

Monthly water situation report: North West England

1 Summary – March 2024

1.1 Rainfall

Rainfall for North-West England for March was classed as Above normal receiving 132% of the long term average (LTA). Greater Manchester, Merseyside and Cheshire (GMC) observed 138% of the LTA for March classed as Notably high and Cumbria and Lancashire (CLA) observed 136% of the LTA for March classed as Above normal.

The highest rainfall (in terms of LTA) was observed in the Cheshire Rivers Group hydrological area (166% of the LTA) classed as Notably high. The lowest being recorded in the Esk (Dumfries) hydrological area (100% of the LTA) which continues the trend of notably lower rainfall (in terms of LTA) being seen in this area when compared to the rest of the North-West over the last 12 months. All other hydrological areas across the North West observed rainfall classed as Above normal with the exception of Wyre and Lune which was classed as Notably High.

The 3-month cumulative rainfall totals show all hydrological areas in the North-West being classed between Exceptionally high and Above normal with the highest rainfall being observed in the Wyre and Lune hydrological area and the lowest in the Esk (Dumfries). All hydrological areas in the North-West except the Esk (Dumfries) and the Eden observed rainfall within the top ten wettest 3 month cumulative period from January to March since 1871.

The 6-month cumulative rainfall totals show all hydrological areas classed as Exceptionally high with the exception of the Esk (Dumfries) which is classed as Normal. The North West observed it's second wettest period covering October to March since 1871 with GMC observing it's record rainfall for that period with 750mm of rain, breaking the previous record of 686mm in 1981.

The 12-month cumulative rainfall totals show the same pattern seen in the 6-month totals with the rainfall in all areas except the Esk (Dumfries) classed as Exceptionally high. This was the wettest 12-month period since 1871 for both GMC and CLA and the second wettest overall for the North-West. Highest cumulative 12-month rainfall since 1871 was observed in the Cheshire Rivers Group, Wyre and Lune, Mersey and Irwell, Kent and Douglas hydrological areas.

1.2 Soil moisture deficit and recharge

Due to continued saturation of many of the MORECS squares covering the North West at the end of March soil moisture deficits (SMD) have mostly remained the same when compared with the end of February. All areas that were not saturated at the end of February saw a decrease in SMD levels and by the end of March all areas had reached full saturation which is lower than expected for the time of year.

1.3 River flows

River flows across North-West England for March were classed between Notably high and Normal with the highest flow (in terms of the LTA) observed in the Weaver catchment with 191% of the LTA, which was classed as Notably high. The lowest flow was observed in the Tame catchment with 104% of the LTA, which was classed as Normal. The lowest flows in North-West England were observed in Irwell and Upper Mersey catchments (mostly classed as Normal and in Tame as Above Normal) as the result of lower rainfall in the area. The river Weaver (classed as Notably high) and the river Dane (classed as Above normal) observed higher flows as the result of higher rainfall in the Cheshire Rivers Group hydrological area. All rivers in CLA also observed higher flows which were classed between Above Normal and Notably high except in Esk and Yarrow (classed as Normal) as the result of Above Normal and Notably high rainfall in the area.

1.4 Groundwater levels

Groundwater levels across the North-West at the end March were classed between Exceptionally high and Normal. The level at Bruntwood Hall decreased from Exceptionally high to Notably high since the end of February. All other sites remained at the same classification with Priors Heyes and Richmond Park being classed as Exceptionally high, Skirwith as Notably high, Brown Bank Lay-By as Above normal and Lea Lane as Normal. Levels at Priors Heyes remain high compared to historic levels because the aquifer is recovering from the effects of historically high abstractions.

