Monthly water situation report: East Anglia

1 Summary - April 2024

Hydrologically, the extremely wet autumn and winter across East Anglia will continue to exert an influence on both groundwater levels and river flows in those parts of the Area where groundwater is important and the rivers have significant baseflow components. April itself was slightly wetter than average, with the most notable rainfall event occurring on the 27th of the month. The west of East Anglia had the heaviest rainfall on the 27th, with 20-25 mm widely, and was the wetter side of the Area overall throughout the month.

1.1 Rainfall

Rainfall this April across East Anglia was higher than the long-term average for the month. The 3-month, 6-month and 12-month running totals continue to be exceptionally high in almost all catchments. The highest rainfall total since records began in 1871 has been recorded in each of those accumulation periods in at least two catchments across East Anglia. Not only have there been some exceptionally wet months during the past year, most notably October and February, but there have been very few dry months. There has not been a month with rainfall significantly less than average across East Anglia since June 2023.

1.2 Soil moisture deficit and recharge

A soil moisture deficit began to build through April, mainly due to increasing day length. The low temperatures during the second half of the month suppressed the deficit slightly, and the widespread rainfall on the 27th led to a temporary reduction. Overall, the deficit is lower than average for the time of year. The recharge season might now have ended, at it usually has by the end of April.

1.3 River flows

As a soil moisture deficit built up throughout the month, most river flows receded to baseflows. The heaviest rainfall on the 27th in the western and southern catchments brought significant increases in flow there, while the lower totals to the east and north led to much more muted responses. Overall, the catchments in the west of East Anglia were generally in the above normal or notably high categories, due to both high baseflows and the responses to rainfall. The catchments in the east were generally in the normal range, reflecting the lower rainfall totals for the month and the lower runoff responses.

1.4 Groundwater levels

Groundwater levels are high across most of East Anglia, reflecting the high rainfall totals across the autumn and winter. Groundwater levels in the west of the Chalk across East Anglia

peaked at particularly high levels over the winter. Several borehole groundwater levels are exceptionally high and some have exceeded their previous highest recorded levels over the past winter. All are in the above normal range or higher except Rook Hall, Braiseworth, which is very close to the above normal range.

1.5   Reservoir stocks

Public water supply reservoirs are generally at healthy levels for the time of year. Grafham is slightly below its control curve for operational reasons, but healthy flows in the Bedford Ouse give little cause for concern for the prospects this summer.

1.6   Forward look

1.6.1   Probabilistic ensemble projections for river flows at key sites

The projections show that none of the model runs using current starting conditions and historic rainfall and potential evapotranspiration simulate flows for June 2024 lower than those categorised as normal. By September, only the projections for Denver show some simulations reaching the below normal category. That could be due to the fenland areas in the Denver catchment not showing as much persistence of the wet conditions from the winter as the other forecast locations as we go through the summer.

1.6.2   Probabilistic ensemble projections for groundwater levels in key aquifers

None of the model runs using current groundwater levels and historic rainfall and potential evapotranspiration simulate groundwater levels for September 2024 lower than the normal category. Two sites, Kenninghall and Therfield Rectory, simulate all model runs as remaining exceptionally high. They show the dominant influence of the winter recharge season in determining groundwater levels throughout the following summer. The projections for March 2025 show the possibility of some lower categories being recorded by then, indicating the declining influence of this wet winter as we go through another year.

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Contact Details: 03708 506 506

2 Rainfall

2.1 Rainfall map

Figure 2.1: Total rainfall for hydrological areas across East Anglia, expressed as a percentage of long term average rainfall for the current month (up to 30 April 2024), the last 3 months, the last 6 months, and the last 12 months. Category classes are based on an analysis of respective historic totals. Table available in the appendices with detailed information.
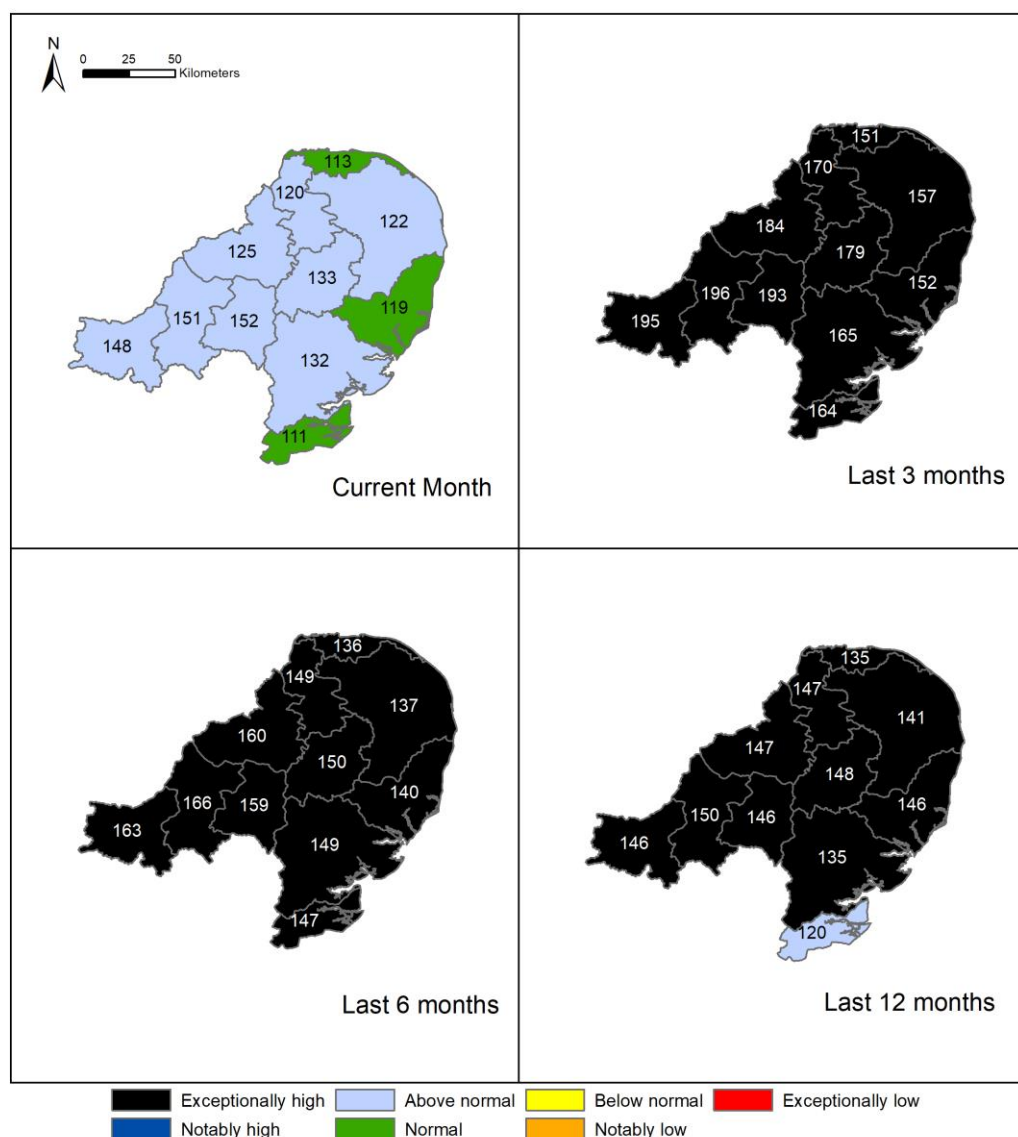

HadUK data based on the Met Office 1km gridded rainfall dataset derived from rain gauges (Source: Met Office. Crown copyright, 2024). Provisional data based on Environment Agency 1km gridded rainfall dataset derived from Environment Agency intensity rain gauges. Crown copyright. All rights reserved. Environment Agency, 100024198, 2024.
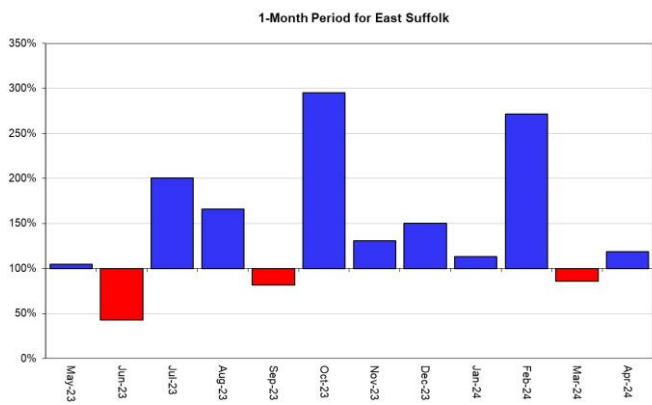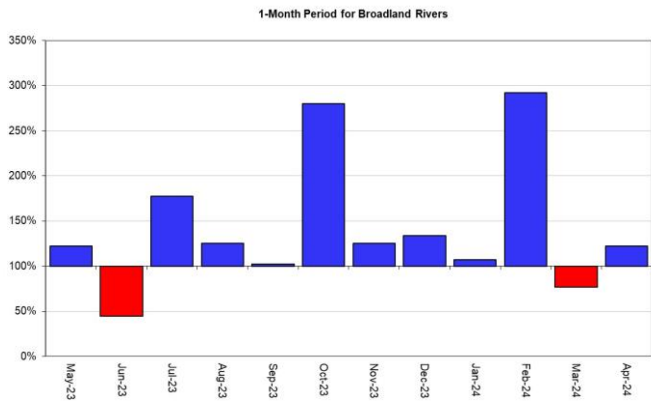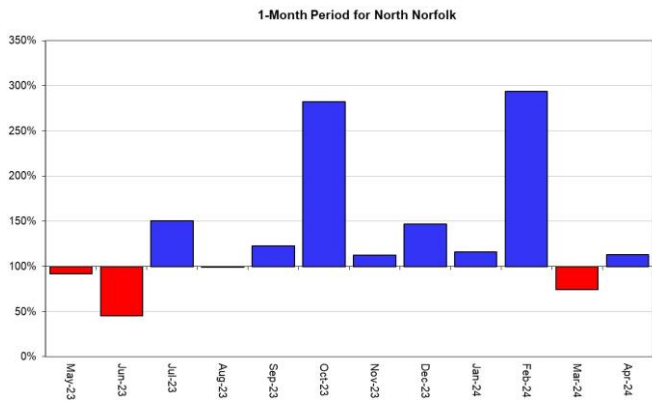
2.2   Rainfall charts

