

Cambridge Water Drought Triggers

Multi-trigger comparison



Introduction

17 September 2024

Levels of Service commitments

- To better protect the environment and to align with other water companies, an update to the current LoS commitments is being considered as part of the update to the drought triggers.
- Based on the Level of Service (LoS) commitments made in WRMP19, Cambridge Water has a less frequent LoS commitment for increased communication, TUB and NEUB measures but a more frequent LoS commitment for EDOs compared to other water companies.

LoS commitments made by Cambridge Water in their WRMP19 compared with other water companies.

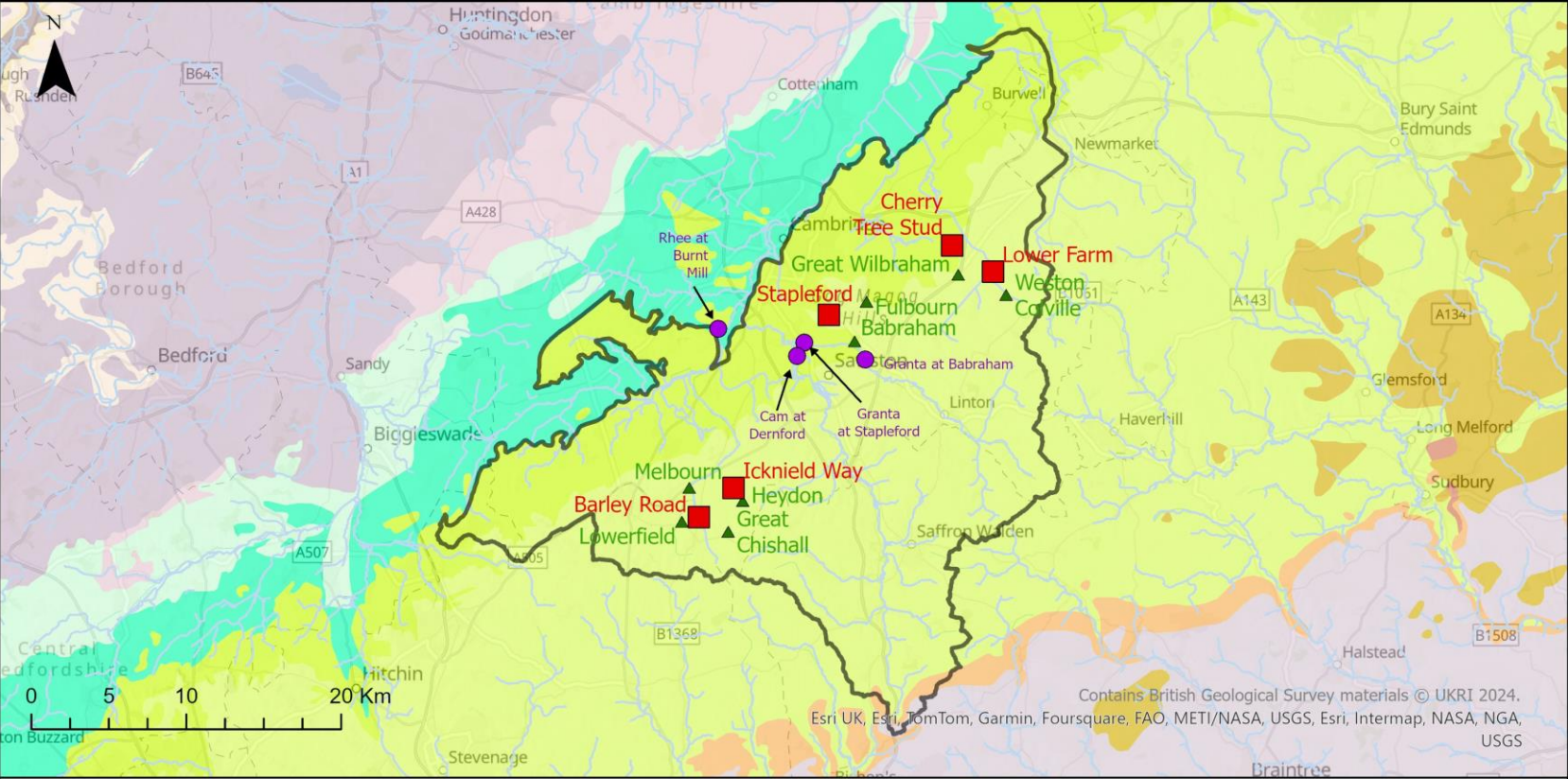
Drought management action	Cambridge Water	Affinity Water	Anglian Water	Southern Water
Increased communication	1 in 10 years	-	-	1 in 5 years
TUB	1 in 20 years	1 in 10 years	1 in 10 years	1 in 10 years
NEUB	1 in 50 years	1 in 40 years	1 in 40 years	1 in 20 years
EDO	1 in 100 years	Deemed unacceptable but could be used for short periods of time in localised areas as a result of a civil emergency. No more frequent than 1 in 200 years (from 2024)	No more frequent than 1 in 200 years (from 2025)	No more frequent than 1 in 500 years

