Monthly water situation report: East Anglia

1 Summary - September 2024

Following a dry August, the rainfall for September 2024 was above average for all of East Anglia, with exceptionally high month totals recorded in the Bedford Ouse catchment. Most of this rainfall occurred over the last 9 days of September and led to flooding within the Great Ouse catchment. Groundwater levels continued to recede at most report sites across September, although levels remain elevated for the time of year. Most public water supply reservoirs have levels above their respective normal operating curves.

1.1 Rainfall

September 2024 was a wet month across East Anglia, with all reporting catchments having above average rainfall totals for the month. The largest rainfall month totals were seen in the Upper Bedford and Lower Bedford Ouse catchments, which respectively had 203mm and 153mm of rainfall across September. These totals are the highest September totals on record for these catchments, based on the long term record dating back to 1871. Most of this rainfall occurred over the last 9 days of September and led to flooding within the Great Ouse catchment. Over the last 12 months, East Anglia has received 878mm of rainfall, which is 252mm greater the long term average (LTA). This value ranks as the third highest October to September 12 month total on record going back to 1871.

1.2 Soil moisture deficit and recharge

Cooler temperatures and a wet end to the September resulted in a reduction in the soil moisture deficit (SMD) value for East Anglia. The largest reductions in SMD were seen in the west of the area, reflecting the distribution of rainfall for the month.

1.3 River flows

With a wet September following a dry August, the majority of river report sites showed an increase in runoff relative to August. This was largely in response to the heavy rainfall seen towards the end of September. Rivers with a significant baseflow component, such as the Burn and Heacham, showed a small reduction in month mean flows, reflecting the continued recession in local groundwater levels. Exceptionally high day mean flows were recorded at gauging stations on the Ouse, such as Offord and Roxton, as well as on upstream tributaries, such as the Ivel, Ouzel and Tove. These flows should be viewed with caution since it is common for gauging stations, such as Roxton, to drown at very high flows resulting in reduced accuracy of flow measurement.

1.4 Groundwater levels

Groundwater levels at the majority of report sites continued to recede across September 2024. Two report sites, Fringford and Biggleswade, recorded increasing groundwater levels from August to September. This is indicative of aquifer recharge within the Upper Bedford Ouse catchment, which has seen exceptional rainfall totals for September 2024. Groundwater levels at the majority of report sites are above normal to exceptionally high for the time of year.

1.5 Reservoir stocks

At the end of September 2024, the majority of water company reservoirs showed levels greater than their respective normal operating curves. Reservoir capacities ranged between 75% to 87% of maximum storage capacities. Only Grafham reservoir ended the month with a level marginally below its normal operating curve.

1.6 Forward look

1.6.1 Probabilistic ensemble projections for river flows at key sites

For all surface water forecast sites there is a high probability of flows being above normal or higher for December 2024, with a continued high probability of flows remaining in the normal or higher range for March 2025.

1.6.2 Probabilistic ensemble projections for groundwater levels in key aquifers

Groundwater levels at the majority of report sites are above normal to exceptionally high for the time of year. A wet September has led to wetter than average soils for the time of year. Consequently, there is a high probability of groundwater levels remaining at normal or higher levels by March 2025 and September 2025.

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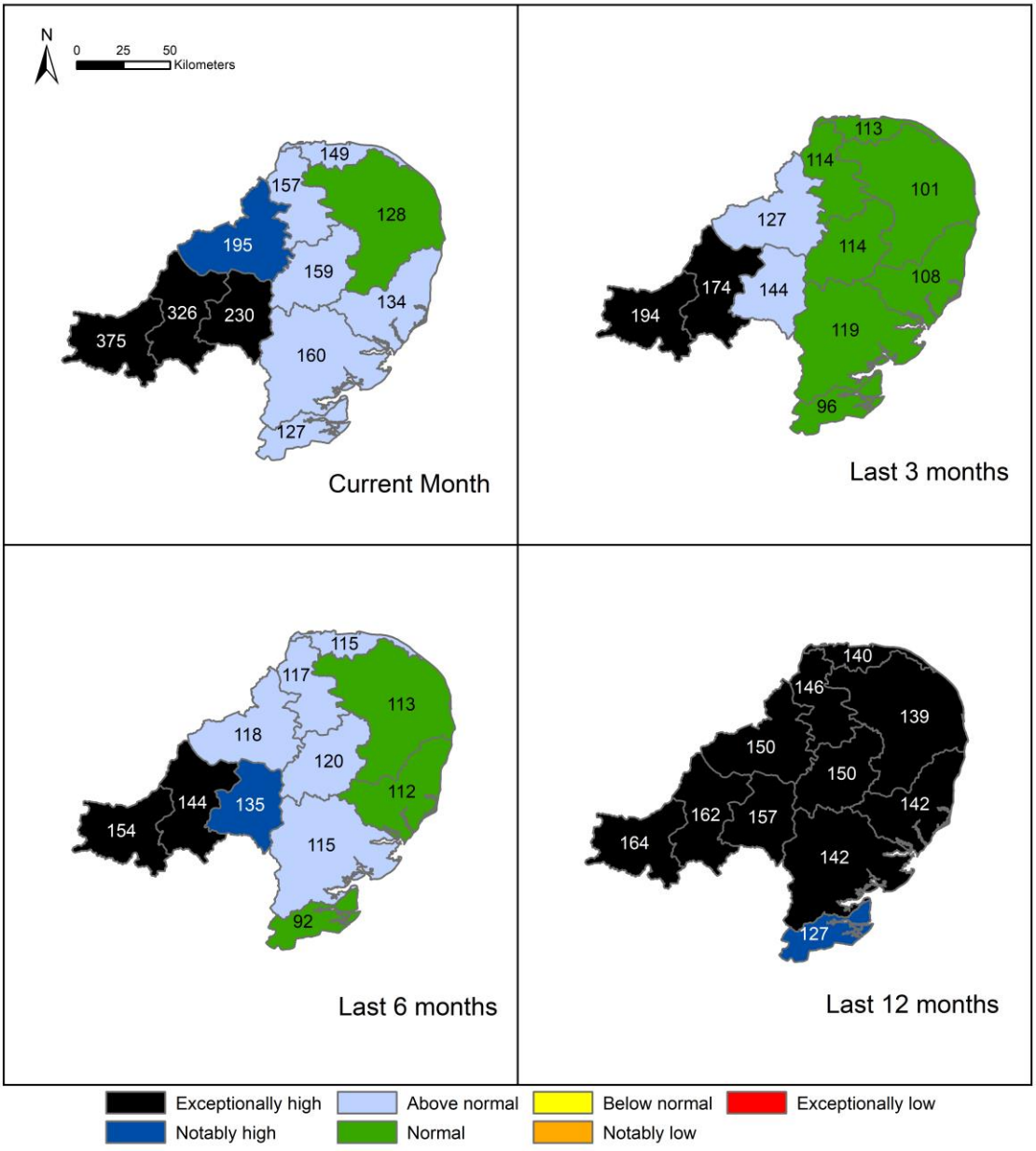
2 Rainfall

