the treatment capacity at each WTW. Benefits can be monitored through the DI figures at each WTW.

L028 Optimise Water Network

Time to implement action: 1 day
Estimated saving: 0Ml/d at a company level

Remotely and manually change sections of the network to be supplied by river sourced Water Treatment Works. Any valve operations or network changes pose a risk but with the right mitigations in place the impact to customers can be minimised. Benefits can be monitored through the DI figures at each WTW.

L029 Managing customer pressures

Time to implement action: 2 weeks
Estimated saving: 30% in PMAs

Reduce pressure at the high point below the target levels of service so customers experience low pressure but will hopefully reduce the demand enough that the water doesn’t run out. Analysis will need to be done to identify the target pressure for each PRV. Where PRV controllers are installed, these can be remotely changed, and the settings will be implemented the next time the device communicates. For fixed outlet PRVs, these will need to be visited by an engineer and the settings manually adjusted, which will take longer to get around all the sites.

L030 Network storage

Time to implement action: 1 day
Estimated saving: 0Ml/d at a company level

Manage large size grouped area (SZ) storage to below normal target levels (low alarm). The water in storage will be allowed into the network to be consumed by customers, this would put us at a higher risk of an interruption to supply if there are any issues on the network, like a significant burst, because there is less water in reserve to cope with a demand spike. The extra water made available could be calculated from the drop in service reservoir storage.

Level 3b Drought Actions

L032 Network storage

Time to implement action: 1 day
Estimated saving: 0Ml/d at a company level

Manage large size grouped area (SZ) storage to below normal target levels (low low alarm). The water in storage will be allowed into the network to be consumed by customers, this would put us at a higher risk of an interruption to supply if there are any issues on the network, like a significant burst, because there is less water in reserve to cope with a demand spike. The extra water made available could be calculated from the drop in service reservoir storage.

Demand (Other) Actions

Overview

There are a number of drought actions that sit outside of water efficiency, leakage or network planning activities which are detailed in this section. These include changes to unbilled use, communication campaigns as well as the overarching drought actions for each level; appeal for restraint, TUBs and NEUBs. We have reviewed a wide range of demand drought actions for this plan and our constrained list builds on our normal BAU activity.

Further detail for TUBs and NEUBs is also available in Appendices 13-17.

Table 5: Demand (Other) drought actions

Drought level	Drought severity	Demand side Drought Actions
0	**Normal**	WRMP24 Demand Management Options (including enhanced optant smart metring strategy, government led interventions and customer communications).
1	**Prolonged dry weather**	Appeal for restraint Requesting local council promotion of drought communications Enhanced dry weather messaging
2	**Drought**	TUB Challenging illegal use
3a		NEUB Hard hitting customer communications
3b	**Severe drought**	Removal of Statutory exceptions and discretionary universal exceptions on TUBs and NEUBs Seasonal tariffs for smart meter customers Reduction in ships watering

Forming the constrained list

There were 14 actions in our unconstrained list for demand (other) actions. To form our constrained list we estimated the implementation time, tracking capability, demand savings and how appropriate it was for a range of droughts. Assessing each of these components for each action gave us an insight early on into the perceived effectiveness of the action in drought conditions. Four actions were not taken through to the constrained list. Three of these actions related to meter installs:

- Refocus smart meter installation on replacements to specific area
- Refocus smart meter installation for compulsory metering to specific area
- Encouraging more customers to request/opt for a meter

These were discounted as the demand saving would not be achieved quick enough to have an impact during drought. The reliance on network installation to receive reads and the timing of customer bills would increase the length of time before a saving would be seen. The technician resource to refocus smart meter installation would also likely be redeployed for leakage activity during drought as well.

For more information on our metering activity please see Appendix 12.

One other action was discounted which was the relocation of farm stock and businesses during drought. This was discounted as it would require a national effort to undertake and decisions would sit within Government as to management. Given drought tends to effect large parts of the UK at the same time then longer distances and multiple areas of the UK would be vying for the same relocation for farm stock and

businesses. It is an action that could be considered during emergency drought status if the drought was constrained to a small locale.

Level 1 Drought Actions

D003 Requesting local councils to promote drought communications

Time to implement action:	2 days
Estimated saving:	0.8 litres/property/day

This action looks at collaborating with local councils to promote drought communications. The benefit is that customers should receive the same messaging but from another trusted source with the aim of increasing behaviour change of our customers. We already have good relationships with our councils therefore we believe the implementation time of this action should be short with councils promoting messaging within a week. Estimated demand savings have been calculated using our WETT tool which estimates based on engagement level a l/p/d value. The effectiveness would be tracked by visual confirmation of the messaging going out into the local council's area. The action could be fast tracked through engagement with local councillors and MP's.

The key risks associated with the action relate to the council's declining to collaborate during drought or delaying the action. This should be mitigated through early liaison with the councils during the drought.

D010 Enhanced dry weather messaging

Time to implement action:	2 days
Estimated saving:	2.7 litres/property/day

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

This action would link directly into the communications plan and involves supplementing water efficiency messaging with specific messages for the customers in water resource zones including current drought conditions, weather, PCC and reservoir / groundwater levels. The aim is to give customers the detail to make an informed decision to take action themselves. It is expected to primarily use social media and therefore implementation time is short and effectiveness tracked through the number of interactions with social media content. It is estimate to produce a 2.7 l/prop/d saving based on WETT behavioural change estimates with low levels of engagement although more effective during spring/summer due to associating with current drought conditions.

The key risks relate to delays in content design which should be mediated through advance planning and customer complaints which with a clear call to action should be minimised.

D011 Appeal for Restraint

Time to implement action:	5 days
Estimated saving:	1.7% reduction in DI

Some droughts, typically those of short duration, do not require us to place restrictions on the use of water. We would always ask our customers to use water wisely. However, as a period of prolonged dry weather develops, we may need to implement a formal Appeal for Restraint. We would use all of our communication channels (e.g. social media and press releases) to formally ask our customers to Use Water Wisely. Examples of messages are detailed in our Communications Plan (see Section 10 in the main report) and include 'having a shorter shower – we recommend 4 minutes' and use a water butt to collect and store rainwater'.

We would expect to be able to implement this within five days as part of the Communications Plan. The estimated saving is set at 1.7% as per the latest UKWIR report findings from the 2022 drought on level 1 actions[8]. The effectiveness of the formal appeal can be tracked through a reduction in daily DI.

The largest risks include the aforementioned reduction in expected demand savings, customer complaints, and delays in implementation. Monitoring daily DI, clear calls to action and good relations with media partners should alleviate these risks.

Level 2 Drought Actions

D006 Temporary Use Bans

Time to implement action:	9 days
Estimated saving:	6.6% reduction in household demand 3.34% reduction in DI

Temporary Use Bans, commonly referred to as TUBs (and historically referred to as a hosepipe ban) are powers granted to water companies to impose restrictions on customers' water use. They predominantly focus on water use by domestic customers as this provides the largest water saving. TUBs can be introduced quickly just seven days after an advert is placed.

Following a review of the 2022 drought demand management measures[9] the introduction of a TUB produced a 3.34% reduction in DI and a 6.60% reduction in household demand and is deemed to have a significant impact on demand reduction. To maximise the effectiveness of TUBs it is recommended that they are implemented early on in the Spring-Summer season.

We aim to implement TUBs at a Drought Management Area level (e.g. Essex area or Suffolk area). Any lower geographical area may cause confusion amongst our customers.

[8] UKWIR (2023) Review of the 2022 Drought demand management measured 23/WR/02/18
[9] UKWIR (2023) Review of the 2022 Drought demand management measured 23/WR/02/18

The largest risks to TUBs is that there is no demand reduction and customer complaints. Clear advice on why the ban is in place alongside government and media advocation should help alleviate customer complaints. Daily monitoring of DI ensures TUB effectiveness is reviewed regularly.

More detailed information on TUBs is found in Appendices 13-15.

D004 Challenging Illegal Use

Time to implement action:	2 days
Estimated saving:	0.01 Ml/d

Day to day water is illegally abstracted from the water network namely from void properties (customers and present but are not paying for their water) and standpipe use (companies using other water company standpipes on our network). This use is challenged as BAU however during a drought we would increase this activity with more internal employees trained to challenge suspicious standpipe activity.

We would expect to be able to implement this action within two days with training available online and managers promoting to their teams. The number of challenges recorded by teams will provide a way to gauge the effectiveness of the action and the action can be scaled up through employee incentivisation. The largest risk to the action would be customer complaints impacting DMEX, with clear customer actions and messaging a way to counter this.

The saving is estimated at 0.01Ml/d based on current illegal use activity.

Level 3a Drought Actions

D013 Hard hitting customer communications

Time to implement action:	7 days
Estimated saving:	10.8 l/prop/d

As a severe drought develops, we will change customer communications to specific hard-hitting messaging on the water resource situation. This will present the critical situation clearly and concisely to our customers, and we envisage a similar level of messaging to that used in 2018 Cape Town ‘Day Zero’ drought campaign.

We expect this to take a maximum of 7 days to implement and expect to achieve 10.8 litres per property per day reduction based on WETT behavioural change estimates with high levels of engagement.

The largest risks to this action is delays in getting the messaging out through advertising partners and customer complaints. Using advertising partners we already have a relationship with and contacting them early should alleviate delays. Clear calls to action and the reason behind the messaging should help reduce the number of complaints.

D007 Non-Essential Use Ban

Time to implement action:	3-14 weeks
Estimated saving:	2% reduction in DI 9% reduction from NHH consumption

Non-Essential Use Bans (NEUB's) are tougher restrictions on the use of water when drought conditions persist and primarily impacts businesses prohibiting them for using water for non-essential purposes.

It is very difficult to estimate the effect of this type of water use restriction on customer demand as there is very little data available. We have assumed that further restrictions on water use beyond that of temporary use ban will yield an additional reduction in DI of 2% made up of about 3.3% reduction in NHH demand (half of TUB saving for household demand).

The timescales for implementing a NEUB are significantly longer than a TUB as the Secretary of State would typically require a public enquire to be held if an objection were received. As an absolute minimum with no objections or delays it could be in place within 3 weeks but is more likely to take far longer.

We aim to implement NEUBs at a Drought Management Area level (e.g. Essex area or Suffolk area). Any lower geographical area may cause confusion amongst our customers.

The largest risks are that there is no demand reduction and customer complaints. Clear advice on why the ban is in place alongside government and media advocation should help alleviate customer complaints. Daily monitoring of DI ensures NEUB effectiveness is reviewed regularly.

More detailed information on NEUBs is found in Appendices 16-17.

Level 3b Drought Actions

D008 Reduction in Ships Watering

Time to implement action:	7 days
Estimated saving:	0.09 Ml/d

Other potential demand reducing measures to be considered include ships watering in Northern/Central Zone (Suffolk Coastline). Currently ESW supplies around 65Ml per year for the purposes of ships watering, predominantly via Great Yarmouth. In a drought this quantity could potentially be reduced by only supplying the essential amount of water required for a ship to get to its next port. It is estimated that only a relatively small quantity (approximately half) would be saved in a year.

This option would not require a drought permit or drought order and could be more effective during the summer months when more cruise ships are active. Customer complaints are thought to be the biggest risk for this action with clear advice and enough notification to ports a way to relieve.

D005 Introducing seasonal tariff for smart meter customers

Time to implement action:	28 days
Estimated saving:	3-5% reduction in PCC

For a Water Resource Zone that is fully smart metered we would introduce a seasonal tariff during a very severe drought. For example, this could be anything greater than 110 litres per head per day is charged at a higher rate or all water for the next 6 weeks is charged at a higher rate. We estimate this could give a 3-5% reduction in PCC and take a minimum of 28 days to implement which includes a 14-day notice period for customers.

The biggest risk is customer complaints and disadvantaging our vulnerable customers. Clear communication and a good notice period should help reduce the impact on complaints. Ensuring Watersure and Priority Services are accounted for will help reduce the impact on our vulnerable customers.

D012 Removal of Statutory Exceptions and Discretionary Universal Exceptions on TUBs and NEUBs

Time to implement action:	21 days
Estimated saving:	1% of NHH consumption

The implementation of TUBs and NEUBs in earlier drought levels will come with some statutory exemptions. In the case of very severe droughts these exemptions will be removed. It is estimated this could save approximately 1% from NHH consumption and take 21 days to implement although will require Government support. The biggest risks are customers not adhering to the ban alongside customer complaints. Government support alongside clear messaging should help resolve these risks.

More information on the removal to exceptions can be found in Appendix 17.

APPENDIX 10: SUPPLY SIDE DROUGHT ACTIONS

This Appendix outlines our L1 to L3b supply side drought actions, and the drought permits/orders we would consider implementing during a drought. A summary of the environmental assessments carried out for all supply-side drought actions can be found in Appendix 11.

Drought Action name	EA River Flow Augmentation Schemes
Drought Level	Level 1
Water Resource Zone	Essex
Summary of Action	Additional transfers of groundwater into the River Stour and Great Ouse to augment river flow.
Trigger for action	Abberton and Hanningfield Reservoir storage control curves, as agreed with the Environment Agency.
Estimated benefit/saving	Historical licence-use dependent – have annual and aggregated licences which restrict volumes.
Barriers to implementation	Volumes are dependent on the daily, annual and aggregated borehole abstraction licence which supply the water.
Environmental impacts	See Appendix 11.
Timescales	Less than 2 weeks to implement, active until recovery above relevant control curve or when natural river flows are great enough that augmentation scheme support does not provide additional benefit.
Priority order for implementation	• As a Level 1 supply-side drought action, this will be one of the first drought actions to be implemented following the implementation of Level 1 demand-side actions. • It is the only Level 1 supply-side action for the Essex supply area, so will be the first supply-side action to be implemented if the region is deemed to have a supply shortage during a drought.

Drought Action name	Road tankering potable water from Carlton Colville Pumping Station to Bedingfield and Eye.
Drought Level	Level 1
Water Resource Zone	Hartismere, Blyth.

Summary of Action	Transport of potable water from Carlton Coalville reservoir to treatment works in Blyth and Hartismere WRZs.
Trigger for action	Decision made through supply meetings based on routine monitoring of water resource utilisation; treatment works utilisation, network storage and weather predictions.
Estimated benefit/saving	0.03 Ml (30 m^3) per tanker
Barriers to implementation	• Relies on available hydrants to inject water into the network without causing issues • Volume is dependent on resource availability.
Environmental impacts	See Appendix 11.
Timescales	Implemented within 24 hours for 4 tankers (additional barrels require longer), can be in place for duration of the drought event, decided through regular supply meetings.
Priority order for implementation	• As a Level 1 supply-side drought action, this will be one of the first drought actions to be implemented following the implementation of Level 1 demand-side actions. • It is the only Level 1 supply-side action for the Suffolk supply area, so will be the first supply-side action to be implemented if the region is deemed to have a supply shortage during a drought.

Drought Action name	**Denver Hands-off flow Drought Order**
Drought Level	Level 2
Water Resource Zone	Essex WRZ
Summary of Action	Drought order to reduce the HOF from 318.23 Ml/d to 113.65 Ml/d 1 March to 30 April to access more water from the EOETS, which is known to be constrained in a drought by the Denver HOF.
Trigger for action	When Essex combined reservoir storage reaches the SAGS control curves (equivalent to a 1 in 15 year return period), to allow lead in time for when/if the Level of Service 2 curve is reached.

Estimated benefit/saving	If full transfers are required for the period of the drought order, then a maximum support from the EOETS would be 19,032Ml i.e. 312Ml/d.
Barriers to implementation	Drought order required (risk of refusal).
Environmental impacts	See Appendix 11.
Timescales	8-12 weeks to apply for drought order, in place from March to end April when applicable.
Priority order for implementation	• As this is a Level 2 drought action, the drought order will be implemented when the trigger is met, providing that all applicable level 1 drought actions, both supply and demand side, are in place prior to its implementation. • The drought order has been designed to promote Essex reservoir re-fill prior to summer high demands following a dry summer, so an assessment will be made on the suitability of demand-side action implementation during the time of application.

Drought Action name	**Bulk water transfer from Thames Water to Chigwell WTW**
Drought Level	Level 3a
Water Resource Zone	Essex WRZ
Summary of Action	Fair apportionment of the volume of bulk water transfer from Thames Water Utilities (TWU), by agreement, to Chigwell WTW.
Trigger for action	When TWU enter their Stage 3 drought restrictions. Both ESW and TWU must have a TUB in place.
Estimated benefit/saving	Fair apportionment of water is agreed upon by the circumstances of each drought event.
Barriers to implementation	Dependent on: - TWU's resource situation (requires their consent). - Nature and spatial distribution of the drought.
Environmental impacts	See Appendix 11.
Timescales	Less than 2 weeks to implement.

Priority order for implementation	• This drought action is a level 3a which means it will not be implemented until the trigger has been met and the applicable Level 1 and 2 supply and demand side drought actions have been fully implemented within the Essex WRZ.

Drought Action name	Coldfair Green Drought Permit
Drought Level	Level 3b
Water Resource Zone	Blyth WRZ
Summary of Action	Drought permit to: 1. to temporarily increase abstraction for Public Water Supply (PWS), from 2.73 Ml/day to 3.102 Ml/day 2. to retain increased PWS abstraction, and temporarily reduce compensation flow, from 0.205 Ml/day to 0.102 Ml/day 3. to retain increased PWS abstraction, and temporarily cease compensation flow (0 Ml/d). at Coldfair Green
Trigger for action	Crag Aquifer in Suffolk drought monitoring boreholes reaching trigger level 3
Estimated benefit/saving	0.48 Ml/d under Step 3.
Barriers to implementation	Drought permit required (risk of refusal).
Environmental impacts	See Appendix 11.
Timescales	4-6 weeks to apply for drought permit, ≤ 6 months with permit in place.
Priority order for implementation	• This is a level 3b extreme supply-side drought action it will not be implemented until the trigger has been met and the applicable Level 1 and 2 supply and demand side drought actions have been fully implemented across the Suffolk supply area.

Supply Side Drought Actions Rejection Register

The table below details those supply-side drought actions included in our unconstrained list, but which were screened out as being infeasible. The drought action is described and the rejection reason given.

Drought Action name	Summary of action	Water Resource Zone	Rejection Reason
Bedingfield Licence Variation	Drought permit to increase annual abstraction licence from 200Ml/yr to 250 Ml/yr to avoid licence breaches from abstraction in the autumn and winter following high summer usage.	Hartismere	• Abstraction licence is subject to ongoing Habitats Regulations investigation by the Environment Agency into the impacts of abstraction on the Broads SAC • Natural England stated that a Habitats Regulations Assessment is unlikely to be approved and signed off. • Network modelling would be required to confirm utilisation of the additional water.
Ormesby Broad/River Bure Licence Variation	Drought Permit to either: - increase annual licence to avoid licence breaches from abstraction in the autumn and winter following high summer usage in drought conditions; - increase April to October quantities during a drought during peak demand conditions.	Northern Central	• Abstraction licence is subject to ongoing Habitats Regulations investigation by the Environment Agency into the impacts of abstraction on the Broads SAC • Natural England stated that a Habitats Regulations Assessment is unlikely to be approved and signed off. • Due to perceived environmental impact, the Environment Agency stated only the Bure abstraction would be permitted to increase, Ormesby Broad could not.

	on the Ormesby/Bure abstraction licence		• The requirement to comply with the Hands Of Flow (HOF) conditions may constrain the ability to increase abstraction under the drought action.
Lound Licence Variation	Drought Permit to either: - increase annual licence to avoid licence breaches from abstraction in the autumn and winter following high summer usage; - increase April to October quantities during a drought during peak demand conditions. on the Lound abstraction licence.	Northern Central	• Abstraction licence is subject to ongoing Habitats Regulations investigation by the Environment Agency into the impacts of abstraction on the Broads SAC • Natural England stated that a Habitats Regulations Assessment is unlikely to be approved and signed off.
Redgrave Group Licence Variation	Drought permit to increase annual group aggregate from Eye, Mendlesham & Syleham sources only.	Hartismere	• Abstraction licence is subject to ongoing Habitats Regulations investigation by the Environment Agency into the impacts of abstraction on the Broads SAC • Natural England stated that a Habitats Regulations Assessment is unlikely to be approved and signed off. • Network modelling indicated that the network would not be able to cope with the increased peak flows or the reduced average flows caused by the implementation of the drought action.

