Monthly water situation report: East Anglia

1 Summary – May 2024

May 2024 was another wet month across the East Anglian region, a continuation of the previous 12 months of wet weather the area has experienced. Catchments all received above average rainfall for the month, with the majority seeing exceptionally high rainfall totals. This has meant groundwater levels, river flows and reservoir stocks all remain high and in a healthy position heading into the summer season. SMD has slowly began to increase but remains below average for this time of year and has supported the high baseflow and responsiveness of the rivers to rainfall events.

1.1 Rainfall

May 2024 was another significantly wet month, ranging between 128% and 203% of the long-term average for May, and following the trend of wet weather experienced over the past 12 months in the region. The last 3-month, 6-month and 12-month rainfall totals have consistently been notably or exceptionally high across the region. Rainfall totals across the region have not dropped below 120% of the long-term average, across any of the observed timeframes.

1.2 Soil moisture deficit and recharge

Soil Moisture Deficit saw a sharp change through May as it continued to increase, due to the warmer temperatures and higher evapotranspiration rates, before this increase was impeded due to the high rainfall received in the middle of the month, causing the SMD to decline. It has since however, continued its rise as rainfall reduced. Overall, the deficit is lower than average for this time of year and May to June usually sees a sharp increase in SMD as rainfall totals drop with warmer, drier days.

1.3 River flows

Monthly river flows ranged between 109% and 275% of the long-term average for May. While the month began with rivers at baseflow for much of the region, the periods of intense rainfall led to a sharp peak in flows towards the beginning of the month before receding. River flows remain above average for the region due to high groundwater levels and soil moisture supporting baseflow and high runoff volumes. Catchments in the south and east of the region,

the Chelmer, Gipping and Waveney saw flows closest to average for the time of year, reflecting the lower rainfall totals.

1.4 Groundwater levels

Groundwater levels remain high across East Anglia, with all catchments with data demonstrating above average, notably or exceptionally high levels compared to the long-term average. The continued high levels of rainfall continue to recharge groundwater; however, a number of sites are now trending down from exceptionally high. Despite this trend, it is likely groundwater levels will remain above normal at many locations through the summer months.

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1.5 Reservoir stocks

Reservoir stocks for the month were in a good position, Abberton, Alton and Hanningfield stocks were all 95% or above, and running above normal operating curve for this time of year. Ardleigh and Grafham are slightly below their normal operating curve, but still have around 90% of normal capacity stored.

1.6 Forward look

1.6.1 Probabilistic ensemble projections for river flows at key sites

Projecting forward, the simulations suggest, based on the current starting conditions, there is roughly a 25% probability flows will be below average or notably low by September 2024, while average conditions are predominately expected. However, it is expected that flows will increase later in the year and by December it is likely flows will be above normal to notable high.

1.6.2 Probabilistic ensemble projections for groundwater levels in key aquifers

None of the models run for the groundwater levels suggest levels to reduce below normal, with sites Kenninghall, Smeetham and Therfield Rectory simulating at least notably high groundwater levels, by September 2024. This highlights the significance of the wet winter experienced in enabling groundwater recharge, as well as the continued above average rainfall totals supplementing the groundwater levels. March 2025 projections show a reduction in groundwater levels with roughly a 25% chance of levels falling below average, this suggests

the influence of the previous wet winter will have subsided and projected average rainfall for the region will drive the groundwater levels.

Author: Hydrology Team, hydrology-ean-and-lna@environemnt-agency.gov.uk

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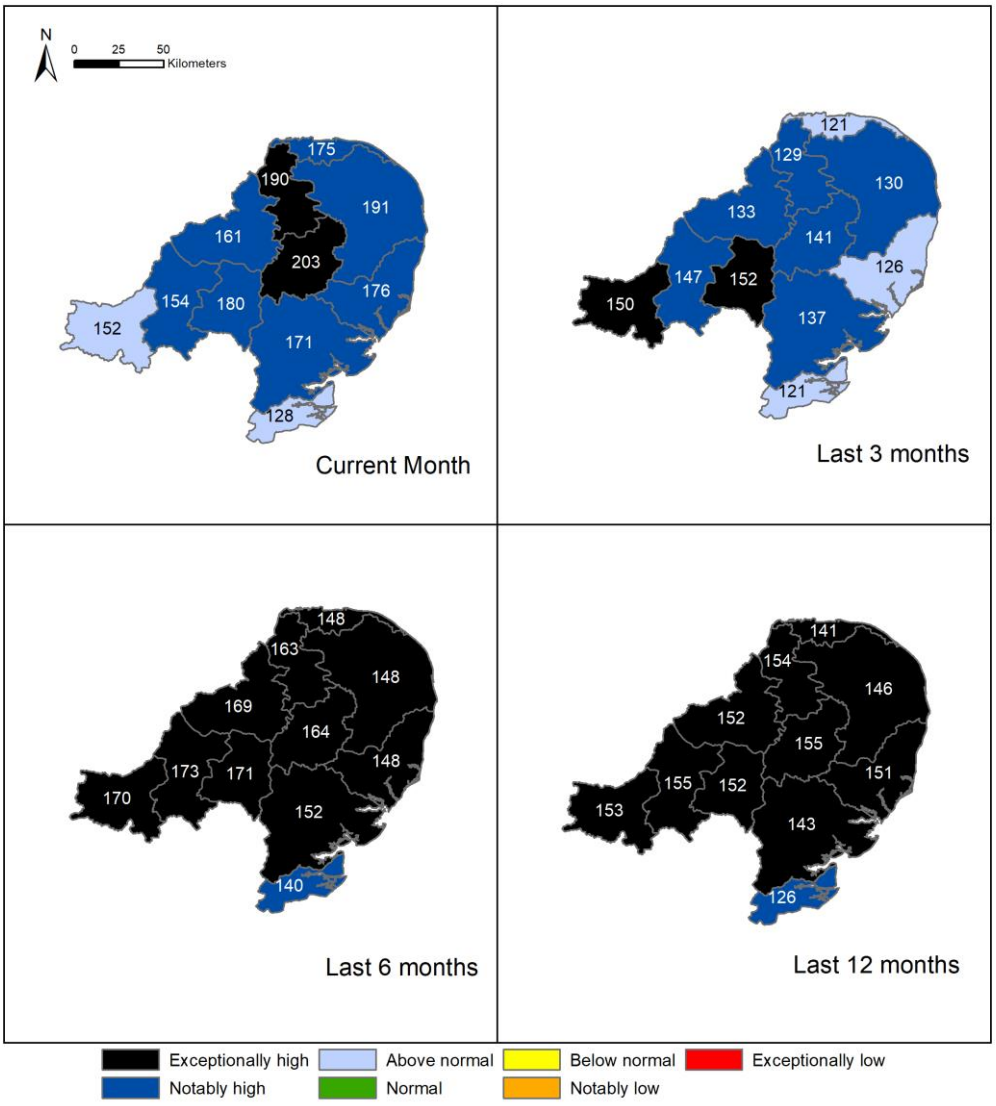
2 Rainfall

2.1 Rainfall map

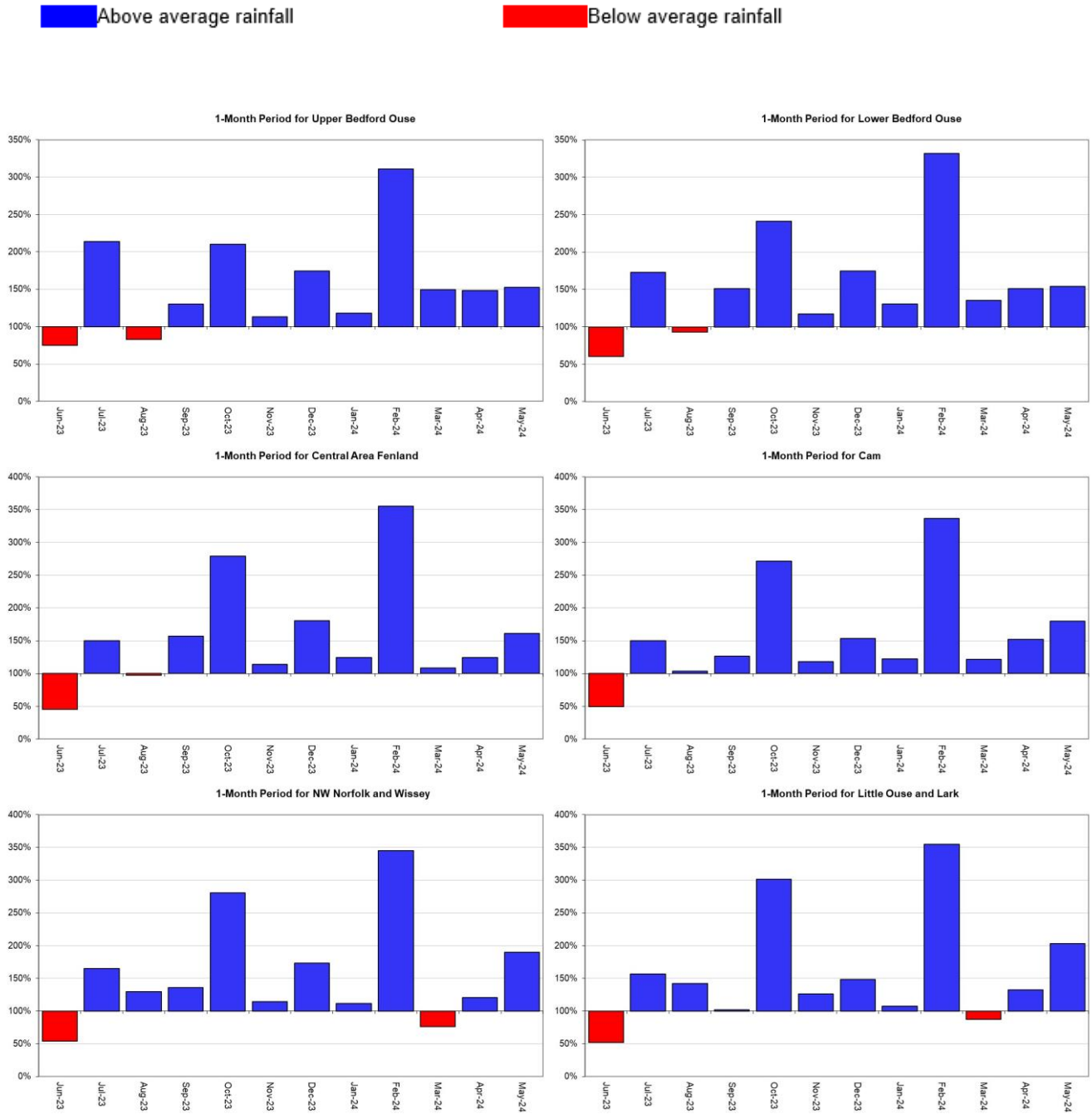
Figure 2.1: Total rainfall for hydrological areas across East Anglia, expressed as a percentage of long term average rainfall for the current month (up to May 2024), the last 3 months, the last 6 months, and the last 12 months. Category classes are based on an analysis of respective historic totals.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