Figure 2.2: Monthly rainfall totals for the past 12 months as a percentage of the 1961 to 1990 long term average for each region and for England.
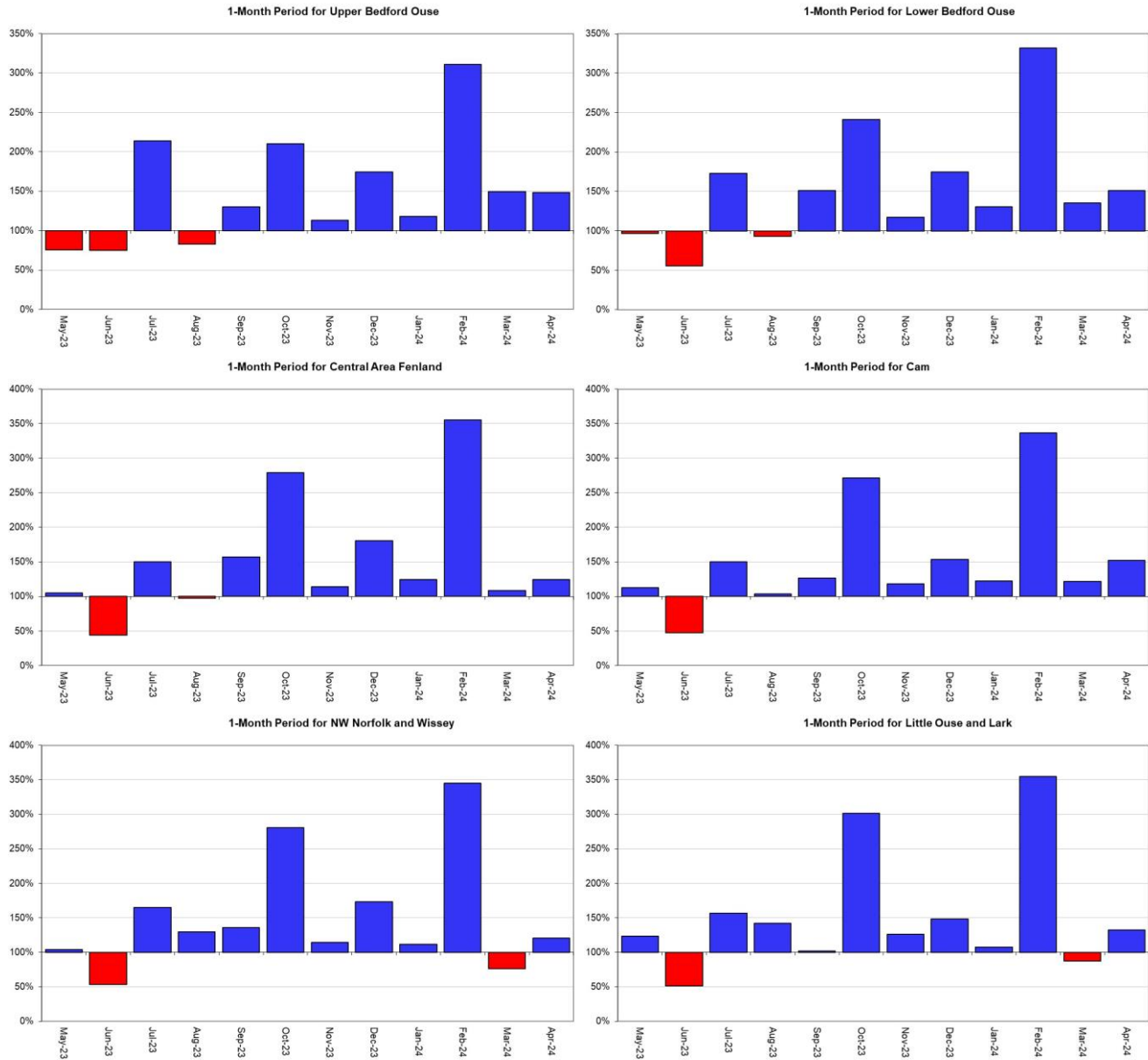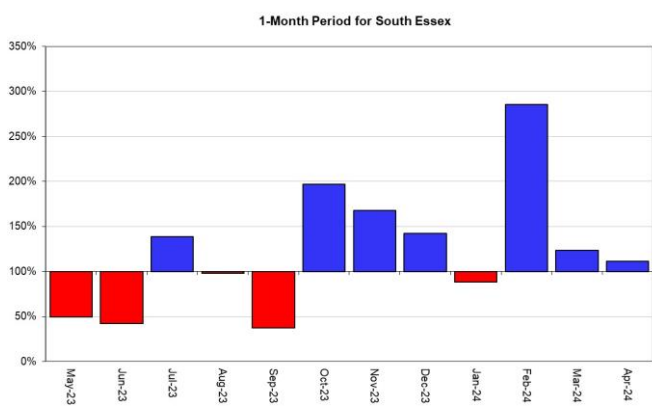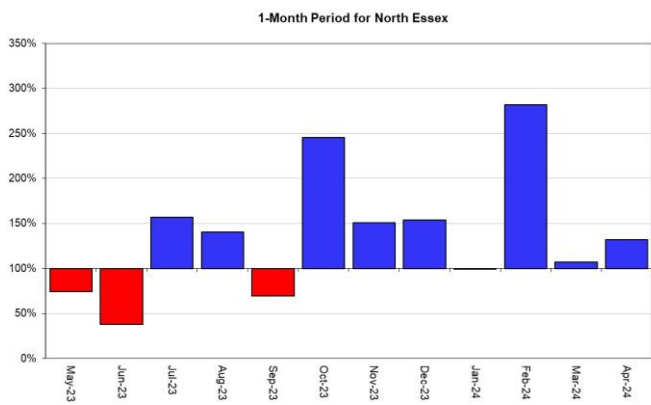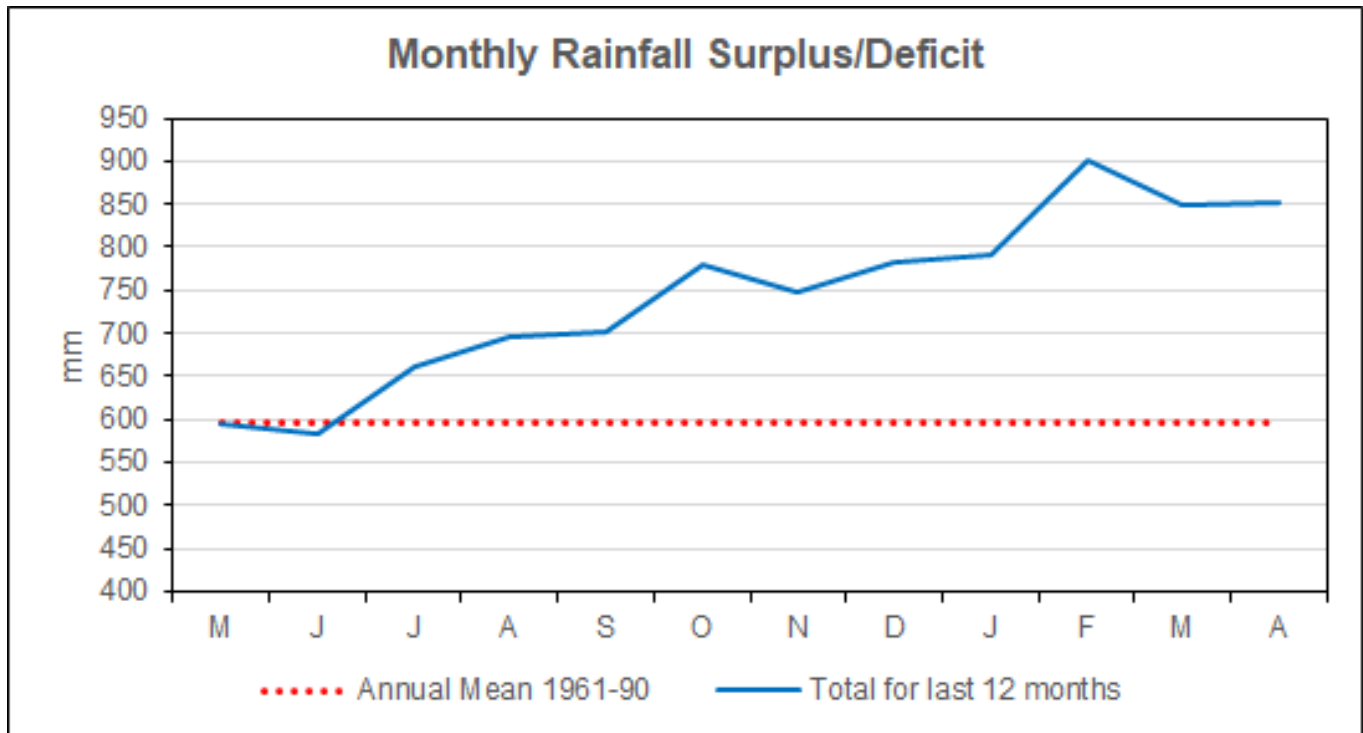
HadUK rainfall data. (Source: Met Office. Crown copyright, 2024).