Grange & Juby Farm / River Bure Licence Variation	Drought order to increase abstraction at Grange Fram & Juby Farm to be discharged as compensation flow into the River Bure to allow increased abstraction under the River Bure licence by maintaining HOF conditions. This drought order was proposed to be used in conjunction with the River Bure licence variation action, or as an alternative.	Northern Central	• Abstraction licence is subject to ongoing Habitats Regulations investigation by the Environment Agency into the impacts of abstraction on the Broads SAC • Natural England stated that a Habitats Regulations Assessment is unlikely to be approved and signed off.
Temporary Horning Abstraction	Drought action to use the Horning abstraction point, which is currently out of supply, instead of the current Belaugh abstraction to avoid the HOF constraints at Belaugh.	Northern Central	• Abstraction licence is subject to ongoing Habitats Regulations investigation by the Environment Agency into the impacts of abstraction on the Broads SAC • Natural England stated that a Habitats Regulations Assessment is unlikely to be approved and signed off. • The Eels (England and Wales) Regulations 2009 would require the installation of a compliant eel screen at the Horning abstraction point.
WAGS Licence Variation	This drought action would include 3 steps during its implementation:	Northern Central	• Abstraction licence is subject to ongoing Habitats Regulations investigation by the Environment Agency into the impacts of abstraction on the Broads SAC

	- A drought order to increase the WAGS support for the River Waveney abstraction at Shipmeadow to increase above 16 Ml/d. - The reduction of the HOF on the Shipmeadow licence Increase in annual abstraction and any future multi-year licence constraint on the WAGS abstraction licences		• Natural England stated that a Habitats Regulations Assessment is unlikely to be approved and signed off.
Raw Water Bulk Transfer Agreement – Abberton Reservoir	This would involve a two-way bulk transfer agreement of raw water between Essex & Suffolk Water, Anglian Water (AWS) and Affinity Water. The transfers would relate to water from Abberton & Ardleigh, depending on which reservoir has the most water when the action was implemented.	Essex	• The action would require consideration of Habitats Regulations implications from additional drawdown on Abberton Reservoir if water is being transferred to AWS or Affinity Water. • The action has too long a lead time due to the requirement of new infrastructure to enable the transfer.
Saxmundham Licence Variation	- Drought permit to increase daily maximum abstraction from 0.91 Ml/d to 1.2 Ml/d.	Blyth	A review of the Deployable Output and drought yield assessment for WRMP24 suggests that 1.2 Ml/d is no longer valid for this abstraction site

Compensation Flow Reduction – Hanningfield Reservoir	Drought permit to reduce the 0.909 Ml/d compensation flow from Hanningfield Reservoir into Sandon Brook and instead put water into public water supply when reservoir levels approach emergency storage levels.	Essex	• Potential environmental impacts through ecological stress and WFD status of Sandon Brook outweigh the potential benefit to deployable output. • Linked to Emergency storage in Hanningfield Reservoir so will be included in Emergency Plan.
SAGS Licence Variation	Drought order to increase the 15-year abstraction volume from the SAGS abstraction licences when there are several significant droughts within the 15-year period.	Essex	• Modelling has indicated that the drought order would not be implemented in the 100-year period, with no benefit to deployable output. • There is no likelihood of needing this drought order within the lifespan of this Drought Plan 2027.
Langford Mill Licence Variation	Drought permit to reduce the compensation flow into the River Blackwater downstream of the Langford Mill intake to be used for public water supply by maximising reservoir re-fill.	Essex	• Potentially high environmental impact. • Negligible benefits for deployable output.
River Chelmer Compensation Flow Reduction	Drought permit to reduce the compensation flow into the River Chelmer downstream of Beeleigh Tilting Weir to be used for public water supply by maximising reservoir re-fill.	Essex	• The eel pass to be installed on Beeleigh Tilting Weir requires the maintenance of some flow.

Aldeburgh Licence Retention	This drought action involves the retainment of the Aldeburgh abstraction licence, with a change in use to drought purposes with water being tankered elsewhere for treatment.	Blyth Northern Central	• Source has been out of supply for some years. • Uncertainty of if treatment can occur at another works due to lack of water quality data. • Uncertainty of the reliability of shallow groundwater sources under drought conditions. • Abstraction licence is subject to a WFD no deterioration cap reducing annual licence from 75 to 16 Ml/yr, but with daily max. of 1.364 Ml/d. • Water requires road tankering to another treatment works for treatment.
Alder Carr / Quay Lane Licence Purpose Change	This drought action involves the change of purpose of Northern Central BH11 to drought purposes, with water being tankered elsewhere for treatment or through mobile treatment onsite.	Northern Central	• Source has been out of supply for some years. • Uncertainty of if treatment can occur at another works due to lack of water quality data. • Uncertainty of the reliability of shallow groundwater sources under drought conditions.
Eye No. 2, Syleham Crag No. 1, Wortham No. 1, Mendlesham, Rickinghall No. 5,	This drought action involves the lowering of the borehole pumps in the Blyth and Hartismere Water Resource Zones.	Blyth Hartismere	• All licences are subject to ongoing Habitats Regulations investigation by the Environment Agency into the impacts of abstraction on the Broads SAC and Waveney Little Ouse Valley Fens SAC. • Natural England stated that a Habitats Regulations Assessment is unlikely to be approved and signed off.

Barsham Hall Pump Operation			• Constraints on taking boreholes out of supply to lower the pumps without additional resilience being available through a duty/standby.
Ball Lane Licence Variation	Drought permit to increase the annual abstraction licence volume to maximise reservoir refill in the winter following a summer drought.	Essex	• Potential Water Framework Directive impact on the Roman River. • Uncertainties for an appropriate trigger and the scale of benefit the action would bring.
Sea Tankering	A service provided by EDRS (Extreme Drought Resilience Service https://edrsl.com/) to transport pristine raw water from Norway via sea tanker to a coastal location within our operational area.	All	• High uncertainty with regards to regulatory support for activity from Defra, Environment Agency and Drinking Water Inspectorate. • Unquantified risk of INNS contamination.
Temporary Desalination	Desalination of Brackish Water via skid-mounted mobile Reverse Osmosis plant.	All	• Yield would be small (~5 Mld), constrained by the maximum size of plant transportable by road. • The locations for such a unit with an adequate supply of brackish water are limited to coastal or estuarine areas. • To feed directly into the network, every component of the plant would need to be Reg 31 compliant. • Extensive testing required on source water for a large range of compounds to understand the requirement of the RO unit.

- DWI requirements for customer acceptability means blending capability would likely limit feasibility.
- The lead-in time to order, agree contractual arrangements with a supplier, plant delivery, plant commissioning and testing, and providing linkage to the supply network, is such that this action is infeasible.

Drought Permits/Orders

Drought permits and order are designed to help water companied manage water resources during drought. They are used when normal drought management measures, such as demand reduction, leakage control and Temporary Use Bans (TUBs) are insufficient.

A drought permit is issued by the Environment Agency (or Natural Resources Wales for Wales) under Section 79A of the Water Resources Act 1991. It authorises a water company to:

- Take water from a specified source.
- Temporarily modify or suspend restrictions or obligations on an existing abstraction or impoundment licence.

A drought order is made by the Secretary of State (or Welsh Ministers) under Sections 73–75 of the Water Resources Act 1991. There are two types:

- Ordinary drought order – allows actions such as:
    - Taking water from specified sources.
    - Restricting non-essential water uses (under Drought Direction 2011).
    - Suspending or modifying obligations on water abstraction, discharge, or supply.
- Emergency drought order – includes all ordinary drought order powers plus:
    - Setting up standpipes, rota cuts, or water tanks for emergency supply.

Our Drought Plan include a drought permit and drought order which cover a range of actions including:

- Reducing river compensation flow
- Increasing groundwater abstraction
- Reducing the hands-off

The ESW supply side drought actions proposes both a drought order and drought permit. Table 1 lists our proposed drought permit and drought order. The actual final drought permits we will seek, will depend on the severity of the drought even, the time of year, and the specific location where water resources are scarce. It is also possible that additional drought permits/orders not included in Table may be required. Each application for a drought permit/order will be assessed by the Environment agency and there is no guarantee that it will be granted.

Table 1: Potential drought permit/order in the ESW supply area

Drought Permit/Order	Drought Action Summary
Coldfair Green Drought Permit	Drought permit to increase abstraction for public water supply to 3.205 Ml/d from Coldfair Green and reduce the compensation flow to the Thorpeness Hundred River to 0 Ml/d.

Denver Drought Order	Drought order to reduce the HOF from 318.23 Ml/d to 113.65 Ml/d 1 March to 30 April to access more water from the EOETS, which is known to be constrained in a drought by the Denver HOF.

Drought Permit Applications

Each drought permit or drought order requires and application as well as supporting information. Please see Appendix 19 for detail on our drought permit applications.

APPENDIX 11: SUPPLY-SIDE ENVIRONMENTAL ASSESSMENT OUTCOMES

The following appendix provides a summary of the environmental assessments carried out for all of our supply-side drought actions included in Table 12 of our Drought Plan 2027. An Environmental Assessment Report (EAR) has been prepared for two of our supply-side drought actions: Denver Drought Order and Coldfair Green Drought Permit. Where an EAR has not been prepared, the Strategic Environmental Assessment (SEA) report has been used to summarise the assessed environmental impact and proposed environmental monitoring for SEA objectives.

Supply Side Drought Action Name		Optimising abstraction from river sources[10]
Supply side action information	**Supply action**	Maximise abstraction from river sources in order to maintain reservoir storage and groundwater sources during the early stages of drought. This maximises their availability at later stages of a drought when river flows are lower.
	Location (WRZ)	Northern Central – River Bure, River Waveney. Essex – River Stour, Roman River, River Chelmer, River Blackwater.
	Likelihood / Level of action	Level 0 (Business as usual)
	Trigger(s) Or preceding actions	On formation of Drought Management Group.
	Demand Saving or DO of action (Mld)	No increase in DO but preserving DO of GW sources for later in drought.
	Implementation Timetable Preparation time, time of year effective, duration	Less than 1 week. During periods of higher river flow early in drought or following in drought rainfall events.
	Permissions required and constraints Including details of liaison carried out with bodies responsible for giving any permits or approvals	No permissions required as all abstraction within licensed volumes and constraints of existing HoFs.
	Risks associated with action	Risk that river flows are not sufficient to generate much benefit.
Summary of environmental	**Overall environmental impact** (minor,	Minorly beneficial - Raw water and WTW optimisation protect sensitive rivers by redistributing

[10] Essex & Suffolk Water (ESW) (2026). ESW Drought Plan 2027 Strategic Environmental Assessment (SEA) Environment Report

assessment (incl. mitigation measures)	moderate, major or uncertain)	abstraction within existing limits, supporting flows, water quality, biodiversity and WFD objectives later during drought.
	Level of confidence (H, M, L)	Moderate
	Summary of likely environmental impacts	As an entirely operational measure, it has no negative habitat, soil, landscape, heritage or waste impacts, minimal carbon or air-quality effects, and instead enhances drought and climate resilience.
	Summary of baseline information used[11]	- ESW supply area - WRE boundary - Wider operational catchments potentially affected by supply-side drought actions. All baseline data have been assessed for future baseline changes through identifying main patterns of change. - Designated sites, NERC species/habitats and INNS. - WFD waterbodies/river basin districts and their classifications, management issues and flood risk. - Soil, land-use and geology. - Air quality. - Climatic factors (temperature and rainfall), climate projections and greenhouse gas emissions. - Population and health statistics. - Historic environment and heritage assets. - Landscape characteristics such as National Character Areas and National Landscapes. - Material assets. - Waste management and resource usage.
	Summary of additional monitoring required	No additional monitoring beyond BAU monitoring of river and GW abstraction, river flows and GW levels.
	Summary of mitigation measures	No mitigation is required.
	Permits / approvals needed for mitigation measures	N/A
	Impact on other activities, e.g. fisheries, industry	None envisaged.

[11] Essex & Suffolk Water (ESW) (2026). ESW Drought Plan 2027 Strategic Environmental Assessment (SEA) Environmental Report: Appendix D – Environmental Baseline

Supply Side Drought Action Name		Outage reduction[12]
Supply side action information	**Supply action**	Reduction of planned maintenance and / or bringing forward maintenance at all WTWs during early drought period.
	Location (WRZ)	Northern Central, Blyth, Hartismere, Essex.
	Likelihood / Level of action	Level 0 (Business as usual)
	Trigger(s) Or preceding actions	On formation of Drought Management Group.
	Demand Saving or DO of action (Mld)	Depends on types of maintenance activities able to be postponed or brought forwards.
	Implementation Timetable Preparation time, time of year effective, duration	Less than 1 week.
	Permissions required and constraints Including details of liaison carried out with bodies responsible for giving any permits or approvals	No permission required. Constraints and ability to deliver will vary depending on demand and outages elsewhere.
	Risks associated with action	Action not able to deliver benefits required.
Summary of environmental assessment (incl. mitigation measures)	**Overall environmental impact** (minor, moderate, major or uncertain)	Minorly beneficial - Coordinating planned outages keeps key sources and treatment works available, preventing reactive abstraction increases on sensitive rivers.
	Level of confidence (H, M, L)	Moderate
	Summary of likely environmental impacts	As a non-physical, operational measure, it poses no habitat, heritage, landscape, soil, INNS or quality risks, while supporting WFD objectives, stable water quality, system resilience, efficient asset use and reliable public supply during drought.

[12] Essex & Suffolk Water (ESW) (2026). ESW Drought Plan 2027 Strategic Environmental Assessment (SEA) Environment Report

	Summary of baseline information used[13]	- ESW supply area - WRE boundary - Wider operational catchments potentially effected by supply-side drought actions. All baseline data have been assessed for future baseline changes through identifying main patterns of change. - Designated sites, NERC species/habitats and INNS. - WFD waterbodies/river basin districts and their classifications, management issues and flood risk. - Soil, land-use and geology. - Air quality. - Climatic factors (temperature and rainfall), climate projections and greenhouse gas emissions. - Population and health statistics. - Historic environment and heritage assets. - Landscape characteristics such as National Character Areas and National Landscapes. - Material assets. - Waste management and resource usage.
	Summary of additional monitoring required	No additional monitoring beyond BAU monitoring of outage and abstraction.
	Summary of mitigation measures	No mitigation is required.
	Permits / approvals needs for mitigation measures	N/A
	Impact on other activities, e.g. fisheries, industry	None envisaged.

Supply Side Drought Action Name		**WTW optimisation**[14]
Supply side action information	**Supply action**	WTW optimisation - various activities including reducing WTW process losses by recirculating more water to the head of the works.
	Location (WRZ)	Essex - Chigwell, Langham, Layer WTW Northern Central – Ormesby WTW

[13] Essex & Suffolk Water (ESW) (2026). ESW Drought Plan 2027 Strategic Environmental Assessment (SEA) Environmental Report: Appendix D – Environmental Baseline
[14] Essex & Suffolk Water (ESW) (2026). ESW Drought Plan 2027 Strategic Environmental Assessment (SEA) Environment Report

	Likelihood / Level of action	Level 0 (Business as usual)
	Trigger(s) Or preceding actions	On formation of Drought Management Group.
	Demand Saving or DO of action (Mld)	Dependent on WTW where activities possible.
	Implementation Timetable Preparation time, time of year effective, duration	Less than one week. During early stages of drought. Effectiveness of action may be dependent on raw water quality.
	Permissions required and constraints Including details of liaison carried out with bodies responsible for giving any permits or approvals	No permissions required.
	Risks associated with action	Effectiveness of action may be dependent on raw water quality.
Summary of environmental assessment (incl. mitigation measures)	**Overall environmental impact** (minor, moderate, major or uncertain)	Minorly beneficial - Raw water and WTW optimisation protect sensitive rivers by redistributing abstraction within existing limits, supporting flows, water quality, biodiversity and WFD objectives during drought
	Level of confidence (H, M, L)	Moderate
	Summary of likely environmental impacts	As an entirely operational measure, it has no negative habitat, soil, landscape, heritage or waste impacts, minimal carbon or air-quality effects, and instead enhances drought and climate resilience.
	Summary of baseline information used[15]	- ESW supply area - WRE boundary - Wider operational catchments potentially affected by supply-side drought actions. All baseline data have been assessed for future baseline changes through identifying main patterns of change. - Designated sites, NERC species/habitats and INNS. - WFD waterbodies/river basin districts and their classifications, management issues and flood risk. - Soil, land-use and geology.

[15] Essex & Suffolk Water (ESW) (2026). ESW Drought Plan 2027 Strategic Environmental Assessment (SEA) Environmental Report: Appendix D – Environmental Baseline

		- Air quality. - Climatic factors (temperature and rainfall), climate projections and greenhouse gas emissions. - Population and health statistics. - Historic environment and heritage assets. - Landscape characteristics such as National Character Areas and National Landscapes. - Material assets. - Waste management and resource usage.
	Summary of additional monitoring required	No additional monitoring beyond BAU monitoring of abstraction and distribution input.
	Summary of mitigation measures	No mitigation is required.
	Permits / approvals needs for mitigation measures	N/A
	Impact on other activities, e.g. fisheries, industry	None envisaged.

Supply Side Drought Action Name		**Use of Langford Recycling Plant (LRP)[16]**
Supply side action information	**Supply action**	Utilisation of Langford Recycling Scheme within current licensed conditions.
	Location (WRZ)	Essex
	Likelihood / Level of action	Level 0 – Business as usual
	Trigger(s) Or preceding actions	Usual dry weather activity. Depends on flows in River Chelmer. Hanningfield Reservoir below EOETS control curve. Triggered when additional flows are needed to support Langford & Hanningfield WTW.
	Demand Saving or DO of action (Mld)	Design output of 20 Ml/d.
	Implementation Timetable Preparation time, time of year effective, duration	Requires 6-8 weeks to ensure effluent quality sufficient for discharge to river.

[16] Essex & Suffolk Water (ESW) (2026). ESW Drought Plan 2027 Strategic Environmental Assessment (SEA) Environment Report

	Permissions required and constraints Including details of liaison carried out with bodies responsible for giving any permits or approvals	No specific permissions required but running of LRP is discussed with Environment Agency. Discharge to river commences when water quality achieves required standards.
	Risks associated with action	Risk of reduced benefit to water availability if additional time required to achieve required effluent water quality.
Summary of environmental assessment (incl. mitigation measures)	**Overall environmental impact** (minor, moderate, major or uncertain)	Minorly beneficial - The Langford Recycling Plant supports Chelmer flows and water quality during drought using high-standard treated effluent, protecting habitats, WFD status and designated sites without altering INNS risk or groundwater.
	Level of confidence (H, M, L)	Moderate
	Summary of likely environmental impacts	Operating entirely within existing infrastructure, licences and permits, it has minimal additional environmental, carbon or landscape impacts while enhancing resource efficiency, drought resilience and recreational conditions.
	Summary of baseline information used[17]	- ESW supply area - WRE boundary - Wider operational catchments potentially affected by supply-side drought actions. All baseline data have been assessed for future baseline changes through identifying main patterns of change. - Designated sites, NERC species/habitats and INNS. - WFD waterbodies/river basin districts and their classifications, management issues and flood risk. - Soil, land-use and geology. - Air quality. - Climatic factors (temperature and rainfall), climate projections and greenhouse gas emissions. - Population and health statistics. - Historic environment and heritage assets. - Landscape characteristics such as National Character Areas and National Landscapes. - Material assets. - Waste management and resource usage.

[17] Essex & Suffolk Water (ESW) (2026). ESW Drought Plan 2027 Strategic Environmental Assessment (SEA) Environmental Report: Appendix D – Environmental Baseline

	Summary of additional monitoring required	No additional monitoring beyond BAU monitoring of river flows, abstraction, water quality.
	Summary of mitigation measures	No mitigation is required.
	Permits / approvals needs for mitigation measures	N/A
	Impact on other activities, e.g. fisheries, industry	None envisaged.

Supply Side Drought Action Name		**Use of EA WAGS within licensed conditions**[18]
Supply side action information	**Supply action**	Use of EA Waveney Augmentation Groundwater Scheme (WAGS) within licensed conditions.
	Location (WRZ)	Northern Central
	Likelihood / Level of action	Level 0 – Business as usual.
	Trigger(s) Or preceding actions	Normal dry weather activity.
	Demand Saving or DO of action (Mld)	Maintains DO of Barsham WTW.
	Implementation Timetable Preparation time, time of year effective, duration	Less than two weeks. Effective during summer low flow conditions.
	Permissions required and constraints Including details of liaison carried out with bodies responsible for giving any permits or approvals	Requires liaison with EA Water Resources Team (Hydrologist).
	Risks associated with action	N/A
Summary of environmental assessment	**Overall environmental impact** (minor, moderate, major or uncertain)	Neutral - WAGS supports river flows during drought, protecting habitats, water quality and WFD status while safeguarding groundwater through strict licensing and monitoring.

[18] Essex & Suffolk Water (ESW) (2026). ESW Drought Plan 2027 Strategic Environmental Assessment (SEA) Environment Report

(incl. mitigation measures)	**Level of confidence** (H, M, L)	Moderate
	Summary of likely environmental impacts	It has low INNS, soil, air and carbon impacts, enhances drought resilience and recreation, and integrates sensitively with heritage, landscape, infrastructure and resource-efficiency requirements.
	Summary of baseline information used[19]	- ESW supply area - WRE boundary - Wider operational catchments potentially affected by supply-side drought actions. All baseline data have been assessed for future baseline changes through identifying main patterns of change. - Designated sites, NERC species/habitats and INNS. - WFD waterbodies/river basin districts and their classifications, management issues and flood risk. - Soil, land-use and geology. - Air quality. - Climatic factors (temperature and rainfall), climate projections and greenhouse gas emissions. - Population and health statistics. - Historic environment and heritage assets. - Landscape characteristics such as National Character Areas and National Landscapes. - Material assets. - Waste management and resource usage.
	Summary of additional monitoring required	No additional monitoring beyond BAU monitoring of river flows and abstraction.
	Summary of mitigation measures	No mitigation is required.
	Permits / approvals needs for mitigation measures	N/A
	Impact on other activities, e.g. fisheries, industry	Neutral - WAGS supports river flows during drought, protecting habitats, water quality and WFD status.