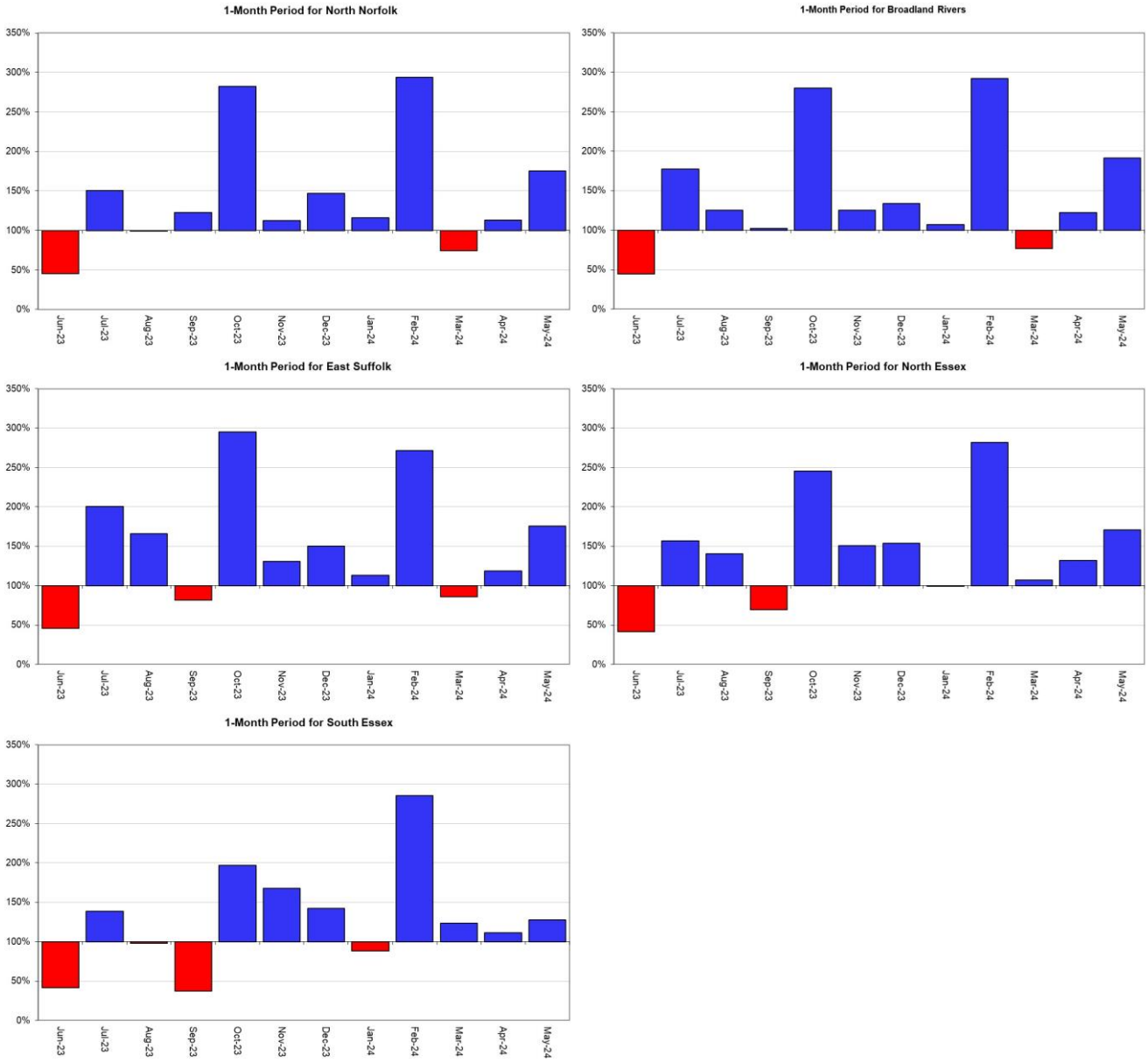


HadUK data based on the Met Office 1km gridded rainfall dataset derived from rain gauges (Source: Met Office. Crown copyright, 2024). Provisional data based on Environment Agency 1km gridded rainfall dataset derived from Environment Agency intensity rain gauges. Crown copyright. All rights reserved.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

2.2 Rainfall charts

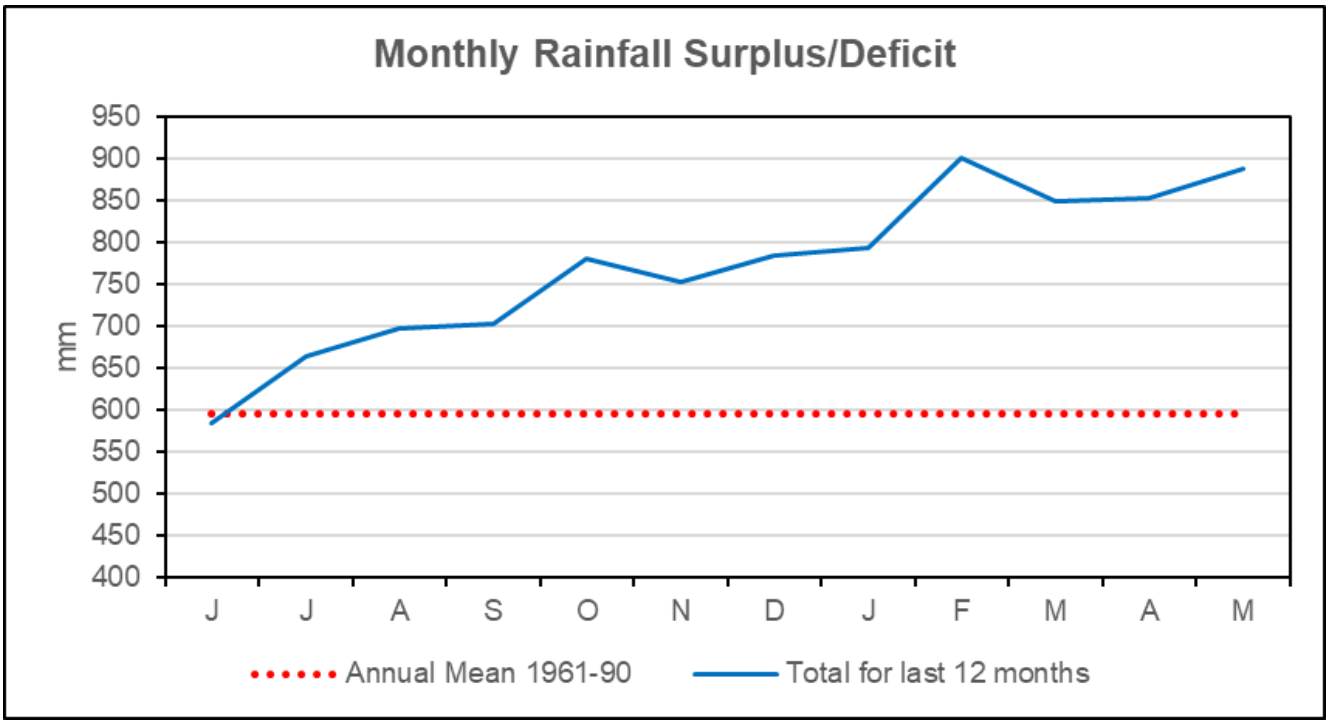
Figure 2.2: Monthly rainfall totals for the past 12 months as a percentage of the 1961 to 1990 long term average for each region and for England.





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

2.3 Monthly rainfall surplus deficit chart

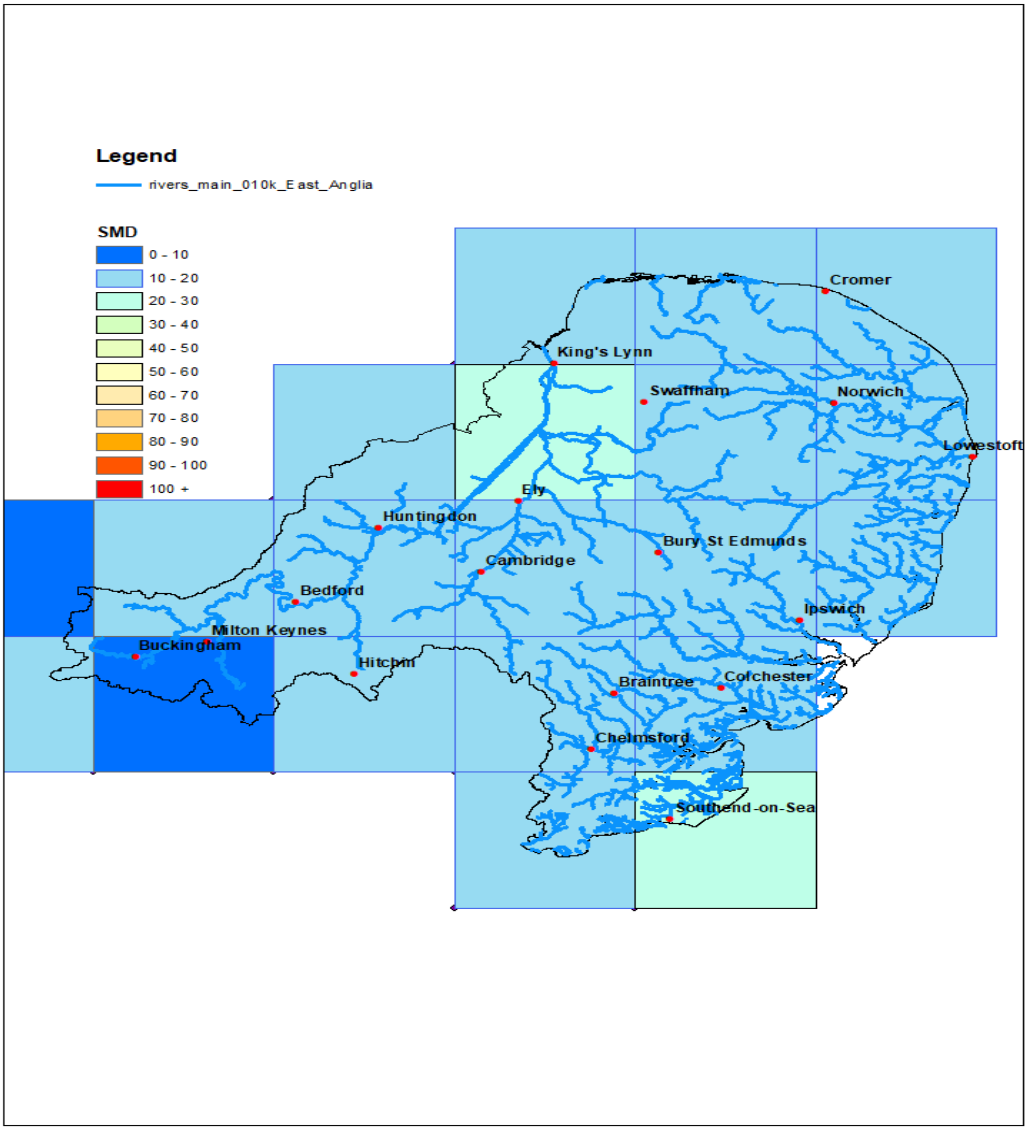


HadUK rainfall data. (Source: Met Office. Crown copyright, 2024).