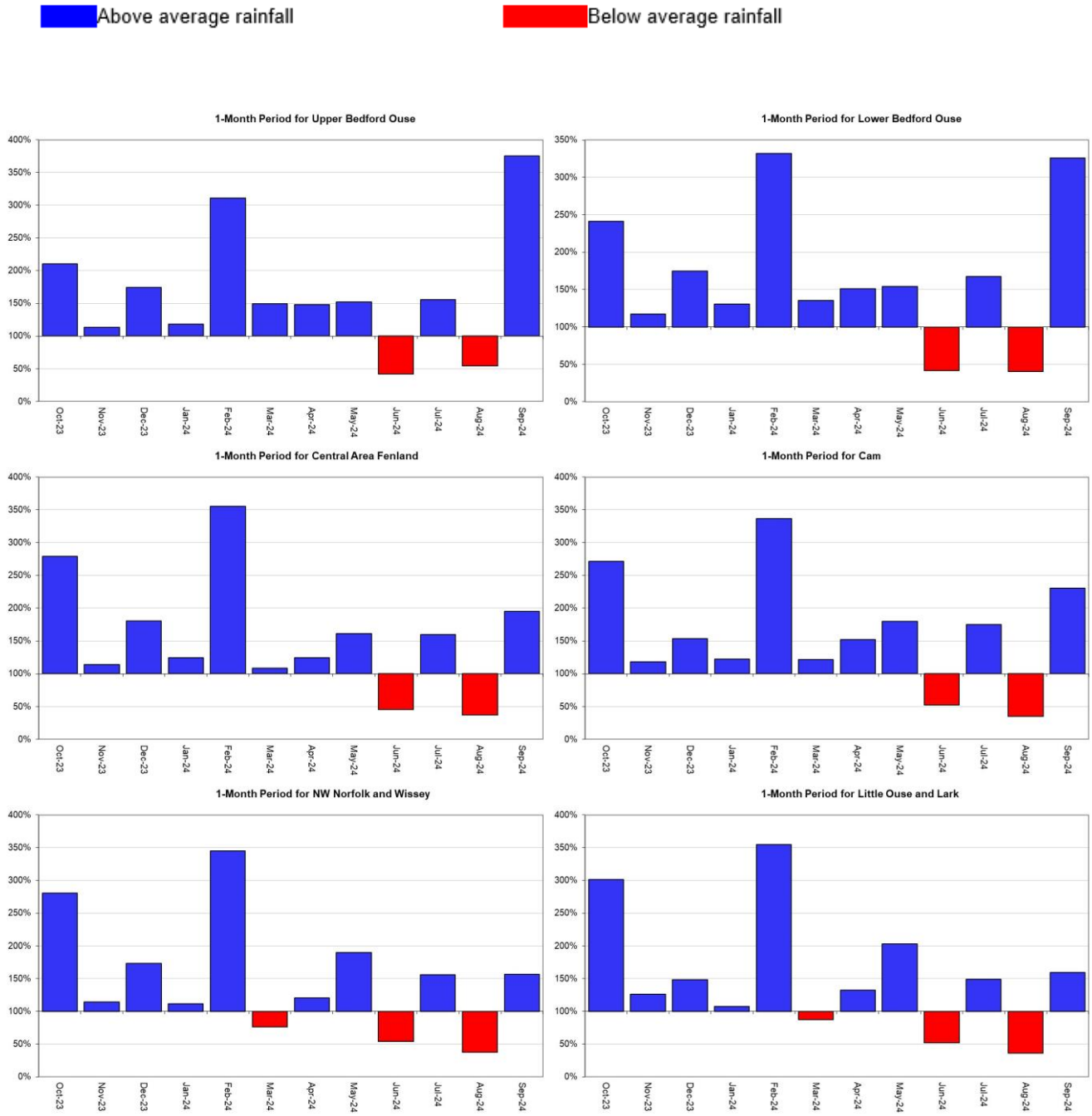
2.1 Rainfall map

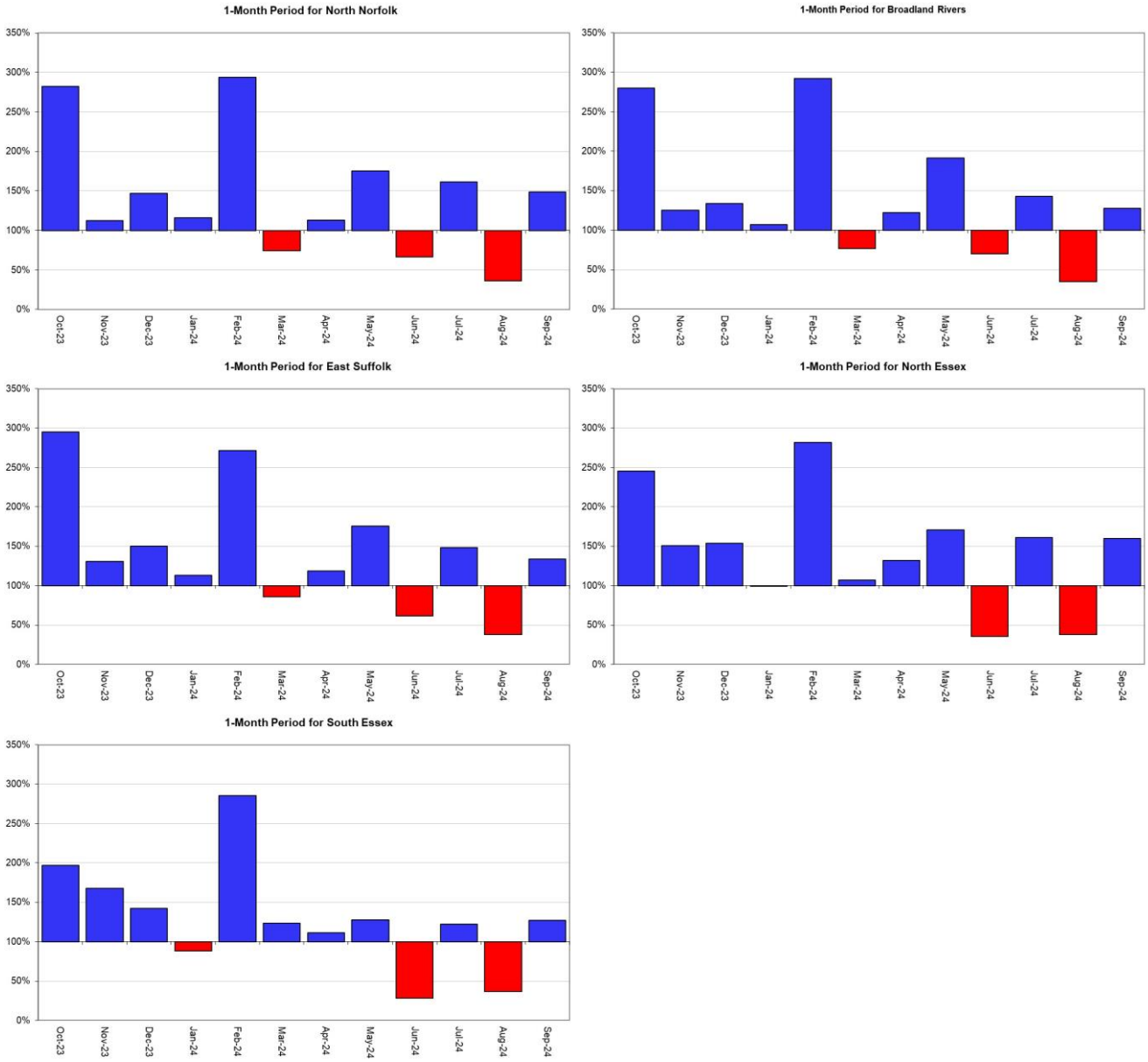
Figure 2.1: Total rainfall for hydrological areas across East Anglia, expressed as a percentage of long term average rainfall for the current month (up to 30 September 2024), the last 3 months, the last 6 months, and the last 12 months. Category classes are based on an analysis of respective historic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



2.2 Rainfall charts

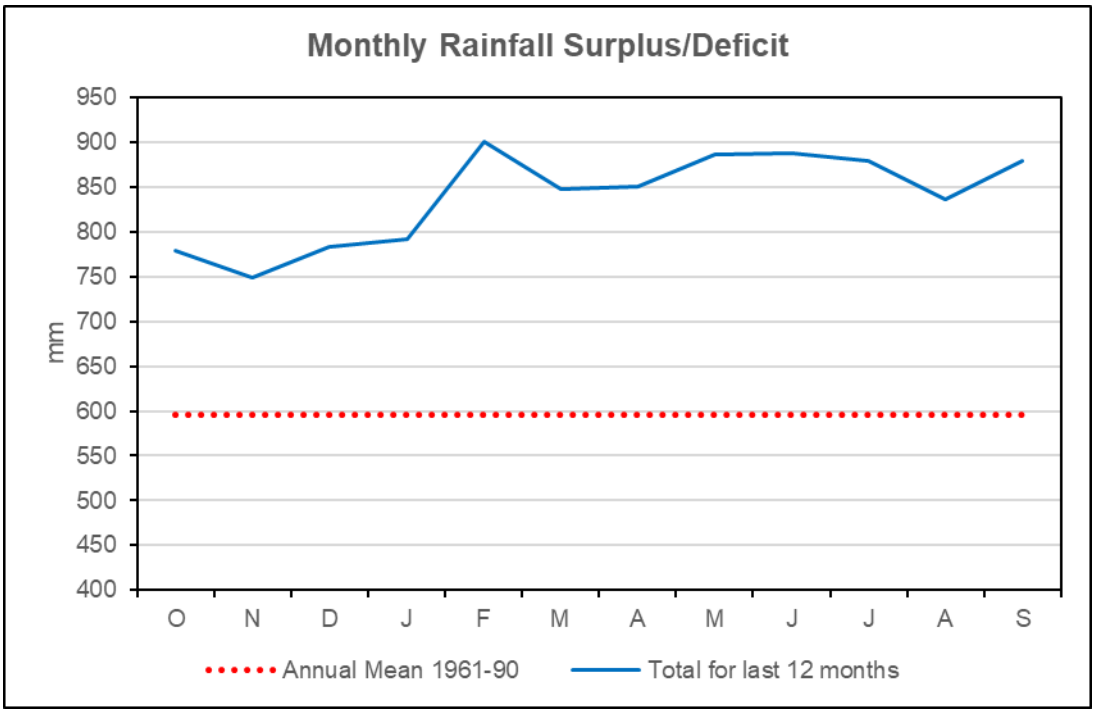
Figure 2.2: Monthly rainfall totals for the past 12 months as a percentage of the 1961 to 1990 long term average for each region and for England.