[19] Essex & Suffolk Water (ESW) (2026). ESW Drought Plan 2027 Strategic Environmental Assessment (SEA) Environmental Report: Appendix D – Environmental Baseline

Supply Side Drought Action Name		Use of EA EOETS within licensed conditions[20]
Supply side action information	**Supply action**	Use of EA Ely Ouse to Essex Transfer Scheme within licensed conditions.
	Location (WRZ)	Essex
	Likelihood / Level of action	Level 0 – Business as usual.
	Trigger(s) Or preceding actions	Normal dry weather activity when Hanningfield or Abberton reservoirs drop below EOETS control curve.
	Demand Saving or DO of action (Mld)	Designed to provide up 312Ml/d (Wixoe pumping station maximum capacity) support to the top of the Stour and 230Ml/d (Kennet pumping station maximum capacity) support to the top of the Blackwater. This is not accounting for losses by the time the water reaches ESW river intakes. Denver has a HoF of 318Ml/d/113Ml/d (time of year dependent as mentioned above) so cannot provide more than the pumping stations maximum capacities
	Implementation Timetable Preparation time, time of year effective, duration	<2 weeks, effective year round dependent on water being available at Denver and HoFs.
	Permissions required and constraints Including details of liaison carried out with bodies responsible for giving any permits or approvals	Requires liaison with EA Water Resources Team (Hydrologist).
	Risks associated with action	Risk that water not available at Denver. Risk of asset failure along transfer.
Summary of environmental assessment (incl. mitigation measures)	**Overall environmental impact** (minor, moderate, major or uncertain)	Major beneficial - The EOETS supports drought resilience by maintaining flows, water quality and ecological function in receiving catchments while protecting donor systems through strict controls.
	Level of confidence (H, M, L)	Moderate
	Summary of likely environmental impacts	It avoids habitat harm, manages invasive-species risks, enhances regional water security and recreation, and operates sustainably with limited

[20] Essex & Suffolk Water (ESW) (2026). ESW Drought Plan 2027 Strategic Environmental Assessment (SEA) Environment Report

		environmental, landscape, heritage or carbon impacts.
	Summary of baseline information used[21]	- ESW supply area - WRE boundary - Wider operational catchments potentially affected by supply-side drought actions. All baseline data have been assessed for future baseline changes through identifying main patterns of change. - Designated sites, NERC species/habitats and INNS. - WFD waterbodies/river basin districts and their classifications, management issues and flood risk. - Soil, land-use and geology. - Air quality. - Climatic factors (temperature and rainfall), climate projections and greenhouse gas emissions. - Population and health statistics. - Historic environment and heritage assets. - Landscape characteristics such as National Character Areas and National Landscapes. - Material assets. - Waste management and resource usage.
	Summary of additional monitoring required	No additional monitoring beyond BAU monitoring of river flows and abstraction.
	Summary of mitigation measures	No mitigation is required.
	Permits / approvals needs for mitigation measures	N/A
	Impact on other activities, e.g. fisheries, industry	Beneficial - EOETS supports river flows during drought, protecting habitats, water quality and WFD status.

Supply Side Drought Action Name		**Tankering Suffolk**[22]
Supply side action information	**Supply action**	Tankering treated water from Carlton Colville Pumping Station (Northern Central) to Hartismere and Blyth WRZs.

[21] Essex & Suffolk Water (ESW) (2026). ESW Drought Plan 2027 Strategic Environmental Assessment (SEA) Environmental Report: Appendix D – Environmental Baseline
[22] Essex & Suffolk Water (ESW) (2026). ESW Drought Plan 2027 Strategic Environmental Assessment (SEA) Environment Report

	Location (WRZ)	Hartismere & Blyth
	Likelihood / Level of action	Level 1
	Trigger(s) Or preceding actions	There are a few scenarios when we would consider moving water by road tanker: a) An immediate event or incident where customers are either off water or likely to go without water in the near future. b) In situations where we have a treatment or resource constraint that is likely to cause a supply deficit at periods of high demand typically the summer months. c) In situations where the network limits the transfer of water to certain parts of a supply zone i.e. we have sufficient water available but infrastructure restricts distribution. In terms of monitoring and escalation, the network analysis and coordination team would monitor the daily demands in all of the supply zones. When demands are starting to increase we would start to hold regular supply meetings between key stakeholders, principally water supply, water networks, network analysis and coordination, and water resources teams. Key drivers for the need for tanker deployment would be: treatment works utilisation, storage situation and predicted weather. So if for example we were not filling a storage site overnight, then we would look at network or treatment interventions and if there are none then tanker deployment would be considered. Another example may be that all treatment works in a supply zone are at 100% capacity and therefore any increase in demand would result in a deficit, and this could lead to tanker deployment also.
	Demand Saving or DO of action (Mld)	Up to 0.84 Ml/d if can scale up to 28 tanker loads per day. 0.03 Ml/d per tanker.
	Implementation Timetable Preparation time, time of year effective, duration	Within 24 hours for up to 4 tankers per day. Additional tankers would require a longer lead in.
	Permissions required and constraints Including details of liaison carried out with bodies responsible for giving any permits or approvals	No permissions required. Constraint would be obtaining sufficient tanker resources – the maximum of 28 tanker loads per day would likely require at least 12 tankers, and all the other resources associated with loading, sampling, offloading etc. Only two fill points at Carlton Colville.
	Risks associated with action	Cannot obtain sufficient tankers. Cannot achieve volumes required.

Summary of environmental assessment (incl. mitigation measures)	**Overall environmental impact** (minor, moderate, major or uncertain)	Neutral - Tankering is a temporary drought measure with no habitat, construction or WFD risks, though traffic, emissions, noise and spill risks cause minor short-term impacts.
	Level of confidence (H, M, L)	Moderate
	Summary of likely environmental impacts	It reduces pressure on stressed sources, supporting flows and recreation, but is carbon-intensive and offers no long-term resilience, landscape, heritage or resource-efficiency benefits.
	Summary of baseline information used[23]	- ESW supply area - WRE boundary - Wider operational catchments potentially affected by supply-side drought actions. All baseline data have been assessed for future baseline changes through identifying main patterns of change. - Designated sites, NERC species/habitats and INNS. - WFD waterbodies/river basin districts and their classifications, management issues and flood risk. - Soil, land-use and geology. - Air quality. - Climatic factors (temperature and rainfall), climate projections and greenhouse gas emissions. - Population and health statistics. - Historic environment and heritage assets. - Landscape characteristics such as National Character Areas and National Landscapes. - Material assets. - Waste management and resource usage.
	Summary of additional monitoring required	No additional monitoring is required.
	Summary of mitigation measures	No mitigation is required.
	Permits / approvals needs for mitigation measures	N/A
	Impact on other activities, e.g. fisheries, industry	Potential minor impacts on other road users if large number of tanker movements required.

[23] Essex & Suffolk Water (ESW) (2026). ESW Drought Plan 2027 Strategic Environmental Assessment (SEA) Environmental Report: Appendix D – Environmental Baseline

Supply Side Drought Action Name		Use of EA SAGS/GOGWS within licensed conditions[24]
Supply side action information	**Supply action**	Use of EA Stour Augmentation Groundwater Scheme (SAGS) and Great Ouse Groundwater Scheme (GOGWS) within licensed conditions.
	Location (WRZ)	Essex
	Likelihood / Level of action	Level 1
	Trigger(s) Or preceding actions	When Hanningfield or Abberton reservoirs drop below SAGS control curve.
	Demand Saving or DO of action (Mld)	Licensed to provide up to ~35000Ml/15 years based on group licensed rates. Licence volumes vary depending on the 16 available boreholes available. Each has a daily, annual and various grouped 15 year licenses. Known to be relatively effective but depends on the borehole used. Some have only a 30% gain, some a 50% and others more or less.
	Implementation Timetable Preparation time, time of year effective, duration	Less than two weeks. Effective year round.
	Permissions required and constraints Including details of liaison carried out with bodies responsible for giving any permits or approvals	Requires liaison with EA Water Resources Team (Hydrologist).
	Risks associated with action	Assets unavailable. Losses during transit in river from source to ESW abstraction greater than anticipated, reducing refill benefit.
Summary of environmental assessment (incl. mitigation measures)	**Overall environmental impact** (minor, moderate, major or uncertain)	Neutral - SAGS sustains River Stour flows and GOGWS sustains Great Ouse flows during drought, protecting habitats, water quality, WFD status and groundwater through strict licensing and monitoring.
	Level of confidence (H, M, L)	Moderate

[24] Essex & Suffolk Water (ESW) (2026). ESW Drought Plan 2027 Strategic Environmental Assessment (SEA) Environment Report

	Summary of likely environmental impacts	Both schemes have negligible INNS, soil, air and carbon impacts, enhance drought and climate resilience, support water supplies and recreation, and integrate sensitively with heritage, landscape, infrastructure and resource-efficiency requirements.
	Summary of baseline information used[25]	- ESW supply area - WRE boundary - Wider operational catchments potentially affected by supply-side drought actions. All baseline data have been assessed for future baseline changes through identifying main patterns of change. - Designated sites, NERC species/habitats and INNS. - WFD waterbodies/river basin districts and their classifications, management issues and flood risk. - Soil, land-use and geology. - Air quality. - Climatic factors (temperature and rainfall), climate projections and greenhouse gas emissions. - Population and health statistics. - Historic environment and heritage assets. - Landscape characteristics such as National Character Areas and National Landscapes. - Material assets. - Waste management and resource usage.
	Summary of additional monitoring required	No additional monitoring beyond BAU monitoring of river flows and abstraction.
	Summary of mitigation measures	No mitigation is required.
	Permits / approvals needs for mitigation measures	N/A
	Impact on other activities, e.g. fisheries, industry	Neutral - SAGS sustains River Stour flows and GOGWS sustains Great Ouse flows during drought, protecting habitats, water quality & WFD status.

[25] Essex & Suffolk Water (ESW) (2026). ESW Drought Plan 2027 Strategic Environmental Assessment (SEA) Environmental Report: Appendix D – Environmental Baseline

Supply Side Drought Action Name		Denver licence variation[26]
Supply side action information	**Supply action**	Reducing the hands off flow (HoF) during March & April from 318,226 m^3/day to the lower HoF value of 113,652 m^3/day.
	Location (WRZ)	Essex
	Likelihood / Level of action	Level 2
	Trigger(s) Or preceding actions	Decision trigger to apply for the drought order when reservoir storage reaches the Stour Augmentation Groundwater Scheme/Great Ouse Groundwater Scheme control curve trigger.
	Demand Saving or DO of action (Mld)	Could allow up to 200 Ml/d additional water to refill reservoirs.
	Implementation Timetable Preparation time, time of year effective, duration	8-12 weeks. Would be implemented in spring following summer drought, depending on reservoir refill probability.
	Permissions required and constraints Including details of liaison carried out with bodies responsible for giving any permits or approvals	The Denver licence is held by the EA so a **Drought Order** would be required to implement this drought action.
	Risks associated with action	Risk that Drought Order is not granted. Risk that sufficient water not available at Denver to deliver anticipated benefit.
Summary of environmental assessment (incl. mitigation measures)	**Overall environmental impact** (minor, moderate, major or uncertain)	Minor - drought action would result in negligible changes to hydrology, hydraulics, water quality and geomorphology, with all receptor-level impacts assessed as Minor and Not Significant.
	Level of confidence (H, M, L)	Medium-High
	Summary of likely environmental impacts	• Designated sites – Low sensitivity, Minor impact. • NERC species/habitats – Low sensitivity, Minor impact (note otters were classified as Medium sensitivity). • INNS – Low sensitivity, Minor impact. • Phytoplankton- Not sensitive, Minor impact. • Fish – Low sensitivity, Minor impact. In-combination: The drought order is not predicted to give rise to significant cumulative or in-combination environmental effects beyond those already assessed for the drought action alone. Overall cumulative effects are assessed as Low, with Minor significance at Medium to High confidence, reflecting the robustness of the modelling evidence and the conservative assumptions adopted in the assessment.

[26] Essex & Suffolk Water (2026) Drought Action Environmental Report: Denver Drought Action

	Summary of baseline information used	• EA WFD classifications and water quality data in local surface and ground waterbodies. • EA rainfall data. • BGS geological data. • Local designated site information and priority habitat / species records. • Long-term flow data at Denver, where Great Ouse divides. • Cross-sectional geometry from the EA flood-risk model. • Socio-economic baseline data. • Fish and ecological monitoring.
	Summary of additional monitoring required	• Daily review by the EA of continuous flow monitoring for HoF compliance post-implementation and for 2 weeks after cessation. • Daily review by the EA of continuous flow monitoring to ensure protected right compliance post-implementation. • Fortnightly spot samples post-implementation, of water quality for WFD compliance, with one sample at one-month post-cessation. • Fortnightly walkovers post-implementation, for algal blooms and phytoplankton indicators, with one survey post-cessation. • Incident Observations fortnightly post-implementation, with one post-cessation inspection.
	Summary of mitigation measures	Given the negligible magnitude of predicted impacts identified by hydrological, hydraulic and water-quality modelling, no receptor-specific mitigation measures are required beyond standard operational monitoring and stakeholder liaison. Should monitoring during implementation indicate unforeseen environmental effects, early withdrawal of the reduced HoF would occur.
	Permits / approvals needs for mitigation measures	N/A
	Impact on other activities, e.g. fisheries, industry	Protected rights, economic tourism/agriculture, water-based recreation and cultural events were all identified as Medium sensitivity, with Minor impact. Land-based recreation and heritage were classified as Low sensitivity, and Minor impact.

Supply Side Drought Action Name		Thames Water Utilities Bulk Transfers (By Agreement)[27]
Supply side action information	**Supply action**	Fair apportionment of the bulk transfer from Thames Water into ESW Chigwell WTW by agreement.
	Location (WRZ)	Essex
	Likelihood / Level of action	Level 3a – severe drought.
	Trigger(s) Or preceding actions	Level 3 drought trigger as per worked examples. ESW and Thames would need a TUB in place.
	Demand Saving or DO of action (Mld)	**Peak:** Up to 27 Ml/d dependent on TWU position and availability.
	Implementation Timetable Preparation time, time of year effective, duration	From DMG approving drought action: Less than 2 weeks.
	Permissions required and constraints Including details of liaison carried out with bodies responsible for giving any permits or approvals	Agreement with Thames Water required. Fair apportionment if both WCs have TUBs Systems constraints and WTW capacity at Chigwell WTW.
	Risks associated with action	Additional quantities not guaranteed to be available and may be highly variable – could lead to a reduction in water transferred.
Summary of environmental assessment (incl. mitigation measures)	**Overall environmental impact** (minor, moderate, major or uncertain)	Neutral - Thames–Chigwell bulk transfer provides an alternative drought source, reducing abstraction pressure on sensitive Essex rivers and aquifers while avoiding new ecological, INNS, soil, heritage or landscape risks.
	Level of confidence (H, M, L)	Moderate
	Summary of likely environmental impacts	Using existing infrastructure, it maintains flows, water quality, WFD compliance, supply reliability and drought resilience, with only minor operational-energy impacts during dry periods.
	Summary of baseline information used[28]	- ESW supply area - WRE boundary - Wider operational catchments potentially affected by supply-side drought actions. All baseline data have been assessed for future baseline changes through identifying main patterns of change. - Designated sites, NERC species/habitats and INNS.

[27] Essex & Suffolk Water (ESW) (2026). ESW Drought Plan 2027 Strategic Environmental Assessment (SEA) Environment Report
[28] Essex & Suffolk Water (ESW) (2026). ESW Drought Plan 2027 Strategic Environmental Assessment (SEA) Environmental Report: Appendix D – Environmental Baseline

		- WFD waterbodies/river basin districts and their classifications, management issues and flood risk. - Soil, land-use and geology. - Air quality. - Climatic factors (temperature and rainfall), climate projections and greenhouse gas emissions. - Population and health statistics. - Historic environment and heritage assets. - Landscape characteristics such as National Character Areas and National Landscapes. - Material assets. - Waste management and resource usage.
	Summary of additional monitoring required	No additional monitoring required.
	Summary of mitigation measures	No mitigation is required.
	Permits / approvals needs for mitigation measures	N/A
	Impact on other activities, e.g. fisheries, industry	None envisaged.

Supply Side Drought Action Name		**Coldfair Green licence changes[29]**
Supply action information	**Supply action**	Increase daily maximum licence from 2730 m^3/day by 10% to 3000 m^3/day. If required, the second step would be to decrease the daily compensation discharge to the Hundred River by 50%, from 205 m^3/day to 102 m^3/day. The third step, if forecast demand necessitates additional abstraction, would be the temporary cessation of compensation discharge release, with the 205 m^3/day volume retained for public water supply.
	Location (WRZ)	Blyth
	Likelihood / level of action	Level 3b – severe drought
	Trigger	Zone deployable output below the groundwater threshold level 3b curve. Only indicative, also dependent on other resource availability and that all relevant prior level 1-3a actions are in place.
	Deployable output of action	<0.27 Ml/d if increase daily licence from 2.73 Ml/d to 3.0 Ml/d and an additional <0.205 Ml/d under cessation of compensation discharge.
	Implementation timetable	6-8 weeks. Likely to be required in summer when drought linked to peak demand.

[29] Source: Essex & Suffolk Water (2026) Environmental Assessment Report: Coldfair Green Drought Action

	Permissions required and constraints	Requires **drought permit**.
	Risks associated with the action	Objections may mean that permit cannot be granted.
Summary of environmental assessment (including mitigation measures)	**Overall environmental impact** (minor, moderate, major or uncertain)	Pathway analysis demonstrated generally low to negligible changes in hydrology, hydraulics, water quality and geomorphology across much of the Zone of Influence (ZoI).
	Level of confidence (H,M,L)	Low – Monitoring, although long term and ongoing, does not extend through a drought where this action has been required.
	Summary of likely environmental impacts	**Environmental impact has been assessed against the step 3 scenario with no compensation discharge.** • Statutory designated sites - Medium sensitivity, Moderate impact on SSSI. • NERC habitats – Medium sensitivity, Moderate impact. • NERC species – Minor sensitivity, Minor impact. • INNS – Low sensitivity, Minor impact. • Macroinvertebrate- Low sensitivity, Low impact. • Fish – Medium sensitivity, Moderate Impact. In-combination: Assessment concluded there is not in-combination deterioration in WFD status class for any quality elements and the action does not introduce a new mechanism of failure beyond existing baseline pressures. Effects on designated sites and priority wetlands were assessed to be Minor to Moderate, localised and reversible. For macrophytes, macroinvertebrates and priority species (exc. Fish), effects were assessed to be Minor. Fish, under step 3, were assessed to be Moderately affected, but with no step-change in ecological status.
	Summary of baseline information used	• ESW abstraction data • BGS geological data • Groundwater levels in abstraction/observation boreholes • River flow data for Hundred River & Leiston Beck • Local designated site information and priority habitat / species records. • GW quality parameters for Crag aquifer • EA WFD classifications and water quality data in local surface and ground waterbodies. • Water quality parameters in Hundred River & Leiston Beck (incl. temperature & DO) • Surface water levels in wetland ditches • Rainfall data. • Socio-economic baseline data
	Summary of additional monitoring required	Increase the frequency of river flow, DO, pH, temperature and phosphate monitoring in the

		Hundred River during pre-permit application and post-implementation. Undertake a pre-application observation survey for fish, with twice weekly observations for the first 2 weeks of implementation, and weekly for the rest of the permit's duration. Within 3 months of post drought recovery, fish observations are to be monthly. Macroinvertebrate surveys during post-drought recovery. On an ad-hoc basis during the permit's implementation, if concerns are raised, targeted botanical walkovers of the North Warren reedbed will occur.
	Summary of mitigation measures	Early withdrawal of drought permit if water quality monitoring indicates DO <5 mg/l sustained for <48 hours, or phosphate greater than the WFD threshold. Fish rescue / relocation if fish distress is observed or DO concentrations suggest acute fish risk. Restoration of the compensation discharge if observed wetted permitter reduction exceeds the modelled precautionary thresholds at designated sites/reedbeds. Check/clean/dry protocols if new INNS spreads are identified.
	Permits / approvals needs for mitigation measures	Any mitigation measures implemented on third party land will require landowner permission.
	Impact on other activities (e.g. fisheries, industry)	Even under the step 3 scenario with no compensation discharge, there was no identified impact on heritage sites, agricultural economy or recreation and tourism. There was a moderate impact on protected rights, same as identified with a typical drought, which will be monitored.

APPENDIX 12: METERING

Water metering is an important part of our strategy for managing demand. Meter penetration in the ESW region currently stands at 67.5% in Essex and 74.1% in Suffolk (as of 31st March 2025).

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

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

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

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

As per our Water Resources Management Plan 2019, in Essex we introduced the Whole Area Metering programme, and as a result installed 31,785 meters in AMP 7, of which 5,472 (17.22%) premises are now charged on a measured basis. As we move into AMP 8, we are introducing compulsory metering, therefore, any customer that was metered under the WAM programme in AMP 7 but is still charged on a RV basis, will be moved over to measured charges.

When a customer moves over to measured charges, we will be honouring a two-year price cap guarantee, so the customer will not suffer financially. However, in these two years we will actively engage with customers at set intervals, providing them with information as to how their measured charges compares to their previous RV charge and offering advice on how to reduce their consumption.

We have made considerable progress over recent years to increase meter penetration in order to support customers in reducing their water use and bills. This has included encouraging customers to opt for a free meter by giving annual information on free meter installations in our billing documentation and numerous marketing campaigns, however, with meter penetration sitting at 74.1% in Suffolk and 67.5% (as at 2025) in Essex, this cannot be considered a long-term drought action as customer demand is likely to decrease in years to come due to those customers who would want to pay by measured charges having already applied and are metered.

Therefore, as part of our WRMP24, we are introducing a compulsory metering scheme and are aiming to have all household properties metered (where a meter installation is possible) by the end of AMP 8 in Suffolk and the end of AMP 9 in Essex.

The rollout of our smart communications network commenced in AMP 7 and will continue through AMP 8 and compulsory meters will be installed where either the smart network is live already or is due to go live. The real-time (or near real-time) data provided by smart meters connected to a smart communications network, in contrast to meters read on a 6 monthly basis, provides a more accurate and up to date measurement of water usage across the distribution chain.

In addition, we can provide customers with visibility of their consumption, allowing them to manage this and in turn take control of their bills, with a direct impact of up to 3% on PCC. We can also identify opportunities to engage with customer that are high users to offer water efficiency audits and advise on how to reduce their consumption.

Smart meters also facilitate the early detection of customer side leakage with greater efficiency, as well as providing more granular data information on DMA performance to support identification of network side leakage. Based on information of smart meters installed in AMP 7, this has shown that 25% of meters are recording customer side leakage. We have in place a Smart Metering Operational Centre to deal with the increase in identified customer side leakage.

To further enhance customer awareness of using water wisely, we have in place two Community Engagement Vehicles: one in Essex and one in Suffolk. These vehicles are each manned by two Community Engagement Ambassadors who will be out in the community supporting the smart metering rollout by engaging with customers and communities, providing one-to-one support and education and responding to questions and building public confidence in the rollout.

APPENDIX 13: TEMPORARY USE BANS DEFINITIONS

Definition of "using a hosepipe"

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

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

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

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

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

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

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

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

- by hand using a bucket or watering can;
- with grey-water (ex bath/ washbasin water) through a hosepipe; and / or

- using rainwater from a water-butt through a hosepipe (assuming sufficient rainfall).