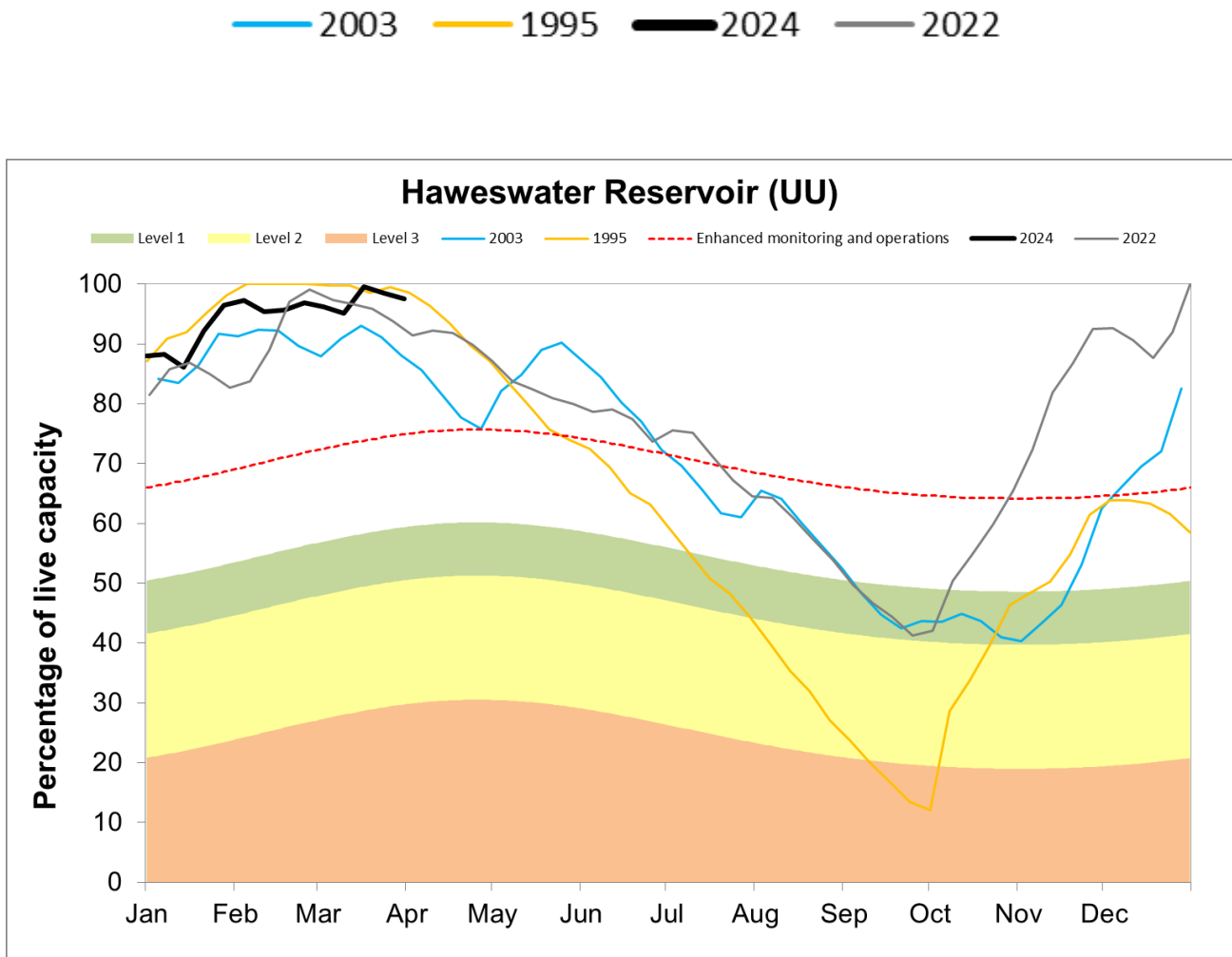
1.5 Reservoir stocks

Total reservoir stocks increased slightly from 92% at the end of February to 93% at the end of March, slightly lower than the average of 94% usually observed at the end of March and equal to the 93% recorded last year. At the end of March the reservoir storage was highest (in terms of percentage) at Crummock, Ennerdale and Lake Vyrnwy which have all remained 100% full since the end of February. Reservoir storage was lowest at Longdendale (77%). The combined storage at Haweswater and Thirlmere was 98% higher than the average of 93% but slightly lower than last year's storage which was 99%.

Reservoirs kept low for maintenance works include Audenshaw No.1, Torside, and Woodhead (part of the Longdendale system), Anglezarke, and High Bullough (part of the Rivington

system); Dingle (part of the Bolton supply system), Harlock (part of the Poaka Beck system), Kitcliffe (part of the Piethorne Valley system), Ogden Lower (part of the Ogden (Barley) system), Alston No.2 (Longridge system) and Llyn Celyn (part of the Dee (Celyn and Brenig) system).

Figure 1.5: Storage in Haweswater Reservoir, including the drought levels for the reservoir and storage for the current year (2024) and representative years: 1995, 2003 and 2021 (Source: United Utilities (UU)).



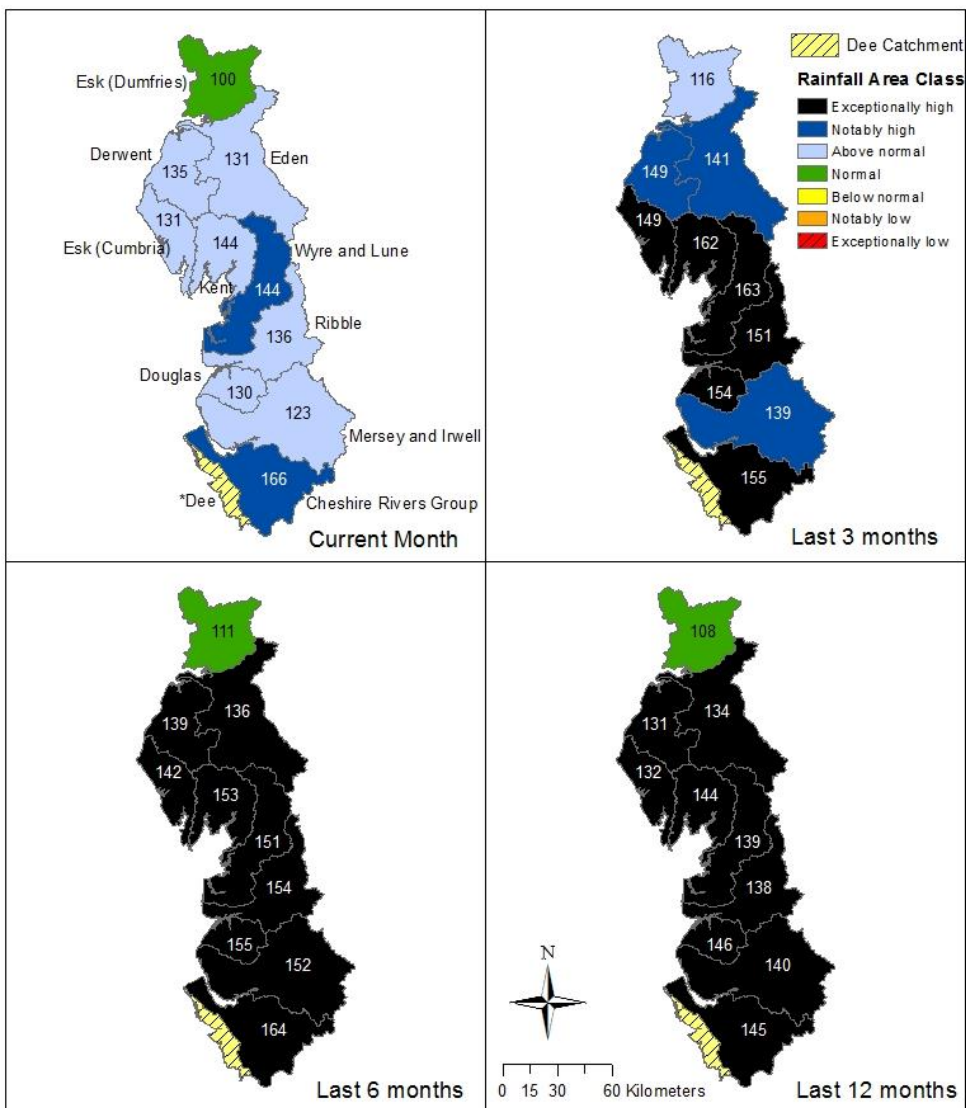
Author: Greater Manchester, Merseyside and Cheshire Hydrology Team,
hydrology.GMMYCH@environment-agency.gov.uk