Source: (South Staffs Water, 2018; Affinity Water, 2022; Anglian Water, 2022; Southern Water, 2019)

TUB: Temporary Use Ban, NEUB: Non-Essential Use Ban, EDO: Emergency Drought Order.

Action	Current LoS	Proposed LoS
Increased communication	1 in 10 years	1 in 5 years
TUB	1 in 20 years	1 in 10 years
NEUB	1 in 50 years	1 in 40 years
EDO	1 in 100 years	1 in 200 years

Map of study area



- The locations of the groundwater trigger boreholes and flow trigger stations are shown alongside the boundary of the groundwater catchment (TPD_A_H13_GW) used for the climate triggers.

Legend

■ Groundwater trigger boreholes	625k Bedrock Geology	■ GREY CHALK SUBGROUP - CHALK	WEST WALTON FORMATION, AMPHILL CLAY FORMATION AND KIMMERIDGE CLAY FORMATION (UNDIFFERENTIATED) - MU	■ GREAT OOLITE GROUP - SANDSTONE, LIMESTONE AND ARGILLACEOUS ROCKS
● Flow trigger locations	■ NEOGENE TO QUATERNARY ROCKS (UNDIFFERENTIATED) - GRAVEL, SAND, SILT AND CLAY	■ WHITE CHALK SUBGROUP - CHALK	KELLAWAYS FORMATION AND OXFORD CLAY FORMATION (UNDIFFERENTIATED) - MUDSTONE, SILTSTONE AND SANDSTONE	■ INFERIOR OOLITE GROUP - LIMESTONE, SANDSTONE, SILTSTONE AND MUDSTONE
▲ Cambridge Water groundwater abstractions	■ THAMES GROUP - CLAY, SILT, SAND AND GRAVEL	■ GAULT FORMATION AND UPPER GREENSAND FORMATION (UNDIFFERENTIATED) - MUDSTONE, SANDSTONE AND LIMESTONE		■ LIAS GROUP - MUDSTONE, SILTSTONE, LIMESTONE AND SANDSTONE
□ Groundwater catchment (TPD_A_H13_GW)	■ THANET SAND FORMATION - SAND, SILT AND CLAY	■ LOWER GREENSAND GROUP - SANDSTONE AND MUDSTONE		
— Watercourse	■ LAMBETH GROUP - CLAY, SILT, SAND AND GRAVEL			