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

2.3 Monthly rainfall surplus deficit chart

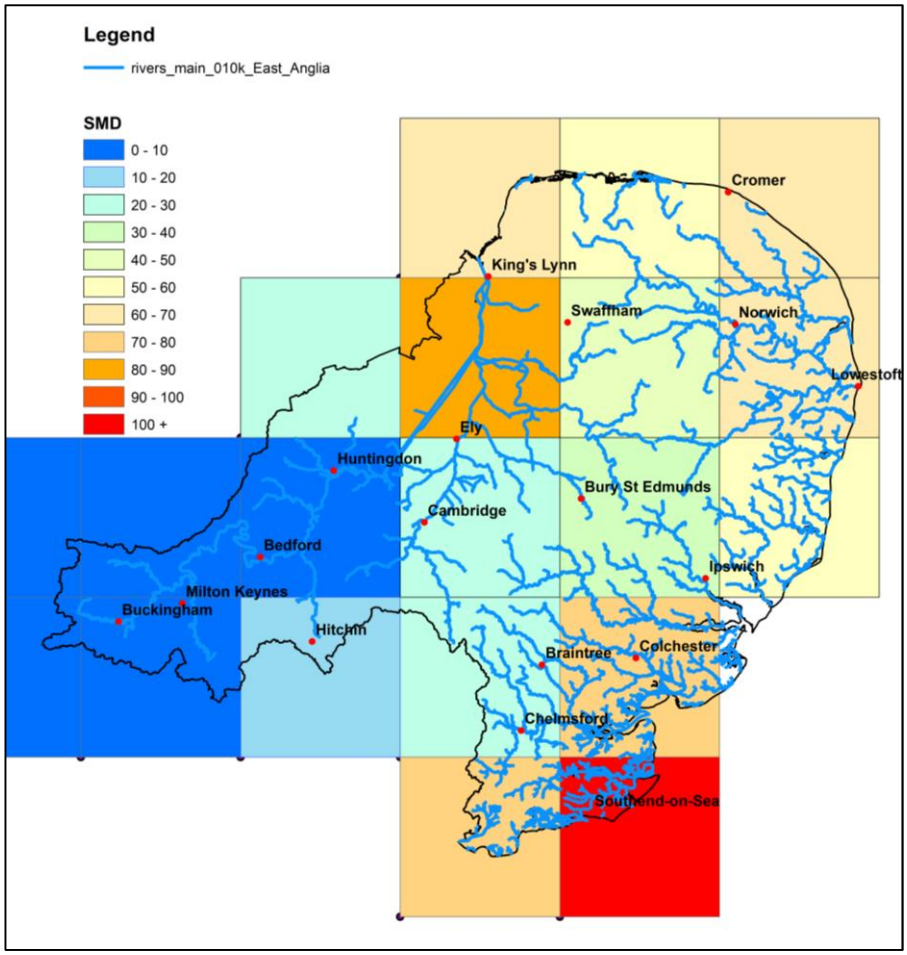


HadUK rainfall data. (Source: Met Office. Crown copyright, 2024).

3 Soil moisture deficit

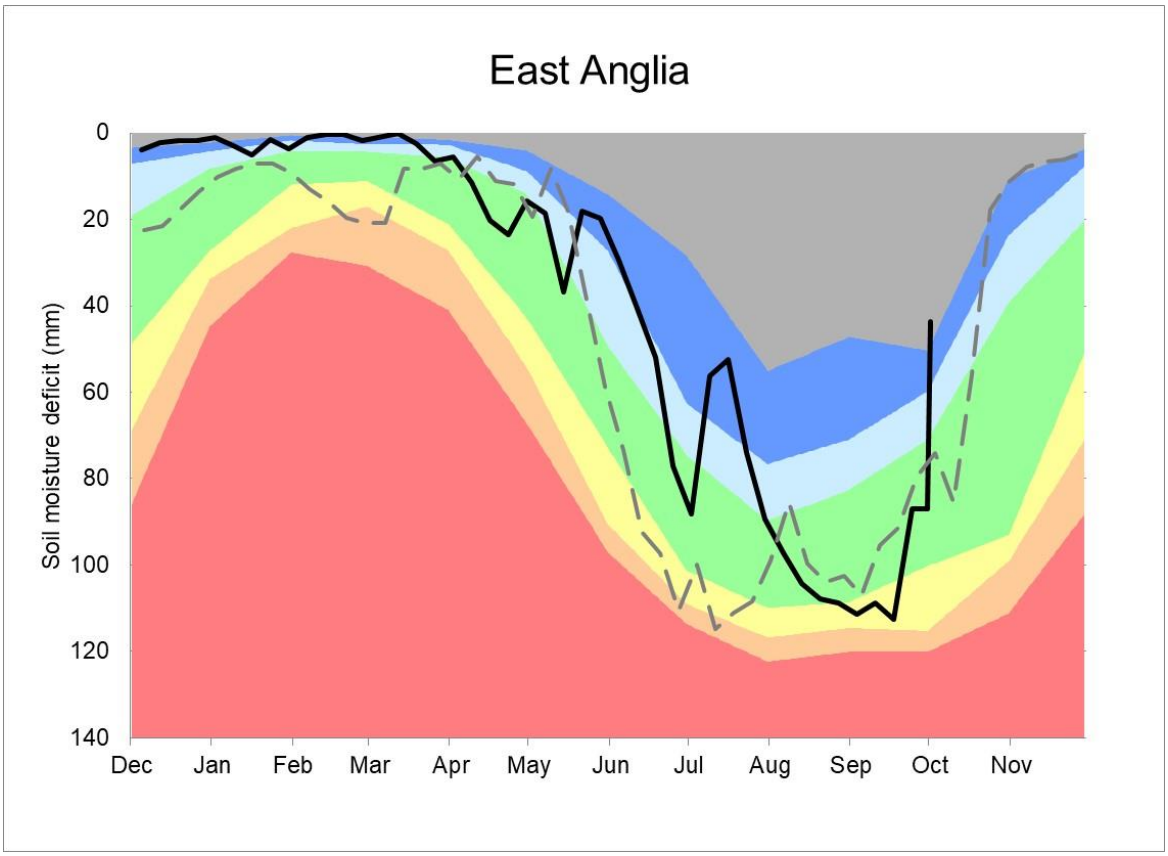
3.1 Soil moisture deficit map

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



3.2 Soil moisture deficit charts

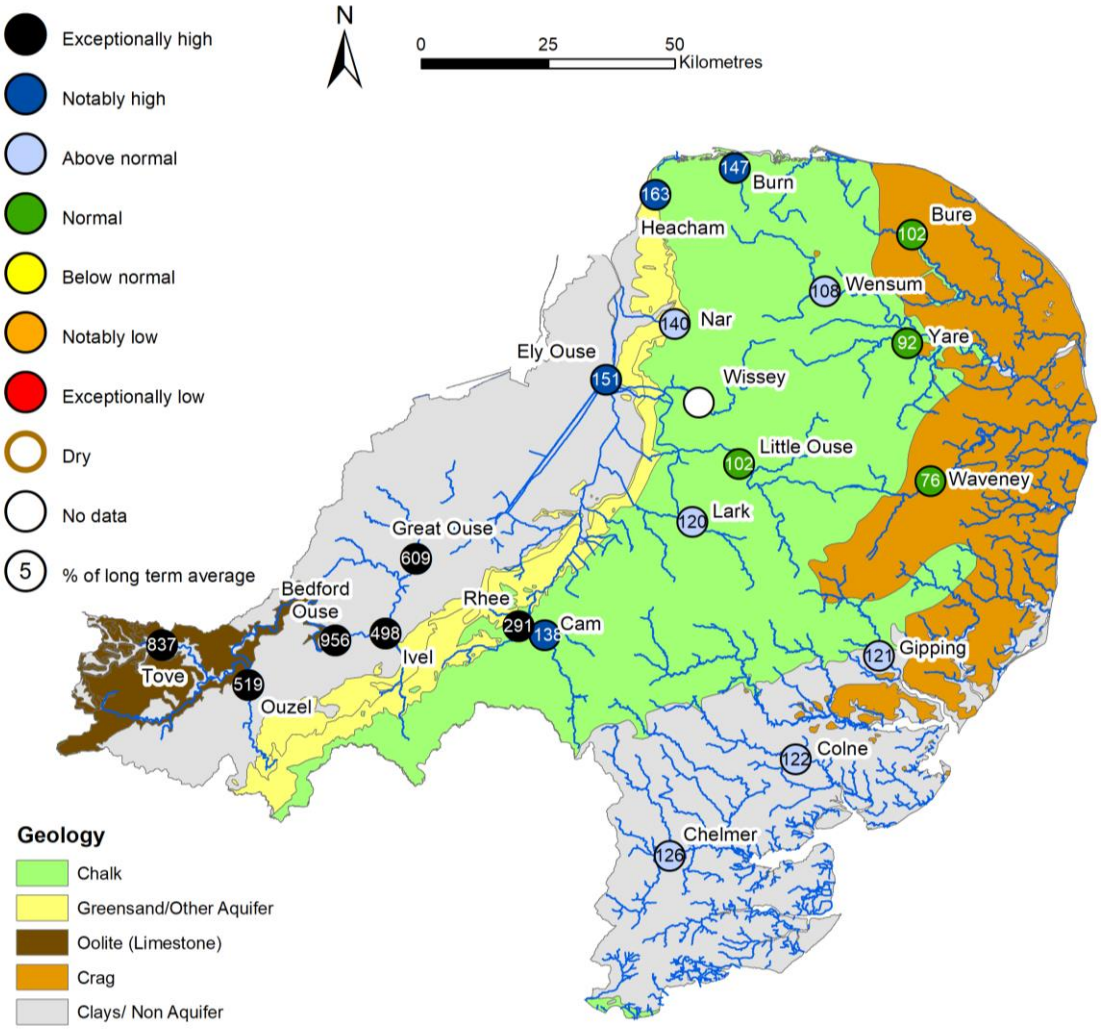
Figure 3.2: Latest soil moisture deficit compared to an analysis of historic 1961 to 1990 long term data set. Weekly MORECS data for real land use.



4 River flows

4.1 River flows map

Figure 4.1: Monthly mean river flow for indicator sites for September 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.