3 Soil moisture deficit

3.1 Soil moisture deficit map

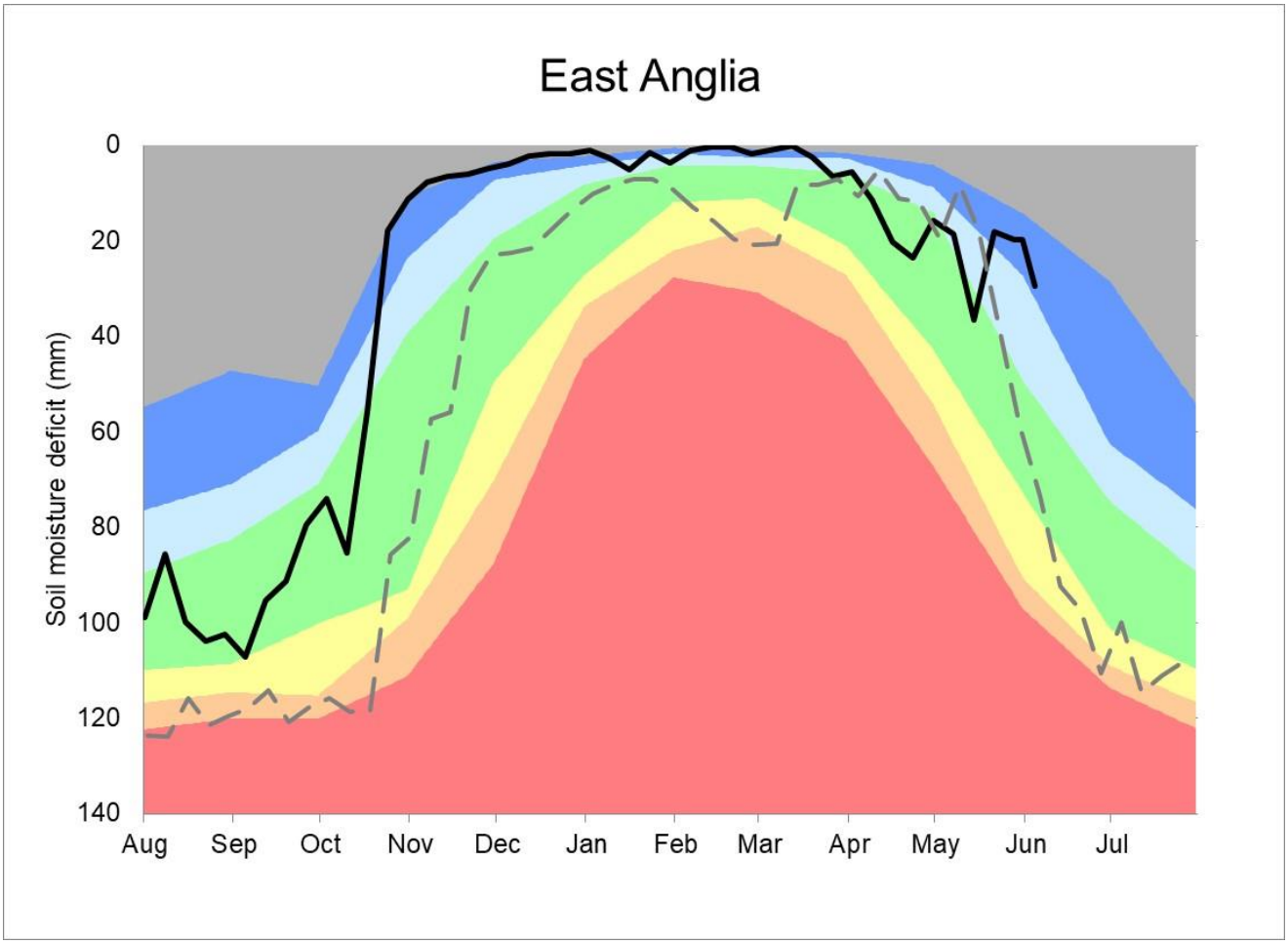
Figure 3.1: Soil moisture deficit values for May 2024. Values based on the weekly MORECS data for real land use.



(Source: Met Office. Crown copyright, 2024). All rights reserved. Environment Agency, 100024198, 2024.

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.

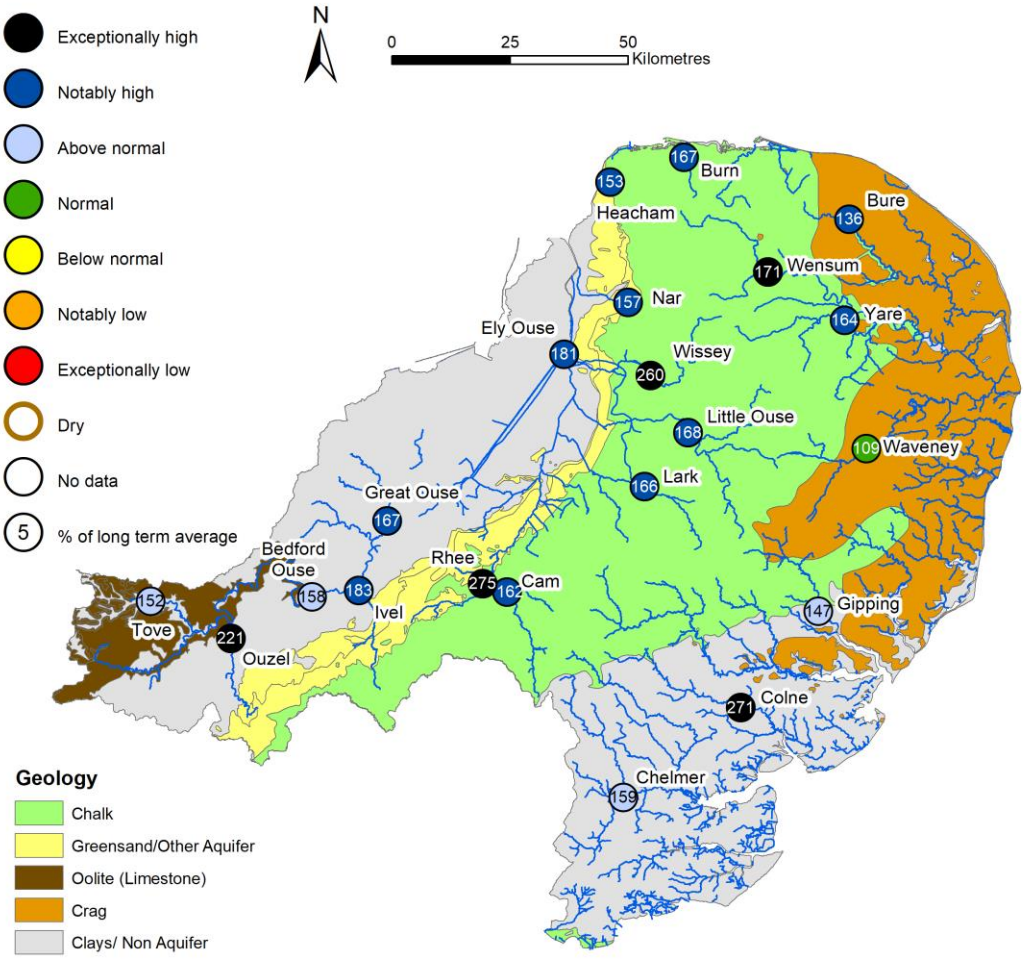


(Source: Met Office. Crown copyright, 2024). All rights reserved. Environment Agency, 100024198, 2024