2.3 Monthly rainfall surplus deficit chart

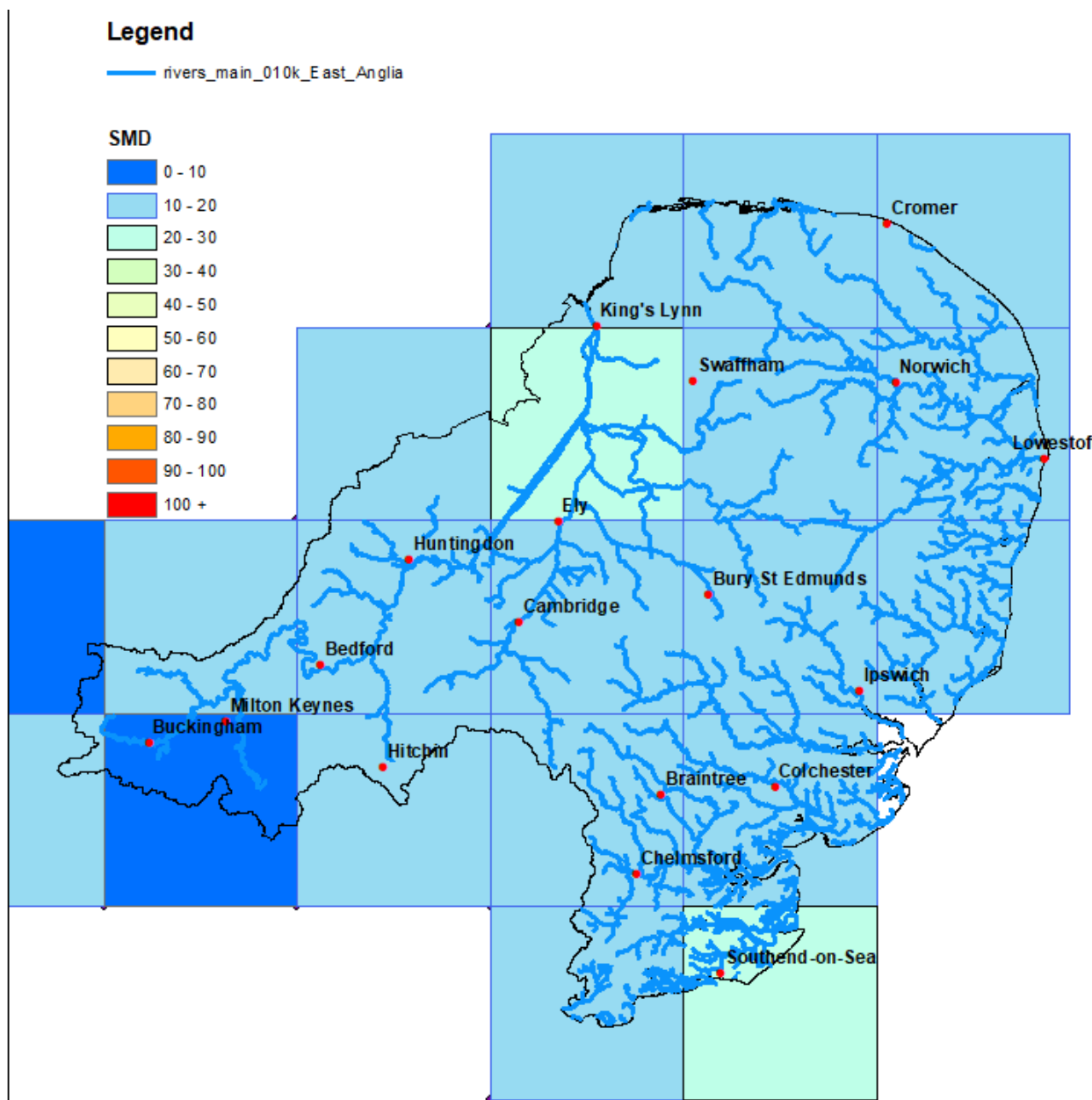**Monthly Rainfall Surplus/Deficit**

HadUK rainfall data. (Source: Met Office. Crown copyright, 2024).

3   Soil moisture deficit
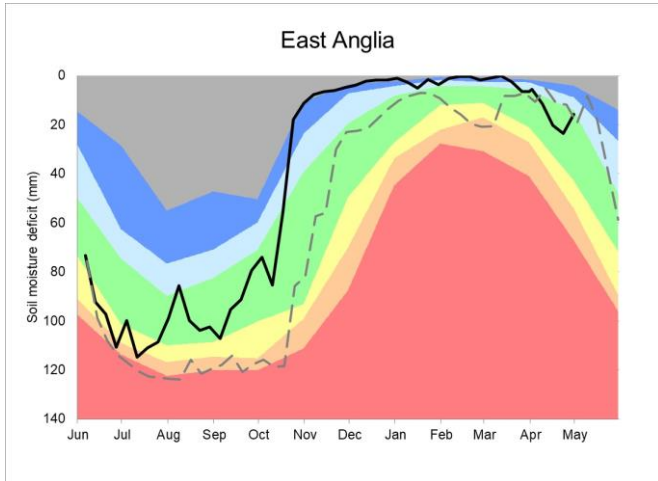
3.1   Soil moisture deficit map

Figure 3.1: Soil moisture deficit values for 30 April 2024. Values based on the weekly MORECS data for real land use.

3.2 Soil moisture deficit charts

Figure 3.2: Latest soil moisture deficit compared to an analysis of historic 1961 to 1990 long term data set. Weekly MORECS data for real land use.
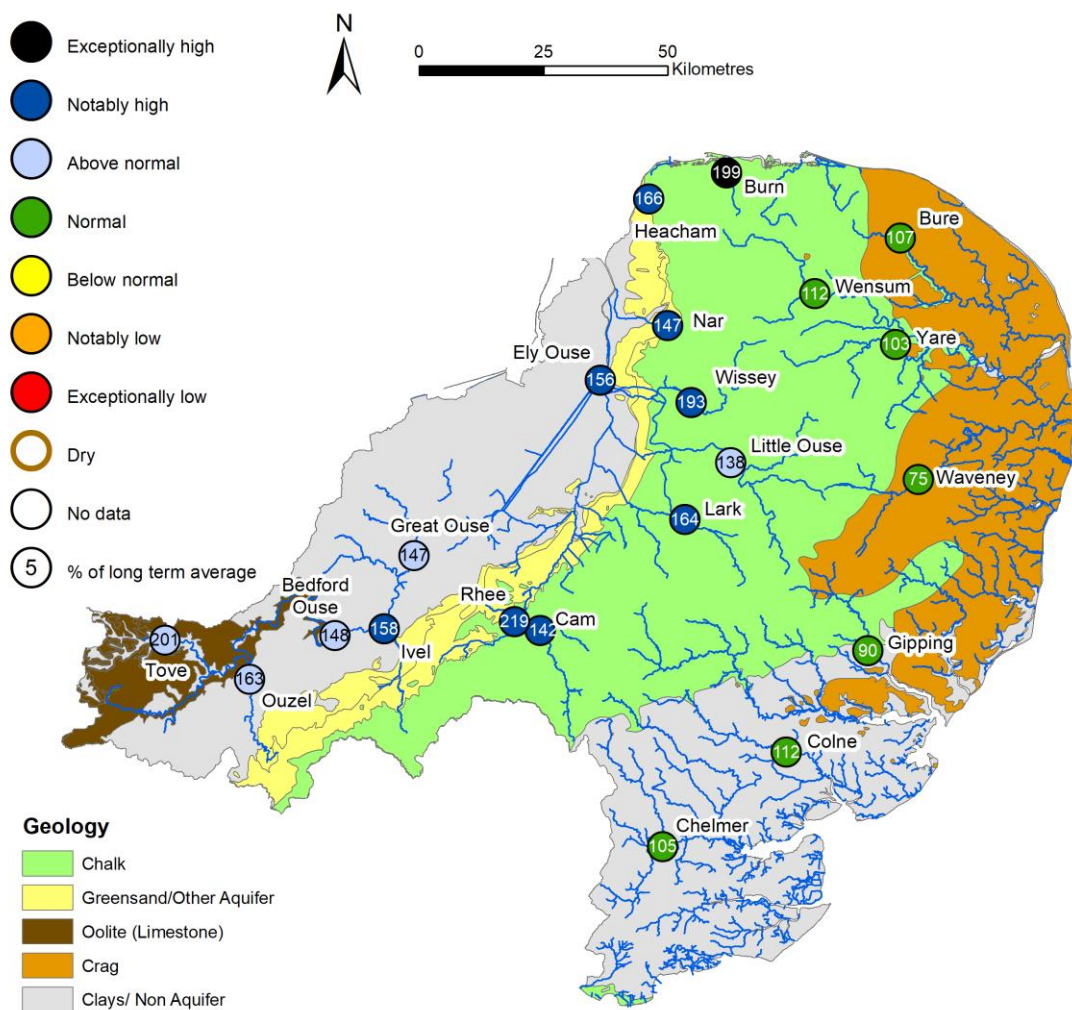

East Anglia

4 River flows

4.1 River flows map

Figure 4.1: Monthly mean river flow for indicator sites for April 2024, expressed as a percentage of the respective long term average and classed relative to an analysis of historic April monthly means Table available in the appendices with detailed information.

(Source: Environment Agency). Geological map reproduced with kind permission from UK Groundwater Forum, BGS copyright NERC. Crown copyright. All rights reserved. Environment Agency, 100024198, 2024.