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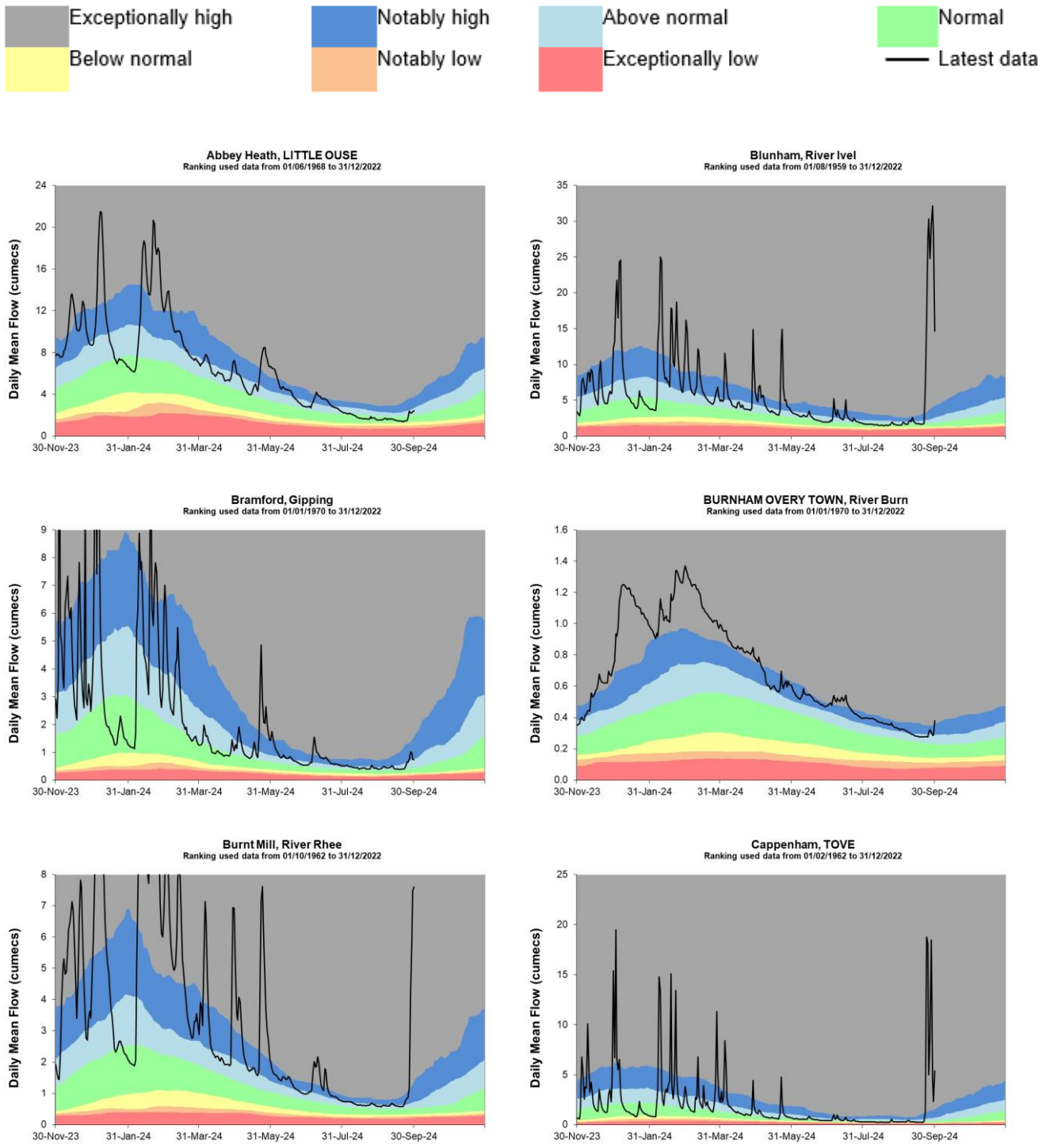
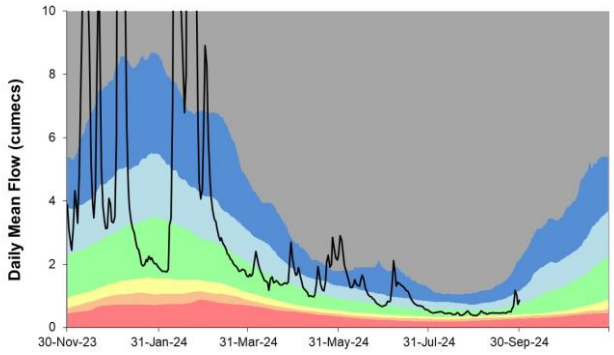
4.2 River flow charts

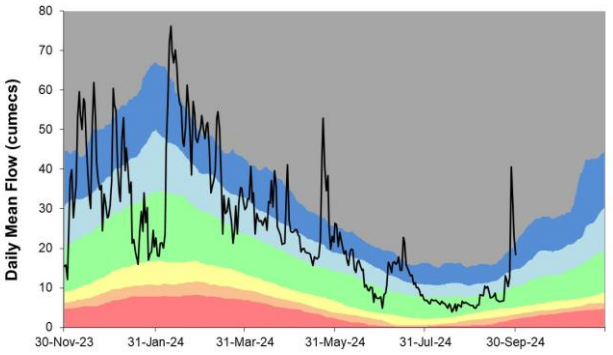
Figure 4.2: Daily mean river flow for index sites over the past year, compared to an analysis of historic daily mean flows, and long term maximum and minimum flows.



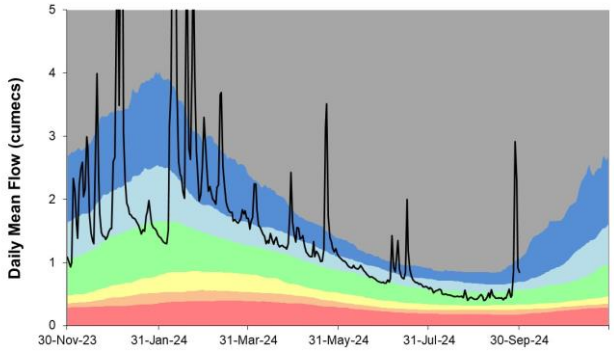
COLNEY, River Yare
Ranking used data from 01/01/1970 to 31/12/2022



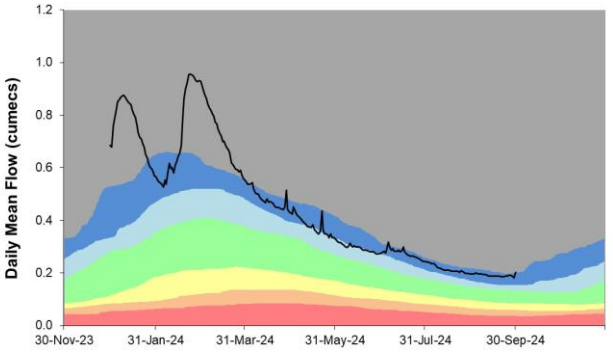
Denver, ELY OUSE
Ranking used data from 01/11/1971 to 31/12/2022



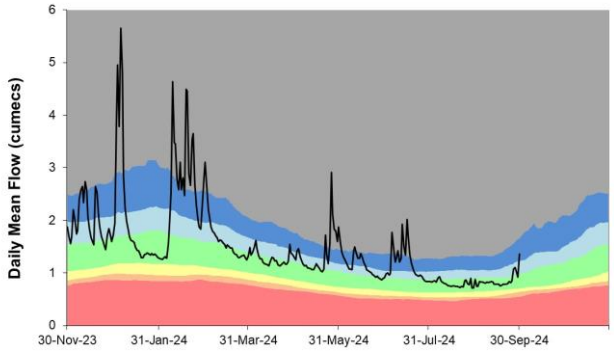
Dernford, CAM
Ranking used data from 21/02/1949 to 23/12/2022



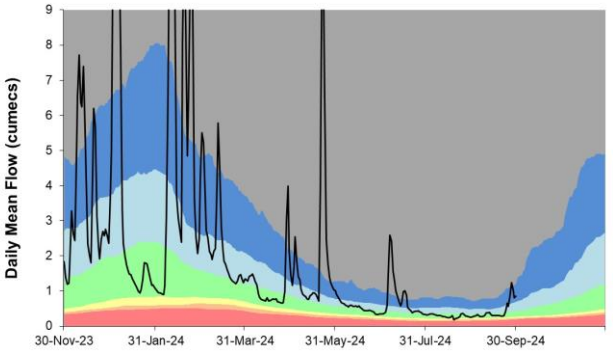
Heacham, HEACHAM
Ranking used data from 01/11/1965 to 31/12/2022



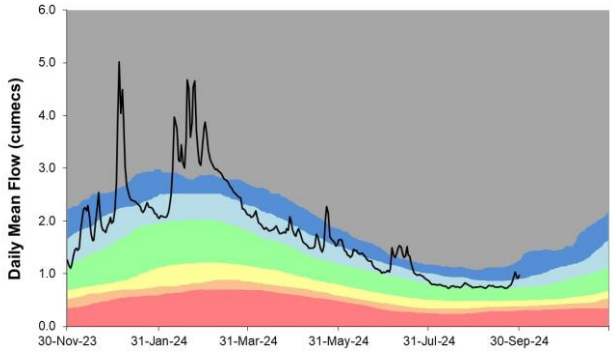
Ingworth, Bure
Ranking used data from 01/01/1970 to 31/12/2022