4 River flows

4.1 River flows map

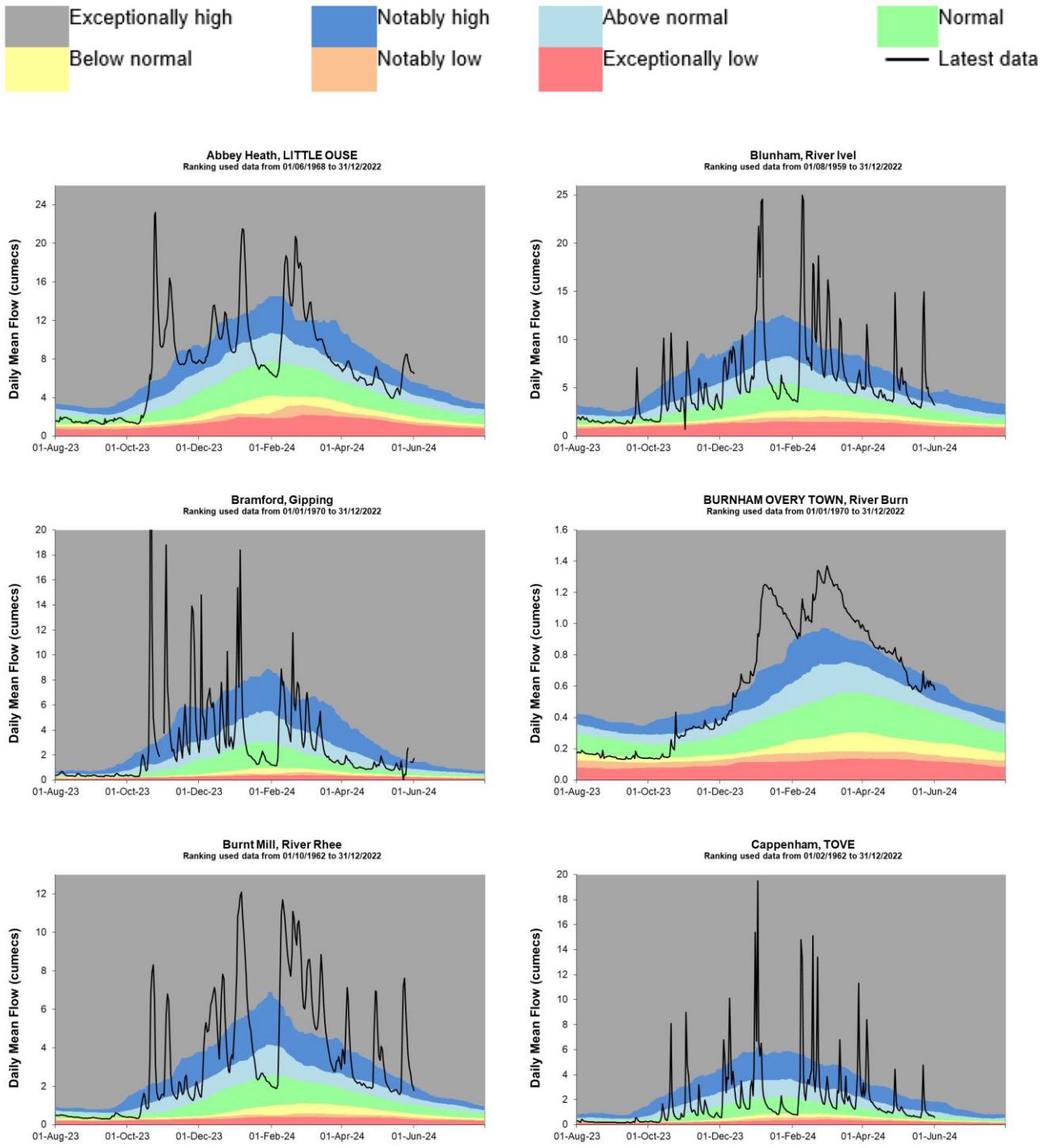
Figure 4.1: Monthly mean river flow for indicator sites for May 2024, expressed as a percentage of the respective long term average and classed relative to an analysis of historic September monthly means Table available in the appendices with detailed information.



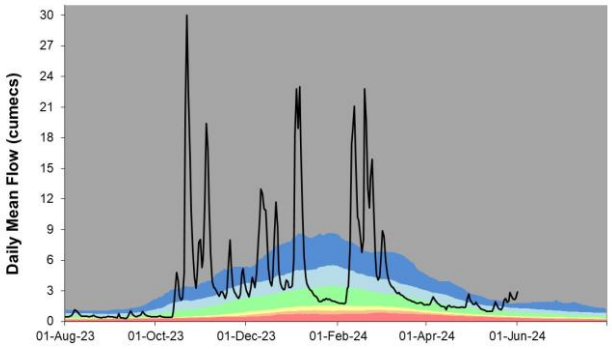
(Source: Environment Agency). Geological map reproduced with kind permission from UK Groundwater Forum, BGS copyright NERC. Crown copyright. All rights reserved. Environment Agency, 100024198, 2024.

4.2 River flow charts

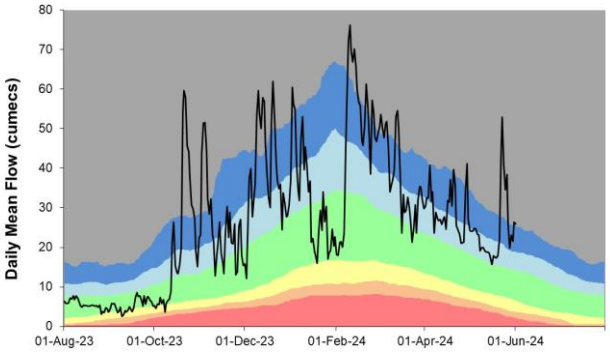
Figure 4.2: Daily mean river flow for index sites over the past year, compared to an analysis of historic daily mean flows, and long term maximum and minimum flows.



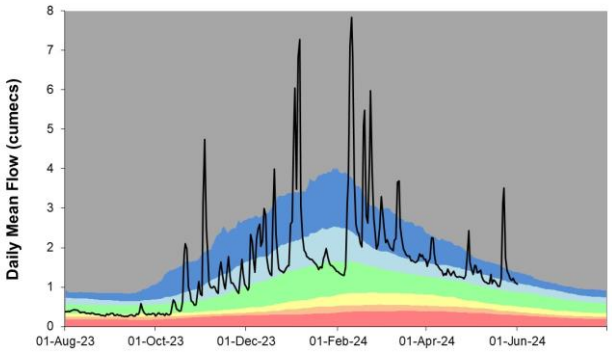
COLNEY, River Yare
Ranking used data from 01/01/1970 to 31/12/2022



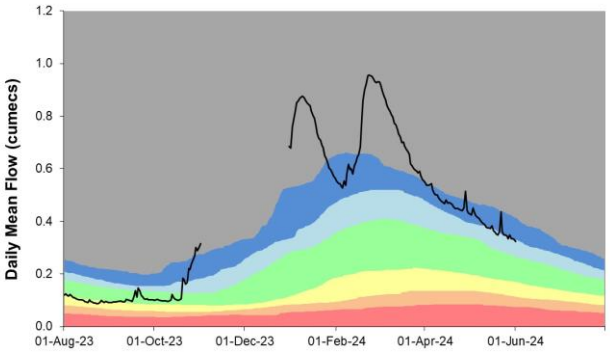
Denver, ELY OUSE
Ranking used data from 01/11/1971 to 31/12/2022



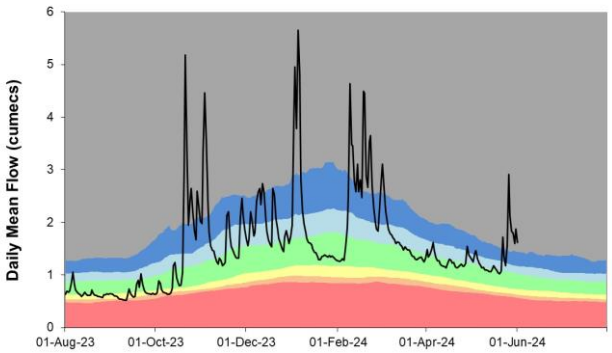
Dernford, CAM
Ranking used data from 21/02/1949 to 23/12/2022



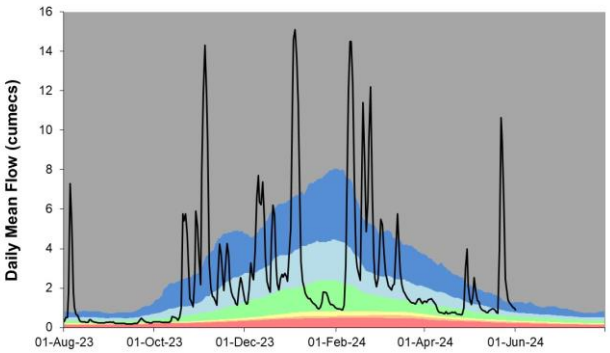
Heacham, HEACHAM
Ranking used data from 01/11/1965 to 31/12/2022



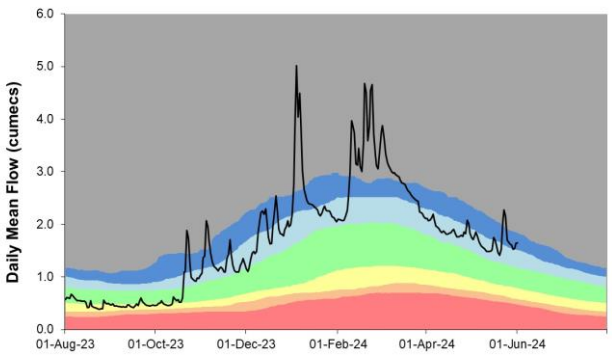
Ingworth, Bure
Ranking used data from 01/01/1970 to 31/12/2022



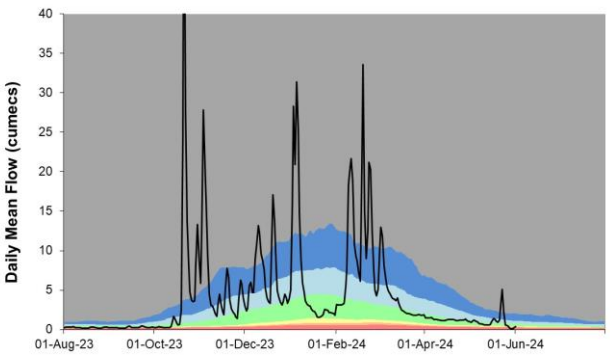
Lexden, Colne
Ranking used data from 01/01/1970 to 31/12/2022

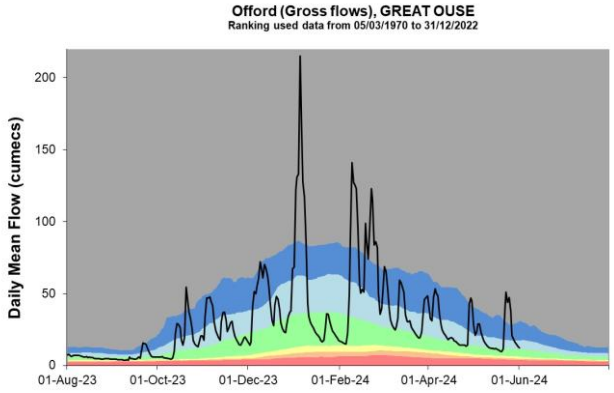


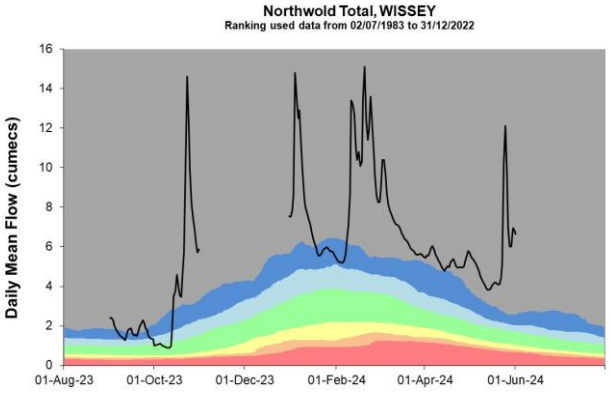
Marham, River Nar
Ranking used data from 01/09/1953 to 31/12/2022