4.2 River flow charts

Figure 4.2: Daily mean river flow for index sites over the past year, compared to an analysis of historic daily mean flows, and long term maximum and minimum flows.
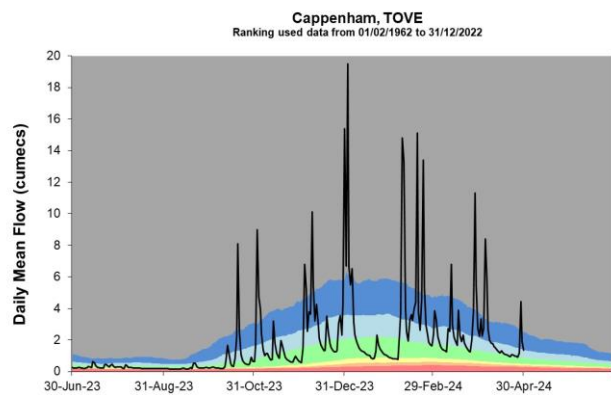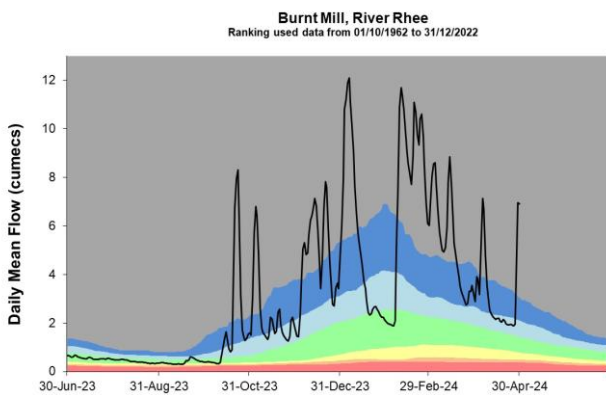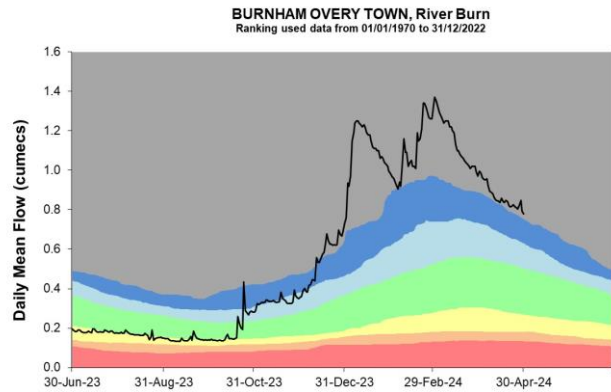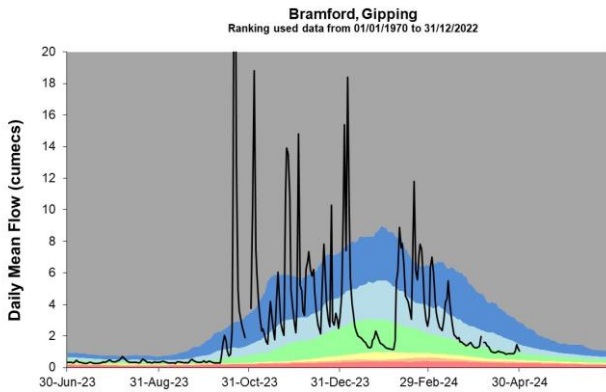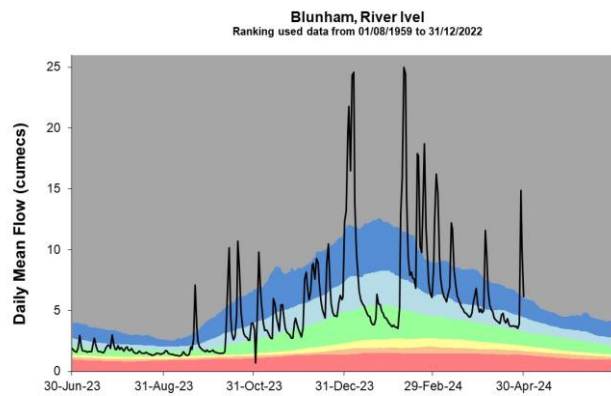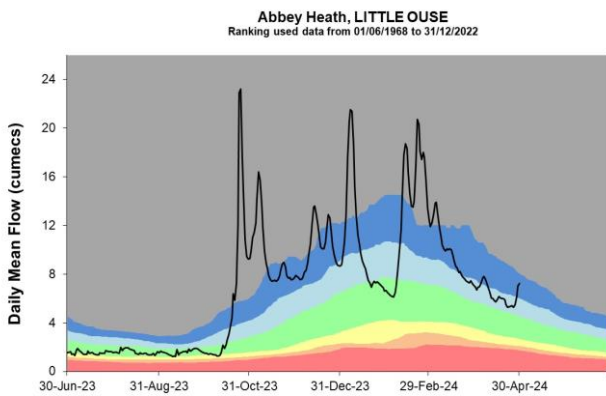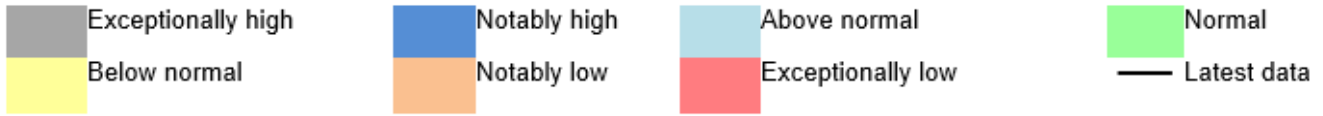
COLNEY, River Yare
Ranking used data from 01/01/1970 to 31/12/2022
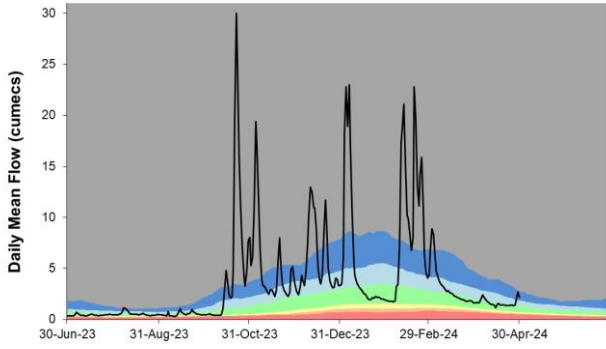
Denver, ELY OUSE
Ranking used data from 01/11/1971 to 31/12/2022
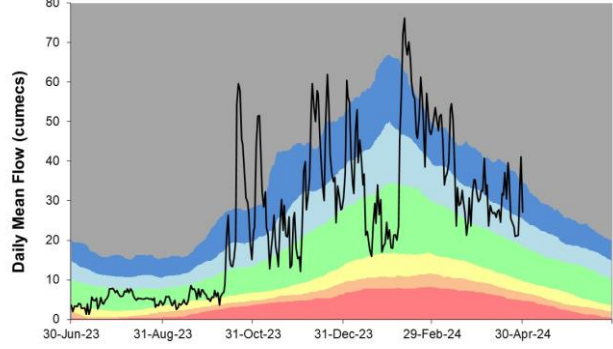
Dernford, CAM
Ranking used data from 21/02/1949 to 23/12/2022
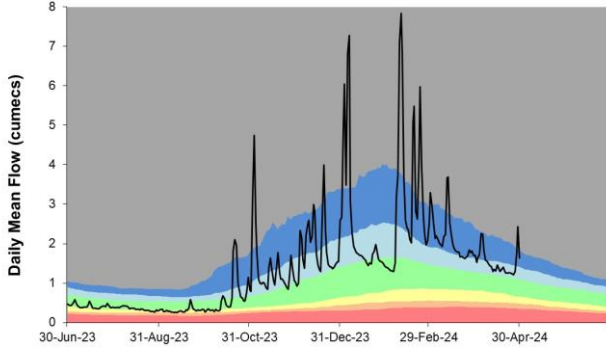
Heacham, HEACHAM
Ranking used data from 01/11/1965 to 31/12/2022
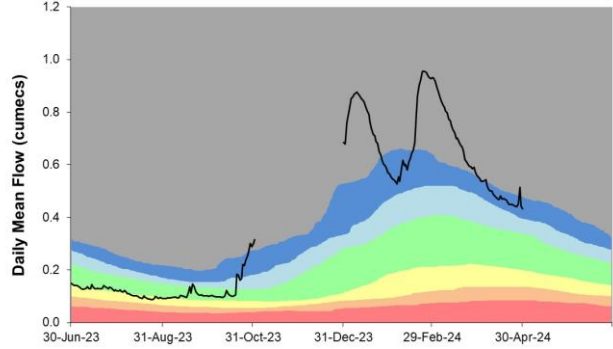
Ingworth, Bure
Ranking used data from 01/01/1970 to 31/12/2022
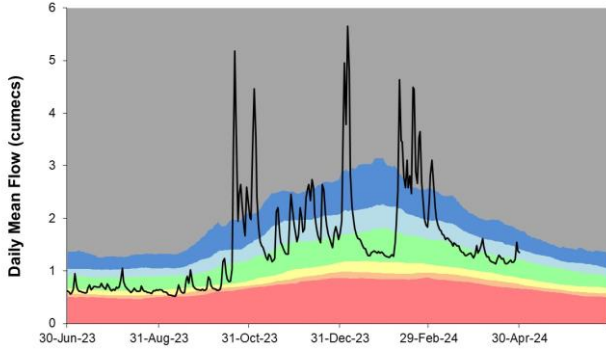
Lexden, Colne
Ranking used data from 01/01/1970 to 31/12/2022
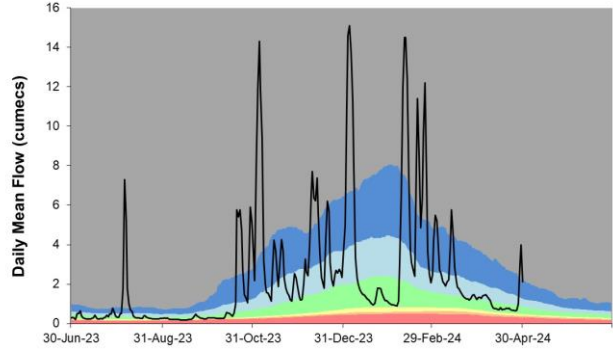
Marham, River Nar
Ranking used data from 01/09/1953 to 31/12/2022
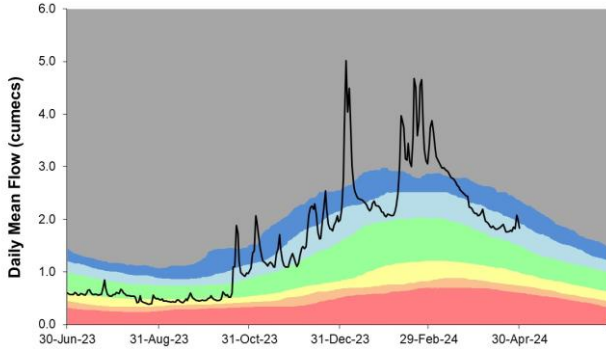
Needham Weir Total, Waveney
Ranking used data from 01/01/1970 to 31/12/2022
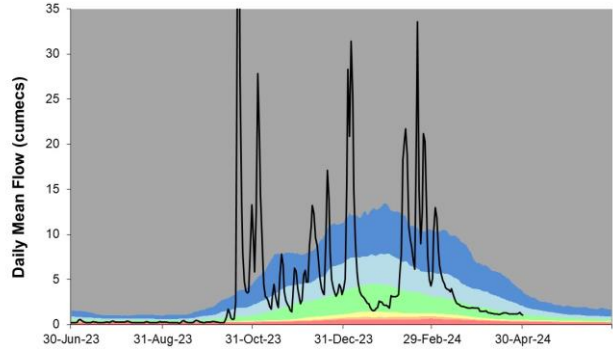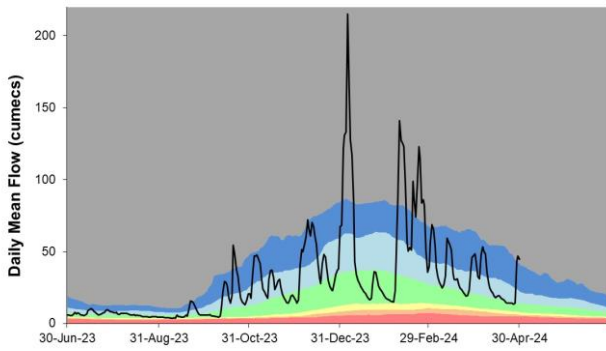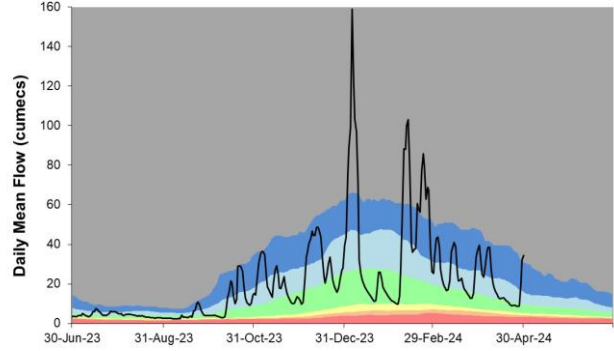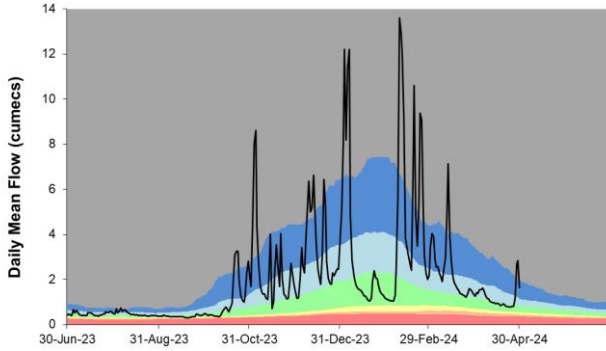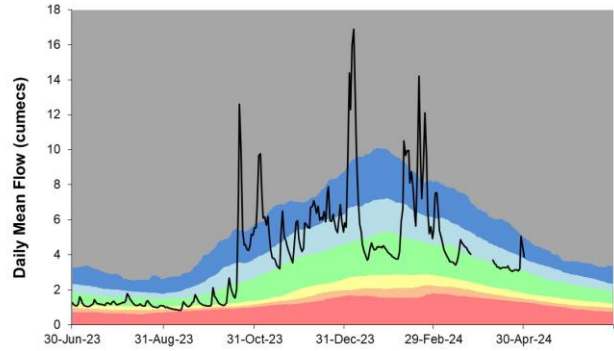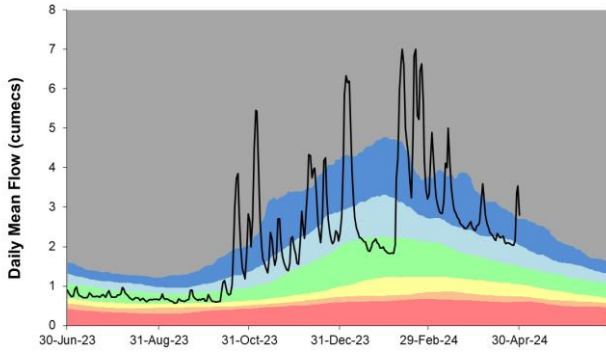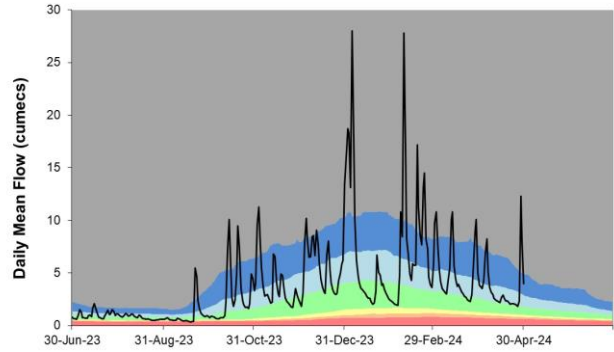
Source: Environment Agency.