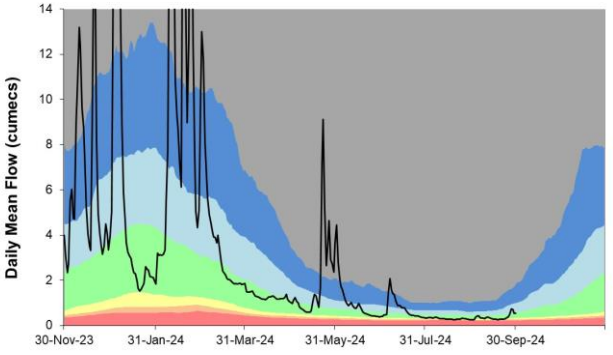
Lexden, Colne
Ranking used data from 01/01/1970 to 31/12/2022

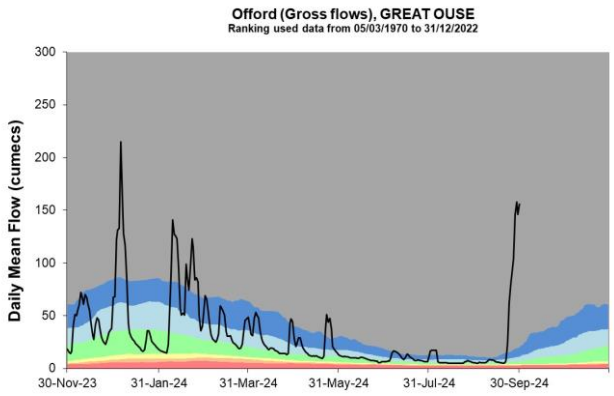


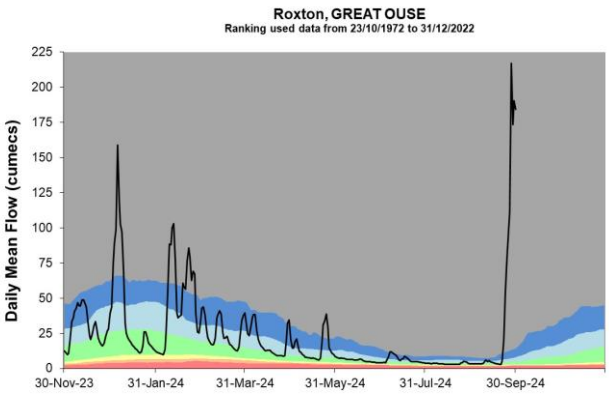
Marham, River Nar
Ranking used data from 01/09/1953 to 31/12/2022

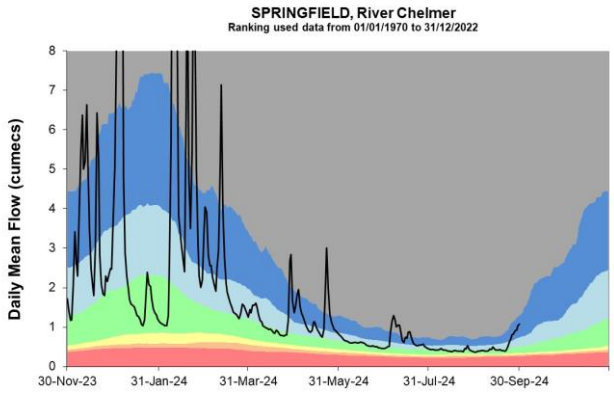


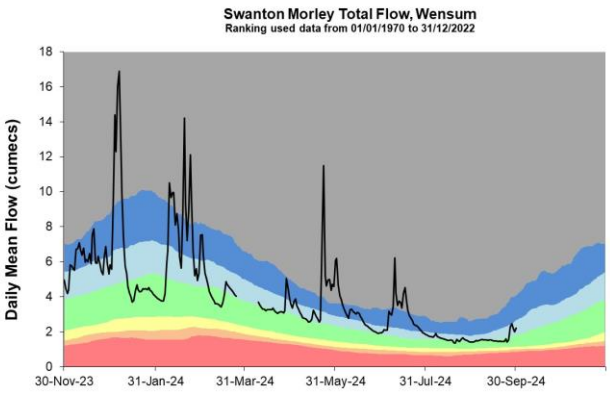
Needham Weir Total, Waveney
Ranking used data from 01/01/1970 to 31/12/2022

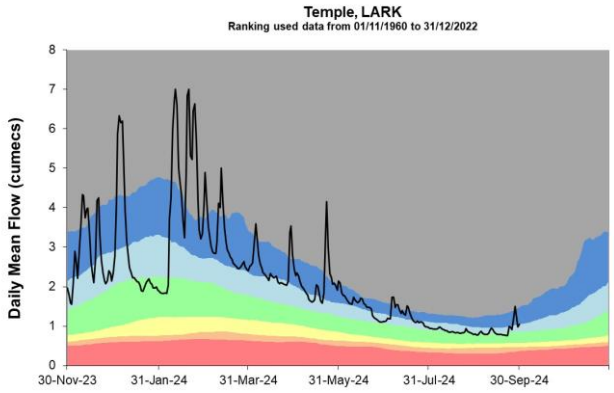


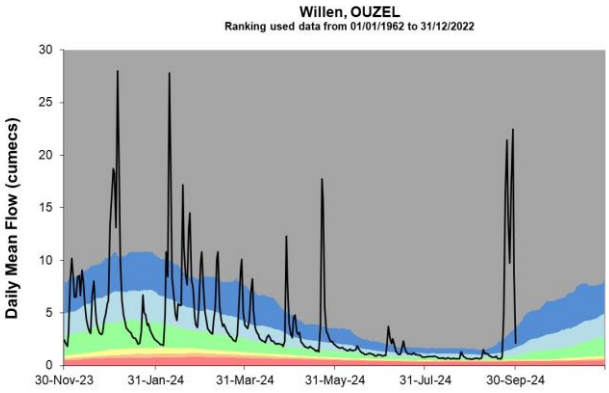










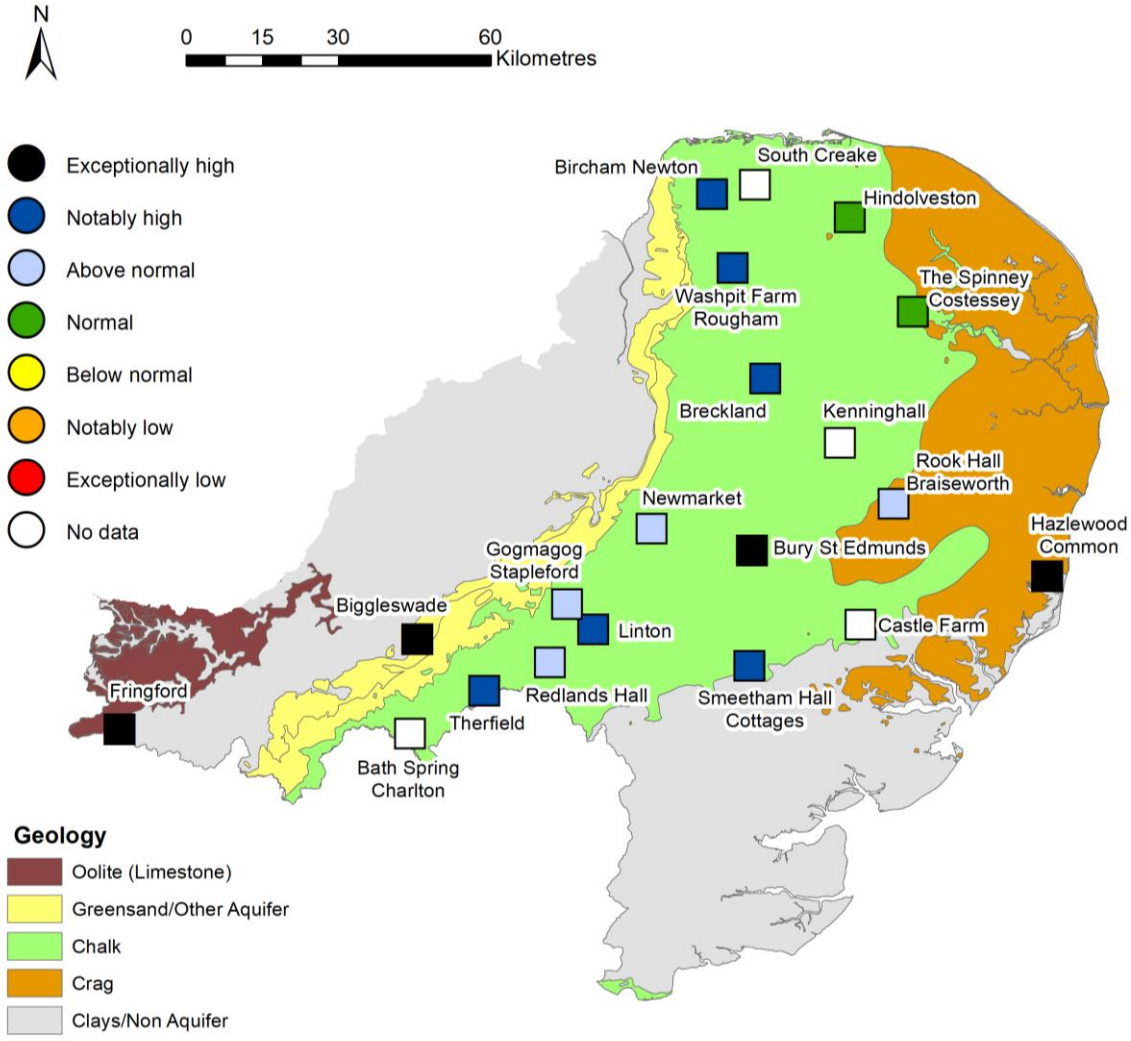


Source: Environment Agency.