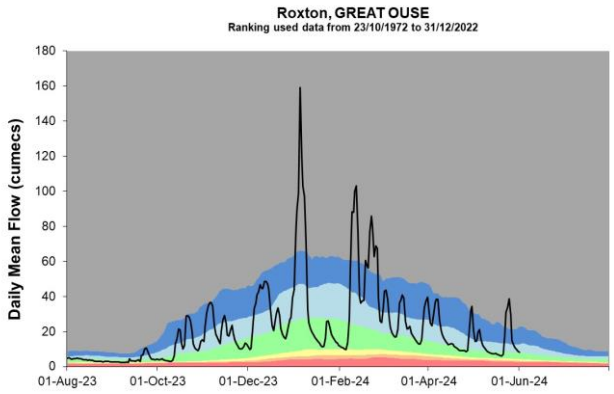


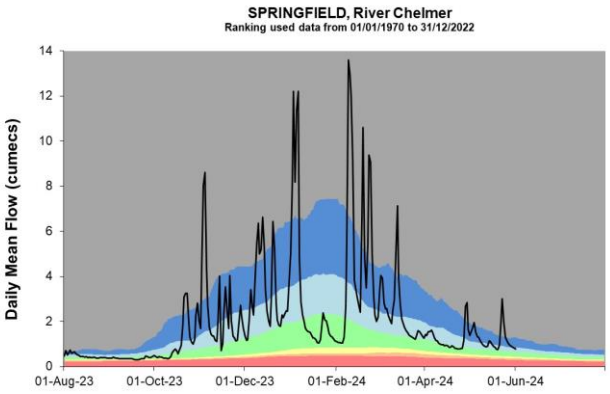
Needham Weir Total, Waveney
Ranking used data from 01/01/1970 to 31/12/2022

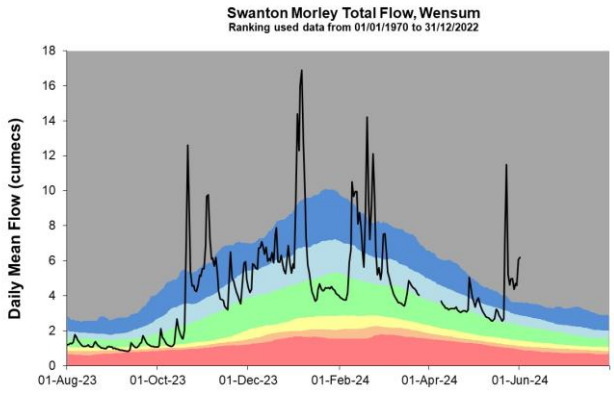


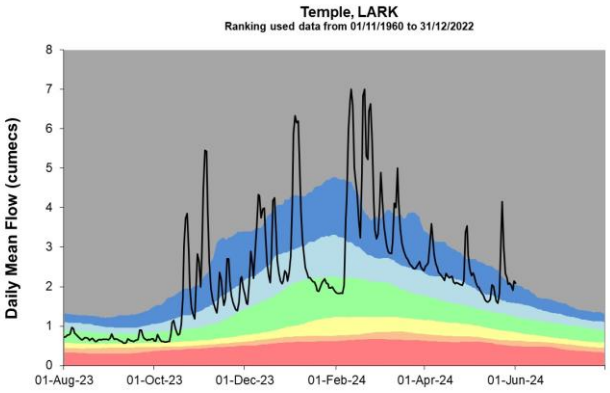


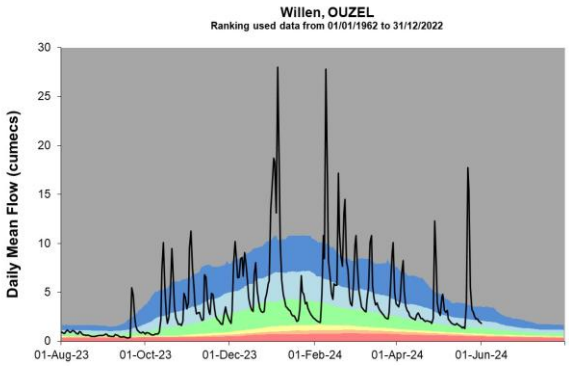










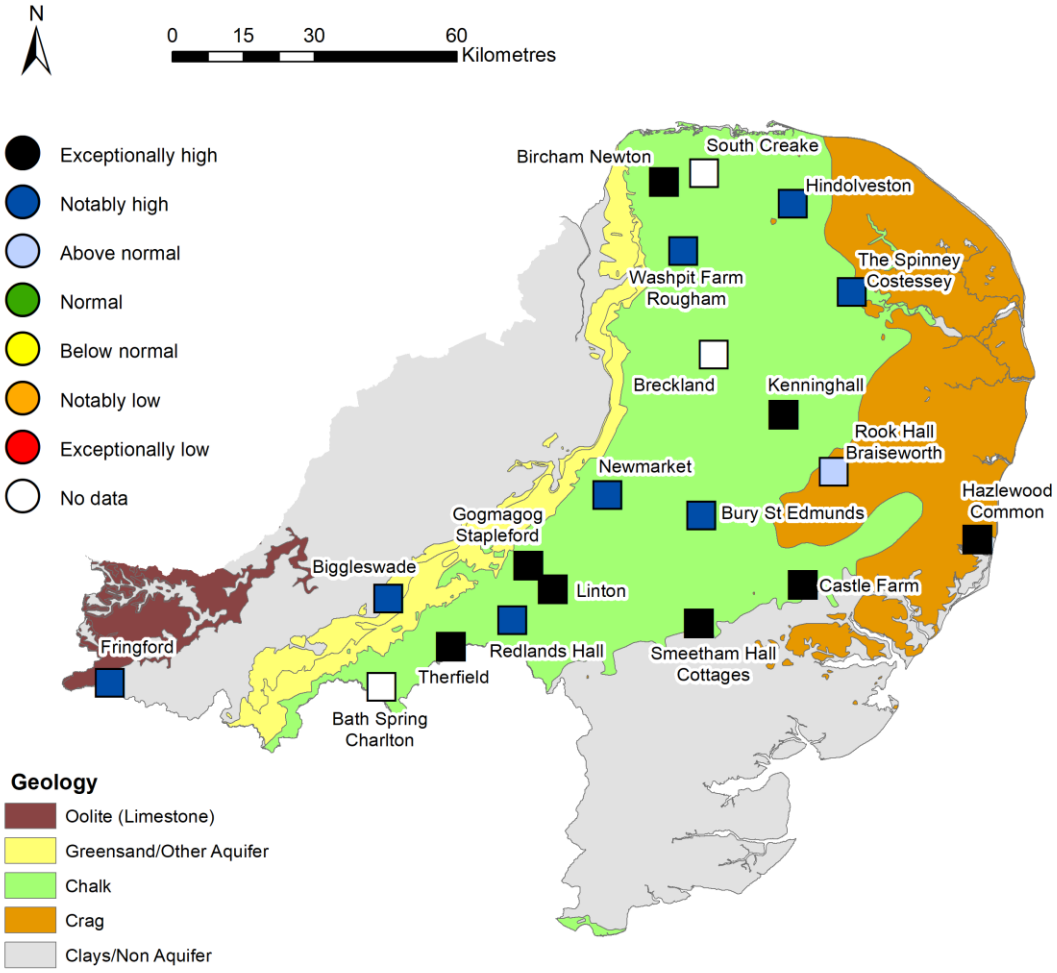


Source: Environment Agency.

5 Groundwater levels

5.1 Groundwater levels map

Figure 5.1: Groundwater levels for indicator sites at the end of May 2024, classed relative to an analysis of respective historic September levels. Table available in the appendices with detailed information.



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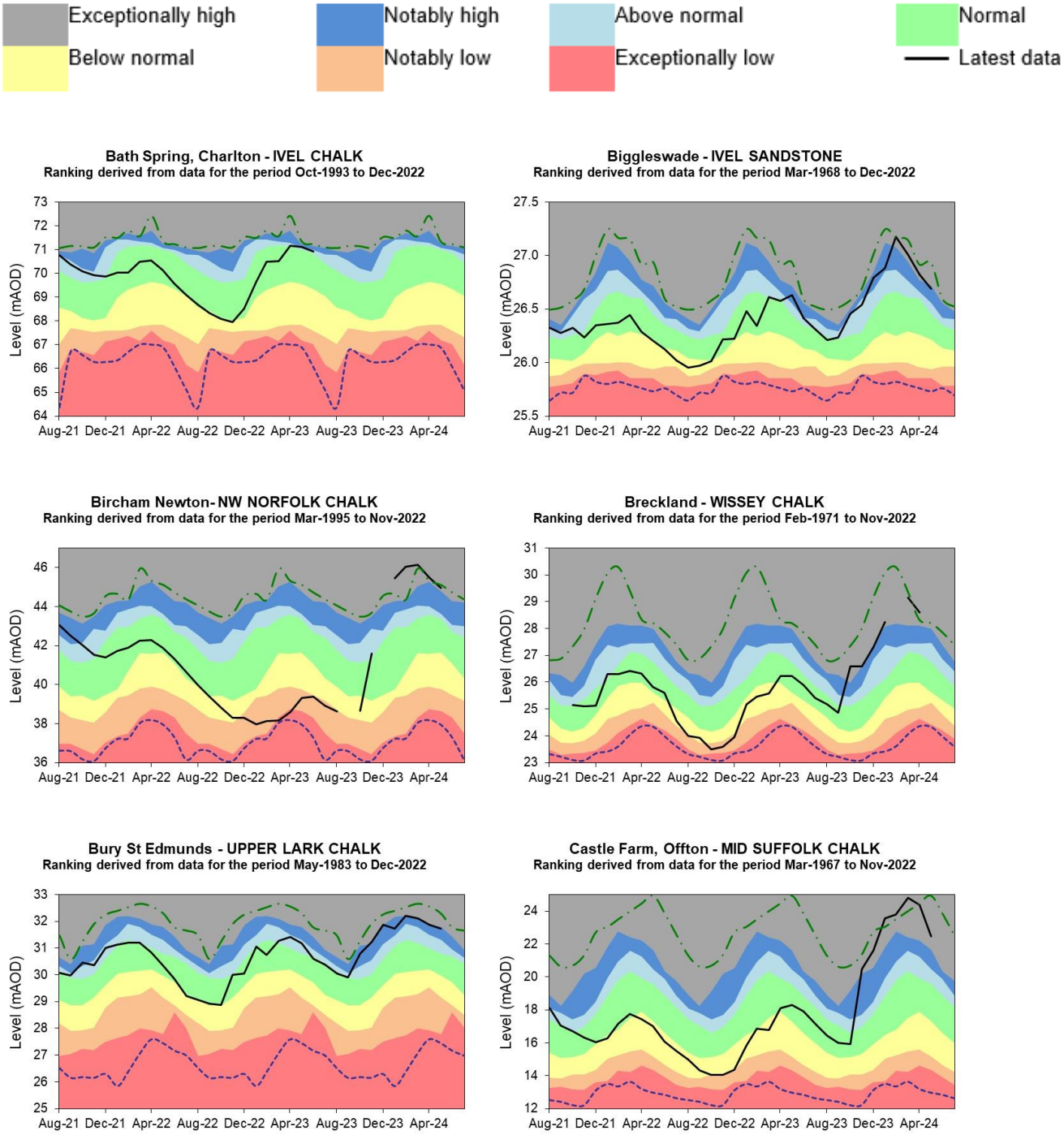
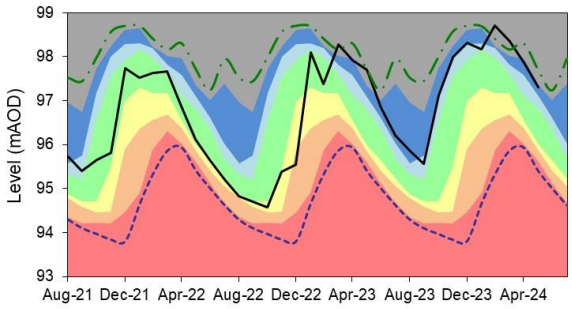
5.2 Groundwater level charts