Further explanation of uses to be banned

Watering a garden using a hosepipe

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

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

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

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

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

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

Cleaning a private motor-vehicle using a hosepipe

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

Exemptions: Legislation excludes:

a) a public service vehicle, as defined in section 1 of the Public Passenger Vehicles Act 1981; and

b) a goods vehicle as defined in section 192 of the Road Traffic Act 1988.

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

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

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

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

“Domestic or other non-commercial premises” means

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

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

Exemptions: Legislation defines some exemptions: -

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

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

Cleaning a private leisure boat using a hosepipe

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

Exemptions: Legislation exempts the following:

- Vessels used in the course of a business

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

Filling or maintaining a domestic swimming or paddling pool

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

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

Exemptions: Legislation excludes filling or maintaining a pool:

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

Drawing water, using a hosepipe, for domestic recreational use

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

Exemptions: There are no legislative exemptions.

Filling or maintaining a domestic pond using a hosepipe

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

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

Filling or maintaining an ornamental fountain

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

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

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

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

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

A domestic premise is defined as:

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

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

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

Cleaning paths or patios using a hosepipe

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

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

Cleaning other artificial outdoor surfaces using a hosepipe

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

a) Any area outdoors which is paved or laid with hard or artificial material;
b) Timber decking;
c) A quay (including a jetty, pontoon, wharf or slipway).
d) A trailer designed, constructed or adapted to launch boats or other vessels or craft into water, other than a private motor vehicle
e) The roof of any domestic premises.

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

APPENDIX 14: TEMPORARY USE BANS IMPLEMENTATION

Temporary Use Bans, commonly referred to as TUBs, are powers granted to water companies to impose restrictions on customers' water use. Previously these were referred to as 'hosepipe bans' but they were modified in 2010 under the Flood and Water Management Act to cover a wider range of restrictions.

TUBs can be introduced quickly – seven days after an advertising the affected area. They predominantly focus on water use by domestic customers because this provides the largest water saving and helps protect public services and the economy.

Following a review of the 2022 drought demand management measures[30] the introduction of a TUB produced a 3.34% reduction in DI and a 6.60% reduction in household demand and is deemed to have a significant impact on demand reduction. To maximise the effectiveness of TUBs it is recommended that they are implemented early on in the Spring-Summer season.

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

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

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

Trigger for a TUB

The Drought Management Group will consider a TUB once Essex reservoir storage falls below the TUB control curve or when Suffolk groundwater levels fall below the TUB control curve. Worked examples illustrating when our DMG will prepare for a TUB are presented in Appendix 7.

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

Areas of Restrictions

If needed we may introduce a TUB either across the whole company supply area or in a Drought Management Area (i.e. Suffolk or Essex supply areas). The last time we imposed a TUB, in the 1990s droughts, we imposed restrictions at the Drought

[30] UKWIR (2023) Review of the 2022 Drought demand management measured 23/WR/02/18

Management Area level; although the bans in Essex and Suffolk were in force at similar times they were not necessarily for the same duration.

If a TUB is required in the future we intend to apply it at the Drought Management Area scale again. This is because the Suffolk and Essex supply areas, while integrated in their own right, are geographically separate with no link between them.

Our Essex supply area comprises one integrated Water Resource Zone with water from any of its five major treatment works theoretically being capable of feeding any area. This means any shortage of water is not attributable to any specific group of Essex customers or their water demand. Savings from any Essex customers help to preserve the total amount of water we have available in Essex. Conversely, our Suffolk supply area comprises of three Water Resource Zones. We believe that applying a TUB at the Water Resource Zone level would be confusing for our customers who would not necessarily know which WRZ they are in.

Phasing of Restrictions

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

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

Please refer to Appendix 12 for the basis for the variability of responses to water use restrictions from different water companies.

Communicating the Introduction, Phasing In and Lifting of Temporary Restrictions

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

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

Advertising and timeline to implementation

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

"Before the period for which a prohibition is to apply the water undertaker must give notice of the prohibition and its terms-

a. in at least two newspapers circulating in the area to which it is to apply, and
b. on the water undertaker's internet website."

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

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

The majority of Water Resources South East (WRSE) and Water Resources East (WRE) water companies, including Essex & Suffolk Water, have agreed a universal TUB enforcement policy which we will follow (see Appendix 4).

Aligning our approach

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

There could be a situation where our neighbouring water companies need to introduce a TUB but we do not because our TUB triggers have not been met. This has been the case in all recent droughts in 2012 and 2022 and 2025. In this instance, we do not believe that we should introduce a TUB simply because a neighbouring water company has done, however we would ensure that our drought messaging was supportive of our neighbouring water companies' positions.

More information for the basis on the variability of responses to water use restrictions by water companies can be found in Appendix 21.

Exceptions

Water companies can grant statutory and discretionary exceptions from these restrictions for customers and businesses. These exceptions aim to minimise the impact on vulnerable customers and the economy. Please see Appendix 15 for our list of exceptions which is in line with other water companies and our regional group.

Exemptions

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

We intend to introduce company exemptions additional to legislative exemptions that will benefit vulnerable customers and, in the initial stages at least, reduce to a minimum the economic consequences of a drought on our non-household customers. The precise groups and activities to be exempted during any TUB will form part of the advertisements that are necessary to introduce a drought and will also appear on our website. The extent of exemptions granted will be dependent on the severity of the drought that we are in and some possible exemptions may not be allowed.

We intend to allow:

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

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

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

Reimbursement of licence fees paid by customers

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

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

In total, there are 26 of these customers in Essex and 3 in Suffolk.

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

APPENDIX 15: TEMPORARY USE BANS EXCEPTIONS

Exceptions

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

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

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

Discretionary Exceptions can be further split into two categories:

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

Summary of exceptions

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

Table 1: Temporary Use Ban Exceptions

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

TUB Category	Statutory exception	Discretionary Universal Exception (granted by all water companies)	Suggested Discretionary Concessional Exception (granted by individual water companies)
swimming or paddling pool	(2) filling or maintaining a pool using a hand-held container which is filled with water drawn directly from a tap (3) filling or maintaining a pool that is designed, constructed or adapted for use in the course of a programme of medical treatment (4) filling or maintaining a pool that is used for the purpose –of decontaminating animals from infection or disease (5) filling or maintaining a pool used in the course of a programme of veterinary treatment (6) filling or maintaining a pool in which fish or other aquatic animals are being reared or kept in captivity		
6. Drawing water, using a hosepipe, for domestic recreational use	None	None	
7. Filling or maintaining a domestic pond using a hosepipe	Filling or maintaining a domestic pond in which fish or other aquatic animals are being reared or kept in captivity	▪ Blue Badge holders on the grounds of disability	▪ To customers on the company's Vulnerable Customers List who have mobility issues but are not in possession of a Blue Badge
8. Filling or maintaining an ornamental fountain	Filling or maintaining an ornamental fountain which is in or near a fish-pond and whose purpose is to supply sufficient oxygen to the water in the pond in order to keep the fish healthy	None	▪ To operate water features with religious significance
9. Cleaning walls, or windows, of domestic premises using a hosepipe	Using a hosepipe to clean the walls or windows of domestic premises for health or safety reasons	▪ To Blue Badge holders on the grounds of disability ▪ Commercial cleaning	▪ To customers on the company's Vulnerable Customers List who have mobility issues but are not in possession of a Blue Badge

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

APPENDIX 16: NON-ESSENTIAL USE BAN IMPLEMENTATION

On average, once every 50 years, a drought and corresponding shortage of raw water may become so acute that we have to implement restrictions on the use of water that are more severe than those introduced in Level 2 under a Temporary Use Ban (TUB). These tougher restrictions are known as a Non-Essential Use Ban (NEUB).

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

It is very difficult to estimate the effect of this type of water use restriction on customer demand as there is very little data available. We have assumed that further restrictions on water use beyond that of temporary use ban will yield an additional reduction in DI of 2% made up of a 9% reduction in NHH demand. This will bring the total demand saving (Appeal for Restraint +TUB + NEUB) to 10.3% reduction in DI.

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

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

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

- Watering outdoor plants on commercial premises;
- Filling or maintaining a non-domestic swimming or paddling pool;
- Filling or maintaining a pond;
- Operating a mechanical vehicle-washer;
- Cleaning any vehicle, boat, aircraft or railway rolling stock;
- Cleaning non-domestic premises;
- Cleaning a window of a non-domestic building;
- Cleaning industrial plant;
- Suppressing dust; and
- Operating cisterns.

NEUB definitions are found in Appendix 17.

In order to grant a Drought Order under the WRA 1991 73(2), the Secretary of State must be satisfied that: "By reason of an exceptional shortage of rain (see Appendix 18), a serious deficiency of supplies of water in any area exists or is threatened".

The potential timescales for introducing restrictions by recourse to a Drought Order are significantly longer than those for Temporary Use Bans under the WIA 1991, and the Secretary of State would typically require a public inquiry or hearing to be held if an objection were received.

Under Schedule 8, paragraph 3(c) of the WRA 1991, we would be required to publish a notice of our application for a Drought Order to restrict water use, which would state that objections to the application may be made to the Secretary of State within seven days from the date on which it is served or published.

Trigger for a NEUB

The Drought Management Group will consider a NEUB once Essex reservoir storage falls below the NEUB control curve or when Suffolk groundwater levels fall below the NEUB control curve. Worked examples illustrating when our DMG will prepare for a NEUB are presented in Appendix 7. We measure customer demand daily and would expect to see a reduction in demand within 1 to 2 weeks.

Areas of Restrictions

In alignment with the TUB restriction areas, we will either introduce a NEUB across the whole company supply area or in a Drought Management Area (i.e. Suffolk or Essex supply areas). This is because the Suffolk and Essex supply areas, while integrated in their own right, are geographically separate with no link between them. We believe that applying a NEUB at the Water Resource Zone level would be confusing for our customers who would not necessarily know which WRZ they are in.

Communicating the Introduction, Phasing In and Lifting of Restrictions

As non-essential use bans directly impact non-household customers more than TUB restrictions the majority of the communications with our business customers will be conducted through the retailer through the agreed communication contact.

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

We will inform neighbouring water companies, Water Resources East, and NAVs by email through our agreed communication contact.

Timeline to implementation

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

Stage 1: Preparing and lodging an application

Our application will:

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

iv. Include copies of the required advertisements, meaning that the Drought Order must be advertised prior to the application being made to Defra.

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

Stage 2: Hearings or inquiries

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

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

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

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

Stage 3: Implementation

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

Depending on the prevailing conditions, including the time of year, we would intend to enact all the prohibitions granted under the Drought Order at once, or introduce only those necessary at that time to preserve water. This phased approach of selectively banning certain actions granted under the Drought Order is the most proportionate response to the situation. The decision on which order to introduce certain restrictions on use will only be decided after the Drought Order is granted. This will ensure that we can restrict the minimum uses of water necessary at any time whilst minimising any economic impact.

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

Aligning our approach

We will work with neighbouring water companies and our regional group to ensure that we align our approach to drought messaging and the introduction of NEUBs. We will

ensure that we share our supply demand position in a timely manner, will consult on our messaging and will ensure they are aware of our intention to implement a NEUB in a timely manner.

Exceptions

A summary of the statutory, universal and discretionary exceptions relating to NEUBs are found in Appendix 17. These have been agreed between the water companies in the regional groups WRSE and WRE.

Compensation arrangements

Individuals who suffer a loss or damage as a result of a drought permit or drought order are entitled to compensation (e.g. owners of a water source or those who have an interest in a source). The rules for compensation are set out in Schedule 9 to the Water Resources Act 1991.

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

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

APPENDIX 17: NON-ESSENTIAL USE BAN DEFINITIONS

Commercial Premises

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

Watering outdoor plants on commercial premises using a hosepipe

- This banning of activity covers:
  - Plants which are in a pot or other container that is outdoors or undercover
  - Plants which are in the ground under cover.

Exemptions:
Legislation exempts the watering of plants using a hosepipe that are:
- Grown or kept for sale or commercial use; or
- Part of a National Collection or temporary garden or flower display.

Filling or maintaining a non-domestic swimming or paddling pool

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

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

- For the purpose of exemptions "Open to the public" is defined as:
- A pool is **not** open to the public if it may only be used if the user is a paying member of an affiliated club or organisation i.e. these are not exempt.

Filling or maintaining a pond

- This extends the areas of pond filling or maintaining being banned beyond those already covered by the Temporary Water Use Ban. Non-domestic ponds are now also covered by the ban on the use of hosepipes and both

domestic and non-domestic ponds are banned from having water added by a fixed pipe. Ponds include manmade and natural ponds of any size.

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

Operating a mechanical vehicle-washer

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

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

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

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

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

Cleaning non-domestic premises using a hosepipe

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

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

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

- This restriction is equivalent in all ways to that covered under the Temporary Water Use Ban for domestic properties. The ban extends to the use of water

fed poles where mains water is the source used to create the de-ionised water.

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

Cleaning industrial plant using a hosepipe

- In this restriction "plant" is defined to mean "*The equipment, including machinery, tools, instruments and fixtures necessary for an industrial operation"*

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

Suppressing dust using a hosepipe

- The Drought Direction 2011 defines "using a hosepipe" as:
  - Drawing relevant water through a hosepipe from a container and applying it for the purpose; and
  - Filling or partly filling a container with relevant water by means of a hosepipe and applying it for the purpose.
- This also includes anything designed, adapted or used for the same purpose as a hosepipe.

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

Operating a cistern in any building that is unoccupied and closed

A cistern is defined as meaning an automatically operated flushing cistern which services a WC pan or urinal. Occupation of a building by security staff is interpreted to comprise a building that is "unoccupied".

APPENDIX 18: NON-ESSENTIAL USE BAN EXCEPTIONS

The table below summarises the statutory, universal and discretionary exceptions relating to a NEUB that have been agreed between Water Resources South East (WRSE) and Water Resources East (WRE) water companies.

Table 1: Non-Essential Use Ban Exemptions

No.	Drought Order Category	Statutory Exemptions	Universal Exception	Discretionary Exception	UKWIR Suggested Discretionary Exceptions
1	**Watering outdoor plants on commercial premises**	This includes plants which are in a pot or container that is outdoors or under cover and plants which are in the ground under cover. This does not include plants grown (i.e. cultivated or propagated) or kept for sale or commercial use or plants part of a National Plant Collection or temporary garden or flower display.	None	Use of an approved drip or trickle irrigation system fitted with a PRV and timer is set for use in the evening or night.	Use of an approved drip or trickle irrigation system fitted with a PRV and timer
				Water newly bought plants for the first 28 days after the implementation of the ban.	Watering newly-bought plants
2	**Filling or maintaining a non-domestic swimming or paddling pool**	This restriction shall not apply to: ▪ Pools open to the public (a pool is not open to the public if it may only be used by paying members of an affiliated club or organisation). ▪ Filling or maintain a pool that is used by pupils of a school for swimming lessons. ▪ filling or maintaining a pool where necessary in the course of construction. ▪ filling or maintaining a pool using a hand-held container which is filled	None	None.	
					Swimming pools with covers
					Pools with religious significance
					Pools fitted with approved water conservation or recycling systems

No.	Drought Order Category	Statutory Exemptions	Universal Exception	Discretionary Exception	UKWIR Suggested Discretionary Exceptions
		with water drawn directly from the tap. ▪ filling or maintaining a pool designed, constructed or adapted for use in the course of a programme of medical treatment. ▪ filling or maintaining a pool that is used to decontaminate animals from infections or disease. ▪ filling or maintaining a pool used in the course of veterinary treatment. ▪ filling or maintaining a pool in which fish or other aquatic animals are being reared or kept in captivity.			Pools that are subject to significant repair and innovation
3	**Filling or maintaining a pond**	This restriction shall not apply to ponds in which fish or other aquatic animals are being reared or kept in captivity or to filling or maintaining the pond with a hand-held container which is filled with water directly from the tap.	Blue Badge holders on grounds of disability	None	Customers on the company's Vulnerable Customer List who have mobility issues but are not in possession of a Blue Badge
4	**Operating a mechanical vehicle washer**	None	None	On biosecurity grounds	Washers which recycle water and thus use less than 23 litres per wash
					On biosecurity grounds
5	**Cleaning any vehicle, boat, aircraft or railway rolling stock**	Cleaning any vehicle, boat, aircraft or railway rolling stock for health and safety reasons	None	On biosecurity grounds	Low water use technologies
					Small businesses whose sole operations are cleaning of vehicles using hosepipes

No.	Drought Order Category	Statutory Exemptions	Universal Exception	Discretionary Exception	UKWIR Suggested Discretionary Exceptions
					Those using vessels as a primary residence
					Cases where fouling of hulls causes fuel consumption
					To remove graffiti
					To prevent of control the spread of non-native and/or invasive species
6	**Cleaning any exterior part of a non-domestic building or non-domestic wall**	Cleaning any exterior part of a non-domestic building or non-domestic wall for health and safety reasons	None	To remove graffiti by applying to the wholesale supplier	Small businesses whose sole operations are cleaning of buildings using hosepipes
					Low water use technologies
					To remove graffiti
7	**Cleaning a window of non-domestic building**	Cleaning a window of non-domestic building using a hosepipe for health and safety reasons	None	Small businesses whose sole operations are cleaning of windows using hosepipes.	Small businesses whose sole operations are cleaning of windows using hosepipes
8	**Cleaning industrial plant**	Cleaning industrial plant using a hosepipe for health and safety reasons	None	Biosecurity	To remove graffiti
9	**Suppressing dust**	Suppressing dust using a hosepipe for health and safety reasons	None	None	None
10	**Operating cisterns on unoccupied buildings**	None	None	None	None

APPENDIX 19: DROUGHT PERMIT AND DROUGHT ORDER 'APPLICATION READINESS'

This Appendix outlines the information we have prepared to demonstrate our Drought Plan's 'application readiness'. We have provided summaries below of the documents that we plan to provide in full as part of any Drought Permit or Drought Order application. We have used Table 5 from Appendix D of the EA's guidance document[31] to identify the key documents and supplementary information we may need.

The documents that we have identified as being required to demonstrate our 'application readiness' are:

1. Draft_Supporting_Information [Drought Action Name]
2. Draft drought permit/orders

Each drought action which requires a drought permit / order has its own version of these documents. Copies of these documents have been submitted to our regulators alongside our Drought Plan.

Drought Permit Application – Supporting Information

The documents contain the following:

1. An Executive Summary outlining the strategic rationale for the application
2. A Description of Proposals including location, current licence conditions and proposed changes, a summary of the environmental impacts and proposed permitting dates.
3. Draft Drought Permit (see below)
4. Statement of Reasons including the case for Exceptional Shortage of Rain (ESOR) (see below)
5. Consent from the Navigation Authority (if required)
6. Copy of Notices and Advertisements
7. Public Inspection Arrangements
8. Existing Abstraction Licences, Acts or Orders
9. Environmental Reports
10. Consultees
11. Objections
12. Appendices

Draft Drought Permit / Order

We have prepared a draft drought permit/order for each of our Drought Actions that require them (see tables in Appendix 10).

[31] Environment Agency, 2025. Drought permits and drought orders supplementary guidance.

For the Coldfair Green Drought Permit, we have used the template provided in Appendix E of the EA's guidance'[32].

For the Denver Licence Variation Drought Order we have used other available documents to create our own draft Drought Order.

Exceptional Shortage of Rain (ESoR)

We have used the Environment Agency guidance document 'Hydrological guidance for the assessment of an Exceptional Shortage of Rain (ESoR) March 2025'[33] to undertake ESoR assessments. This guidance states that 'A drought order or a drought permit cannot be granted if the serious deficiency of supplies, or threat to (or serious threat to flora and fauna) has not been caused by an exceptional shortage of rain' (page 7). It is therefore incumbent on us as the water company to demonstrate that the lack of rain qualifies as 'exceptional'.

Our detailed approach to demonstrating this is in the 'Draft_Supporting_Information [Drought Action Name]' document for each relevant drought action.

[32] Environment Agency, 2025. Drought permits and drought orders supplementary guidance.
[33] Environment Agency, 2025. Hydrological guidance for the assessment of an Exceptional Shortage of Rain (ESoR) March 2025'

APPENDIX 20: LESSONS FROM 2022 DROUGHT

Drought Summary

2022 was the warmest year on record for the UK with extreme heatwaves in the summer months that included temperatures in excess of 40˚C being recorded for the first time in the UK. It was the also the driest January-August period since 1976 and drought conditions were declared across parts of England and Wales including East Anglia. Drought status was declared in the East of England on the 12 of August 2022.

For the Water Resource Management Plan (WRMP) we are required to set out the lessons we have identified as a result of our experiences during the prolonged dry weather / drought event in 2022, with particular consideration given to:

- how you can improve the resilience of your supply system to similar events;
- whether any new temporary schemes implemented during the drought could be made permanent, ensuring they are assessed as an option in your plan;
- include any newly identified drought permits as an option in your plan;
- ensuring the assumed benefits in your options list for drought interventions (such as drought permits/orders and Temporary Use Bans) implemented this year reflect your latest understanding;
- reviewing your planned level of service;
- updating deployable outputs where you have gained an improved understanding of how your sources respond to drought;
- ensuring your planning assumptions for dead storage and emergency storage are accurate;
- reviewing your demand forecast assumptions, following your experience of the impact of 2022 drought and heatwaves on household and non-household customer demand, including the extent and duration of peak demands;
- if you do not currently use dry year critical period scenario/s, consider whether you should introduce this scenario in your planning;
- ensuring you consider high demand (leakage) resulting from all extreme weather - including heat waves, as well as freeze-thaw events;
- considering whether you need to include any schemes as part of your business plan to improve connectivity and zone integrity;
- reflecting any updates to bulk supply agreements, including pain-share agreements discussed during the drought; and

- reviewing your forecast outage, as this is particularly important in acute drought events.

Rainfall

The first 5 months of 2022 (January to May inclusive) recorded 70% of the long term average rainfall in Essex and Suffolk. Rainfall in June was below average in most southern and eastern areas, with both Essex and Suffolk recording 62% of the long term average. July was significantly dry with Essex recording 5% of the long term average rainfall and Suffolk recording 11% of the long term average rainfall. August was dry also for many areas, though localised thunderstorms contributed to rainfall totals in some places, with an overall figure of 54% of average.