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2 Rainfall

2.1 Rainfall map

Figure 2.1: Total rainfall (as a percentage) for hydrological areas for the current month (up to 31 March 2024), the last 3 months, the last 6 months, and the last 12 months, classed relative to an analysis of respective historic totals. Table available in the appendices with detailed information.

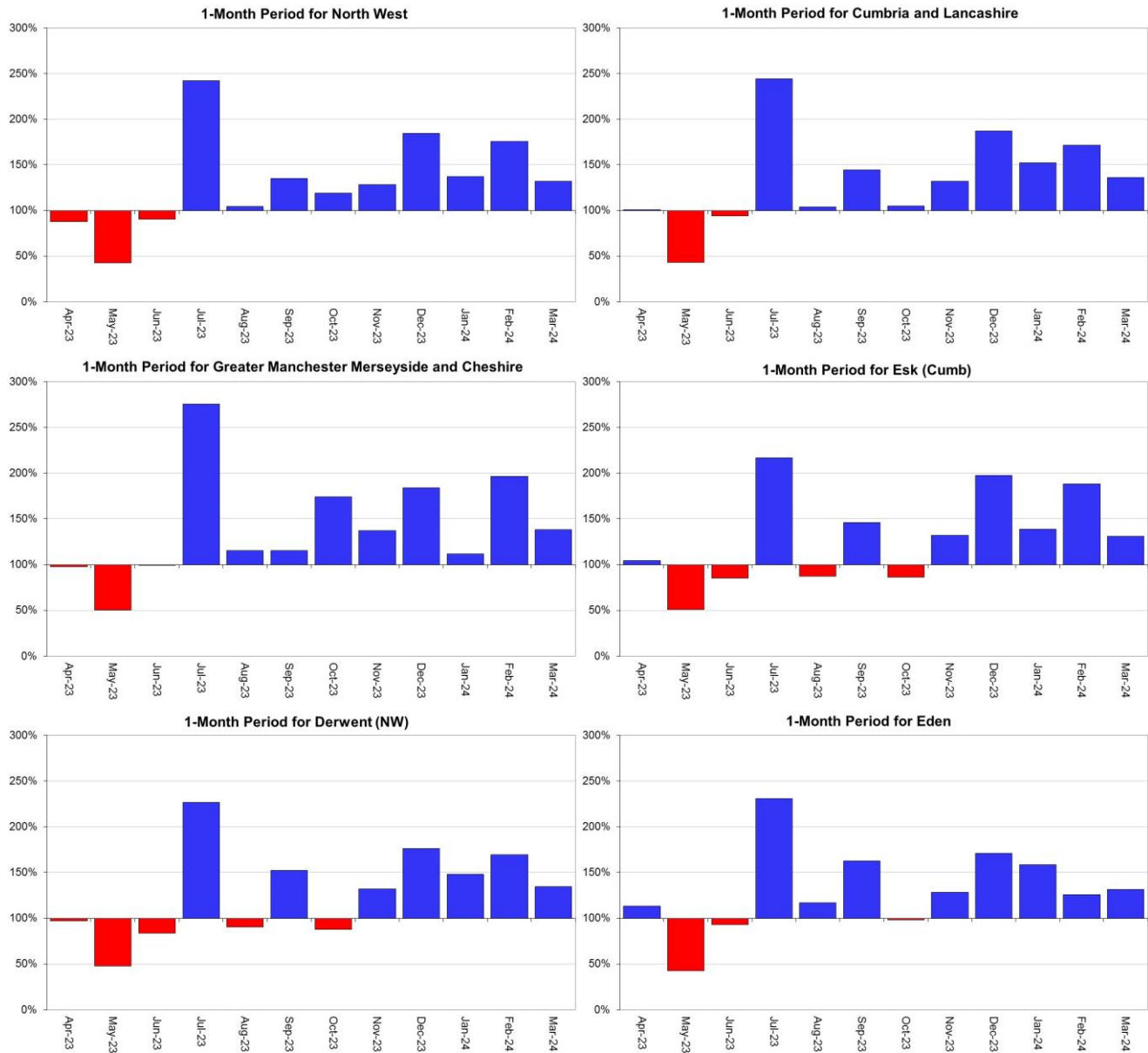


Rainfall data for 2023 and 2024, extracted from Environment Agency 1km gridded rainfall dataset derived from Environment Agency intensity rain gauges. (Source: Environment Agency. Crown Copyright, 100024198, 2024). Rainfall data prior to 2023, extracted from Met Office HadUK 1km gridded rainfall dataset derived from registered rain gauges (Source: Met Office. Crown copyright, 2024).