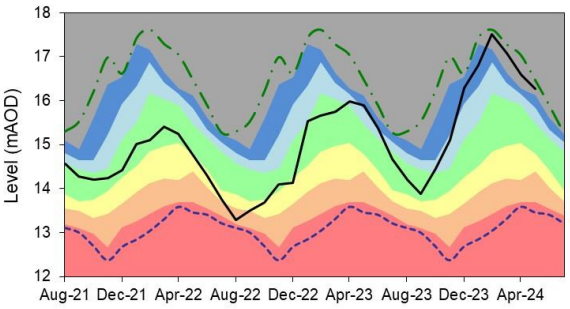
Figure 5.2: End of month groundwater levels at index groundwater level sites for major aquifers. 22 months compared to an analysis of historic end of month levels and long term maximum and minimum levels.



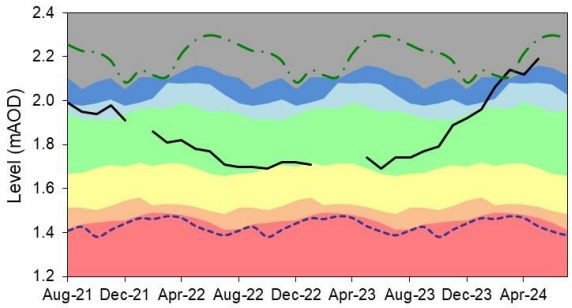
Fringford - GREAT OOLITE
Ranking derived from data for the period Sep-1980 to Dec-2022



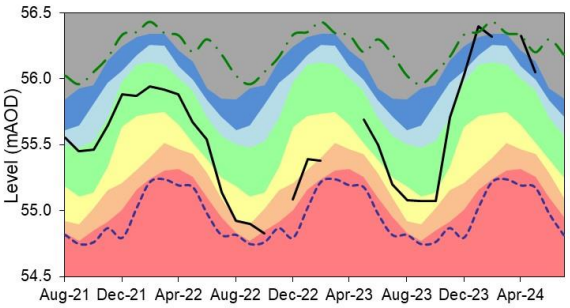
Gog Magog, Stapleford - CAM CHALK
Ranking derived from data for the period Jan-1980 to Dec-2022



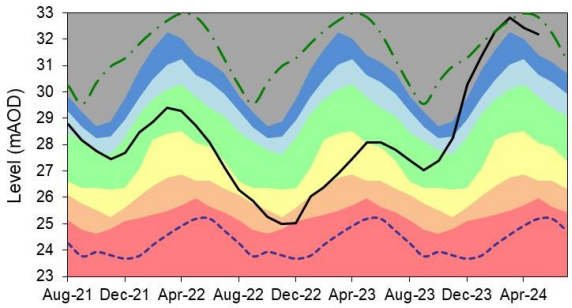
Hazlewood Common - SUFFOLK CRAG
Ranking derived from data for the period Oct-1988 to Nov-2022



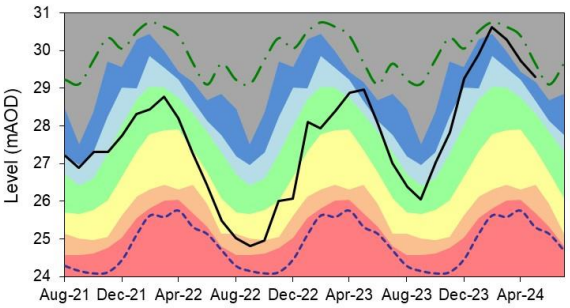
Hindolveston - NORFOLK CHALK
Ranking derived from data for the period Sep-1984 to Nov-2022



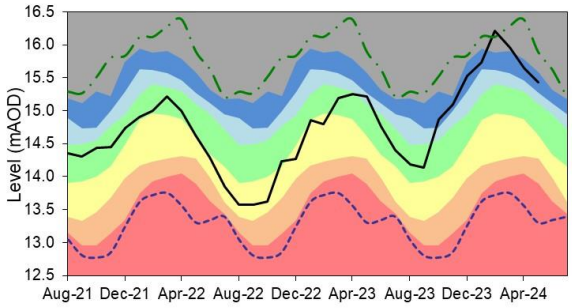
Kenninghall - LITTLE OUSE CHALK
Ranking derived from data for the period Aug-1973 to Dec-2022



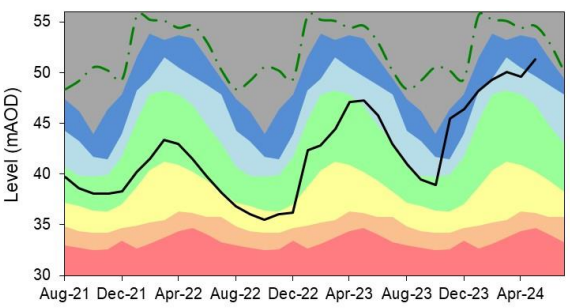
Linton- CAM CHALK
Ranking derived from data for the period Jan-1980 to Dec-2022

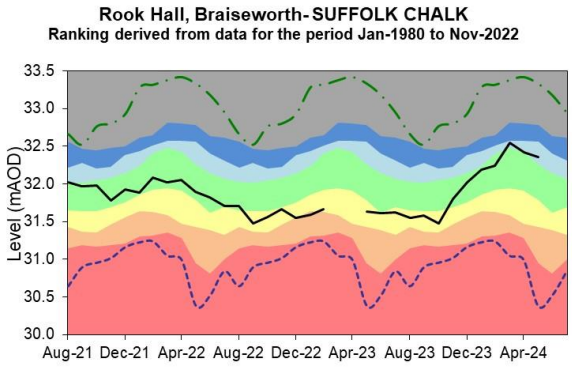


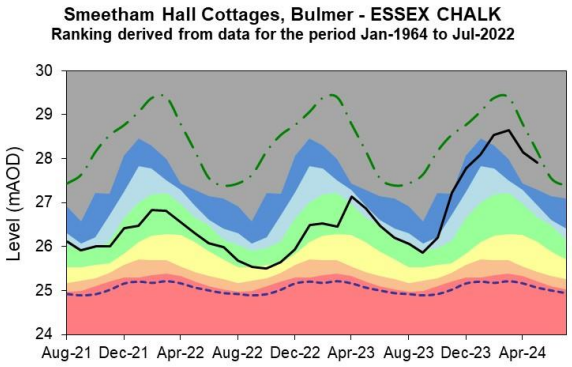
Newmarket - SNAIL CHALK
Ranking derived from data for the period Feb-1983 to Dec-2022

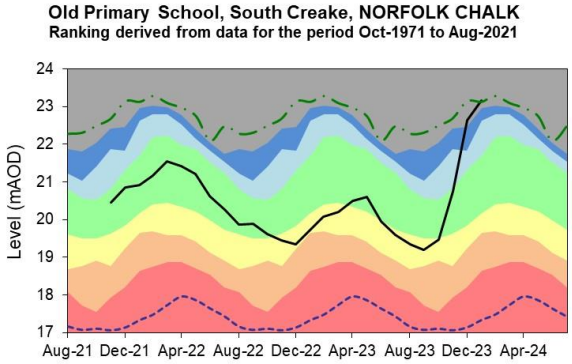


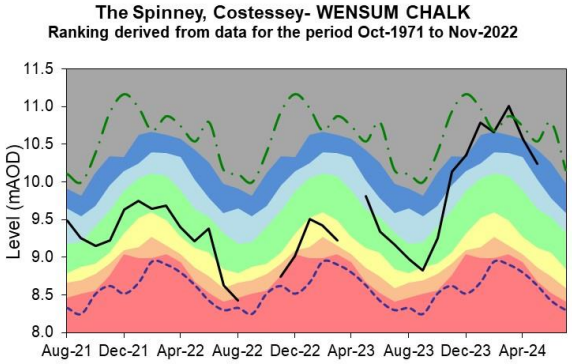
Redlands Hall, Ickleton - CAM CHALK
Ranking derived from data for the period Aug-1963 to Dec-2022