Summary of multi-trigger analysis

Methodology and approach

- A multi-trigger comparison has been conducted, including analysis of:
 - **Climate triggers:** Rainfall and evapotranspiration series have been used to calculate two drought metrics (SPI and SPEI) for four catchments and six accumulation periods (3, 6, 12, 24, 36 and 48 months).
 - **Groundwater triggers:** Historical groundwater level data at five observation boreholes have been used to derive groundwater level triggers.
- A set of triggers has been derived for each return period related to the proposed LoS commitments (1 in 5, 1 in 20, 1 in 40 and 1 in 200 years). Triggers have also been derived for the 1 in 10 and are analysed alongside the proposed LoS to provide insights into the impacts of moving from a 1 in 20 to a 1 in 10-year LoS commitment. Note that only one of these return periods will be used.
- The triggers have been checked against historic drought sequences, in terms of timing and severity of the droughts alongside actions taken by other water companies to support the decision on which return period to adopt.
- For the 1972-74, 1975-76, 2011-12, 2019-20 and 2022 droughts – these are all recognised to be short duration-severe magnitude events. In these cases, the climate triggers that are most in line with the groundwater triggers are those at longer accumulation periods (24-month and above). Therefore, for the purposes of this analysis, we propose using the longer accumulation periods to determine the actions to be taken.

1972-74 drought sequence



- This period forms the first part of a larger drought sequence from 1972-77. The entire drought sequence consists of a period of recovery in 1975 that is sandwiched between the two distinct drought periods (1972-74 and 1975-76). Taken as an entire sequence, it is akin to a long-term drought of less severe magnitude.
- The groundwater triggers show the 1 in 5 is triggered in 1973-74 (at the one site where data is available). The climate triggers shows the 1 in 10 is triggered in 1973-74 (for the 24-month and 36-month accumulation period).
- If using the proposed LoS, a TUB may potentially be implemented in 1973-74 (based on the climate triggers only). However, if using the current LoS, only increased communication would be implemented.

1989-93 drought sequence

Trigger Level		1960s					1970s					1980s					1990s					2000s					2010s					2020s																																				
		1 in 5 year	1 in 10 year	1 in 20 year	1 in 40 year	1 in 200 year	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Climate	Site	Accumulation	Type																																																																	
	Climate	TPD_A_H13_GW	3 month	SPI																																																																
TPD_A_H13_GW		3 month	SPEI																																																																	
TPD_A_H13_GW		6 month	SPI																																																																	
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- The groundwater triggers show the 1 in 10 is triggered in 1990, 1 in 20 is triggered in 1991 and the 1 in 40 is triggered in 1992. The climate triggers show that only the 1 in 10 is triggered across most accumulation periods.
- Based on the groundwater sites, if using the proposed LoS, a TUB would be implemented in 1990-92. However, if using the current LoS, a TUB would be implemented in 1991-92. There is limited evidence from the climate triggers to support this.
- The actions taken by Cambridge Water during this drought sequence included increased communication during 1989-90 and a hosepipe ban during 1991-92.

1995-98 drought sequence

Trigger Level		1960s					1970s					1980s					1990s					2000s					2010s					2020s																															
		1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Site		Accumulation	Type																																																												
Climate	TPD_A_H13_GW	3 month	SPI																																																												
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- The groundwater triggers show that in 1997, the 1 in 10 is triggered at all boreholes and the 1 in 40 is triggered at 2 boreholes. In 1998, the 1 in 20 is triggered at 4 boreholes. The climate triggers show a range of triggers for different accumulation periods, with the majority at a 1 in 10 year or lower severity during this period.
- Under both the current and proposed LoS, a TUB would be implemented in 1997 and 1998 as the 1 in 10 and 1 in 20 are both triggered across the majority of groundwater sites.
- The actions taken by Cambridge Water during this drought sequence included increased communication in 1996. A hosepipe restriction was considered at the end of 1997 but not implemented.

2003-07 drought sequence

Trigger Level		1960s					1970s					1980s					1990s					2000s					2010s					2020s																																				
		1 in 5 year	1 in 10 year	1 in 20 year	1 in 40 year	1 in 200 year	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
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- The groundwater triggers show the 1 in 5 is triggered at four boreholes, with the 1 in 10 is triggered at one borehole in 2006. The climate triggers show only the 1 in 5 is triggered in 2003 for the 3-month accumulation period.
- No water restrictions would be implemented, since neither the 1 in 10 or 1 in 20 are triggered substantially. Increased communication would be implemented as the 1 in 5 is triggered.
- The actions taken by Cambridge Water during this drought sequence included increased communication during the 2005-06 winter period.