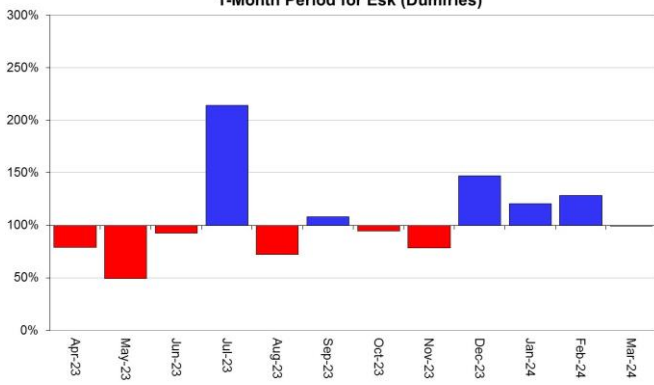
2.2 Rainfall charts

Figure 2.2: Monthly rainfall totals for the past 12 months expressed as a percentage of the 1961 to 1990 long term average for North-west England and its hydrological areas.

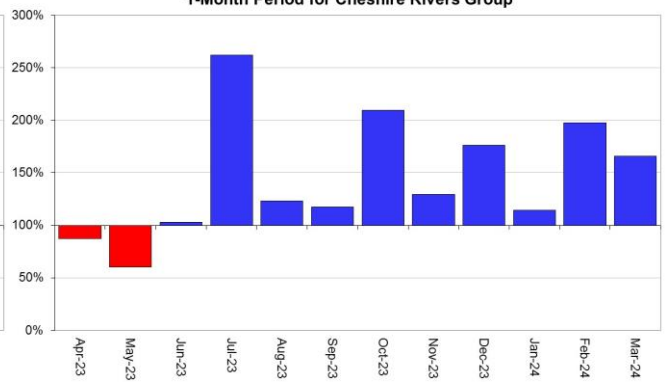
■ Above average rainfall ■ Below average rainfall



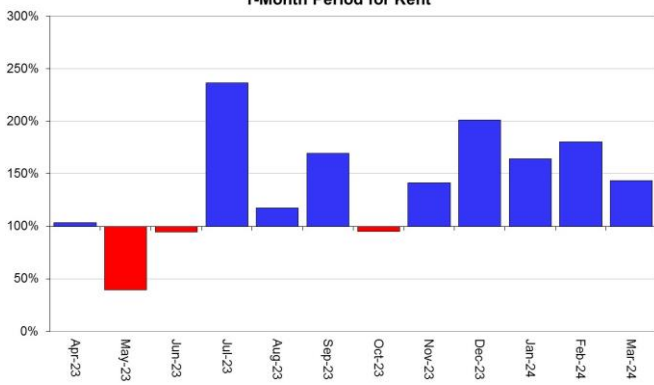
1-Month Period for Esk (Dumfries)



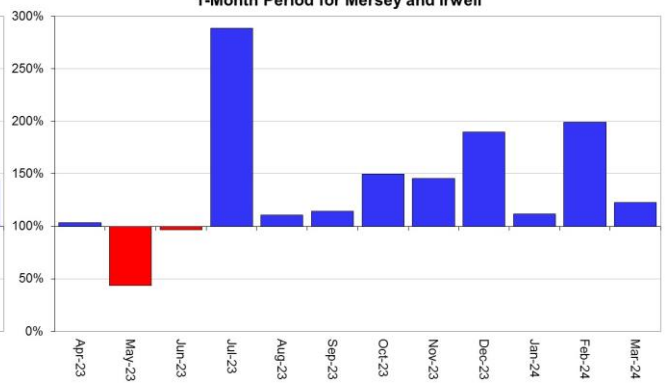
1-Month Period for Cheshire Rivers Group