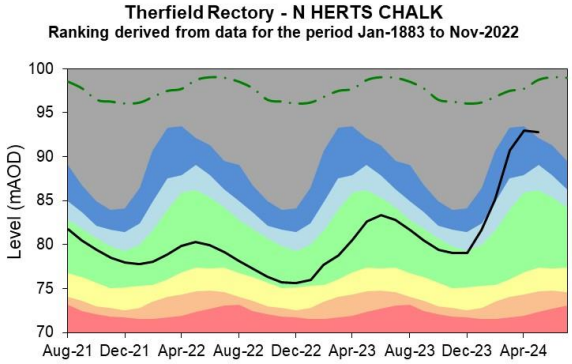


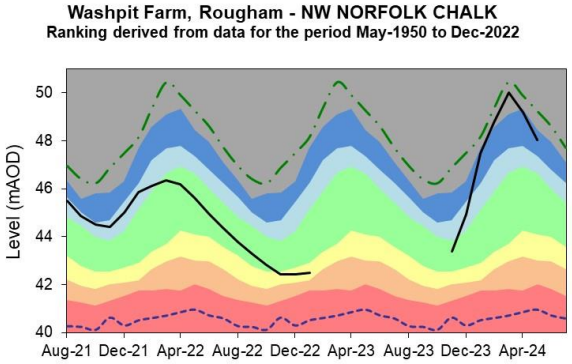








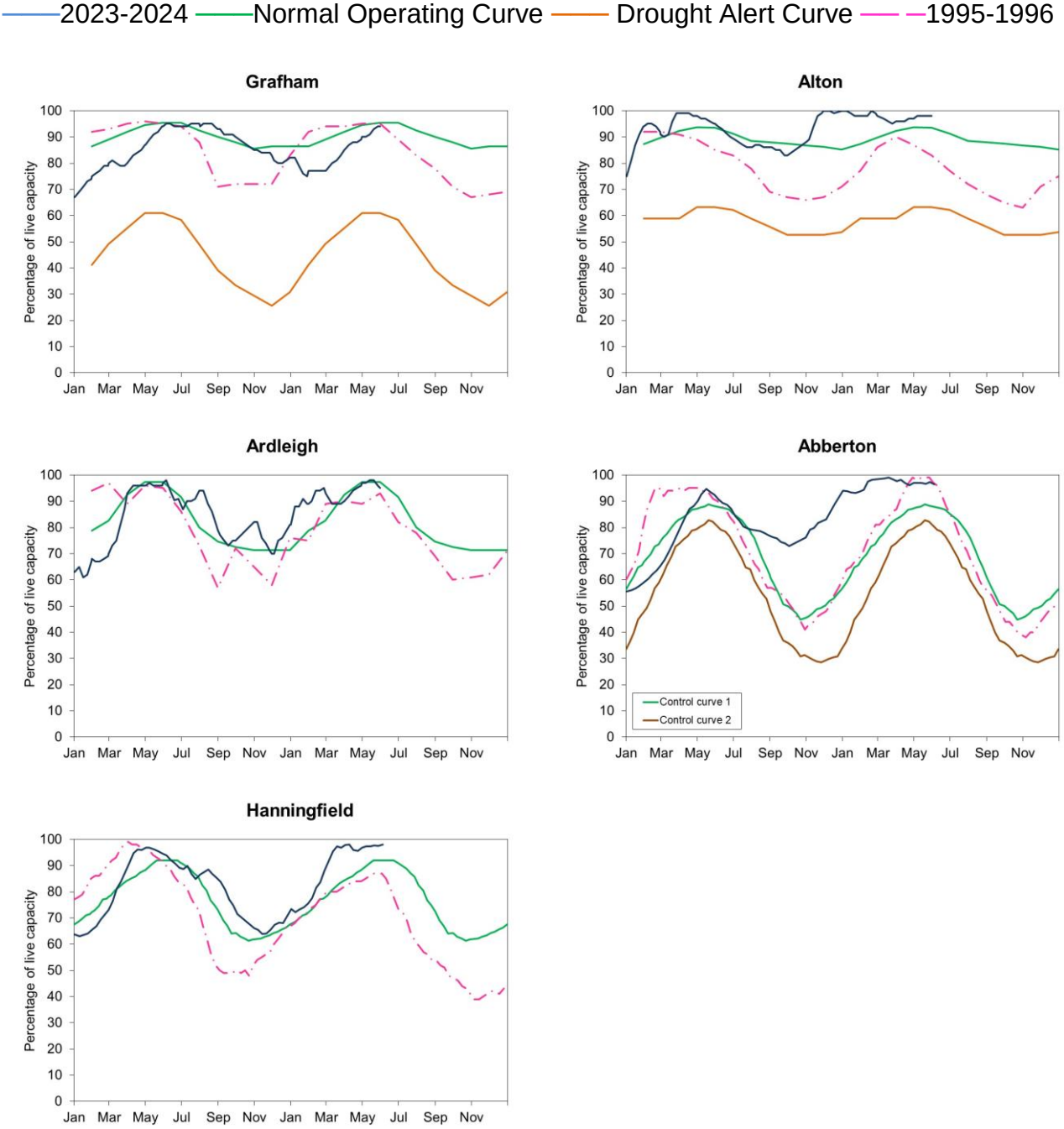




Source: Environment Agency, 2024.

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.



(Source: water companies).

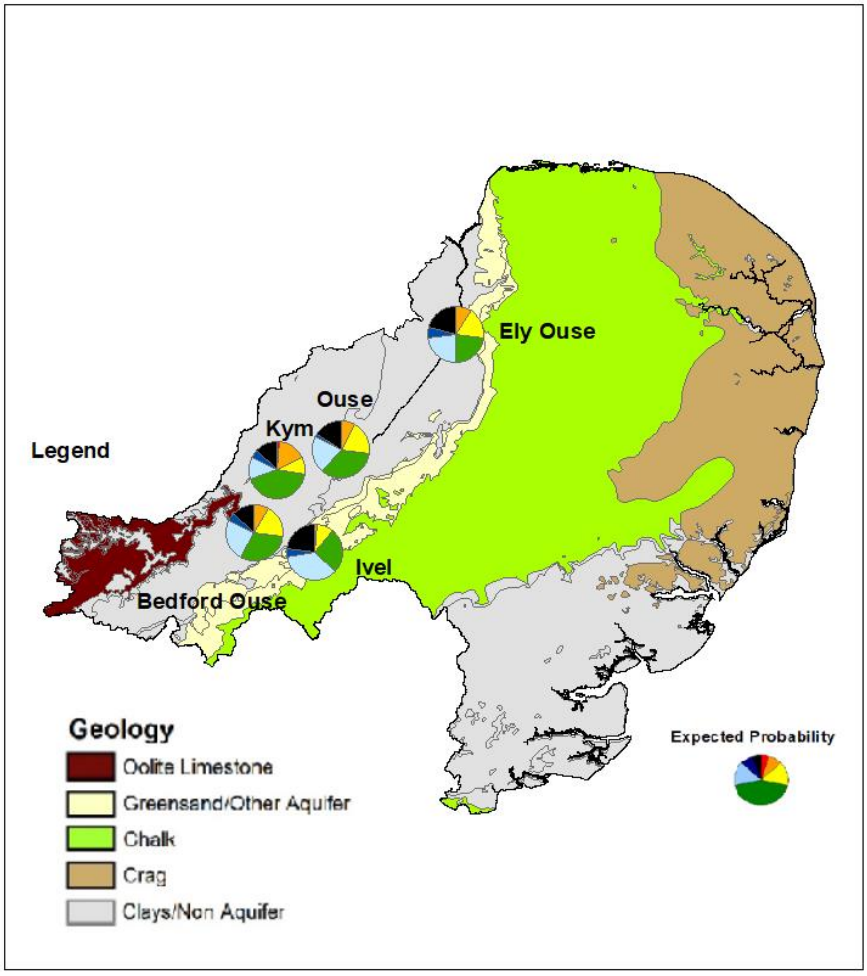
6.1 Reservoir stocks map

(Source: Environment Agency). Crown copyright. All rights reserved. Environment Agency, 100024198, 2024

7 Forward look

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

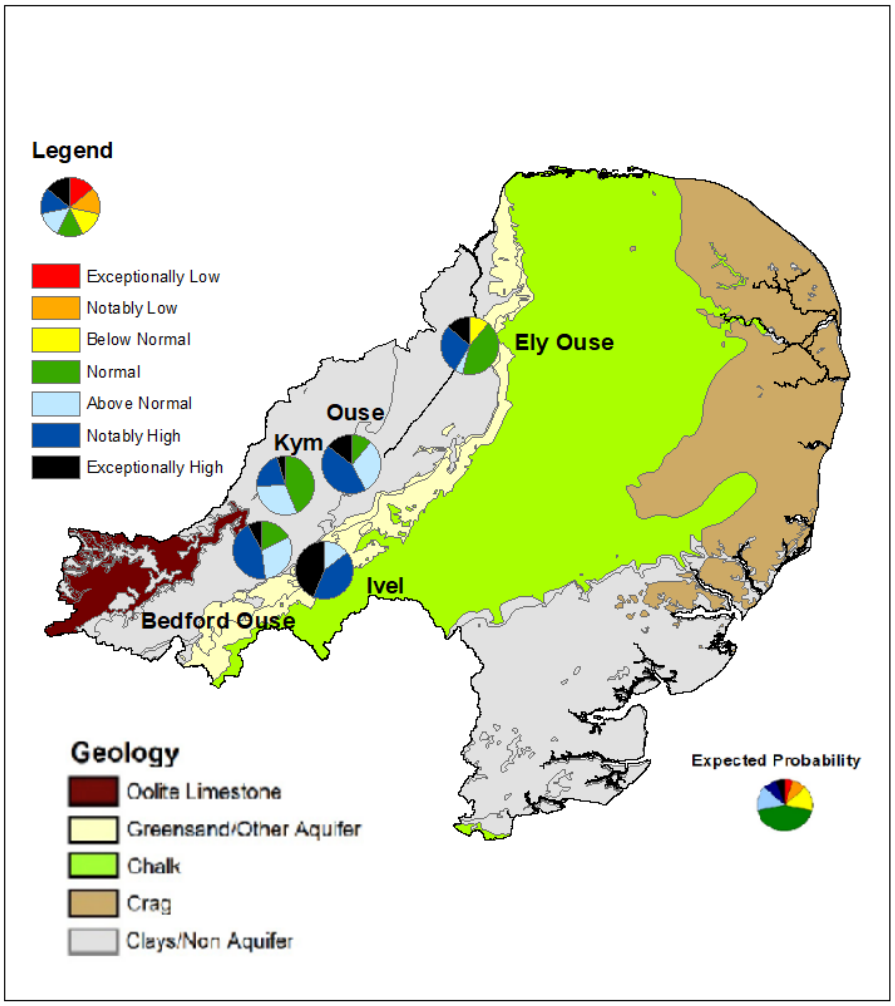
Table available in the appendices with detailed information. Exceptionally high or low levels are those which would typically occur 5% of the time within the historic record. Notably high or low levels are those which would typically occur 8% of the time. Above normal or below normal levels are those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