5 Groundwater levels

5.1 Groundwater levels map

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



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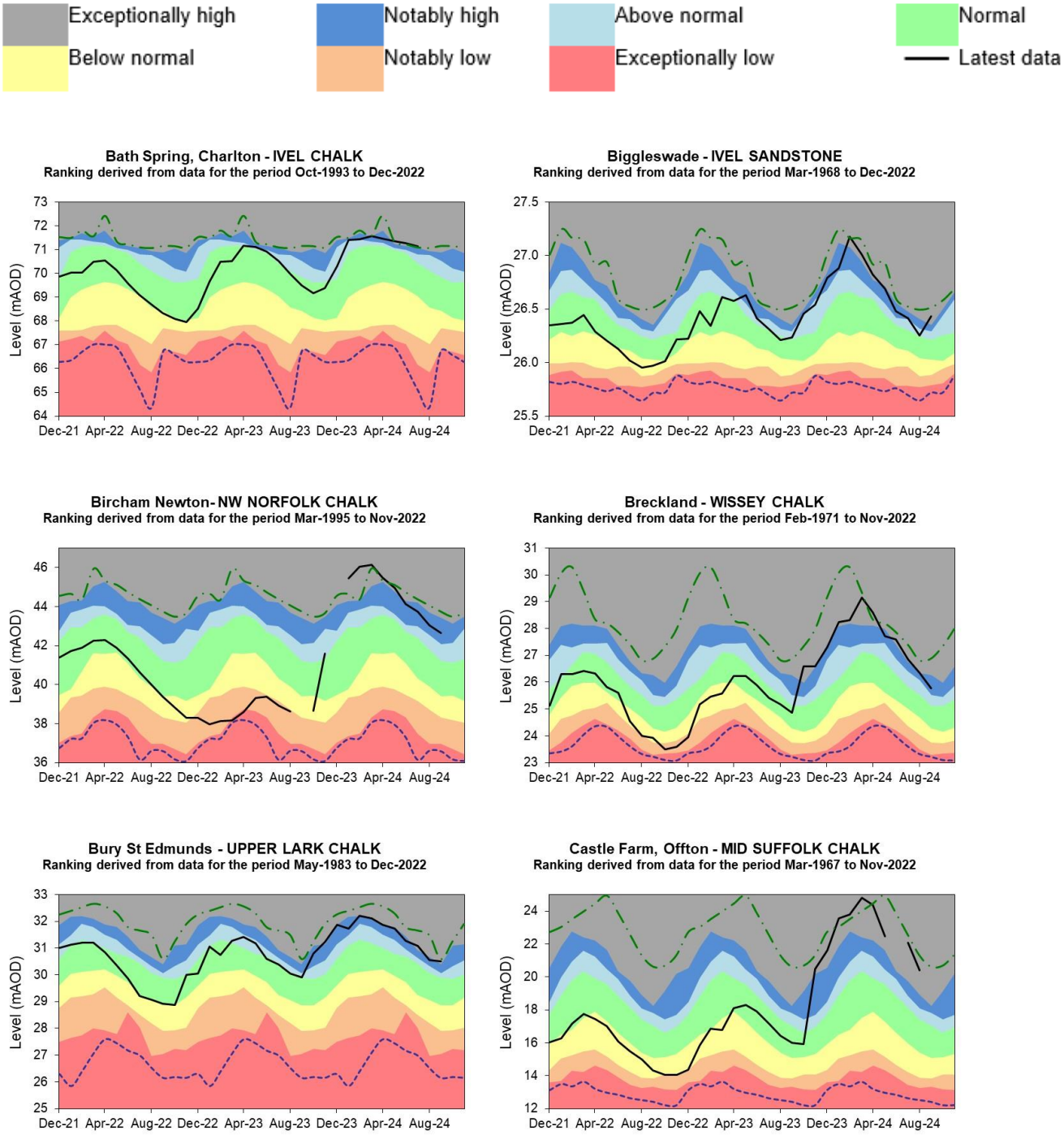
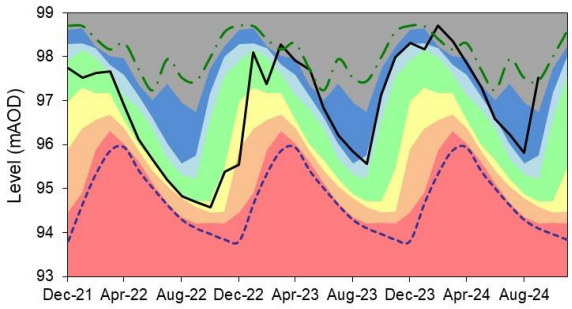
5.2 Groundwater level charts

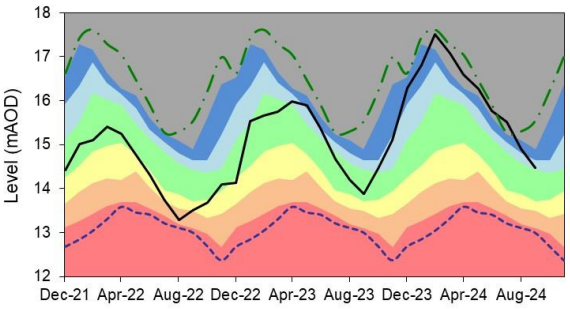
Figure 5.2: End of month groundwater levels at index groundwater level sites for major aquifers. 22 months compared to an analysis of historic end of month levels and long term maximum and minimum levels.



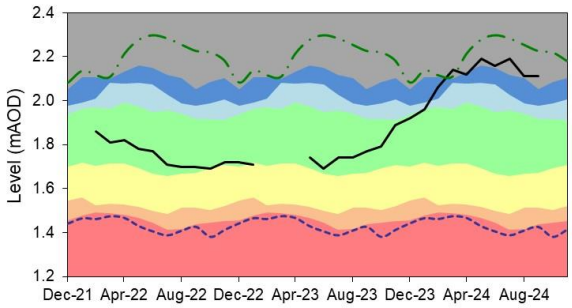
Fringford - GREAT OOLITE
Ranking derived from data for the period Sep-1980 to Dec-2022



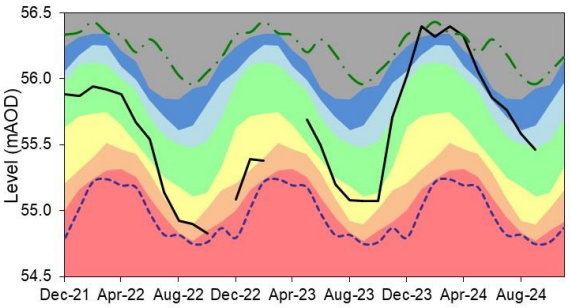
Gog Magog, Stapleford - CAM CHALK
Ranking derived from data for the period Jan-1980 to Dec-2022



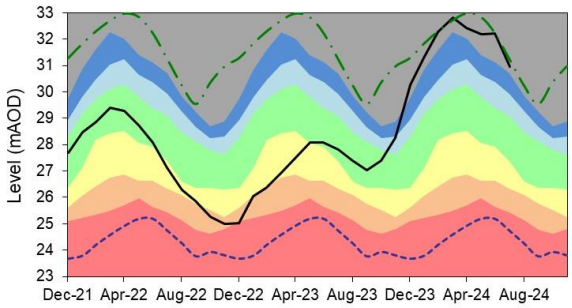
Hazlewood Common - SUFFOLK CRAG
Ranking derived from data for the period Oct-1988 to Nov-2022



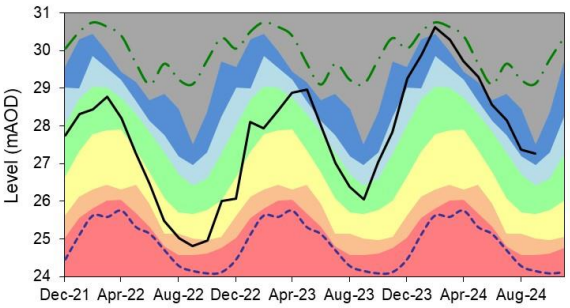
Hindolveston - NORFOLK CHALK
Ranking derived from data for the period Sep-1984 to Nov-2022



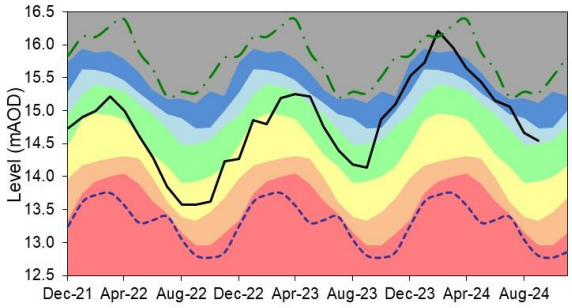
Kenninghall - LITTLE OUSE CHALK
Ranking derived from data for the period Aug-1973 to Dec-2022