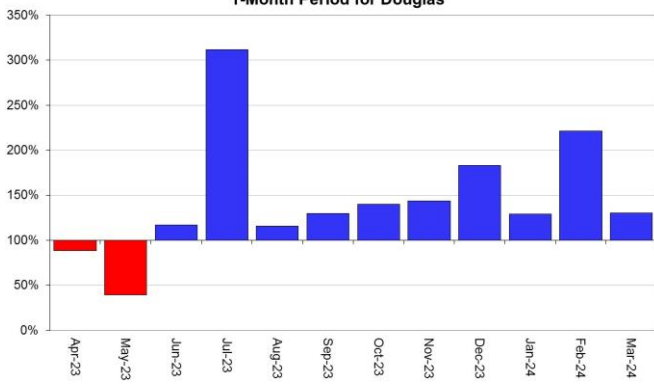
1-Month Period for Kent



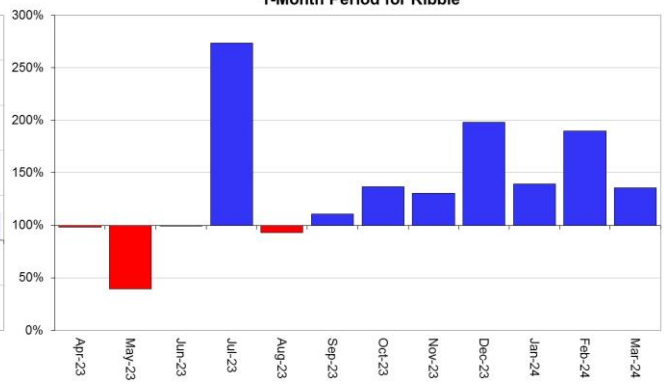
1-Month Period for Mersey and Irwell

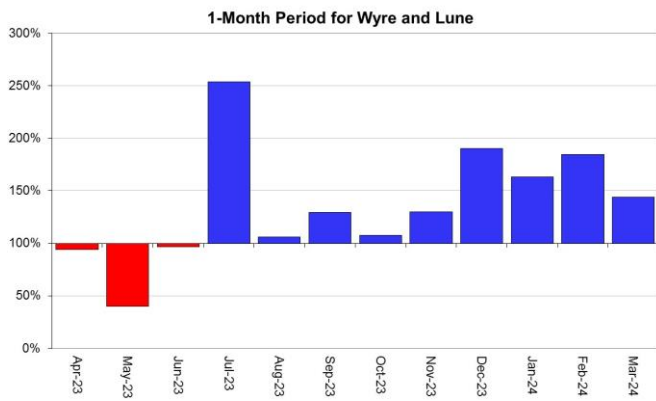


1-Month Period for Douglas



1-Month Period for Ribble



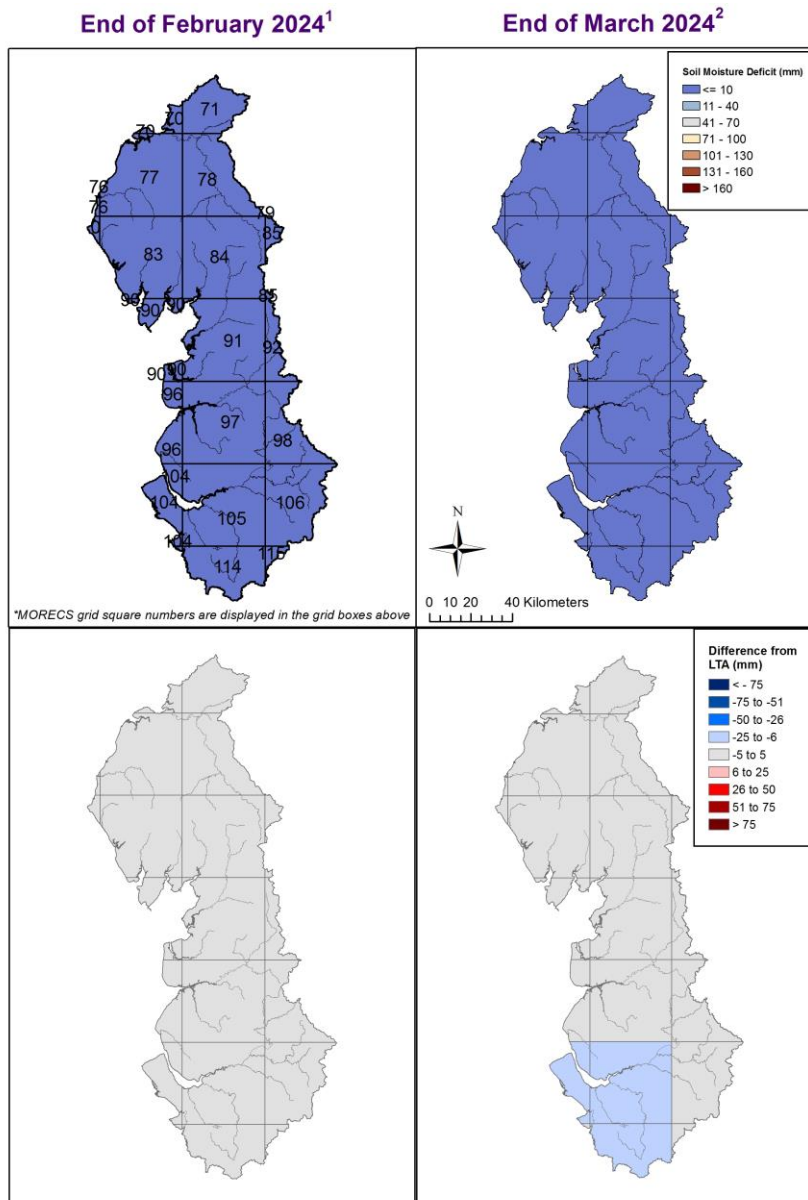


Rainfall data for 2023 and 2024, extracted from Environment Agency 1km gridded rainfall dataset derived from Environment Agency intensity rain gauges. (Source: Environment Agency. Crown Copyright, 100024198, 2024). Rainfall data prior to 2023, extracted from Met Office HadUK 1km gridded rainfall dataset derived from registered rain gauges (Source: Met Office. Crown copyright, 2024).

3 Soil moisture deficit

3.1 Soil moisture deficit map

Figure 3.1: Soil moisture deficits for weeks ending 27 February¹ (left panel) and 27 March 2024² (right panel). Top row shows actual soil moisture deficits (mm) and bottom row shows the difference (mm) of the actual from the 1961-90 long term average soil moisture deficits. MORECS data for real land use.