Figure 1 shows the mean rainfall for summer 2022. For the months of June, July, and August, Essex experienced no rainfall for 74 out of the 92 days, with a particularly dry period between the 9 of June and the 14 of August in which there was just 8.4 mm of rainfall. Over the three period of June to August (inclusive) rainfall recorded in Essex was 42% of the long term average and in Suffolk, 32% of the long term average rainfall.

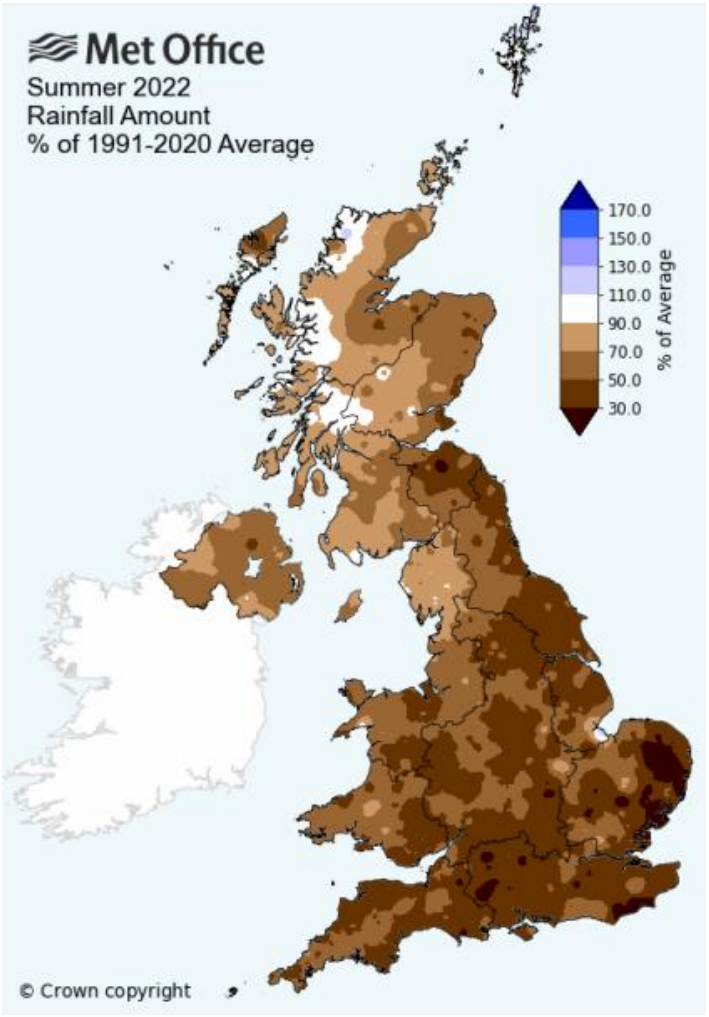


Figure 1: Mean rainfall for summer 2022.

Temperature

In Essex and Suffolk the summer recorded warmer than average temperatures, where mean temperatures were nearly 2°C above average. There were hot spells in each month, and the summer recorded a new high of 40.3°C at Coningsby (Lincolnshire) on 19th July. The weather was settled for much of the time, with little rain in many areas during most of July and early August.

Figure 2 shows the mean temperature for summer 2022. Both All three summer months saw above average temperatures overall, especially in eastern areas, with maximum temperatures above average. Overall mean temperatures for June were 0.6°C above average, and July was 1.3°C above average, with August then 1.5°C above average.

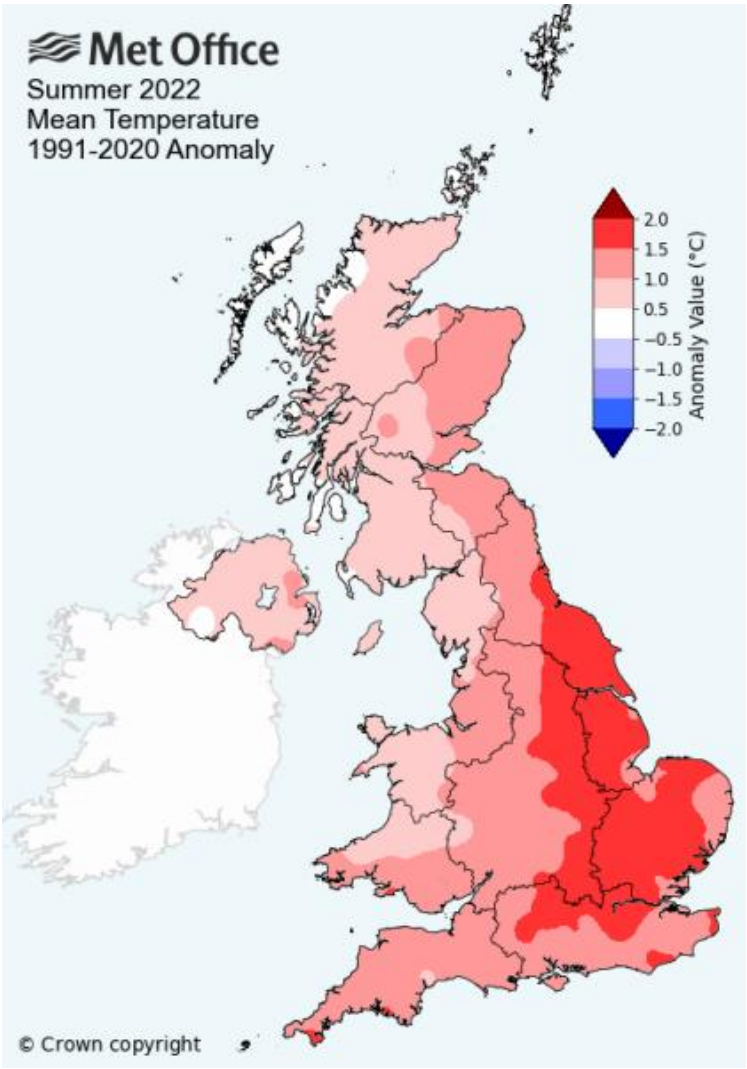


Figure 2. Mean temperature for summer 2022

Figure 3 shows the impact on Essex (green) and Suffolk (purple) total demand (Ml/d) against daily total rainfall (blue) and daily max temperature (red) for Apr-Oct 2022.

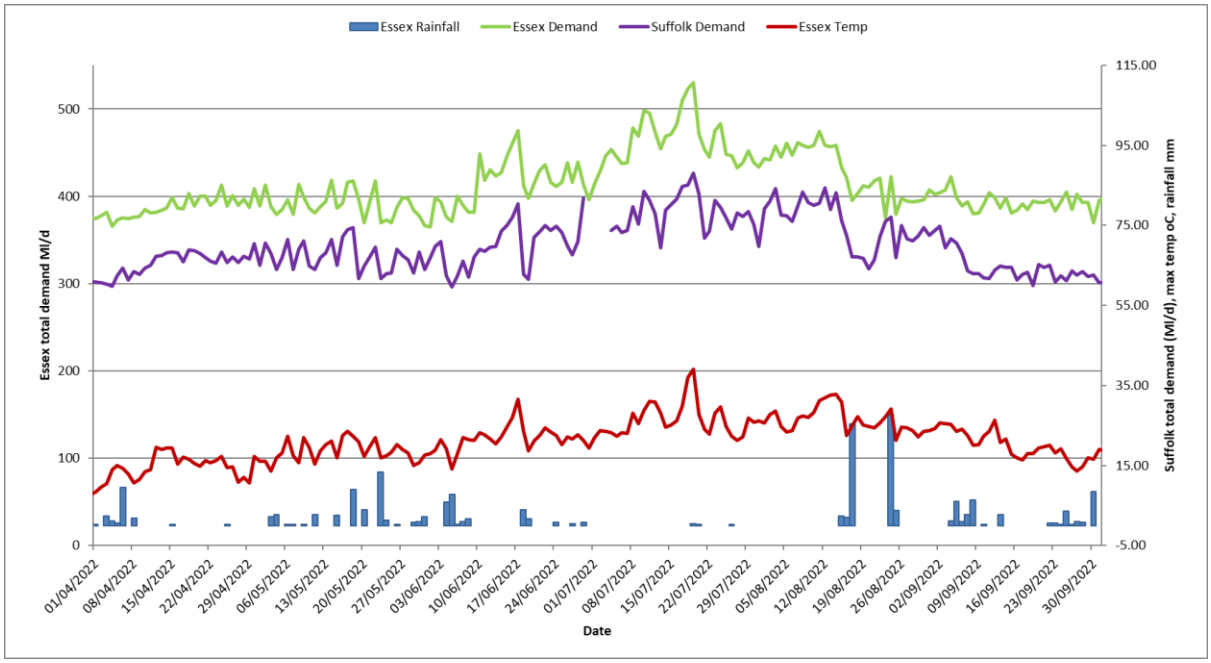
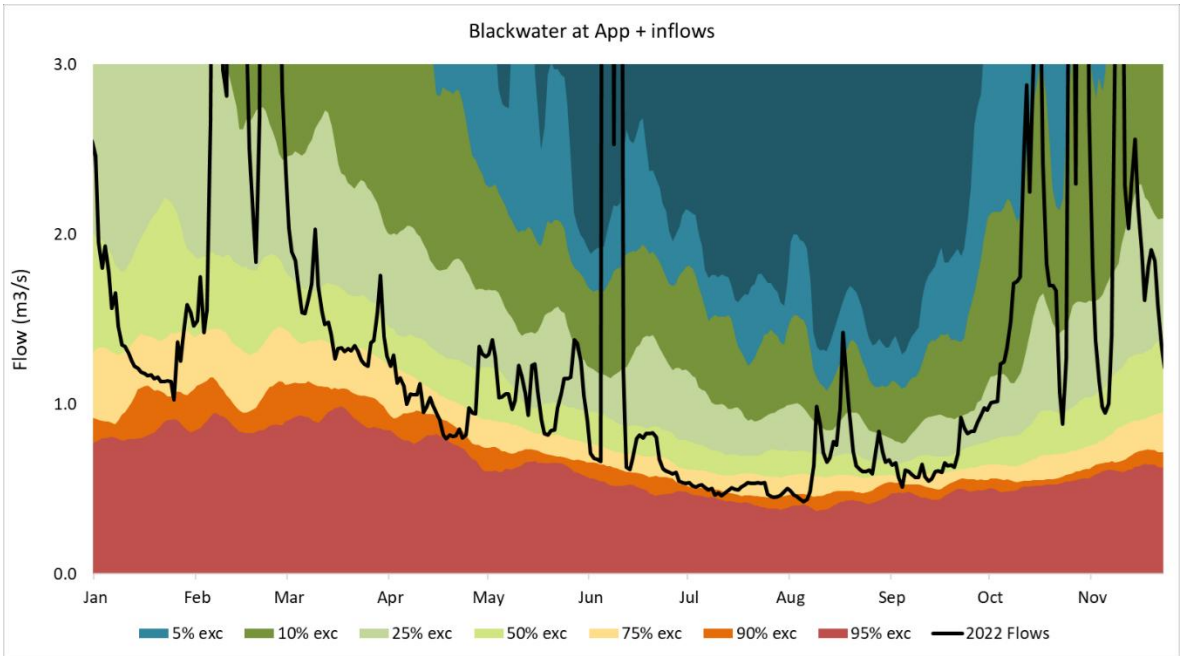


Figure 3: Essex (green) and Suffolk (purple) total demand (Ml/d) against daily total rainfall (blue) and daily max temperature (red) for Apr-Oct 2022.

River Flows

River Flows in Essex and Suffolk started the summer period below average due to the below average antecedent rainfall with the previous 6 months (December to May inclusive) recording 80% of the long term average in both Essex and Suffolk and the previous 3 months (March to May inclusive) recording around 60% of the long term average.

The continued below average rainfall over the summer period caused river flows in Essex and Suffolk to decline below the 75% flow exceedance percentile (i.e. Q75) and in some cases reach Q90 or Q95 as shown in the river Stour and the river Blackwater examples in figure 4. It was not until October that river flows returned to average (around the 50% exceedance percentile).



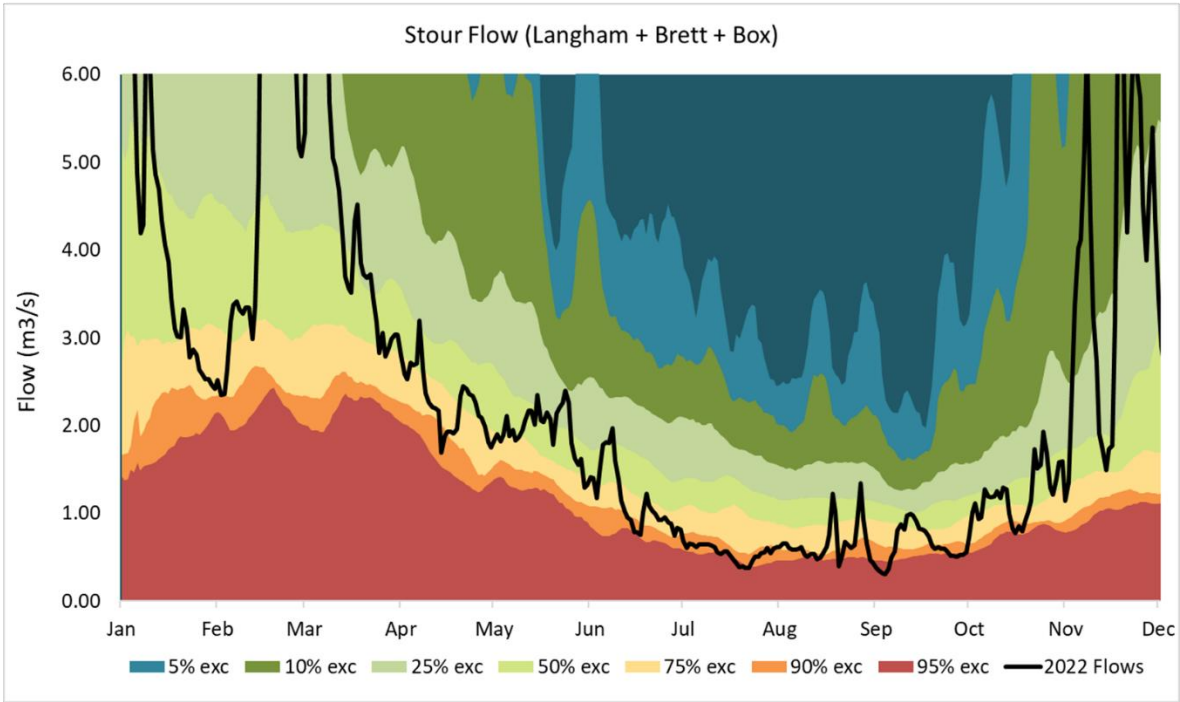


Figure 4. River flow exceedance percentiles for the River Stour and the River Blackwater in 2022

Soil Moisture Deficit

Soil moisture deficit (SMD) in Essex and Suffolk was below average at the start of 2022 (figure 5) but increased at a greater rate than average due to below average rainfall in Spring, starting the summer period above average. The continued dry weather caused SMD to reach close to the historic maximum in the summer period. SMD declined in throughout autumn due to above average rainfall and returned to average by late November.

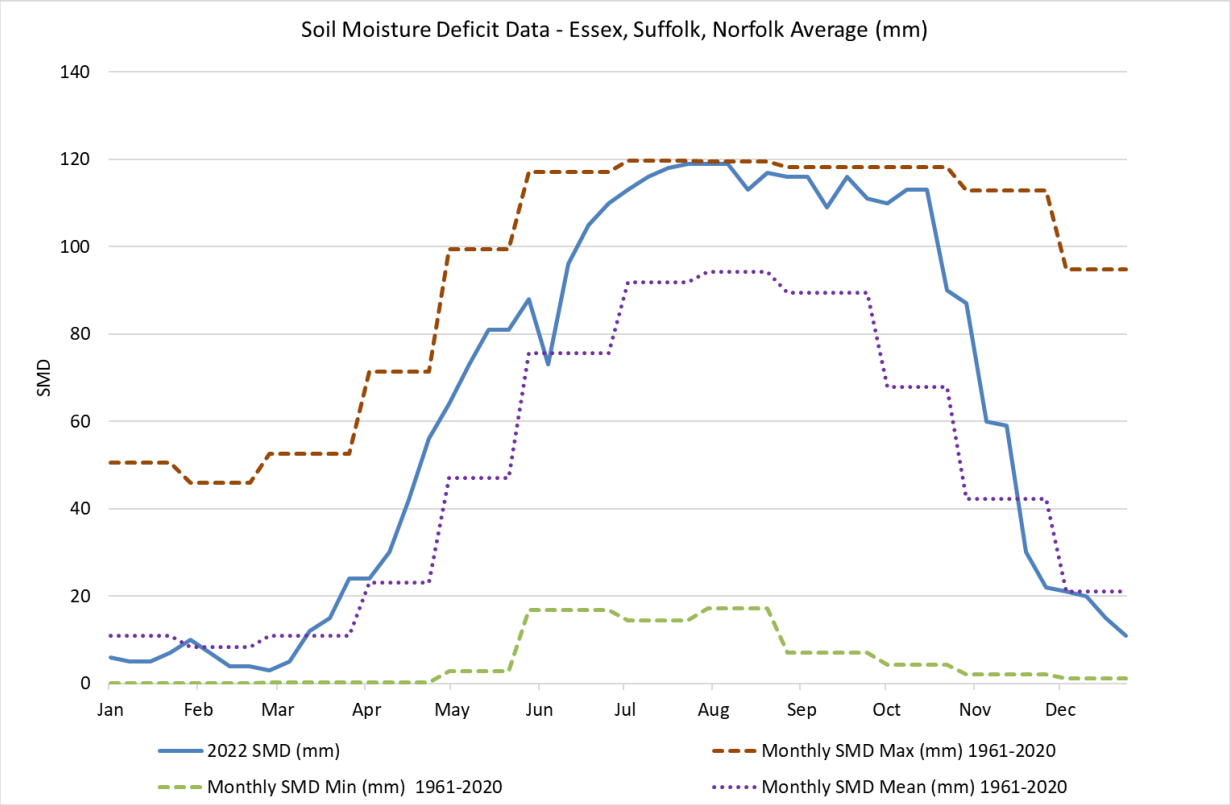


Figure 5. Soil Moisture Deficit in Essex, Suffolk and Norfolk in 2022. Plotted with Average, Minimum and Maximum.

2022 Classification

Plotting rainfall and temperature data in quadrants can graphically represent the weather conditions and show if a year would be classified as ‘dry’, ‘normal’ or ‘wet’. The quadrant graph for Essex highlights 2022 as having 41 days with a temperature greater than 25°C and a cumulative rainfall of less than 500mm. This puts 2022 for Essex in the ‘dry year’ category. Out of the years covered, Suffolk 2022 recorded both the second greatest number of days over 25°C and the second lowest cumulative rainfall; 33 days and ~410 mm respectively. This puts Suffolk 2022 in the ‘dry year’ category.

Figures 6 and 7 shows the number of days with temperature greater than 25°C against cumulative rainfall in Essex and Suffolk respectively, in 2022.

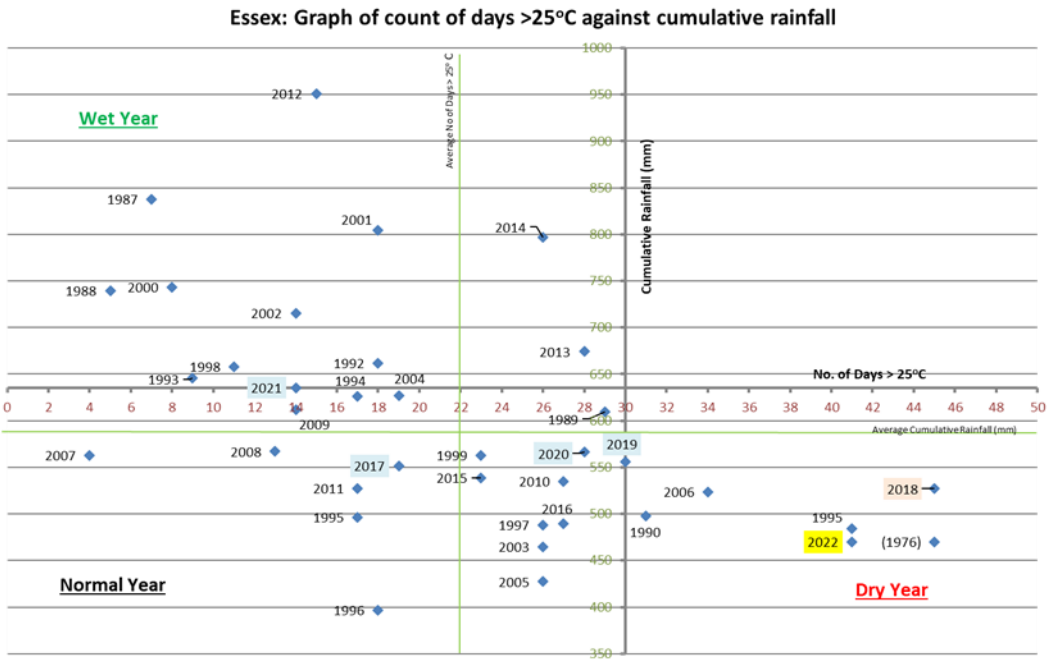


Figure 6: Quadrant graph for Essex 2022 showing number of days with temperature greater than 25°C against cumulative rainfall.