5 Groundwater levels

5.1 Groundwater levels map

Figure 5.1: Groundwater levels for indicator sites at the end of April 2024, classed relative to an analysis of respective historic April levels. Table available in the appendices with detailed information.
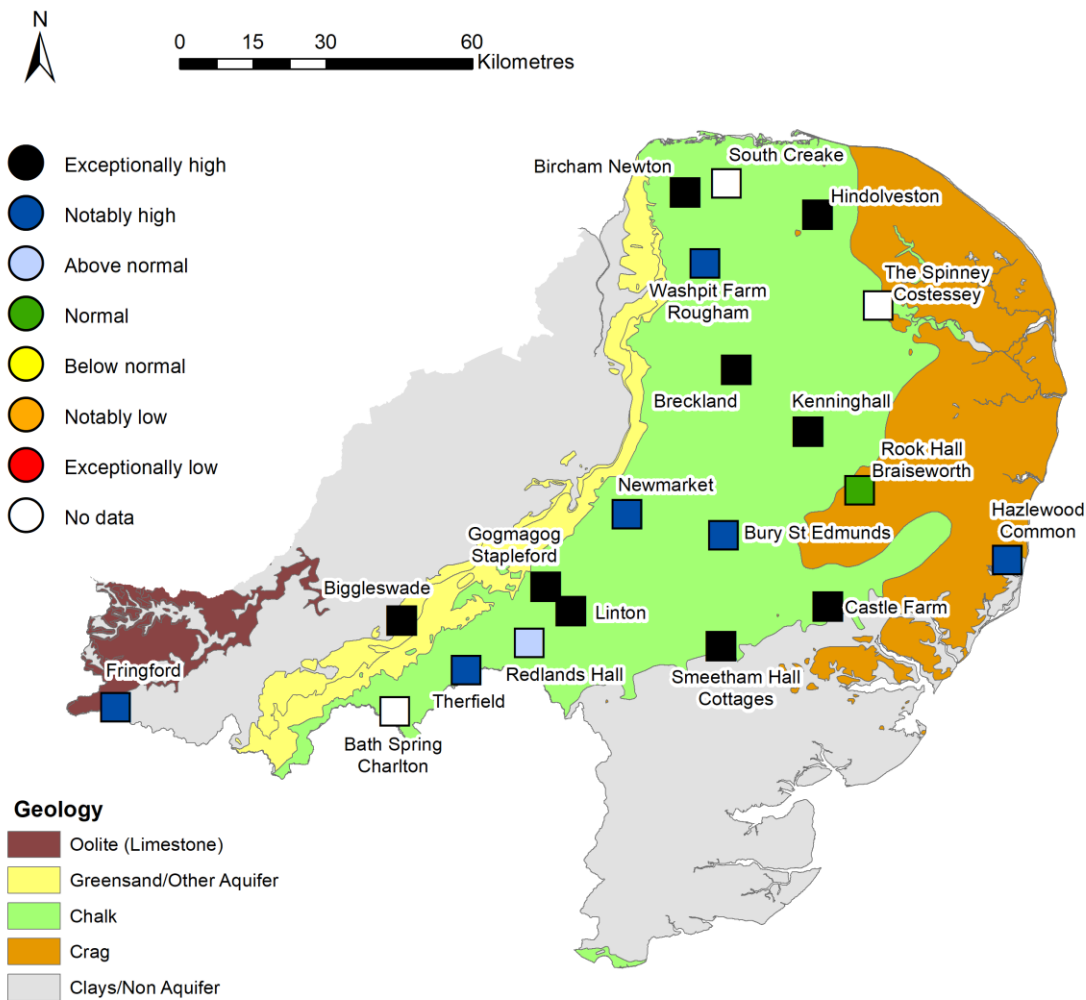
(Source: Environment Agency). Geological map reproduced with kind permission from UK Groundwater Forum, BGS copyright NERC. Crown copyright. All rights reserved. Environment Agency, 100024198, 2024.

5.2 Groundwater level charts

Figure 5.2: End of month groundwater levels at index groundwater level sites for major aquifers. 22 months compared to an analysis of historic end of month levels and long term maximum and minimum levels.
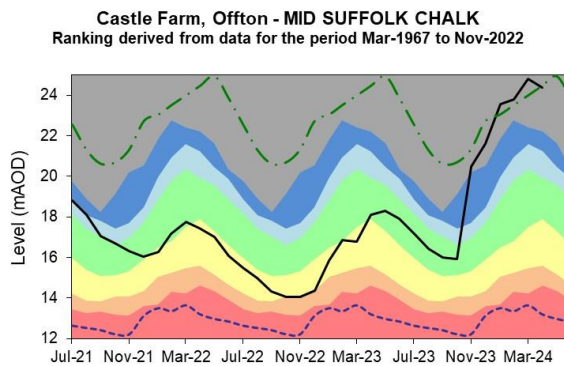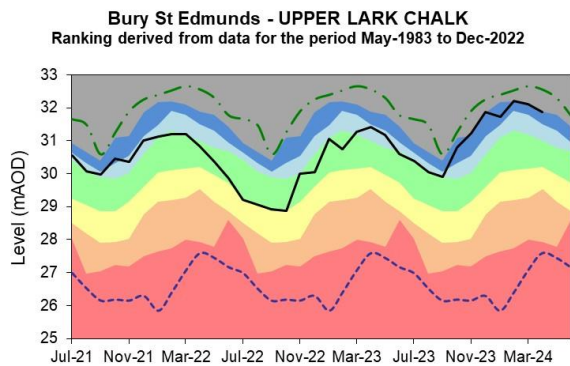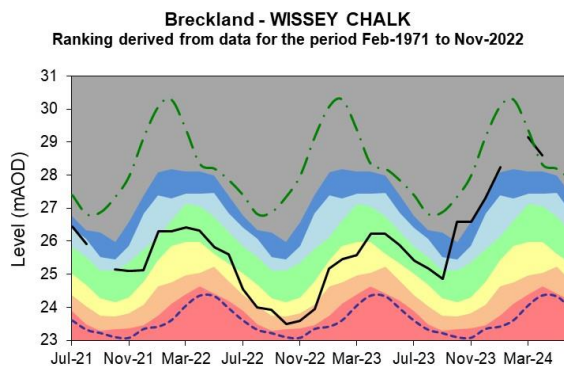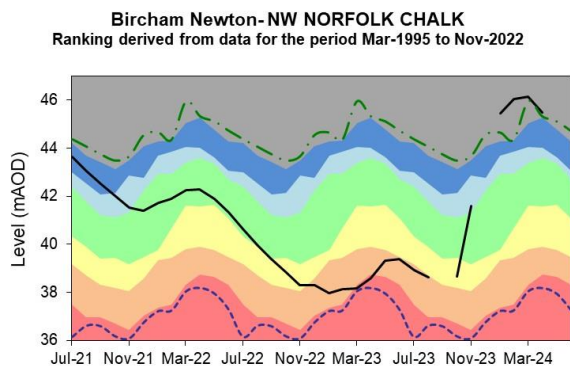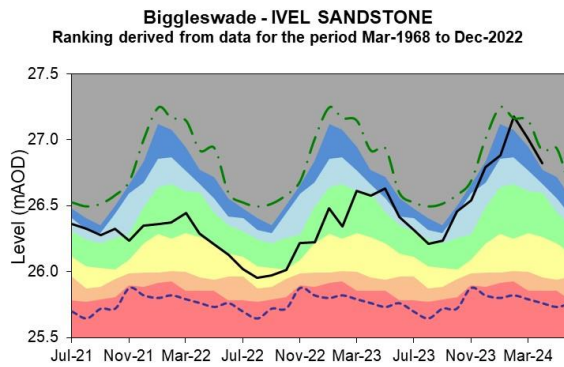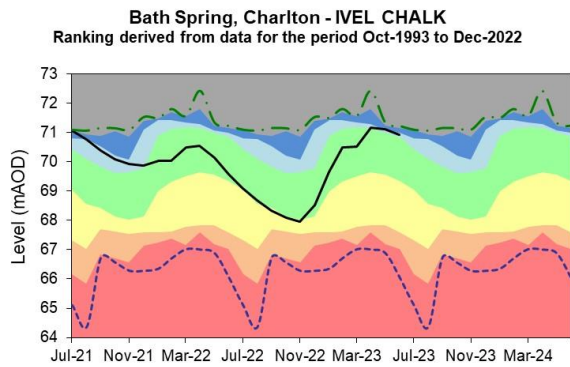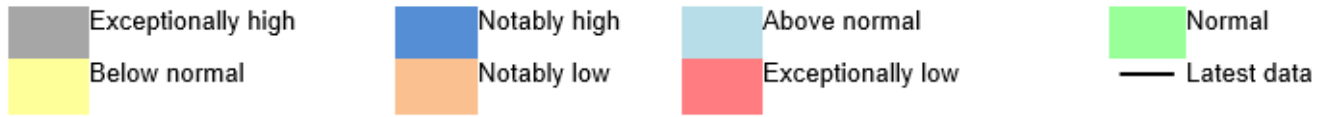
Fringford - GREAT OOLITE
Ranking derived from data for the period Sep-1980 to Dec-2022