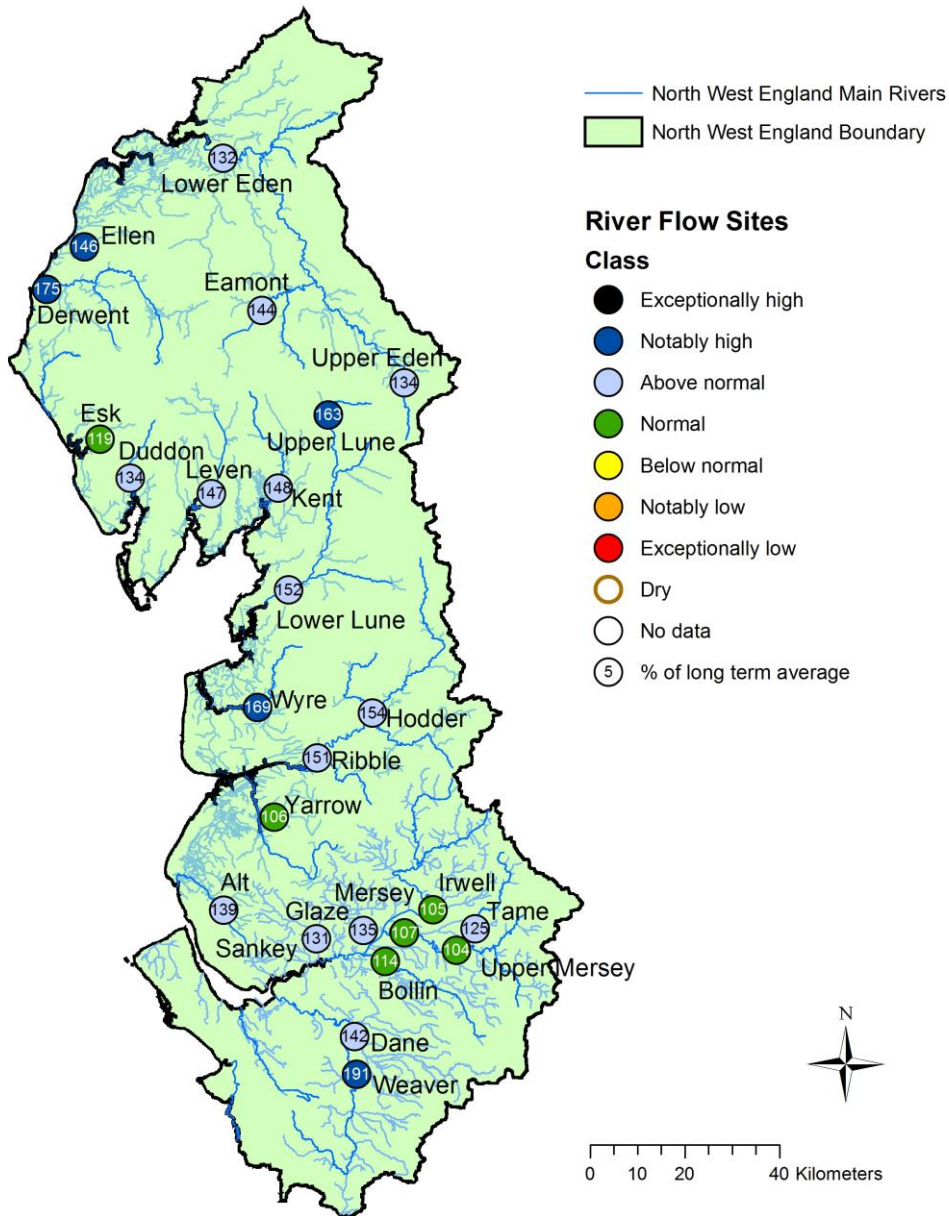


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4 River flows

4.1 River flows map

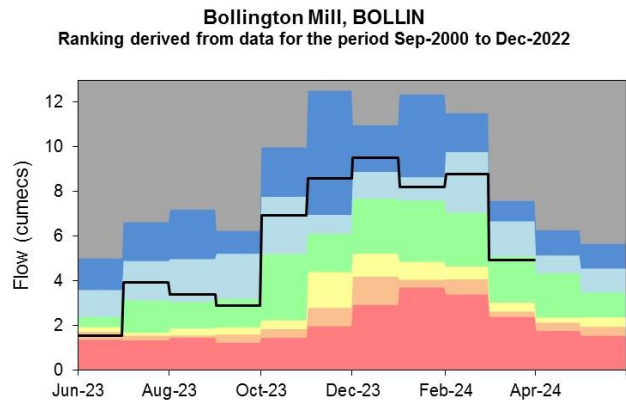
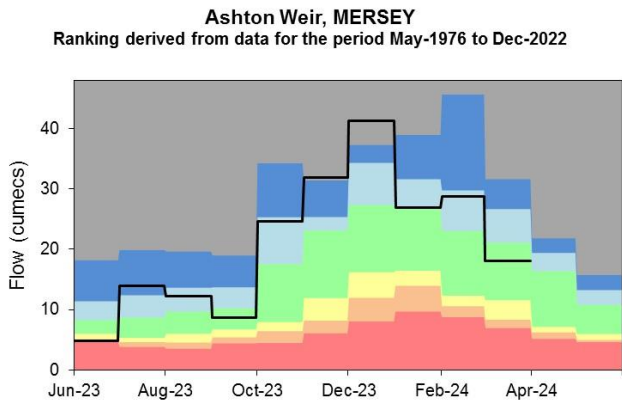
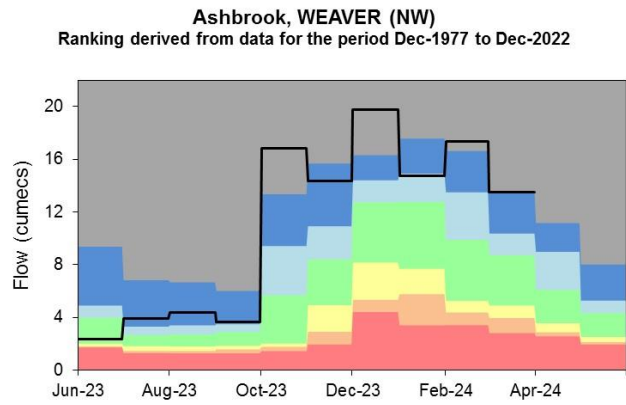
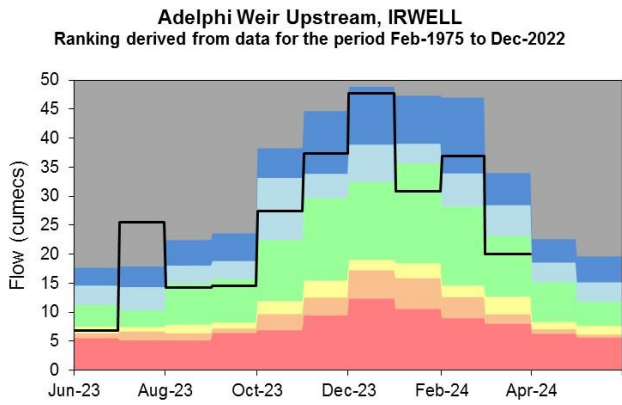
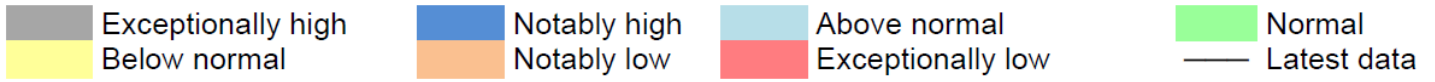
Figure 4.1: Monthly mean river flow for indicator sites for March 2024, expressed as a percentage of the respective long term average and classed relative to an analysis of historic March monthly means. Table available in the appendices with detailed information.



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

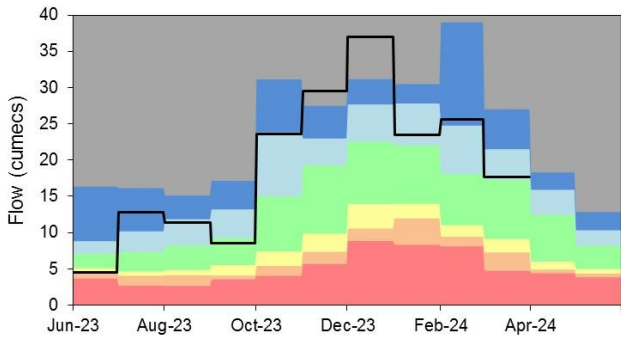
4.2 River flow charts

Figure 4.2: Monthly mean river flow for index sites over the past year, compared to an analysis of historic monthly mean flows.