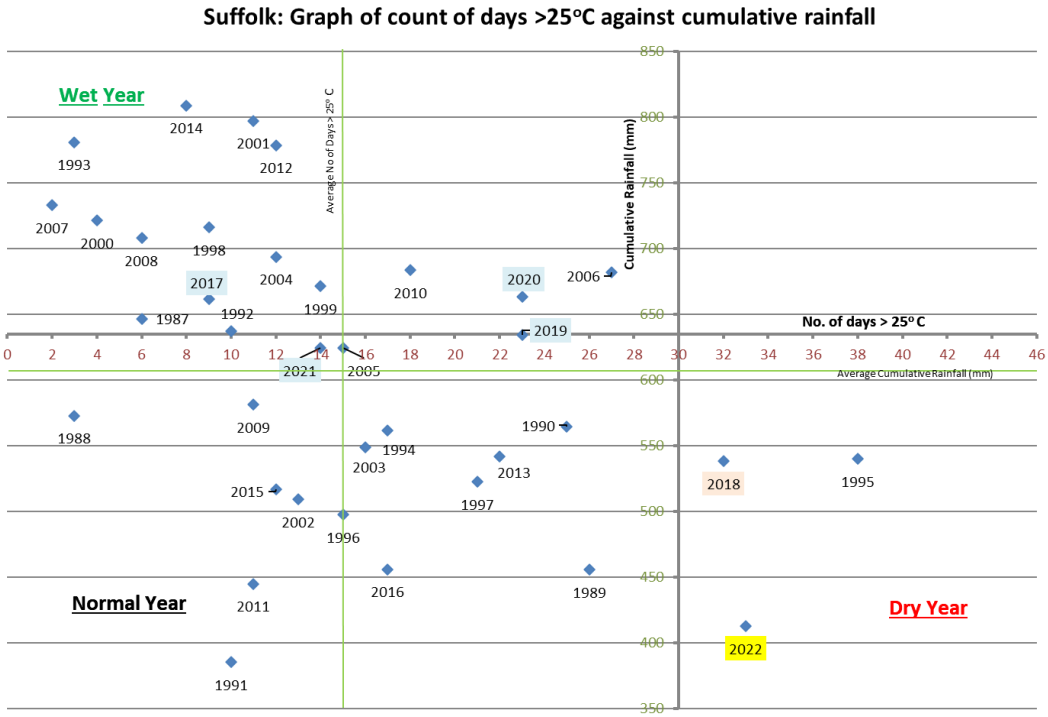


Figure 7: Quadrant graph for Suffolk 2022 showing number of days with temperature greater than 25°C against cumulative rainfall.

Restrictions on customer water use in 2022

- During the 2022 we did not place any restrictions on customer water use across our area of supply.
- We did not introduce a TUB in our area of supply during 2022.

- We implemented Level 1 for demand side actions of our drought plan during the summer 2022.
- We implemented Level 1 supply side actions of our drought plan during the summer 2022.

Lessons Learnt:

1. How you can improve the resilience of your supply system to similar events

As part of our water resources planning process, we are required to update our Water Resources Management Plan under the current periodic review for 2024 (PR24). As part of this work, we have updated the Supply Demand Balance (SDB) for each of our water resource zones, as required under the Environment Agency's Water Resource Planning Guidelines (2021). We are planning to be resilient to a 1-500 drought event, i.e., increasing the likely frequency of implementing level 4 restrictions to 1 in 500 years on average as soon as our planned investment allows.

2. Whether any new temporary schemes implemented during the drought could be made permanent, ensuring they are assessed as an option in your plan

We did not implement any temporary use schemes in our area of supply during 2022. Our level 1 drought actions were implemented, shown in figure 8.

SEVERITY OF THE DROUGHT	LEVEL	DEMAND SIDE ACTIONS	SUPPLY SIDE ACTIONS
Drought plan	Level 1	• Communications campaign • Increased leakage control	• Optimising sources • Reducing treatment works outage • Reducing process losses • Running dry weather river support schemes including Essex Recycling Plant, the Ely Ouse to Essex Transfer Scheme and the Waveney Augmentation Groundwater Scheme
		• Formal Appeal for Restraint for voluntary reduction in water use	

Figure 8: Level 1 drought actions.

Planned outage was differed entirely until reservoir stocks were regained. In addition, since last year, we have focused on winter maintenance and actions to ensure we are as resilient as possible for the coming 2023 summer. This has included reviewing groundwater source pump levels to ensure they are optimised.

3. Include any newly identified drought permits as an option in your plan

During the 2022 drought, the Environment Agency (EA) indicated that they would consider a request from us, to them, to make a temporary licence variation to their Ely Ouse River at Denver abstraction licence, part of the Ely Ouse to Essex Transfer Scheme, to increase water available to replenish our reservoir stocks. This would be

to change the Hands Off Flow (HOF) at Denver, whereby the HOF in April would be lowered. This may require an associated increase in the HOF in October. The HOF applicable to April is currently 318 Mld, and in October it is 114 Ml/d. On average, there is more water available for transfer in April than in October; and generally, the quality of the water in the Essex Rivers is better in April compared to October, where elevated nitrates constrain abstraction from the rivers directly into Langham and Langford WTW. This constraint requires Langham WTW to be fed from Abberton Reservoir instead, which not only reduces the quantity in storage but also constrains the volume we can abstract from the river to put into Abberton Reservoir, due to the current raw water network arrangement. Whilst we did not need to pursue requesting the EA to vary their Denver abstraction licence in 2022/23, we will either as a new drought option in our Drought Plan, or a permanent variation of the licence.

4. Ensuring the assumed benefits in your options list for drought interventions (such as drought permits/orders and Temporary Use Bans) implemented this year reflect your latest understanding

We did not implement any drought actions in 2022. We do benefit from our previous experience of implementing Temporary Use Bans (TUBs), the most recent being in 1997/98. Also, the ongoing UK Water Industry Research (UKWIR) project on the impact of TUBs on demand will help inform our understanding of the benefits of such measures going forward.

5. Reviewing your planned level of service

As part of the WRMP24 process we have reviewed our planned levels of service. In-line with the Environment Agency's Water Resource Planning Guidelines (2021) we are planning to be resilient to a 1-500 drought event, i.e., planning for the likely frequency of implementing level 4 restrictions to 1 in 500 years on average. Our draft WRMP forecasted SDB indicates that to be resilient with a 1 in 500 year drought, we need to temporarily reduce our planned levels of service as shown in table 1, increasing the frequency of level 1 and 2 restrictions on water use to 1 in 5 years, and 1 in 10 years respectively.

Table 1: Planned levels of service

ESSEX SUPPLY AREA DROUGHT ACTION LEVEL OF SERVICE	WRMP24	
	FREQUENCY OF RESTRICTION	**ANNUAL CHANCE OF RESTRICTION**
Level 1: Appeal for restraint	1 in 10 years	10% probability in any one year
Level 2: Phase 1 Temporary Use Ban	1 in 20 years	5% probability in any one year
Level 3: Phase 2 Drought Order Ban	1 in 50 years	2% probability in any one year
Level 4: Reduced supply at customer tap	2025 to 2030: 1 in 200 years 2031 onwards: 1 in 500 years	2025 to 2030: 0.5% probability in any one year 2031 onwards: 0.2% probability in any one year

SUFFOLK SUPPLY AREA DROUGHT ACTION LEVEL OF SERVICE	WRMP24	
	FREQUENCY OF RESTRICTION	**ANNUAL CHANCE OF RESTRICTION**
Level 1: Appeal for restraint	1 in 5 years	20% probability in any one year
Level 2: Temporary Use Ban	1 in 10 years	10% probability in any one year
Level 3: Drought Order Ban	1 in 50 years	2% probability in any one year
Level 4**:** Reduced supply at customer tap	1 in 200 years (1 in 500 from 2032)	0.2% probability in any one year

6. Updating deployable outputs where you have gained an improved understanding of how your sources respond to drought

As part of the WRMP24 process we have undertaken stochastic modelling to derive updated deployable outputs (DO) for our Water Resource Zones (WRZs). The stochastic timeseries used in the DO modelling includes synthetic droughts of varying intensity and duration. This will enable us to plan to be resilient to not just the worst historic droughts, but also potential future droughts that are more severe.

We know that periods of dry weather impact the quality of water in the rivers we abstract from. There appears to be a link between dry weather and the severity and duration of the elevated nitrate season the following autumn/winter. Therefore, we are planning to install nitrate removal at Langham, Langford and Barsham WTW in Asset Management Plan 8 (AMP8) to increase our drought resilience and water available for use in periods of poor water quality. We are also planning a number of other resilience schemes in AMP8, include the upgrade of the treatment process at Langford WTW including UV removal of cryptosporidium, increasing the pumping capacity of the River Chelmer intake and Abberton Raw water Pumping Station. These investments will ensure that we utilise our available resources efficiently.

7. Ensuring your planning assumptions for dead storage and emergency storage are accurate

As part of our continuous improvement, we have invested in new rainfall-runoff models (GR6j) and have updated our historic inflow timeseries used in our Aquator® models to include the recent droughts of 2018 and 2022. Since our draft WRMP, we have made updates to our Essex system Aquator model to include Chigwell, Stifford and Roding WTW. As a result, we have reviewed our reservoir control curves, including the emergency and dead storage levels.

8. Reviewing your demand forecast assumptions, following your experience of the impact of 2022 drought and heatwaves on household and non-household customer demand, including the extent and duration of peak demands

We have updated our revised draft demand forecast to include the impact of the 2022 drought. This is completed through updating our critical period and peak demand analysis and resulting assumptions.

Peak Demand

Historic daily weather and demand data is collected for assessing the peak demand and critical period uplift. The demand data consists of daily distribution input (DI) data and daily per capita consumption (PCC) (split measured and unmeasured) data for each WRZ for a minimum of 12 years and has been updated to include data from 2022. The weather data consists of daily maximum temperature data, daily rainfall data and daily sunshine hours data.
A peak week has been determined as a period of 7 days. This aligns with our regional group. The maximum 7-day rolling average DI for the last 12 years, including 2022, is shown below for Essex and Suffolk Water (ESW) along with the reasons for the peak.

Table 2: Max 7-day rolling average of DI for ESW, for the last 12 reporting years.

Reporting year	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022
Max 7 day rolling average DI (Peak)	507.15	510.13	556.12	476.79	511.51	502.73	540.33	562.31	517.09	596.63	544.13	587.88
Date of Peak	26/05/11	10/09/12	21/07/13	25/06/14	05/07/15	25/07/16	22/06/17	27/07/18	27/07/19	13/08/20	15/06/21	20/07/22

- 2011/12- Peak demand followed a period of nine days with no rainfall and high temperatures. High temperatures and low rainfall are synonymous with peaks in demands and occurring during a school holiday week when people are at home more increases demand more than normal.
- 2012/13- The peak in demand followed 13 days on no rainfall and high temperatures (including three days directly before of temperatures above 26˚C) in September in our southern region.
- 2013/14- The peak in demand followed a period of 17 consecutive days with no rainfall and high temperatures, during a heat wave which effected the UK between 3-23rd July 2013.
- 2014/15- The peak in demand followed a period on 31 days with no rainfall in June 2014, and high temperatures.
- 2015/16- The peak demand followed a week which included the hottest July temperature on record for the UK at the time. In Essex this saw temperatures above 31˚C.
- 2016/17- The peak in demand for this year occurred during a July period of high temperatures (reaching above 30°C) and no rainfall (13 consecutive days).
- 2017/18- Similar to the previous year, the peak in demand for this year occurred during a period of high temperatures (reaching 30°C) and no rainfall (12 consecutive days).
- 2018/19- This was classed as a dry year in the Southeast region. On this particular day temperatures soared to 34°C and followed a period of 55 days of no rainfall.
- 2019/20- The peak demand followed a week of high temperatures including one day of nearly 38°C.

- 2020/21- The peak in demand occurred during August for this year and followed a period of 16 days with very little rainfall. Temperatures of greater than 27°C were seen in the week before the peak demand. However, this was also coupled with lockdowns due to the Covid pandemic which also increased demand over and above what would normal be expected for the time of year. This is predominantly due to more people being at home all the time, not being able to travel for holidays either and increased hand-washing, cleaning activities.
- 2021/22- The middle of June saw the peak in demand for this year. This followed a period of no rainfall (10 days) and high temperatures. The Covid pandemic is still found to be impacting demand for water causing a further increase. This is predominantly due to people working from home more and staycations being the holiday of choice for the year34.
- 2022/23- The warmest year on record for the UK with all months except December being warmer than average. Rainfall was below average for the entire year, and it was sunnier than average especially in Eastern England. Extreme heatwaves in the summer months included temperatures in excess of 40°C being recorded in the UK for the first time.

Critical Period

We have updated our critical period analysis to include weather and demand data from the whole of 2022. The resulting critical period uplifts that include the data from 2022 are as follows:

Table 3: Critical Period Uplifts

Critical period uplift (%)	Unmeasured HH	Measured HH	NHH
Essex	38.2%	35.0%	0% (N/A)
Blyth	36.9%	8.6%	23.5%
Hartismere	36.9%	8.6%	23.5%
Northern Central	36.9%	8.6%	23.5%

Including the 2022 data in the critical period analysis has increased the Unmeasured Household (HH) % uplift by an average 9% and decreased the Measured HH uplift by -1% on average across ESW. Non-household (NHH) uplift has decreased by an average 9% from 33% to 23.5% in Suffolk.

Dry Year

The 2022 dry year data has not been included in the estimate of dry year uplift. This is because reported figures for PCC and DI for 2022/23 were not finalised in time to be included in the revised draft demand forecast. There was also a concern that the

[34] Staycations.pdf (accumulatecapital.co.uk)

impact of Covid could still be affecting demand. However draft PCC and DI figures for 2022/23 did not differ significantly from the previous 2018 dry year therefore we feel the 2022 dry year impact will be accounted for sufficiently in our dry year uplift already.

COVID

Met Office - Building COVID and Non COVID Demand models for COVID PCC comparisons – Update 2022

We commissioned work with the Met Office to understand the effects of weather and Covid-19 on our demand during 2020 and 2021. We once again commissioned the Met Office to update this analysis for 2022 to continue to understand the impact of Covid on both weather and non-weather dependant demand for the third year since the pandemic began. We were particularly interested in the impact of the 2022 drought on demand in conjunction with the impact of Covid which we requested the Met Office to conduct further analysis on.

A summary of the report[35] is provided below. The report is available upon request.

The Met Office produced a water demand model that splits total water usage into base usage and weather-dependent usage, thereby enabling all three to be analysed and addressed. Warm weather and cold weather aspects are covered to produce a capability that can be used throughout the year.
A pre-Covid normal demand model has been developed for each of the three regions (Essex, Suffolk and Northumbrian). This takes observed demand over the last 10 years, and this is used to create a model of this demand which splits out base demand and weather dependant demand. Not only are weather variables investigated but also day, week, year, and time series analysed to ensure differences in seasonal, bank holiday, weekday vs. weekend and general long-term trend in demand are considered. The modelled data matches historic observed data very well in all three areas.

Demand data from 2020 is then used to create a COVID model suitable for use in the Northumbrian, Essex, and Suffolk regions. The need to extract suitable weather data from Met Office archives remains the same as for non-COVID modelling. Having removed any potentially erroneous data, data from Northumbrian, United Utilities and Yorkshire Water is combined and data from Essex and Suffolk regions is combined to give better prospects of developing a stable model.

This Pre-Covid model is then run with a Covid demand model for the weather data from 2020 through to the end of 2022.
Pre-Covid model = model of normal demand for weather experienced and…
Covid model = model of lockdown demand for weather experienced. (Lockdown demand is the increased demand experienced because of the lockdown due to Covid).
Previously calibrated demand models for 2020 have been applied to more recent weather data for 2022. For both the pre-Covid and Covid models base demand and

[35] Met Office (2023) Building COVID and Non COVID Demand models for COVID PCC comparisons – Update 2022

weather dependant demand have been modelled separately before being looked at together in comparison with observed demand. Demand has been analysed both as total demand and PCC.

Essex:

As is shown in Figure 9 the pre-COVID model captures spikes in demand (though slightly underestimating their magnitude) between April and September. The COVID model significantly over-predicts demand at some points, appearing to be too sensitive to weather, and its constant base component appears too high particularly in the Autumn. Neither model captures the high demand in December 2022, likely related to particularly cold weather and freeze-thaw processes which would need to be modelled separately.

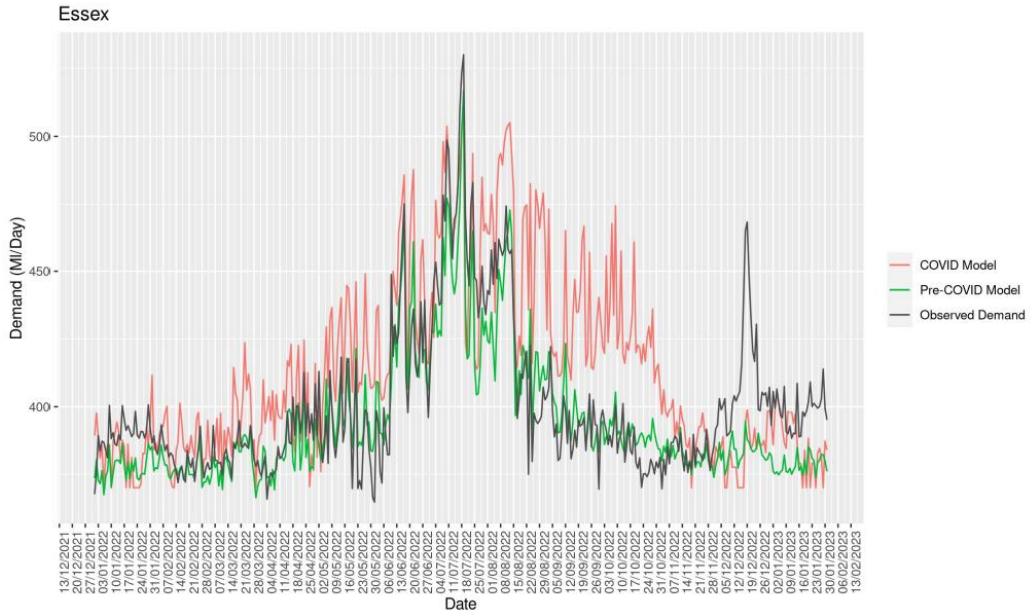


Figure 9: Observed demand compared to covid and pre-covid models for Essex in 2022.

Between April and September, the pre-COVID model appears to be a better fit for observed demand than the COVID model, with a R^2 of 0.82 meaning that 82% of the variation in the observed demand is explained by the pre-COVID model, as opposed to 57% by the COVID model (see Figure 10).

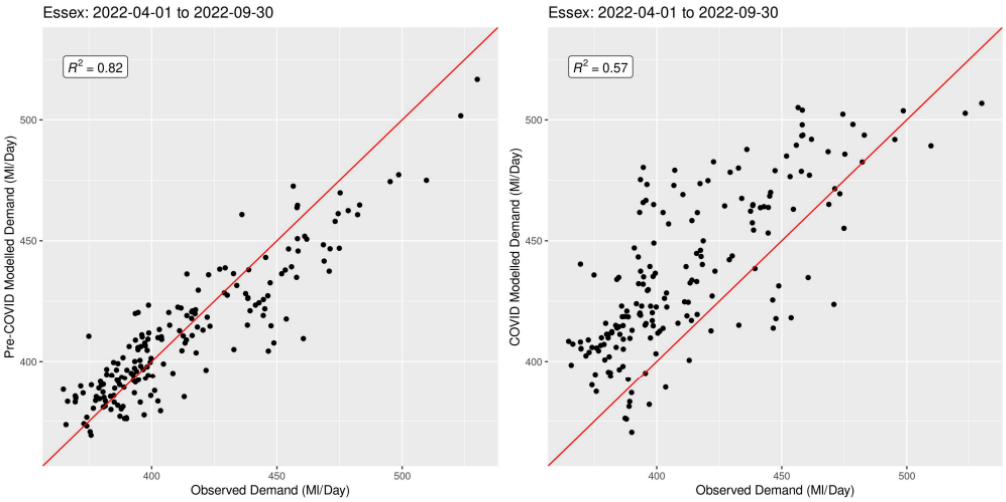


Figure 10: Scatter plots showing observed demand compared to covid and pre-covid models for Essex between Apr-Sep 2022.

The predictions of the pre-Covid models for both Essex and Suffolk perform well against the observed demand between April and September 2022, whereas the COVID models perform poorly. This indicates that demand has returned to pre-COVID weather sensitivity and base usage levels. There are some periods where neither model is able to fully predict the weather dependent demand that is observed, leading to some under and overestimation of monthly demand totals by the pre-COVID model in particular.

Total demand across all three regions appears to have returned to pre-COVID weather sensitivity and base usage. The additional increase in demand that could be attributed to Covid was small (0.5 % for Northumbrian Water Group (NWG)) and is more likely due to the drought conditions of 2022 causing weather-dependant demand to be higher than modelled.

The overall impact on average PCC saw a small increase of 0.9-5.2 l/hd/d. This represents an increase of 2.3% in Essex and Suffolk and an average of 1.65% increase in PCC for NWG (weighted on population). This increase can be attributed to the ongoing impact of Covid but is more likely to be attributed to the extreme weather in 2022.

The relationship between weather and demand (pre-COVID, observed) has been investigated further. Key findings include:

- All three areas experienced some days of notably low demand, thought to be related to high rainfall or non-weather factors, that were not predicted by the model. This resulted in some slightly high predictions of monthly totals.
- The largest differences between the observed demand and modelled demand were found on particularly high usage days. The summer of 2022 was notably hot and dry, with the UK experiencing 40°C for the first time on record. Investigation into these periods found that for Essex and Northumbrian, the model was unable to fully capture the extent of spikes in demand occurring at particularly high temperatures. This is thought to be due to previously unseen

high temperatures that were not included in part of the model calibration. For Essex, this resulted in 19.8 Ml/Day additional usage through July.

- In Suffolk, whilst the highest spikes in demand were captured by the model the extended periods of high demand following them were not. This is thought to be related to the prolonged dry conditions experienced, which the Soil Moisture Deficit component of the model does not fully capture the impact of. This resulted in 2.5 Ml/Day additional demand in July and 3.0 Ml/Day in August.