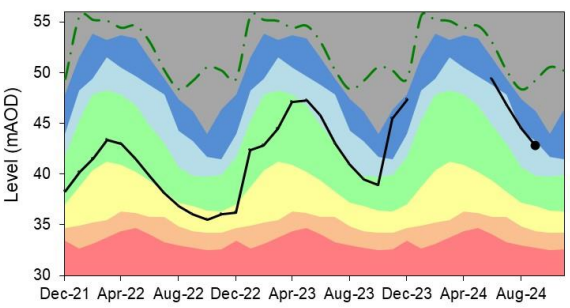
Linton- CAM CHALK
Ranking derived from data for the period Jan-1980 to Dec-2022

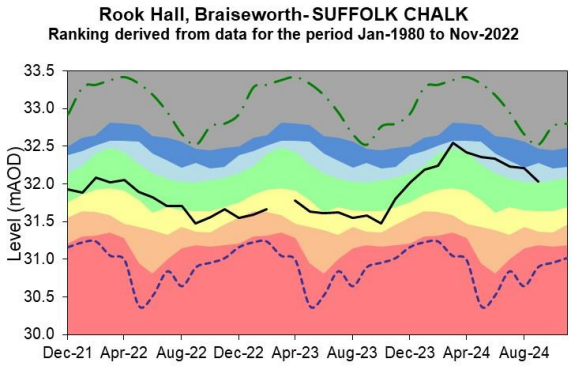


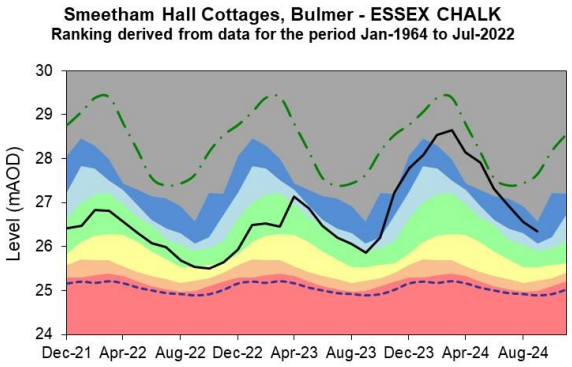
Newmarket - SNAIL CHALK
Ranking derived from data for the period Feb-1983 to Dec-2022

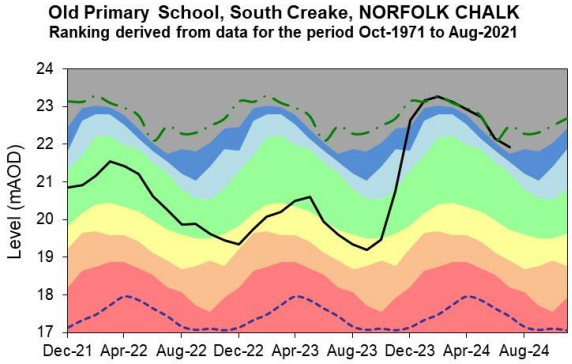


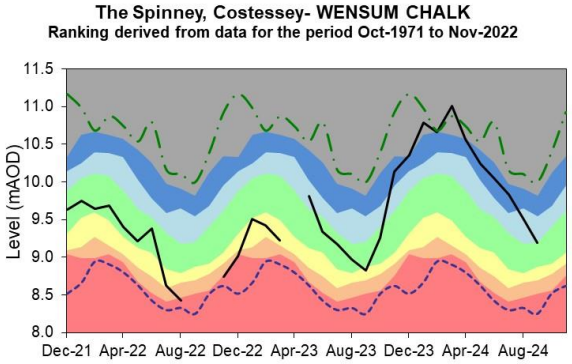
Redlands Hall, Ickleton - CAM CHALK
Ranking derived from data for the period Aug-1963 to Dec-2022

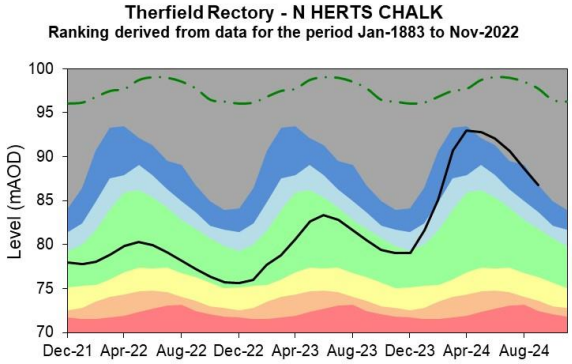


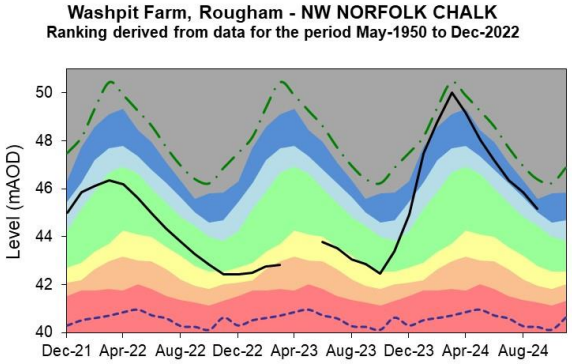










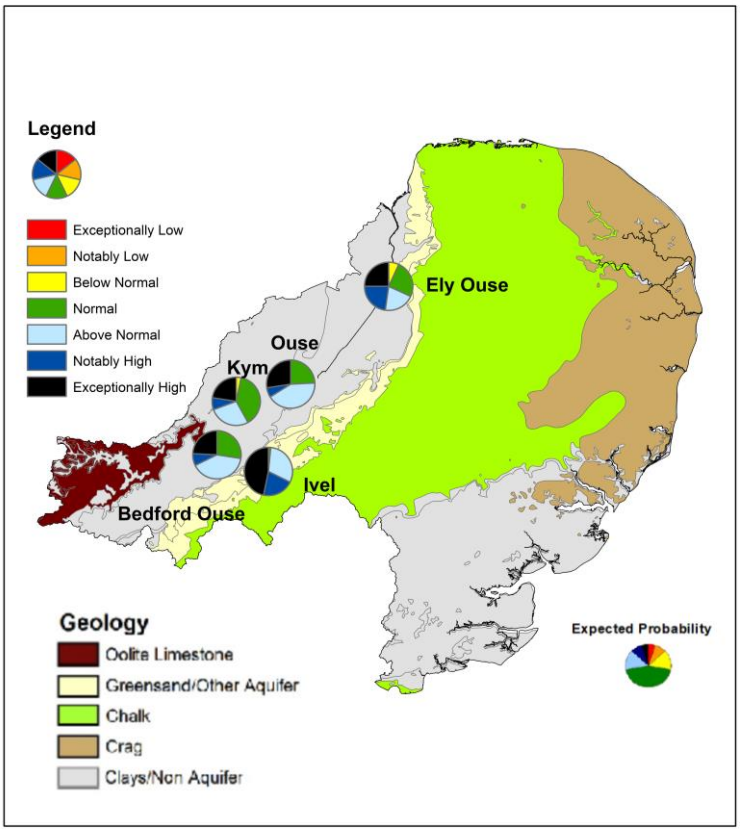


Source: Environment Agency, 2024.

6 Forward look

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

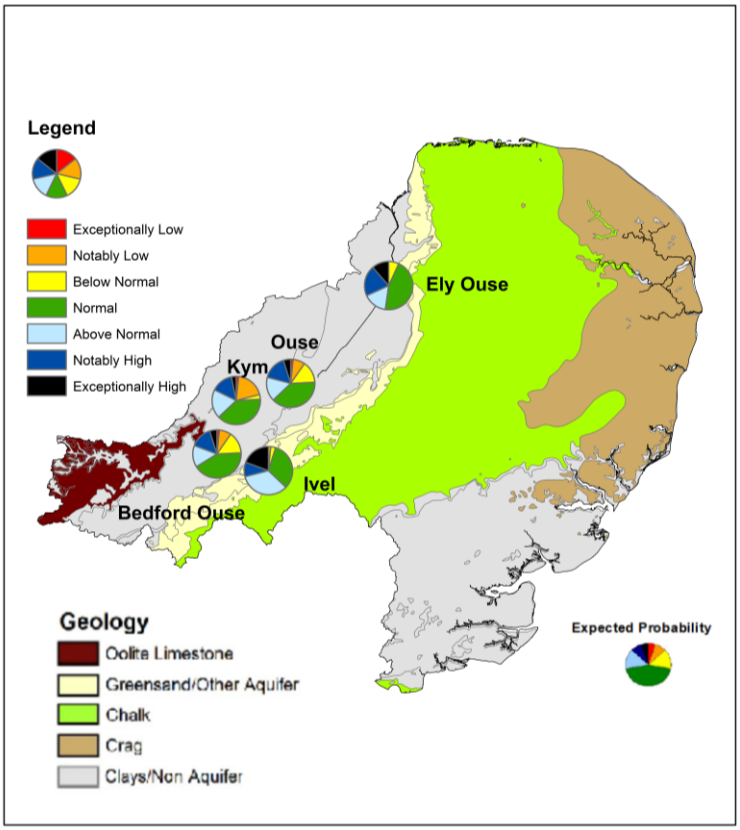
Table available in the appendices with detailed information. Exceptionally high or low levels are those which would typically occur 5% of the time within the historic record. Notably high or low levels are those which would typically occur 8% of the time. Above normal or below normal levels are those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