Level (mAOD)

99, 98, 97, 96, 95, 94, 93

Jul-21 Nov-21 Mar-22 Jul-22 Nov-22 Mar-23 Jul-23 Nov-23 Mar-24

Gog Magog, Stapleford - CAM CHALK
Ranking derived from data for the period Jan-1980 to Dec-2022

Level (mAOD)

18, 17, 16, 15, 14, 13, 12

Jul-21 Nov-21 Mar-22 Jul-22 Nov-22 Mar-23 Jul-23 Nov-23 Mar-24
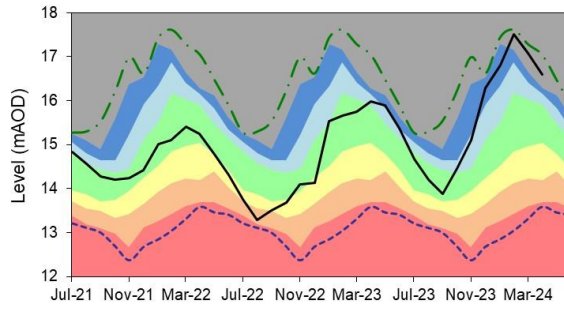
Hazlewood Common - SUFFOLK CRAG
Ranking derived from data for the period Oct-1988 to Nov-2022

Level (mAOD)

2.4, 2.2, 2.0, 1.8, 1.6, 1.4, 1.2

Jul-21 Nov-21 Mar-22 Jul-22 Nov-22 Mar-23 Jul-23 Nov-23 Mar-24
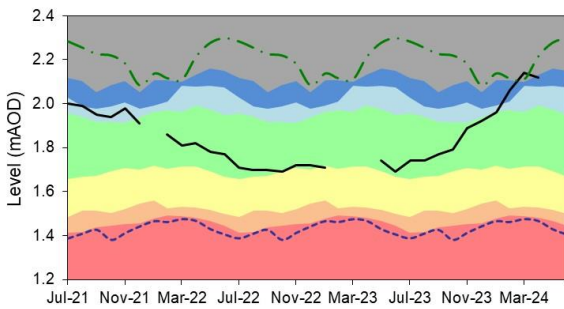
Hindolveston - NORFOLK CHALK
Ranking derived from data for the period Sep-1984 to Nov-2022

Level (mAOD)

56.5, 56.0, 55.5, 55.0, 54.5

Jul-21 Nov-21 Mar-22 Jul-22 Nov-22 Mar-23 Jul-23 Nov-23 Mar-24
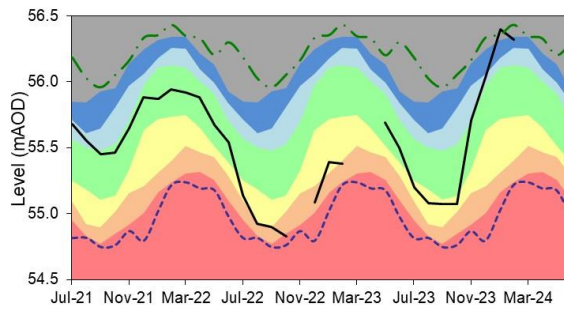
Kenninghall - LITTLE OUSE CHALK
Ranking derived from data for the period Aug-1973 to Dec-2022
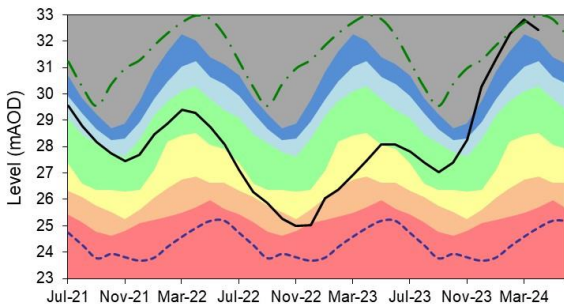
Level (mAOD)

33, 32, 31, 30, 29, 28, 27, 26, 25, 24, 23

Jul-21 Nov-21 Mar-22 Jul-22 Nov-22 Mar-23 Jul-23 Nov-23 Mar-24

Linton- CAM CHALK
Ranking derived from data for the period Jan-1980 to Dec-2022

Level (mAOD)

31, 30, 29, 28, 27, 26, 25, 24

Jul-21 Nov-21 Mar-22 Jul-22 Nov-22 Mar-23 Jul-23 Nov-23 Mar-24
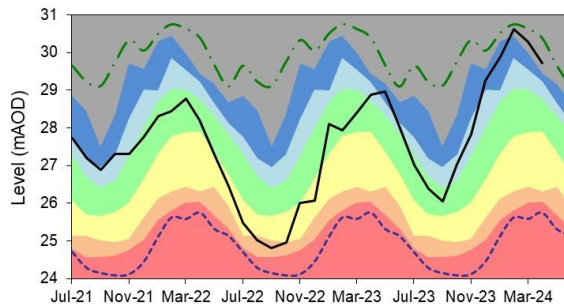
Newmarket - SNAIL CHALK
Ranking derived from data for the period Feb-1983 to Dec-2022

Level (mAOD)

16.5, 16.0, 15.5, 15.0, 14.5, 14.0, 13.5, 13.0, 12.5

Jul-21 Nov-21 Mar-22 Jul-22 Nov-22 Mar-23 Jul-23 Nov-23 Mar-24
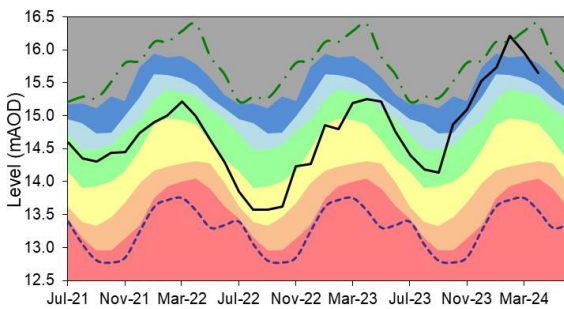
Redlands Hall, Ickleton - CAM CHALK
Ranking derived from data for the period Aug-1963 to Dec-2022

Level (mAOD)