The modelled weather dependent usage for each April to September period from 1961 to 2022 was calculated and ranked. In 2022 Suffolk had the 2nd, Essex had the 4th highest modelled weather dependent usage since 1961. However, weather dependent usage in 2022 may have ranked higher due to known underestimation of the model due to previously unseen weather conditions.

Due to underestimation, the weather dependant percentage of total usage was calculated using the modelled base usage and total observed usage. The weather dependent usage as a percentage of total usage was calculated for Essex and Northumbrian Water operating areas.

- For Essex, weather dependent usage reached a maximum of 32.6% of total usage in one day. Between April and September 2022, 13.9% of usage was weather dependent.

- For Suffolk, weather dependent usage reached a maximum of 42.5% of total household usage in one day. Between April and September 2022, 23.7% of household usage was weather dependant.

Impact of Covid

The impact of the Covid-19 pandemic and the associated measures to reduce transmission continue to affect the activities of society and have also had unforeseen outcomes within the water industry. The large impact on water consumption in homes and businesses as a result of restrictions and lockdowns, combined with the hot and dry weather of 2020 resulted in some of the highest peaks in water demand water companies, including Essex & Suffolk Water, has ever seen.

From the outset we wanted to understand the impacts of this pandemic both on demand, including PCC, but also on our customer's behaviour. We took to collecting DI, total demand and logged metered and unmetered customer consumption data since the beginning of the pandemic. We also conducted a number of customer surveys to understand how customers may be using water differently. Research, regarding the pandemic's effects, was also conducted in projects with partners, by the wider water industry and also outside of the industry as well.

We have prepared a report ('Impact of Covid-19 on demand - NWG') that documents the evidence collected and collated over the last three years (April 2020 – April 2023) to demonstrate the impact Covid-19 has had on demand and PCC both through our

own data collection and action as well as involvement in industry projects, wider research and water efficiency activity.

All the research and data summarised in the report[36] indicate that demand and PCC have been greatly impacted by the effect of the Covid-19 pandemic during 2020 and 2021. Namely that HH demand has increased, and NHH demand has decreased, with overall total demand increasing. In 2022 information from the Met Office and other sources suggests that the Impact of Covid on demand and PCC has lessened with the drought of 2022 having a greater impact than Covid.

9. Demand Management Options

Our demand management options were impacted by the drought 2022 and the lessons learnt from this period are described below.

Leakage:

Leakage increased quite significantly through the summer of 2022 as we saw a 37% increase in leakage jobs compared to the summer period in 2021. A combination of the hot/dry weather causing ground movement and additional customer consumption on the network results in more pressure on the pipes which in turn leads to more failures. There is a known issue with Asbestos Cement pipes in clay soil which react particularly badly to dry conditions. This needs to be targeted through our proactive mains replacement programme so that we reduce the risk of failure on our network. Despite this we were still able to reduce the average daily leakage by 3.3Ml/d in 2022/23 compared to 2021/22. The impact of these weather events is something that we take into consideration when developing our plan to deliver future leakage targets.

Water Efficiency:

Our typical water efficiency interventions outlined in our water efficiency strategy were delivered throughout the summer of 2022 as planned. In addition, a significant communications campaign was also delivered with the purpose of the upscaled communications activity being to communicate effectively with customers around the Water's Worth Saving message resulting in significant reach. Taking a multi-channelled approach to the campaigns, we leveraged greater engagement with significantly larger proportion of our customers. Following the 2022 campaign, there was a significant increase in those who reported being highly aware of water stress in their areas (from 10% to 32%). Successfully, the top message 'Simple changes in your daily routine can help water efficiency' was well communicated with a score of 63%. 61% of participants claimed to take/taken action as a result of seeing the communication. There was also a significant rise in the proportion who were aware of and/or have made use of the Leaky Loo programme (from 7% to 23%).

Whilst successful, a key learning point from 2022 was to start communicating with customers earlier in the year, in order to encourage water-efficient practices and behaviours before the impacts of weather would start to take effect. We recognise that we need to engage customers with tailored Water's Worth Saving communications all year round, with amplified communications leading up to periods of particularly heavy

[36] Impact of Covid-19 on demand in NWG (June 2022), NWG – report is supplied with this annual update.

water usage (i.e. March-October). This should involve a multi-channelled approach including TV, cinema, streaming, digital, social-media, direct marketing and involving employees, stakeholders and water retailers. This has been applied in 2023.

9.1. If you do not currently use dry year critical period scenario/s, consider whether you should introduce this scenario in your planning

We have already included dry year and critical period scenarios as part of the draft WRMP24 for all water resource zones. We have included 2022 weather and demand data in our critical period analysis and have updated assumptions accordingly.

9.2. Ensuring you consider high demand (leakage) resulting from all extreme weather - including heat waves, as well as freeze-thaw events

We have included all demand data (including leakage) from the entire year of 2022 in our assessment of critical period. Historic daily weather and demand data is collected for assessing the peak demand and critical period uplift. The demand data consists of daily DI data and daily PCC (split measured and unmeasured) data for each WRZ for a minimum of 12 years and has been updated to include data from 2022. The weather data consists of daily maximum temperature data, daily rainfall data and daily sunshine hours data. This allows us to make sure both heatwaves during the summer and freeze-thaw events during the winter are included in our assessment of critical period, and therefore in the uplift applied to demand for critical period.

9.3. Considering whether you need to include any schemes as part of your business plan to improve connectivity and zone integrity

Our draft WRMP baseline supply demand balances in all of our water resources zones are in deficit for all or part of the PR24 planning horizon. Therefore, as part of our options appraisal we have considered a range of options which improve connectivity between our water resource zones, and with neighbouring companies, Thames Water and Anglian Water. As part of our AMP7 Zonal Studies, we have also assessed where intra-zonal network improvements are required, and this has fed into both our WRMP24 and PR24 Business plan.

Our WRMP24 preferred plan includes two new potable water transfers, one connecting the Northern Central WRZ with the Blyth WRZ, and one from the Northern Central WRZ to the Hartismere WRZ. Once operational, these will supply Blyth and Hartismere initially with surplus water in the Northern Central WRZ, and then with additional water from our planned new resources, which are Lowestoft Reuse and the North Suffolk Reservoir. Included in these new potable water transfers are associated potable water service reservoir and network enhancements that are required to move the water into the area of our potable water network where they will be required.

9.4. Reflecting any updates to bulk supply agreements, including pain-share agreements discussed during the drought

We encouraged the New Appointments & Variations (NAV's) operating within our area to increase the water efficiency messaging to their customers during the drought of 2022 in line with our drought plan. We did not impose any customer water use

restrictions during the drought and kept our NAV's informed of this. We also have since repeated our drought plan to our NAV's alongside the expected timescales between each drought plan level option to ensure they understand the length of time they would have to inform their customers of any restrictions that may take place.

Our Chigwell WTW in west Essex, is supplied by a bulk import of raw water from Thames Waters' Lee Valley Reservoirs. Under normal conditions we take an average of 91 Mld of raw water to treat at Chigwell WTW. We have a Water sharing agreement with Thames Water, whereby during a drought we will take up to 20 Mld less. This agreement was implemented for the first time during the 2022 drought, because Thames Water were required to implement a Temporary Use ban, whilst we did not. Our Essex WRZ is highly integrated, so that we were able to accommodate the reduction in bulk supply and output of Chigwell WTW, by increasing output of other WTWs in the WRZ, to meet customer demand.

Whilst the implementation of this agreement did not impact our ability to meet customer demand in 2002, we know from our WRMP24 baseline SDB assessments that will not be in a position to renew or extend the agreement past the current end date in 2035.

9.5. Reviewing your forecast outage, as this is particularly important in acute drought events.

As part of our coordination planning process, all planned outages undergo a risk assessment with appropriate mitigation measures implemented to ensure the outage will not impact on security of supply to customers. Additionally, any unplanned outages that occur are continually monitored and are reviewed at daily and weekly operations meetings to ensure that our customers continue to receive a sufficient supply of water. Whilst we worked hard to minimise the impact of unplanned outages and delayed planned outage where required during the 2022 drought, planned outages that were required to occur, did so later in the outturn year. Our 2022/23 outturn actual outage figures shown in table 2, show the impact of this, where all are lower than WRMP19 outage allowance figures.

We have updated our methodology for assessing outage allowance for WRMP24 to consider that:

- we are now planning for a DYAA drought with a return period of 1 in 200 / 1 in 500 years, which has changed the way we calculate outage magnitude, and,
- to account for the highly integrated raw and potable water network in the Essex WRZ.

Our revised draft WRMP outage allowances are also shown in Table 4. The notable reduction in outage allowance in the Hartismere WRZ in the WRMP24 allowance is largely due to an upgrade at Rickinghall WTW, which will be completed in AMP7.

The high outage allowance in the Northern Central WRZ is in large part due to poor water quality, notably elevated nitrate and algae, in the river water feeding Barsham WTW, and the impact that has on the treatment processes, such as the GAC filters.

Despite many years of targeted Catchment Management by ourselves and Catchment Sensitive Farming, each autumn/winter river nitrate concentrations prevent abstraction into Barsham WTW. Investment to install a new nitrate removal treatment process at Barsham is included in our WRMP24.

Table 4: WRMP24 forecast outage allowances, historical actual and 2022/23 actual outage

Resource Zone	WRMP19 Outage Allowance (Ml/d)	WRMP24 Outage Allowance (Ml/d)	Actual Outage (Ml/d)					
			17/18	18/19	19/20	20/21	21/22	22/23
Essex	29.93	5.7*	33.06	37.65	22.94	16.34	30.62	20.79
Northern Central	1.36	8.83	0.58	0.38	0.64	0.25	2.06	1.17
Blyth	0.68	0.68	0.07	0.03	0.14	0.06	0.01	0.10
Hartismere	0.71	0.04	0.01	0.03	0.00	0.48	0.10	0.001

*1 in 200 yr

When making comparisons between the actual outage figures calculated for this 2022/23 and previous outturn years, with outage allowance figures calculated for WRMP19 and WRMP24, it must be noted that the methodology for calculating the outage allowance in the WRMP goes further than that used to determine actual outage, as it involves a Monte Carlo probabilistic assessment step in the methodology, which combines outage magnitude and duration to make a future forecast.

Detail on how we have updated our methodology for WRMP24 and the derivation of the WRMP24 outage allowances is in our ESW Outage Allowance Revised WRMP24 Technical Report.

APPENDIX 21: LESSONS FROM 2025 DROUGHT

Drought Summary

2025 was the UK's warmest and sunniest year on record with a key feature being the prolonged warm, dry and sunny weather across much of the UK during the spring and summer months. Central and eastern England experienced several heatwaves during July and August[37]. The 'prolonged dry weather' status was declared in East Anglia in July 2025.

Rainfall

The first five months of 2025 were all drier than average, and England had its driest spring for over 130 years (Figure 1). The period from March to August saw less than half the normal rainfall amount across southern and central England, with Essex recording 51% of the long term average (LTA) rainfall and Suffolk recording 57% of the LTA rainfall. Subsequent rainfall in September and November recording average in Essex (100% of the LTA rainfall) and above average in Suffolk (124% LTA rainfall) saw a partial recovery across East Anglia.

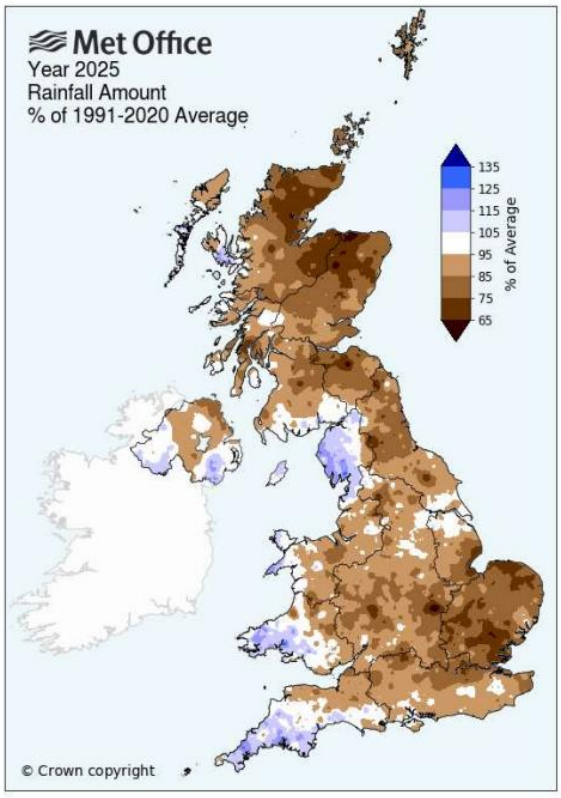


Figure 1: Rainfall amount as a percentage of average for 2025

Temperature

The record warm year was largely as a result of persistent warmth and absence of cold, rather than any individual extreme spell (Figure 2). While no individual month

[37] Met Office (2026) Microsoft Word - Annual_assessment_2025.docx

was record-breaking, March to August was at least 1°C warmer than average. ESW's highest temperature of the year was on 34.5°C on 1st July, 5°C lower than in 2022 though.

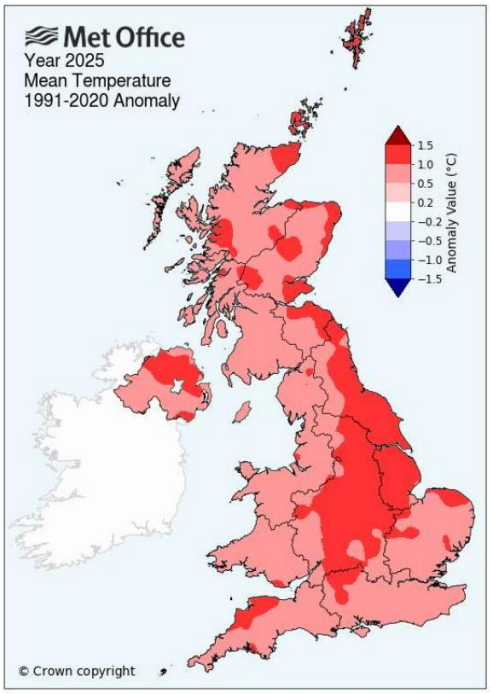


Figure 2: Mean Temperature for 2025 compared to average

River Flows

River flows started 2025 at average to above average in Essex and Suffolk following average rainfall in Autumn/Winter of 2024/25. However, drier than average Spring and Summer as detailed above caused river flows to drop to around the 90th flow percentile (Q90) in many rivers in Essex and Suffolk (Figure 3). River flows did not return to average (around 50th percentile) until late autumn/early winter.

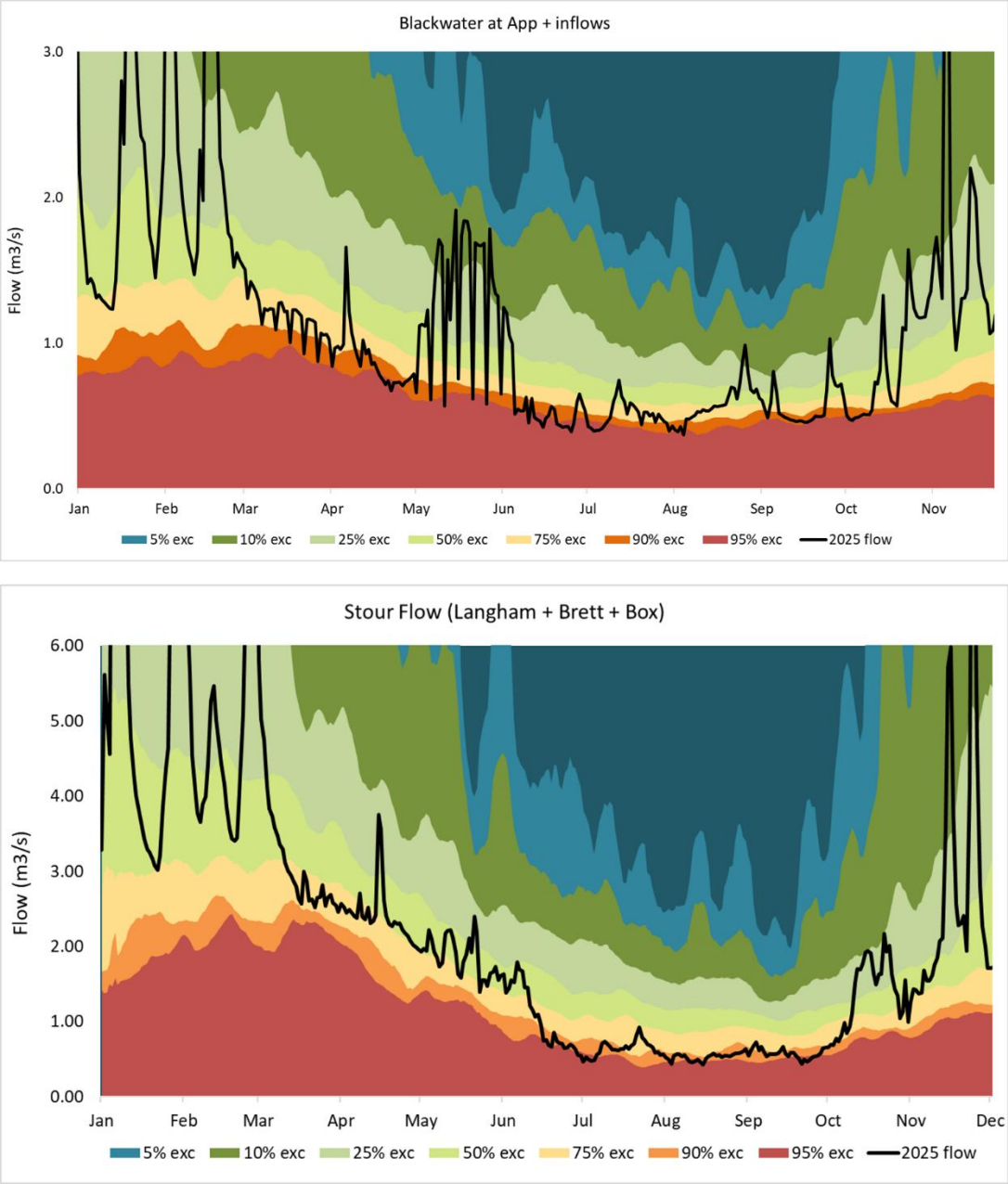


Figure 3. River flow exceedance percentiles for the River Stour and the River Blackwater in 2025

Soil Moisture Deficit

Soil Moisture Deficit (SMD) started 2025 below average following an average autumn/winter 2024/25 (Figure 4). However, a drier than average spring and summer caused SMD to increase at a greater rate than average reaching the historic maximum in July 2025. SMD remained at the historic maximum until early winter where levels declined to average following average to above average rainfall in autumn.

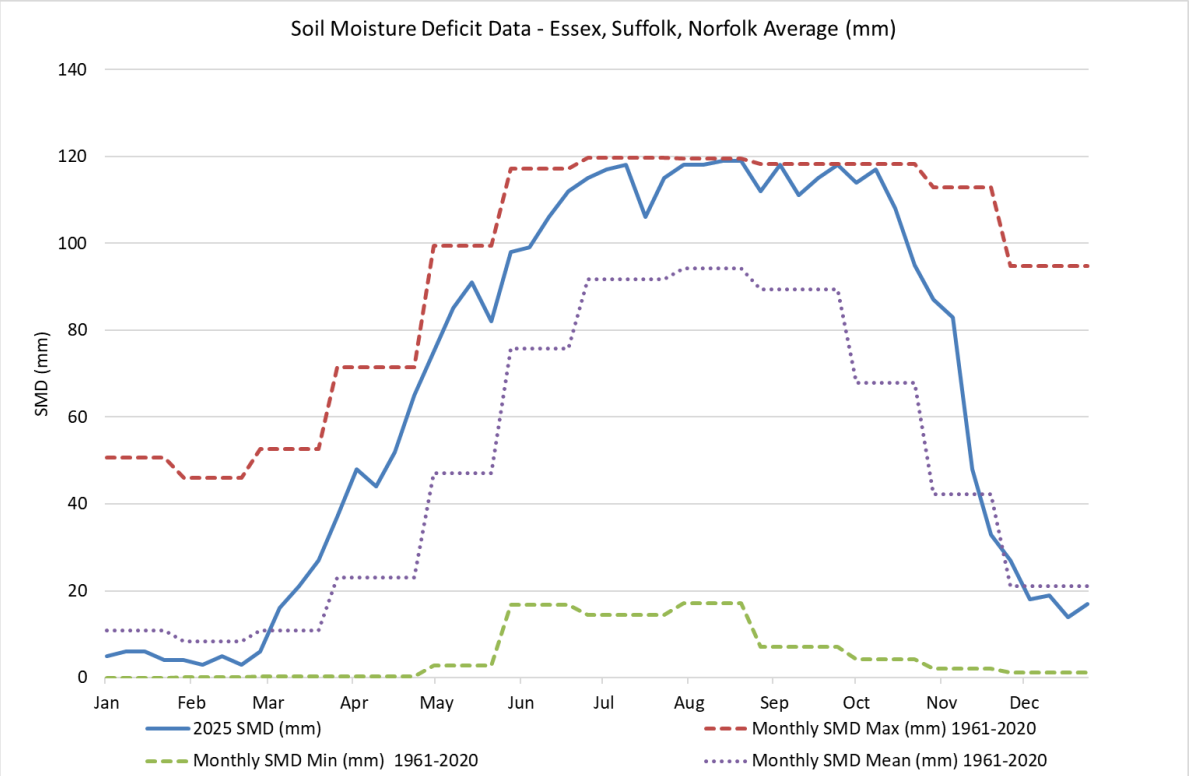


Figure 4. Soil Moisture Deficit in Essex, Suffolk and Norfolk in 2025. Plotted with Average, Minimum and Maximum

DI

Average DI for ESW during 2025 was 468 Ml/d compared to the average of 463 Ml/d from the two previous dry years of 2022 and 2018 (Figure 5). As expected peaks in demand aligned with days of high temperatures and following days with little rainfall.