6.2 Probabilistic ensemble projection of river flows at key sites in March 2025

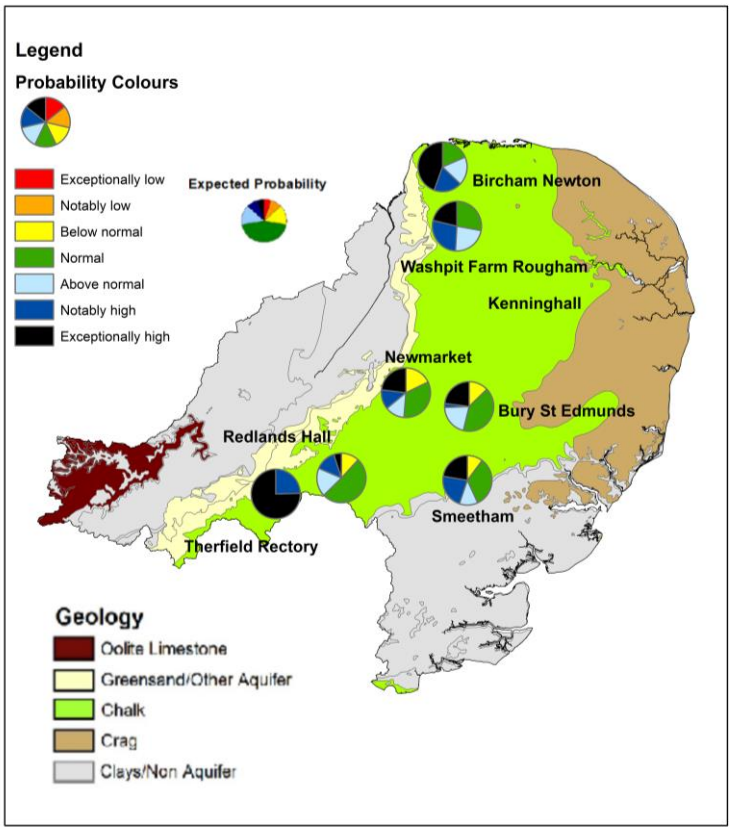
Table available in the appendices with detailed information. Exceptionally high or low levels are those which would typically occur 5% of the time within the historic record. Notably high or low levels are those which would typically occur 8% of the time. Above normal or below normal levels are those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



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

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

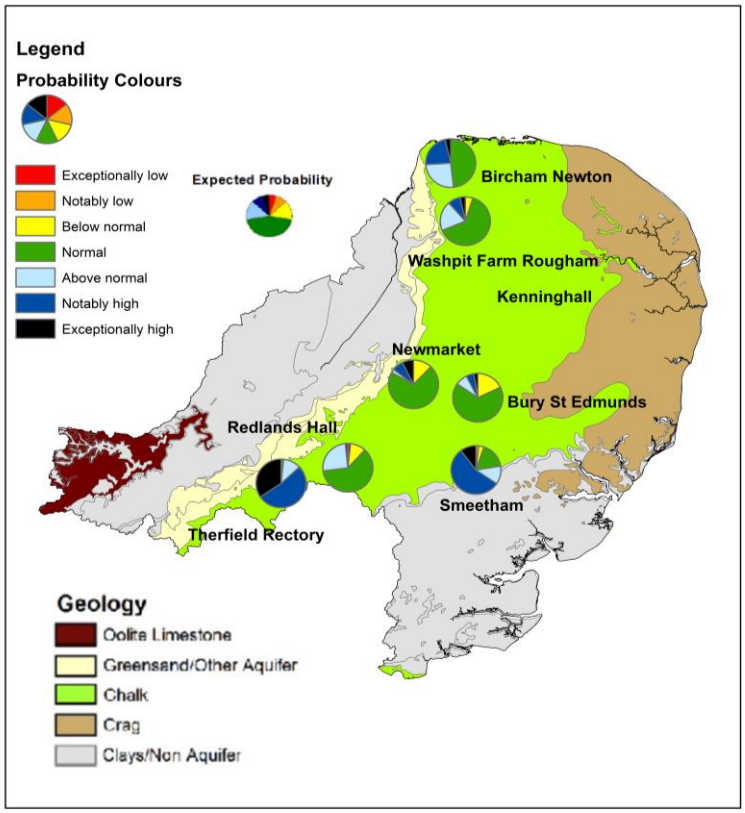
Table available in the appendices with detailed information. Exceptionally high or low levels are those which would typically occur 5% of the time within the historic record. Notably high or low levels are those which would typically occur 8% of the time. Above normal or below normal levels are those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

6.4 Probabilistic ensemble projection of groundwater levels at key sites in September 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

7 Glossary

7.1 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).

7.2 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.

8 Appendices

8.1 Rainfall table

Hydrological area	Sep 2024 rainfall % of long term average 1961 to 1990	Sep 2024 band	Jul 2024 to September cumulative band	Apr 2024 to September cumulative band	Oct 2023 to September cumulative band
Broadland Rivers	128	Normal	Normal	Normal	Exceptionally high
Cam	230	Exceptionally High	Above normal	Notably high	Exceptionally high
Central Area Fenland	195	Notably High	Above normal	Above normal	Exceptionally high
East Suffolk	134	Above Normal	Normal	Normal	Exceptionally high
Little Ouse And Lark	160	Above Normal	Normal	Above normal	Exceptionally high
Lower Bedford Ouse	326	Exceptionally High	Exceptionally high	Exceptionally high	Exceptionally high
North Essex	160	Above Normal	Normal	Above normal	Exceptionally high
North Norfolk	149	Above Normal	Normal	Above normal	Exceptionally high
Nw Norfolk And Wissey	157	Above Normal	Normal	Above normal	Exceptionally high

South Essex	127	Above Normal	Normal	Normal	Notably high
Upper Bedford Ouse	375	Exceptionally High	Exceptionally high	Exceptionally high	Exceptionally high

8.2 River flows table

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

Needham Weir Total	Waveney (lower)	Waveney	Normal	Below normal
Northwold Total	Wissey	Wissey	No Data	No Data
Offord (gross Flows)	Great Ouse	Ouse Beds	Exceptionally high	Above normal
Roxton	Great Ouse	Ivel	Exceptionally high	Normal
Springfield	Chelmer	Chelmer Upper	Above normal	Normal
Swanton Morley Total	Wensum	Wensum	Above normal	Above normal
Temple	Lark	Lark	Above normal	Above normal
Willen	Ouzel	Ouzel	Exceptionally high	Normal

8.3 Groundwater table

Site name	Aquifer	End of Sep 2024 band	End of Aug 2024 band
Biggleswade	Ivel Woburn Sands	Exceptionally high	Above normal
Bircham Newton	North West Norfolk Chalk	Notably high	Notably high
Breckland	Wissey Chalk	Notably high	Exceptionally high
Bury St Edmunds	Upper Lark Chalk	Exceptionally high	Notably high
Castle Farm, Offton	East Suffolk Chalk	No Data	Exceptionally high
Gog Magog, Stapleford	Cam Chalk	Above normal	Notably high
Hazlewood Common	East Suffolk Crag	Exceptionally high	Exceptionally high
Hindolveston	Norfolk Chalk	Normal	Above normal
Kenninghall	Little Ouse Chalk	No Data	No Data
Linton	Cam Chalk	Notably high	Notably high
Newmarket	Snail Chalk	Above normal	Above normal
Old Primary School, South Creake	North Norfolk Chalk	No Data	No Data

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

8.4 Ensemble projections tables

8.4.1 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	0	0	0	0
Notably low	0	0	0	0	0
Below normal	0	3	0	0	7
Normal	27	39	2	24	25
Above normal	40	27	31	42	20
Notably high	8	8	21	6	23
Exceptionally high	24	23	47	27	25

8.4.2 Probabilistic ensemble projection of river flows at key sites in March 2025

Percentage of pie chart for each band

Site	Bedford Ouse	Kym	Ivel	Ouse	Ely Ouse
Exceptionally low	2	2	0	2	0
Notably low	8	19	2	8	0
Below normal	15	3	3	15	7
Normal	42	39	32	39	45
Above normal	15	19	34	16	16
Notably high	15	15	10	16	20
Exceptionally high	5	3	19	5	11

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

Percentage of pie chart for each band

Site	Therfield Rectory	Redlands Hall	Newmarket	Washpit Farm	Bircham Newton	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	11.9	17.9	0.0	0.0	12.8	10.3
Normal	0.0	50.8	33.3	27.9	18.5	41.0	32.8
Above normal	0.0	18.6	12.8	23.0	18.5	20.5	12.1
Notably high	24.6	13.6	12.8	27.9	18.5	2.6	22.4
Exceptionally high	75.4	5.1	23.1	21.3	44.4	23.1	22.4

8.4.4 Probabilistic ensemble projection of groundwater levels at key sites in September 2025

Percentage of pie chart for each band

Site	Therfield Rectory	Redlands Hall	Newmarket	Washpit Farm	Bircham Newton	Bury St Edmunds	Smeetham
Exceptionally low	0.0	1.7	0.0	0.0	0.0	0.0	0.0
Notably low	0.0	0.0	0.0	0.0	0.0	0.0	1.7
Below normal	0.0	10.2	12.2	4.9	0.0	17.9	3.4
Normal	1.6	61.0	70.7	63.9	48.1	66.7	17.2
Above normal	11.5	25.4	2.4	19.7	25.9	7.7	12.1
Notably high	52.5	1.7	7.3	8.2	22.2	5.1	55.2
Exceptionally high	34.4	0.0	7.3	3.3	3.7	2.6	10.3