7.2 Probabilistic ensemble projection of river flows at key sites in December 2024

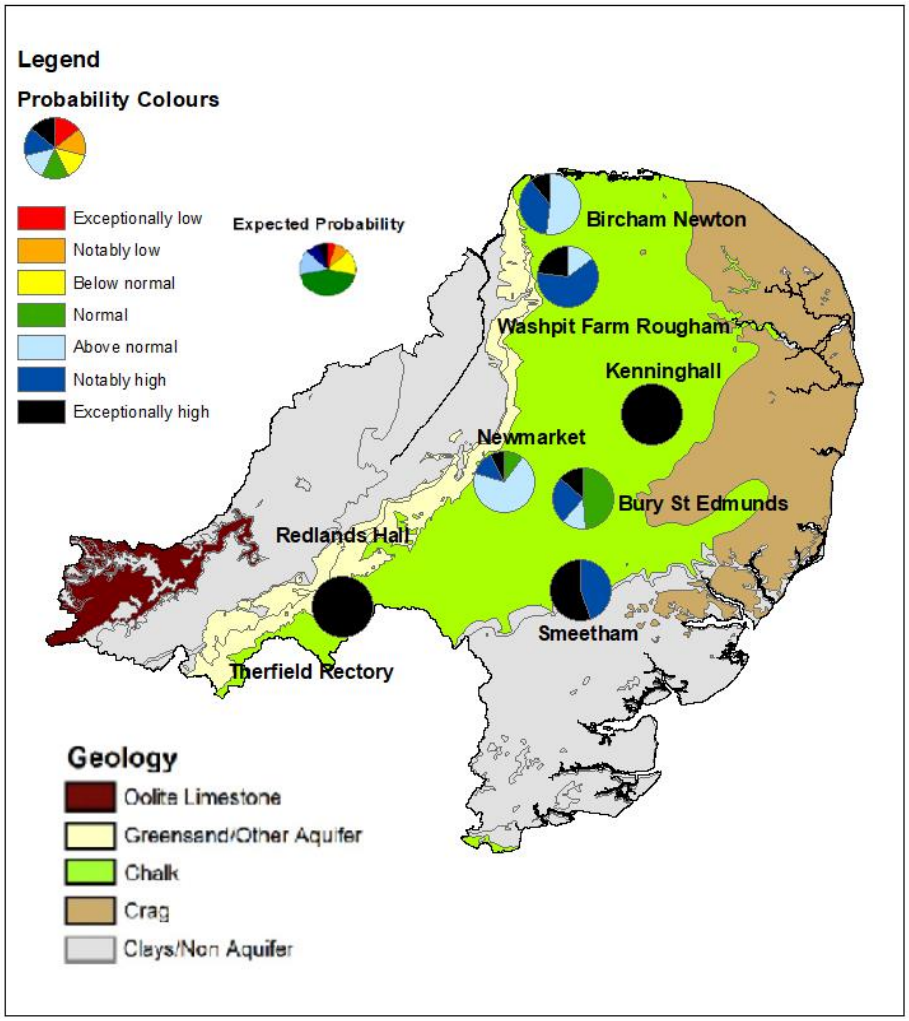
Table available in the appendices with detailed information. Exceptionally high or low levels are those which would typically occur 5% of the time within the historic record. Notably high or low levels are those which would typically occur 8% of the time. Above normal or below normal levels are those 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)
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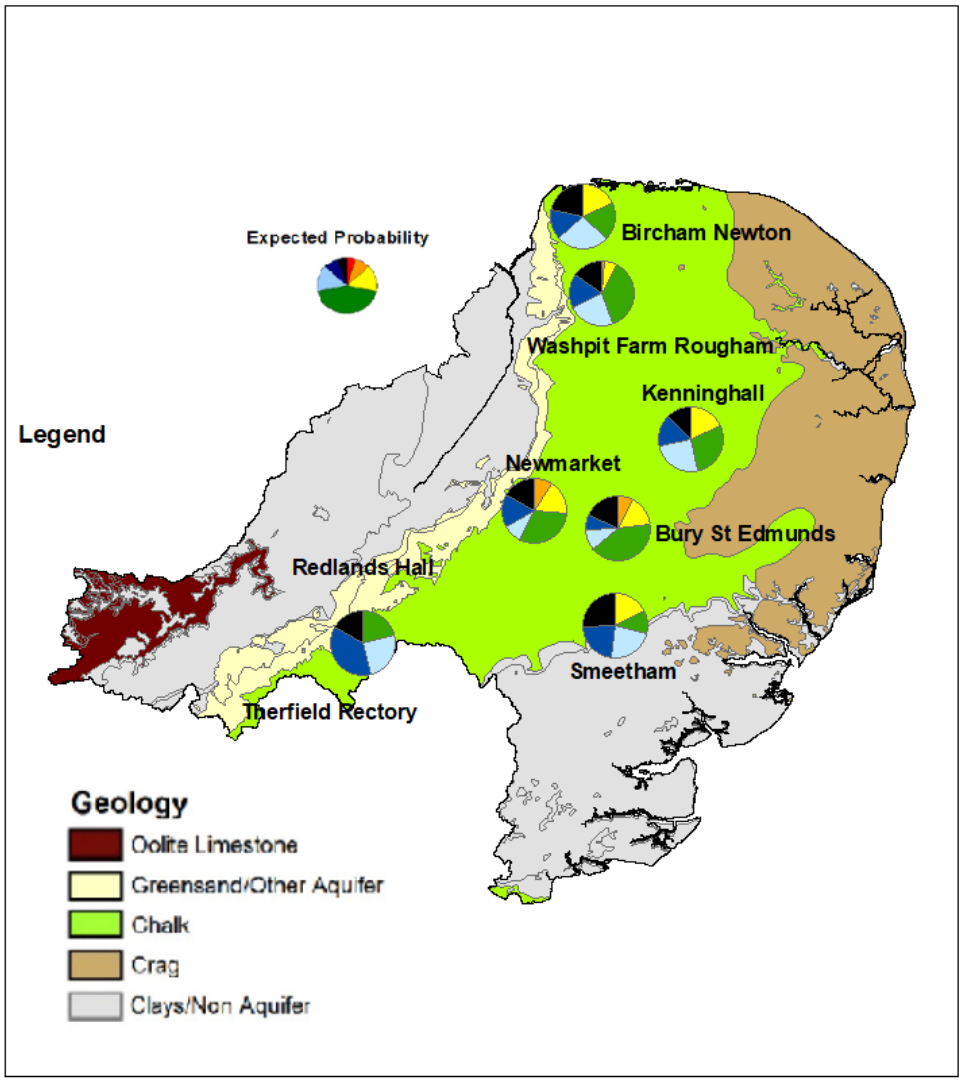
7.4 Probabilistic ensemble projection of groundwater levels at key sites in March 2025

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)
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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	May 2024 rainfall % of long term average 1961 to 1990	May 2024 band	March 2024 to May cumulative band	Jan 2024 to May cumulative band	June 2023 to May 2024 cumulative band
Broadland Rivers	191	Notably High	Notably high	Exceptionally high	Exceptionally high
Cam	180	Notably High	Exceptionally high	Exceptionally high	Exceptionally high
Central Area Fenland	161	Notably High	Notably high	Exceptionally high	Exceptionally high
East Suffolk	176	Notably High	Above normal	Exceptionally high	Exceptionally high
Little Ouse And Lark	203	Exceptionally High	Notably high	Exceptionally high	Exceptionally high
Lower Bedford Ouse	154	Notably High	Notably high	Exceptionally high	Exceptionally high
North Essex	171	Notably High	Notably high	Exceptionally high	Exceptionally high
North Norfolk	175	Notably High	Above normal	Exceptionally high	Exceptionally high
Nw Norfolk And Wissey	190	Exceptionally High	Notably high	Exceptionally high	Exceptionally high

South Essex	128	Above Normal	Above normal	Notably high	Notably high
Upper Bedford Ouse	152	Above Normal	Exceptionally high	Exceptionally high	Exceptionally high

9.2 River flows table

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

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

9.3 Groundwater table

Site name	Aquifer	End of May 2024 band	End of April 2024 band
Biggleswade	Ivel Woburn Sands	Notably high	Exceptionally high
Bircham Newton	North West Norfolk Chalk	Exceptionally high	Exceptionally high
Breckland	Wissey Chalk		Exceptionally high
Bury St Edmunds	Upper Lark Chalk	Notably high	Notably 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	Exceptionally high	Notably high
Hindolveston	Norfolk Chalk	Notably high	Exceptionally high
Kenninghall	Little Ouse Chalk	Exceptionally high	Exceptionally high
Linton	Cam Chalk	Exceptionally high	Exceptionally high
Newmarket	Snail Chalk	Notably high	Notably high

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

9.4 Ensemble projections tables

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

Percentage of pie chart for each band

Site	Bedford Ouse	Kym	Ivel	Ouse	Ely Ouse
Exceptionally low	0	0	0	0	0
Notably low	0	0	0	0	0
Below normal	0	0	0	0	0
Normal	34	76	0	11	0
Above normal	45	3	0	65	36
Notably high	6	5	73	6	41
Exceptionally high	15	16	27	18	23

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

Percentage of pie chart for each band

Site	Bedford Ouse	Kym	Ivel	Ouse	Ely Ouse
Exceptionally low	0	2	0	0	0
Notably low	8	16	2	8	9
Below normal	19	10	10	19	18
Normal	31	42	26	34	23
Above normal	24	13	35	21	23
Notably high	5	5	5	2	7
Exceptionally high	13	13	23	16	20

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	10.3	12.5	0.0	0.0	48.7	0.0
Above normal	0.0	69.2	0.0	51.9	0.0	12.8	0.0
Notably high	0.0	12.8	0.0	37.0	0.0	25.6	44.8
Exceptionally high	100.0	7.7	0.0	11.1	100.0	12.8	55.2

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	0.0	0.0	0.0	0.0	0.0	0.0
Notably low	0.0	9.5	12.5	0.0	0.0	7.7	0.0
Below normal	0.0	16.7	12.5	18.5	18.4	15.4	17.2
Normal	21.3	31.0	59.4	18.5	28.6	41.0	12.1
Above normal	24.6	9.5	3.1	25.9	24.5	10.3	22.4
Notably high	37.7	16.7	9.4	14.8	16.3	7.7	22.4
Exceptionally high	16.4	16.7	3.1	22.2	12.2	17.9	25.9