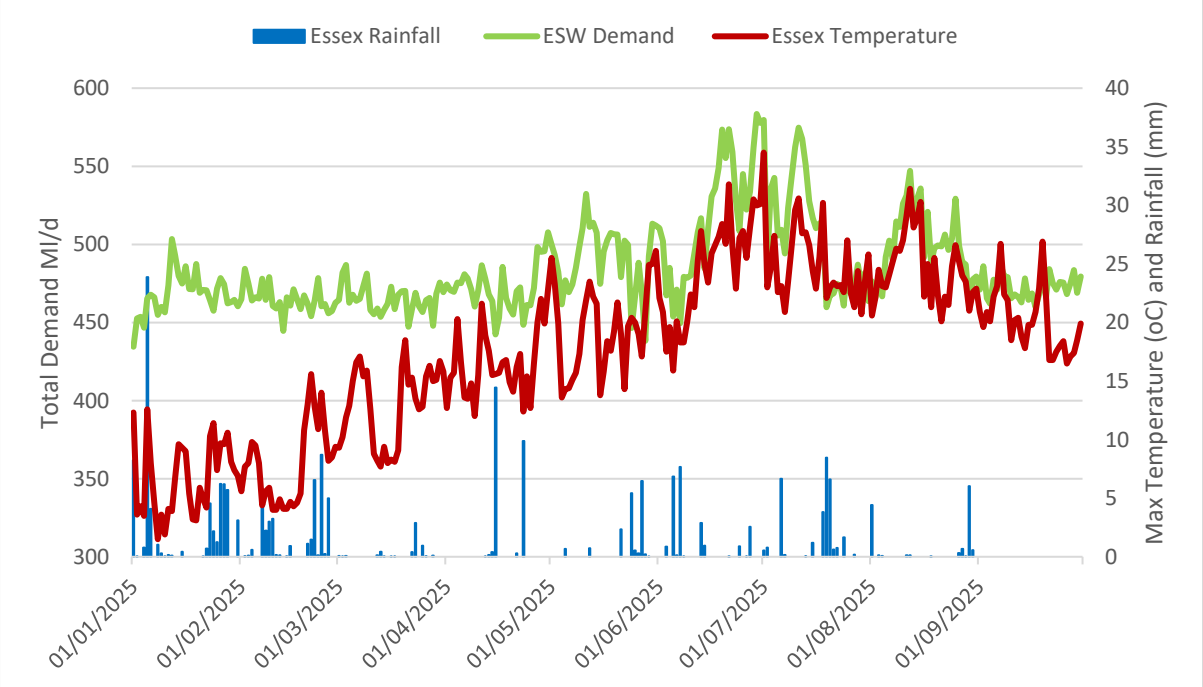


Figure 5: Demand plotted against rainfall and temperature for Jan-Sep 2025

2025 Classification

Plotting rainfall and temperature data in quadrants can graphically represent the weather conditions and show if a year would be classified as ‘dry’, ‘normal’ or ‘wet’ (Figure 6). The following graph demonstrates how the Essex and Suffolk regions were classed as ‘dry’ for 2025. Essex experienced 47 days where temperatures were greater than 25°C. This is considerably higher than the average of 23 days. The area experienced 449mm of cumulative rainfall for the year, which is the lowest rainfall since 1996.

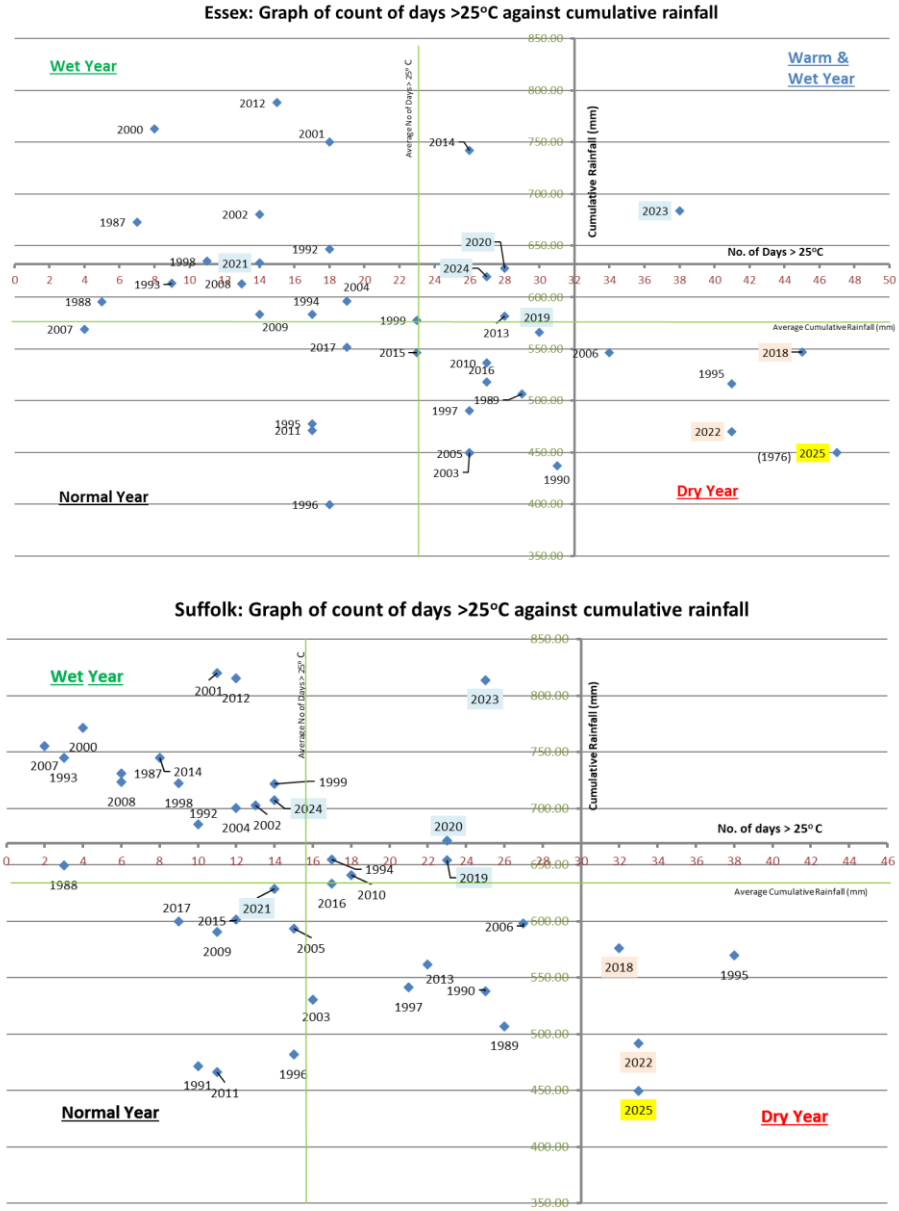


Figure 6: Separate quadrant graphs for Essex and Suffolk showing number of days with temperature greater than 25°C against cumulative rainfall.

Restrictions on customer water use in 2025

- During the 2025 we did not place any restrictions on customer water use across our area of supply.
- We did not introduce a TUB in our area of supply during 2025.
- We implemented a Formal Appeal for Restraint for voluntary reduction in water use on 17th October 2025.

Lessons Learnt

How you can improve the resilience of your supply system to similar events

As part of our water resources planning process, we are required to update our Water Resources Management Plan (WRMP) under the current periodic review for 2024 (PR24). As part of this work, we have updated the Supply Demand Balance (SDB) for each of our water resource zones, as required under the Environment Agency's Water Resource Planning Guidelines (2021). We have identified a number of additional supply schemes to support planning to be resilient to a 1-500 drought event.

The onset of the hydrological refill period often brings poor water quality (typically, high nitrates) that constrain surface water abstraction, reservoir refill and water treatment. From mid-November 2025, nitrates were exceptionally high in the rivers from which Essex and Suffolk water abstract for public water supply in Essex, and refill Abberton and Hanningfield reservoir. We managed this by actively adjusting our abstraction pattern to maximise the river abstraction through blending with other sources. The WRMP has highlighted the need for nitrate treatment, and this example further exacerbates Essex and Suffolk Water's requirements.

Whether any new temporary schemes implemented during the drought could be made permanent, ensuring they are assessed as an option in your plan

We did not introduce any temporary use schemes in our area of supply during 2025.

Include any newly identified drought permits as an option in your plan

Following the 2025 prolonged dry weather and constrained refill, Essex & Suffolk Water have identified one new drought order for the 2027 Drought Plan.

The Denver Drought Order is identified in the drought plan to be a level 2 drought action. This drought order involves a temporary reduction in the Denver Hands off Flow condition from the 1st March to the 30th April, allowing Essex & Suffolk Water to access support from the Ely Ouse Transfer Scheme (EOETS) to improve re-fill reliability of Hanningfield and Abberton reservoirs. For more information about this drought order, refer to Section 8.4.1 of the ESW Draft Drought Plan 2027.

Ensuring the assumed benefits in your options list for drought interventions (such as drought permits/orders and Temporary Use Bans) implemented this year reflect your latest understanding

We have updated the benefits in our options in our latest drought plan to reflect our latest understanding. We have included the results from the UKWIR project on the impact of TUBs[38] and will also include in the final Drought Plan 2027 the results from the latest UKWIR project on TUBs which assesses savings from 2025.

Reviewing your planned level of service

As part of the WRMP24 process we have reviewed our planned levels of service. We have not changed our planned frequency of implementation of Level 1, level 2, or level 3. In-line with the Environment Agency's Water Resource Planning Guidelines (2021) we are planning to be resilient to a 1-500 drought event, i.e., increasing the likely frequency of implementing level 4 restrictions to 1 in 500 years on average.

Updating deployable outputs where you have gained an improved understanding of how your sources respond to drought

As part of the WRMP24 process we have undertaken stochastic modelling to derive updated deployable outputs (DO) for our WRZs. The stochastic timeseries used in the DO modelling includes synthetic droughts of varying intensity and duration. This will enable us to plan to be resilient to not just the worst historic droughts, but also potential future droughts that are more severe.

We undertook a number of operational changes during the 2025 drought to maximise output during times of poor water quality and low river flow. We will incorporate these operational changes into our water resource models that will be used in future DO assessments.

Ensuring your planning assumptions for dead storage and emergency storage are accurate

As part of our continuous improvement, we revise our reservoir control curves, including emergency and dead storage when there are significant changes to how we operate Abberton and Hanningfield reservoir. The last iterative change was in 2022 to include the implementation of the Layer to Langford pipeline.

Reviewing your demand forecast assumptions, following your experience of the impact of 2025 drought and heatwaves on household and non-household customer demand, including the extent and duration of peak demands

We will incorporate the impact of the 2025 drought on household and non-household demand in our demand forecast for WRMP29. This is done through the critical period and peak demand analysis and resulting assumptions.

[38] UKWIR (2023) Review of the 2022 Drought demand management measured 23/WR/02/18

Peak Demand

Historic daily weather and demand data is collected for assessing the peak demand and critical period uplift. The demand data consists of daily DI data and daily PCC (split measured and unmeasured) data for each WRZ for a minimum of 12 years and will be updated for WRMP29 to include data from 2025. The weather data consists of daily maximum temperature data, daily rainfall data and daily sunshine hours data.

A peak week has been determined as a period of 7 days. This aligns with our regional group. The maximum 7-day rolling average DI for the last 12 years, including 2022, is shown below for NW along with the reasons for the peak.

The results of the latest UKWIR project on improving approaches to demand forecasting, which includes a section of peak demand reporting, will be included in WRMP29 demand forecasts.

Table 4: Max 7-day rolling average of DI for ESW, for the last 12 reporting years.

Reporting year	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025
Max 7 day rolling average DI (Peak)	476.79	511.51	502.73	540.33	562.31	517.09	596.63	544.13	587.88	548.99	532.21	532.21
Date of Peak	25-Jun	05-Jul	25-Jul	22-Jun	27-Jul	27-Jul	13-Aug	15-Jun	20-Jul	16-Jun	27-Jun	27-Jun

Dry Year and Critical Period

We will update our dry year and critical period analysis to include weather and demand data from the whole of 2025 for WRMP29 demand forecasts.

Demand Management Options

Our demand management options were impacted by the drought 2025 and the lessons learnt from this period are described below.

Leakage:

In an average year we would normally expect to see a small increase in leakage through the summer period, approximately 10%, as demand increases on the network and we get an uplift in reactive bursts. In 2025, between May and August, we saw an increase in leakage of about 20Ml/d which was a step up of almost 45%. In terms of job numbers, we repaired over 650 more leaks during 2025 compared to 2024, which is an increase of about 4.5%. However, the number of reactive mains repairs (which are the highest volume failures) were up by 30% compared to the previous year.
A combination of the hot/dry weather causing ground movement and additional customer consumption on the network results in more pressure on the pipes which in turn leads to more failures. We also see a rewetting of the soils in autumn causing a second wave of failures as the ground moves significantly again.

It is difficult to prevent these weather events as the impact is so widely spread but we can identify sections of the network with the highest risk and put measures in place,

like fixed acoustic loggers, to be able to respond quicker and more efficiently to the failures in future.

Other actions, like pressure reductions, worked well in the Northumbria region; to reduce demand on the network and these have been included extensively in the 2027 drought plan. At the moment, most of our Pressure Reducing Valves (PRVs) need to be adjusted manually, which can take a long time to get around all the sites. An increase in PRV controllers would give us the ability to remotely change settings and be more flexible with the pressure profile so we could deliver more reductions quicker.

Water Efficiency:

Our typical water efficiency interventions outlined in our water efficiency strategy were delivered throughout the summer of 2025 as planned. In addition, a significant communications campaign was also delivered with the purpose of the upscaled communications activity being to communicate effectively with customers around the Water's Worth Saving message resulting in significant reach. Taking a multi-channelled approach to the campaigns, we leveraged greater engagement with significantly larger proportion of our customers.

Whilst successful, a key learning point from 2025 was to start communicating with customers earlier in the year, in order to encourage water-efficient practices and behaviours before the impacts of weather would start to take effect. We recognise that we need to engage customers with tailored Water's Worth Saving communications all year round, with amplified communications leading up to periods of particularly heavy water usage (i.e. March-October). This should involve a multi-channelled approach including TV, cinema, streaming, digital, social-media, direct marketing and involving employees, stakeholders and water retailers.

If you do not currently use dry year critical period scenario/s, consider whether you should introduce this scenario in your planning

We have already included dry year and critical period scenarios as part of the WRMP24 for all water resource zones.

Ensuring you consider high demand (leakage) resulting from all extreme weather - including heat waves, as well as freeze-thaw events

As mentioned previously we have observed in 2025 that leakage increased due to the exceptionally dry weather experienced in our region. We have previously not applied a dry year uplift to leakage in the demand forecasts however results from 2025 have proved otherwise. Therefore, we will now apply a dry year uplift to leakage for the WRMP29 forecasts. All demand data (including leakage) is already included in the assessment of critical period.

Considering whether you need to include any schemes as part of your business plan to improve connectivity and zone integrity

In AMP7 we completed construction of the Layer to Langford pipeline, which has allowed Abberton to supply water to north and south Essex, and support the same rate

of drawdown in both reservoirs effectively treating Abberton and Hanningfield as a single storage unit thus improving zone connectivity and integrity.

Reflecting any updates to bulk supply agreements, including pain-share agreements discussed during the drought

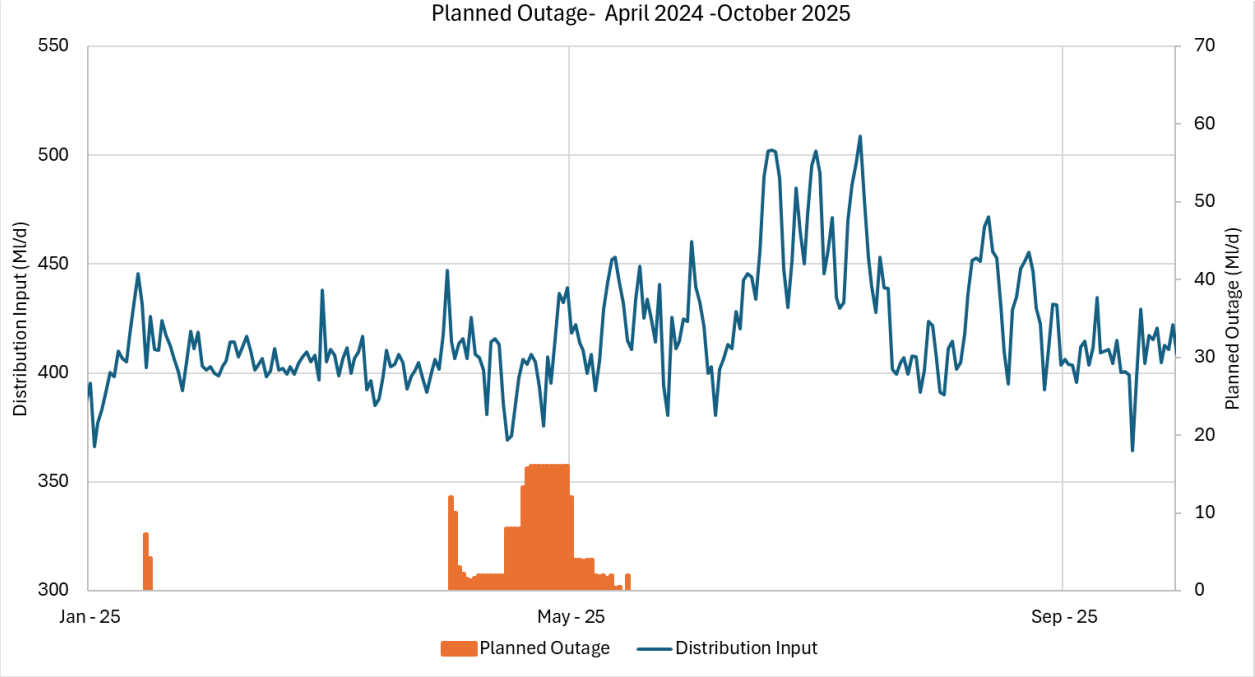
We encouraged the New Appointments & Variations (NAV's) operating within our area to increase the water efficiency messaging to their customers during the drought of 2025 in line with our drought plan. We did not impose any customer water use restrictions during the drought and kept our NAV's informed of this. We are reviewing the best way to communicate with our NAVs in our draft drought plan 2027.

Our bulk supply agreements with neighbouring water companies are considered sustainable under drought conditions. No temporary changes were made to our water supply agreements in 2025.

Reviewing your forecast outage, as this is particularly important in acute drought events.

As part of the WRMP24 process we have revised our outage allowance, included in this is a critical period outage allowance. As the graph below displays, as distribution input (DI) increases in the summer months due to the dry weather, the amount of planned outage was minimised to ensure there was no risk to security of supply.

Operationally to assess the risk to security of supply, all planned outages are risk assessed as part of our coordination planning process.



APPENDIX 22: THE BASIS FOR THE VARIABILITY OF RESPONSES TO WATER USE RESTRICTIONS FROM WATER COMPANIES

In the South East region, water companies source their supplies of raw water prior to treatment in the following ways:

- River abstraction;
- Reservoirs filled by river abstraction or impoundment of river water; and / or
- Groundwater abstraction from boreholes and springs.

The ratio of source types varies within a company's own Water Resource Zones and between companies and this causes variability in drought resilience and response. Unlike unseasonably dry soil that constitutes an agricultural drought and which can arise from only a few weeks of dry and sunny weather over the growing season, it takes at least several months of below average rainfall to initiate a water resources drought. Particularly important is winter rainfall as it is this that replenishes most water resources. The low groundwater levels and river flows that result from this type of dry period reduce water availability from rivers and boreholes and so reservoir levels fall. This poses a risk to a water company's ability to supply its customers.

To manage this risk water use restrictions are an important measure that water companies can use to reduce demand during drought. They not only enable companies to maintain essential supplies but also help to conserve water resources for later in a drought and reduce the environmental impacts of abstraction during this critical period.

Water companies will only impose water use restrictions upon their customers if they are absolutely necessary, and in accordance with their Levels of Service for water supply. Water companies fully appreciate the confusion that can be caused among some customers when one company introduces restrictions, but its neighbouring water company does not. Clearly from a customer point of view if restrictions need to be imposed, then a simple and consistent approach should be adopted for introducing water use restrictions across the South East. Where we make an Appeal for Restraint or impose restrictions, we will always consult neighbouring water companies and Water Resources East to ensure messaging is consistent. However, two reasons why water companies may have to react differently in terms of restrictions and their timing are as follows:

- **Differing levels of drought severity across the region:** While droughts across the South East will generally be caused by a regional trend of several months of below average rainfall, sub-regional differences in rainfall may cause differing levels of drought severity across the region. In other words, the need to impose restrictions for one company may not equally apply to another company in the South East. This was the case in 2012.
- **Differing vulnerabilities at Water Resource Zone level:** Due to the way the water supply system has developed over time, many water company supply areas are sub-divided into Water Resources Zones (WRZs). These are defined as the largest possible zone in which all resources, including external transfers, can be shared and hence the zone in which customers experience the same

risk of supply failure from a resource shortfall. WRZs can be divided into those dependent upon:

- River abstraction only;
- Groundwater abstraction only;
- Reservoirs filled by abstracting local river water or by impounding river water; and
- Various combinations of the above.

This mix of WRZ types means that even if there were not a significant difference in drought severity across the region, WRZs will tend to react differently to the same drought, with certain zones experiencing higher levels of risk to supplies than others. That means in similar drought conditions, rivers, groundwater sources and reservoirs across the region can respond differently in terms of risk to supply. For example, a WRZ dependent on combined river abstraction and reservoir storage for supply may have a different level of risk to one based on groundwater abstraction. This difference in WRZ vulnerability has an impact both at the company level and regional level. A water company may need to introduce water use restrictions preferentially in its more vulnerable WRZs while it may not need to extend the ban to the remaining zones in its area of supply. At the regional level one water company may need to impose water use restrictions earlier in a drought than its neighbours, while another water company is able to withhold the imposition of restrictions until much later or not at all.