55, 50, 45, 40, 35, 30

Jul-21 Nov-21 Mar-22 Jul-22 Nov-22 Mar-23 Jul-23 Nov-23 Mar-24
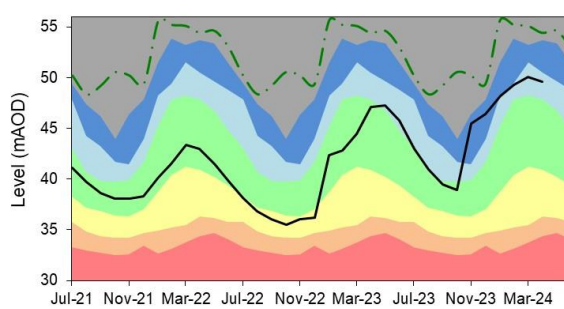
Rook Hall, Braiseworth- SUFFOLK CHALK
Ranking derived from data for the period Jan-1980 to Nov-2022
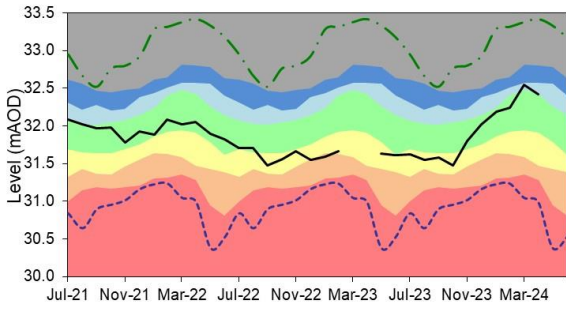
Smeetham Hall Cottages, Bulmer - ESSEX CHALK
Ranking derived from data for the period Jan-1964 to Jul-2022
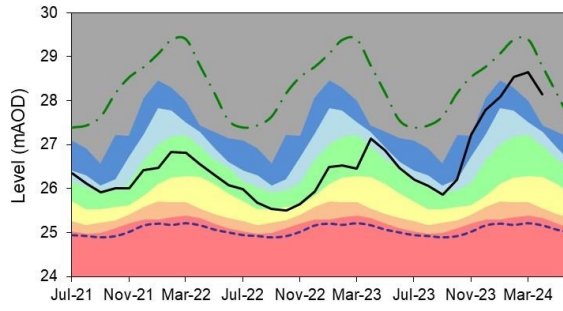
Old Primary School, South Creake, NORFOLK CHALK
Ranking derived from data for the period Oct-1971 to Aug-2021
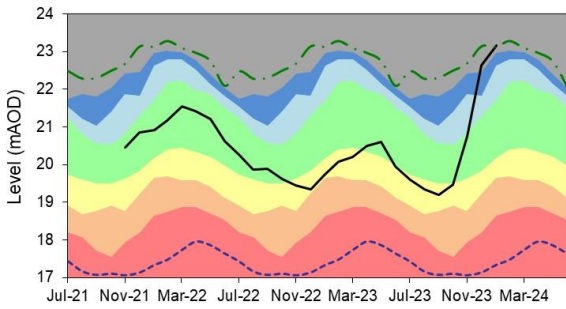
The Spinney, Costessey- WENSUM CHALK
Ranking derived from data for the period Oct-1971 to Nov-2022
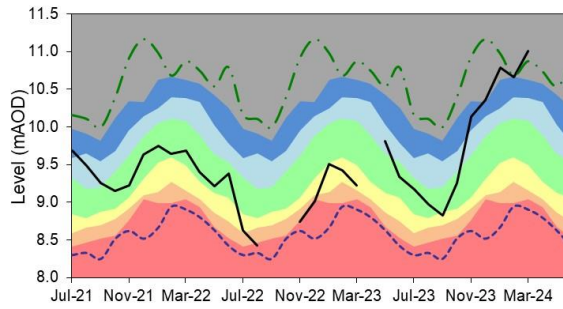
Therfield Rectory - N HERTS CHALK
Ranking derived from data for the period Jan-1883 to Nov-2022
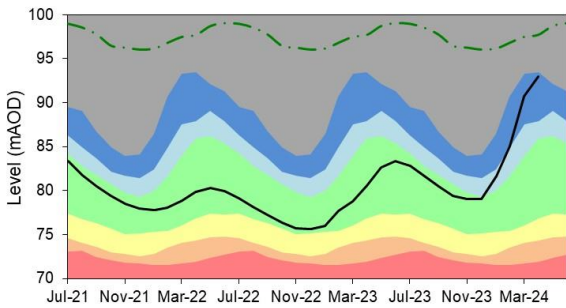
Washpit Farm, Rougham - NW NORFOLK CHALK
Ranking derived from data for the period May-1950 to Dec-2022
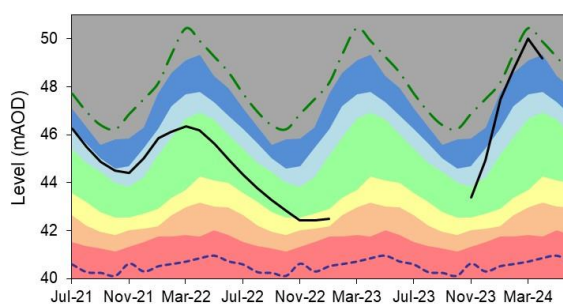
Source: Environment Agency, 2024.

6   Reservoir stocks

Figure 6.1: End of month regional reservoir stocks compared to the normal operating curve, drought curve and dry 1995-1996 stocks. Note: Historic records of individual reservoirs and reservoir groups making up the regional values vary in length.

—— 2023-2024   —— Normal Operating Curve   —— Drought Alert Curve   — — 1995-1996
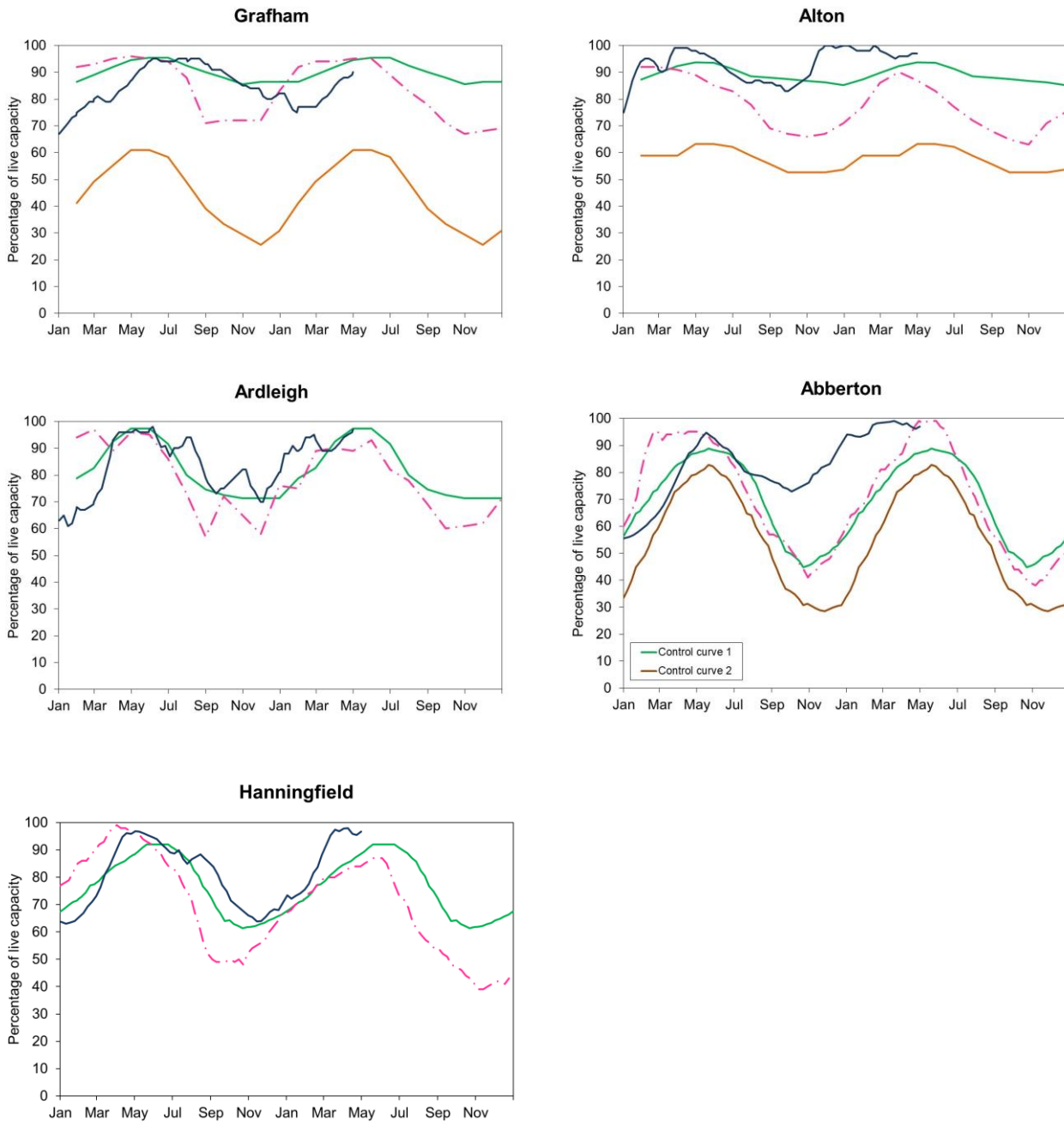
(Source: water companies).

7   Forward look

7.1   Probabilistic ensemble projection of river flows at key sites in June 2024

Table available in the appendices with detailed information. Exceptionally high or low levels are those which would typically occur 5% of the time within the historic record. Notably high or low levels are those which would typically occur 8% of the time. Above normal or below normal levels are those which would typically occur 15% of the time. Normal levels are those which would typically occur 44% of the time within the historic record.

Pie charts indicate probability, based on climatology, of the surface water flow at each site being, for example, exceptionally low for the time of year. (Source: Centre for Ecology and Hydrology, Environment Agency) Geological map reproduced with kind permission from UK Groundwater Forum, BGS © NERC. Crown copyright. All rights reserved. Environment Agency, 100026380, 2024.
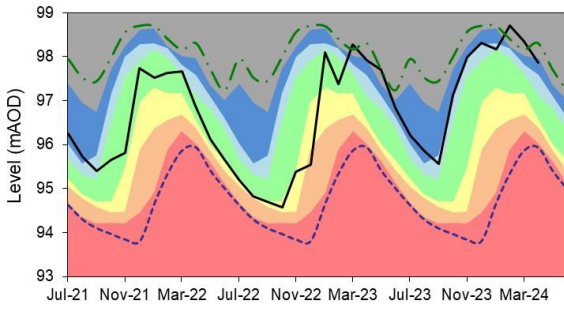
7.2 Probabilistic ensemble projection of river flows at key sites in September 2024

Table available in the appendices with detailed information. Exceptionally high or low levels are those which would typically occur 5% of the time within the historic record. Notably high or low levels are those which would typically occur 8% of the time. Above normal or below normal levels are those which would typically occur 15% of the time. Normal levels are those which would typically occur 44% of the time within the historic record.

Pie charts indicate probability, based on climatology, of the surface water flow at each site being, for example, exceptionally low for the time of year. (Source: Centre for Ecology and Hydrology, Environment Agency) Geological map reproduced with kind permission from UK Groundwater Forum, BGS © NERC. Crown copyright. All rights reserved. Environment Agency, 100026380, 2024

7.3 Probabilistic ensemble projection of groundwater levels at key sites in September 2024

Table available in the appendices with detailed information. Exceptionally high or low levels are those which would typically occur 5% of the time within the historic record. Notably high or low levels are those which would typically occur 8% of the time. Above normal or below normal levels are those which would typically occur 15% of the time. Normal levels are those which would typically occur 44% of the time within the historic record.