2011-12 drought sequence

Trigger Level		1960s					1970s					1980s					1990s					2000s					2010s					2020s																															
		1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
1 in 5 year	1 in 10 year	1 in 20 year	1 in 40 year	1 in 200 year																																																											
Site	Accumulation	Type																																																													
Climate	TPD_A_H13_GW	3 month	SPI																																																												
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- The groundwater triggers show the 1 in 5 is triggered at four boreholes in 2012, whilst the 1 in 10 is not triggered at any boreholes. The climate triggers show the 1 in 5 triggered in 2011-12 for the accumulation periods that are 24-month or longer.
- If using the proposed LoS, a TUB would potentially be implemented in 2012 (based on the climate triggers only). However, if using the current LoS, a TUB would not be implemented.
- The actions taken by Cambridge Water during this drought sequence included increased communication. However, other companies in the south-east imposed temporary water use bans.

2022 drought event

Trigger Level		1960s					1970s					1980s					1990s					2000s					2010s					2020																																				
		1 in 5 year	1 in 10 year	1 in 20 year	1 in 40 year	1 in 200 year	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
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- The groundwater triggers show no boreholes are triggered during this drought event. The climate triggers show that the 1 in 5 is triggered for the 48-month accumulation period.
- There is very little evidence from the groundwater triggers and climate triggers (24-month accumulation period or longer) to support any actions. Increased communication may potentially be implemented.

Drought period	Actions taken under current Levels of Service	Actions taken under proposed Levels of Service	Actions taken by Cambridge Water	Most extreme groundwater trigger crossed	Most extreme climate trigger crossed
1972-1974	Increased communication	Increased communication Potentially TUB	No information available	1 in 5	1 in 10 (24-month or longer)
					1 in 20 (3 and 12-month)
1975-1976	Increased communication	Increased communication Potentially TUB	No information available	1 in 5	1 in 10 (24-month or longer)
					1 in 200 (6-month)
1989-1993	Increased communication TUB	Increased communication TUB NEUB	Increased communication during 1989/1990 and a hosepipe ban during 1991/1992	1 in 40	1 in 10 (24-month or longer)
					1 in 20 (6-month)
1995-1998	Increased communication TUB	Increased communication TUB NEUB	Increased communication in 1996. Hosepipe ban considered in 1997 but not implemented.	1 in 40	1 in 40 (24-month or longer)
					1 in 40 (3 and 24-month)
2003-2007	Increased communication	Increased communication	Increased communication during the 2005-06 winter period.	1 in 5	Not triggered (24-month or longer)
					1 in 5 (3-month)
2011-2012	Increased communication	Increased communication	Increased communication. Other companies in the south-east imposed TUBs.	1 in 5	1 in 5 (24-month or longer)
					1 in 200 (3-month)
2019-2020	Increased communication	Increased communication Potentially TUB	No information available	1 in 10 (based on single borehole triggered)	1 in 5 (24-month or longer)
					1 in 20 (3 and 12-month)
2022	Potentially increased communication	Potentially increased communication	No information available	No boreholes triggered	1 in 5 (24-month or longer)
					1 in 40 (6-month)

Notes: The actions proposed are based on a combination of the groundwater triggers and the climate triggers (24-month or longer accumulation periods). For reference, the most extreme climate trigger crossed is shown for both the longer duration accumulation periods (24-month or longer) and across all accumulation periods. Climate triggers analysed are for TPD_A_H13_GW. For the 1970s drought sequences, data are only available for one groundwater site. Therefore, the actions suggested are based on limited information. For all other drought sequences, the most extreme groundwater trigger crossed is given only where that threshold has been crossed at two or more boreholes (unless otherwise stated).

Action	Current LoS	Proposed LoS
Increased communication	1 in 10 years	1 in 5 years
TUB	1 in 20 years	1 in 10 years
NEUB	1 in 50 years	1 in 40 years
EDO	1 in 100 years	1 in 200 years



Thank you