Pie charts indicate probability, based on climatology, of the groundwater level at each site being, for example, exceptionally low for the time of year. (Source: Environment Agency) Geological map reproduced with kind permission from UK Groundwater Forum, BGS © NERC. Crown copyright. All rights reserved. Environment Agency, 100026380, 2024

7.4 Probabilistic ensemble projection of groundwater levels at key sites in March 2025

Table available in the appendices with detailed information. Exceptionally high or low levels are those which would typically occur 5% of the time within the historic record. Notably high or low levels are those which would typically occur 8% of the time. Above normal or below normal levels are those which would typically occur 15% of the time. Normal levels are those which would typically occur 44% of the time within the historic record.

Pie charts indicate probability, based on climatology, of the groundwater level at each site being, for example, exceptionally low for the time of year. (Source: Environment Agency) Geological map reproduced with kind permission from UK Groundwater Forum, BGS © NERC. Crown copyright. All rights reserved. Environment Agency, 100026380, 2024

8   Glossary

8.1   Terminology

Aquifer

A geological formation able to store and transmit water.

Areal average rainfall

The estimated average depth of rainfall over a defined area. Expressed in depth of water (mm).

Artesian

The condition where the groundwater level is above ground surface but is prevented from rising to this level by an overlying continuous low permeability layer, such as clay.

Artesian borehole

Borehole where the level of groundwater is above the top of the borehole and groundwater flows out of the borehole when unsealed.

Cumecs

Cubic metres per second (m^{3s-1}).

Effective rainfall

The rainfall available to percolate into the soil or produce river flow. Expressed in depth of water (mm).

Flood alert and flood warning

Three levels of warnings may be issued by the Environment Agency. Flood alerts indicate flooding is possible. Flood warnings indicate flooding is expected. Severe flood warnings indicate severe flooding.

Groundwater

The water found in an aquifer.

Long term average (LTA)

The arithmetic mean calculated from the historic record, usually based on the period 1961 to 1990. However, the period used may vary by parameter being reported on (see figure captions for details).

mAOD

Metres above ordnance datum (mean sea level at Newlyn Cornwall).

MORECS

Met Office Rainfall and Evaporation Calculation System. Met Office service providing real time calculation of evapotranspiration, soil moisture deficit and effective rainfall on a 40 by 40 km grid.

Naturalised flow

River flow with the impacts of artificial influences removed. Artificial influences may include abstractions, discharges, transfers, augmentation and impoundments.

NCIC

National Climate Information Centre. NCIC area monthly rainfall totals are derived using the Met Office 5 km gridded dataset, which uses rain gauge observations.

Recharge

The process of increasing the water stored in the saturated zone of an aquifer. Expressed in depth of water (mm).

Reservoir gross capacity

The total capacity of a reservoir.

Reservoir live capacity

The capacity of the reservoir that is normally usable for storage to meet established reservoir operating requirements. This excludes any capacity not available for use (for example, storage held back for emergency services, operating agreements or physical restrictions). May also be referred to as 'net' or 'deployable' capacity.

Soil moisture deficit (SMD)

The difference between the amount of water actually in the soil and the amount of water the soil can hold. Expressed in depth of water (mm).

8.2   Categories

Exceptionally high

Value likely to fall within this band 5% of the time.

Notably high

Value likely to fall within this band 8% of the time.

Above normal

Value likely to fall within this band 15% of the time.

Normal

Value likely to fall within this band 44% of the time.

Below normal

Value likely to fall within this band 15% of the time.

Notably low

Value likely to fall within this band 8% of the time.

Exceptionally low

Value likely to fall within this band 5% of the time.

9   Appendices

9.1   Rainfall table

Hydrological area	Apr 2024 rainfall % of long term average 1961 to 1990	Apr 2024 band	Feb 2024 to April cumulative band	Nov 2023 to April cumulative band	May 2023 to April cumulative band
Broadland Rivers	122	Above Normal	Exceptionally high	Exceptionally high	Exceptionally high
Cam	152	Above Normal	Exceptionally high	Exceptionally high	Exceptionally high
Central Area Fenland	125	Above Normal	Exceptionally high	Exceptionally high	Exceptionally high
East Suffolk	119	Normal	Exceptionally high	Exceptionally high	Exceptionally high
Little Ouse And Lark	133	Above Normal	Exceptionally high	Exceptionally high	Exceptionally high
Lower Bedford Ouse	151	Above Normal	Exceptionally high	Exceptionally high	Exceptionally high
North Essex	132	Above Normal	Exceptionally high	Exceptionally high	Exceptionally high
North Norfolk	113	Normal	Exceptionally high	Exceptionally high	Exceptionally high
Nw Norfolk And Wissey	120	Above Normal	Exceptionally high	Exceptionally high	Exceptionally high

South Essex	111	Normal	Exceptionally high	Exceptionally high	Above normal
Upper Bedford Ouse	148	Above Normal	Exceptionally high	Exceptionally high	Exceptionally high

9.2   River flows table

Site name	River	Catchment	Apr 2024 band	Mar 2024 band
Abbey Heath	Little Ouse	Little Ouse	Above normal	Notably high
Blunham	Ivel	Ivel	Notably high	Exceptionally high
Bramford	Gipping	Gipping	Normal	Above normal
Burnham Overy	Burn	Burn	Exceptionally high	Exceptionally high
Burnt Mill	Rhee	Rhee	Notably high	Exceptionally high
Cappenham	Tove	Tove	Above normal	Exceptionally high
Colney	Yare	Yare	Normal	Above normal
Denver	Ely Ouse	Cutoff and Renew Channel	Notably high	Notably high
Dernford	Cam	Cam	Notably high	Notably high
Heacham	Heacham	Heacham	Notably high	Exceptionally high
Ingworth	Bure	Bure	Normal	Above normal
Lexden	Colne	Colne Essex	Normal	Notably high
Marham	Nar	Nar	Notably high	Exceptionally high

Needham Weir Total	Waveney (lower)	Waveney	Normal	Above normal
Offord (gross Flows)	Great Ouse	Ouse Beds	Above normal	Notably high
Roxton	Great Ouse	Ivel	Above normal	Notably high
Springfield	Chelmer	Chelmer Upper	Normal	Notably high
Swanton Morley Total	Wensum	Wensum	Normal	Exceptionally high
Temple	Lark	Lark	Notably high	Notably high
Willen	Ouzel	Ouzel	Above normal	Notably high

9.3 Groundwater table

Site name	Aquifer	End of Apr 2024 band	End of Mar 2024 band
Biggleswade	Ivel Woburn Sands	Exceptionally high	Exceptionally high
Bircham Newton	North West Norfolk Chalk	Exceptionally high	Exceptionally high
Breckland	Wissey Chalk	Exceptionally high	Exceptionally high
Bury St Edmunds	Upper Lark Chalk	Notably high	Exceptionally high
Castle Farm, Offton	East Suffolk Chalk	Exceptionally high	Exceptionally high
Gog Magog, Stapleford	Cam Chalk	Exceptionally high	Exceptionally high
Hazlewood Common	East Suffolk Crag	Notably high	Exceptionally high
Hindolveston	Norfolk Chalk	Exceptionally high	
Kenninghall	Little Ouse Chalk	Exceptionally high	Exceptionally high
Linton	Cam Chalk	Exceptionally high	Exceptionally high
Newmarket	Snail Chalk	Notably high	Exceptionally high

Old Primary School, South Creake	North Norfolk Chalk		
Redlands Hall, Ickleton	Cam Chalk	Above normal	Notably high
Rook Hall, Braiseworth	East Suffolk Chalk	Normal	Above normal
Smeetham Hall Cottages, Bulmer	North Essex Chalk	Exceptionally high	Exceptionally high
The Spinney, Costessey	Wensum Chalk		Exceptionally high
Washpit Farm, Rougham	North West Norfolk Chalk	Notably high	Exceptionally high
Therfield Rectory	Upper Lee Chalk	Notably high	Notably high
Fringford P.s.	Upper Bedford Ouse Oolitic Limestone (great)	Notably high	Exceptionally high

9.4 Ensemble projections tables

9.4.1 Probabilistic ensemble projection of river flows at key sites in June 2024

Percentage of pie chart for each band

Site	Bedford Ouse at Roxton	Kym	Ivel	Ouse at Offord	Ely Ouse
Exceptionally low	0	0	0	0	0
Notably low	0	0	0	0	0
Below normal	0	0	0	0	0
Normal	45	69	0	42	34
Above normal	34	10	45	39	27
Notably high	13	5	35	8	25
Exceptionally high	8	16	19	11	14

9.4.2 Probabilistic ensemble projection of river flows at key sites in September 2024

Percentage of pie chart for each band

Site	Bedford Ouse at Roxton	Kym	Ivel	Ouse at Offord	Ely Ouse
Exceptionally low	0	0	0	0	0
Notably low	0	0	0	0	0
Below normal	0	0	0	0	20
Normal	21	44	0	11	41
Above normal	31	35	18	34	2
Notably high	40	18	42	44	25
Exceptionally high	8	3	40	11	11

9.4.3 Probabilistic ensemble projection of groundwater levels at key sites in September 2024

Percentage of pie chart for each band

Site	Therfield Rectory	Newmarket	Washpit Farm	Bircham Newton	Kenninghall	Bury St Edmunds	Smeetham
Exceptionally low	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Notably low	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Below normal	0.0	0.0	87.5	0.0	0.0	0.0	0.0
Normal	0.0	46.2	12.5	0.0	0.0	51.3	0.0
Above normal	0.0	41.0	0.0	77.8	0.0	17.9	0.0
Notably high	0.0	7.7	0.0	18.5	0.0	12.8	58.6
Exceptionally high	100.0	5.1	0.0	3.7	100.0	17.9	41.4

9.4.4 Probabilistic ensemble projection of groundwater levels at key sites in March 2025

Percentage of pie chart for each band

Site	Therfield Rectory	Newmarket	Washpit Farm	Bircham Newton	Kenninghall	Bury St Edmunds	Smeetham
Exceptionally low	0.0	7.1	0.0	0.0	0.0	0.0	0.0
Notably low	0.0	7.1	12.5	3.7	2.0	10.3	1.7
Below normal	0.0	19.0	12.5	18.5	22.4	15.4	17.2
Normal	27.9	26.2	59.4	22.2	26.5	38.5	20.7
Above normal	24.6	9.5	3.1	25.9	22.4	12.8	15.5
Notably high	36.1	14.3	9.4	7.4	16.3	5.1	24.1
Exceptionally high	11.5	16.7	3.1	22.2	10.2	17.9	20.7