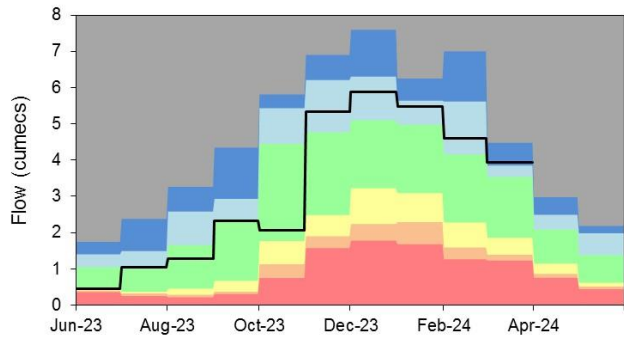
Brinksway, MERSEY

Ranking derived from data for the period Jan-1974 to Dec-2022



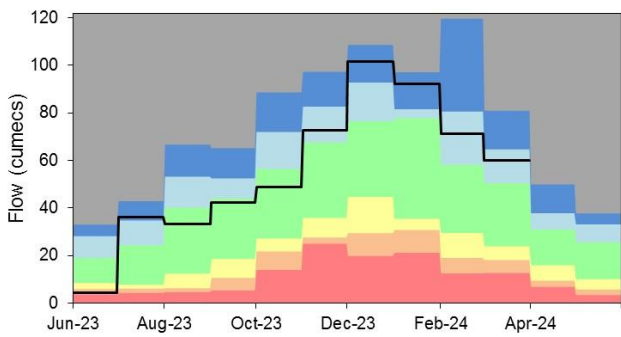
Bullgill, ELLEN

Ranking derived from data for the period Jan-1976 to Dec-2022



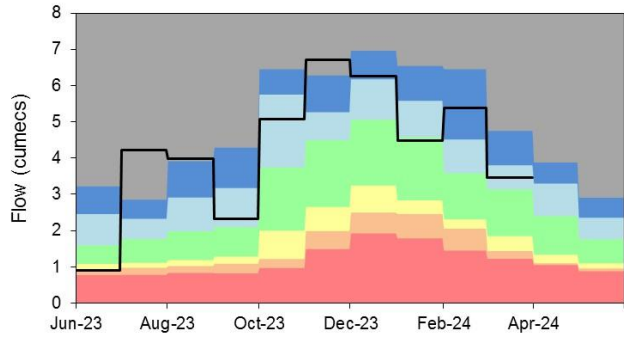
Caton, LUNE

Ranking derived from data for the period Jan-1959 to Dec-2022



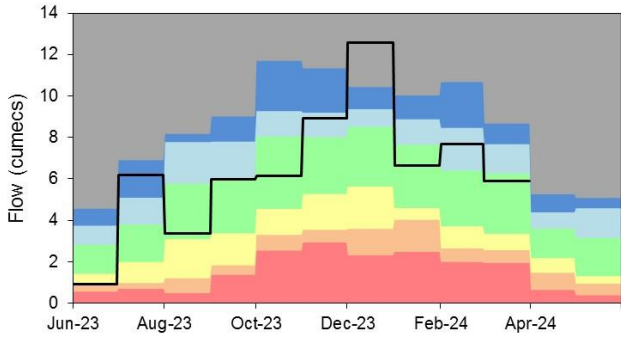
Causey Bridges, SANKEY

Ranking derived from data for the period Jan-1977 to Dec-2022



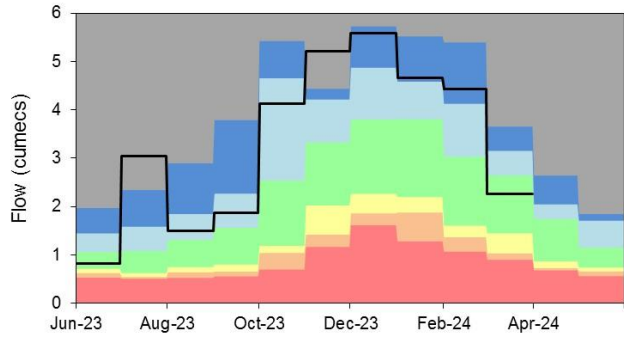
Crople How, ESK (NW)

Ranking derived from data for the period Jan-1976 to Dec-2022

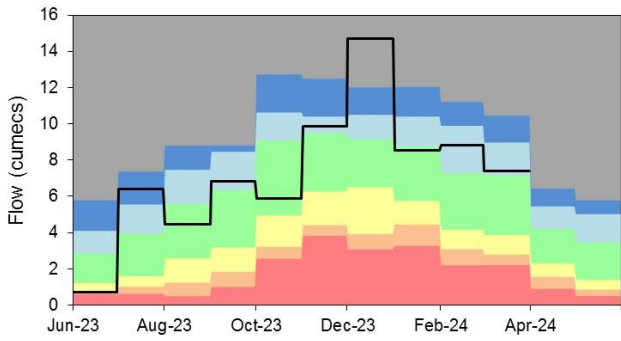


Croston, YARROW

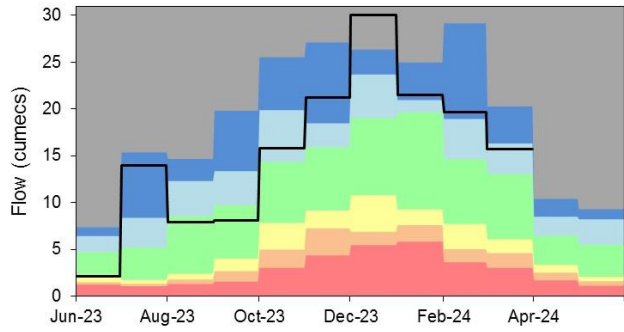
Ranking derived from data for the period Jan-1976 to Dec-2022



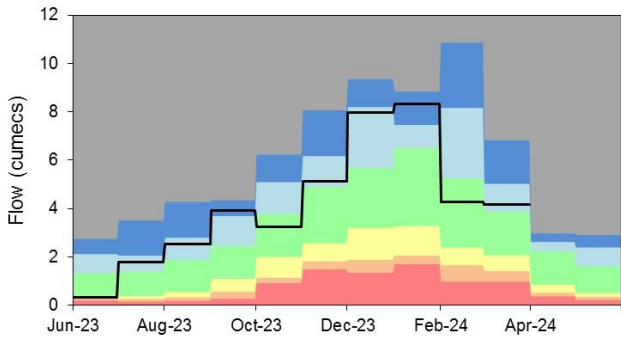
Duddon Hall, DUDDON
Ranking derived from data for the period Mar-1968 to Dec-2022



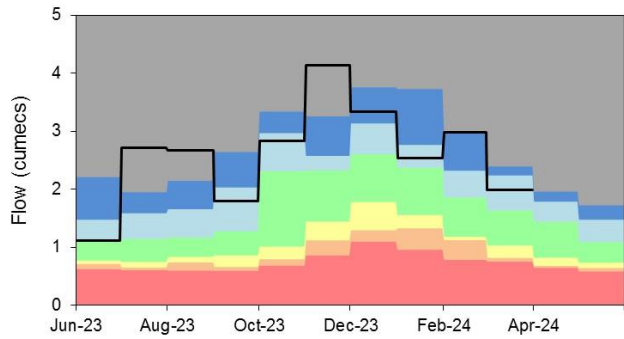
Hodder Place, HODDER
Ranking derived from data for the period Jan-1976 to Dec-2022



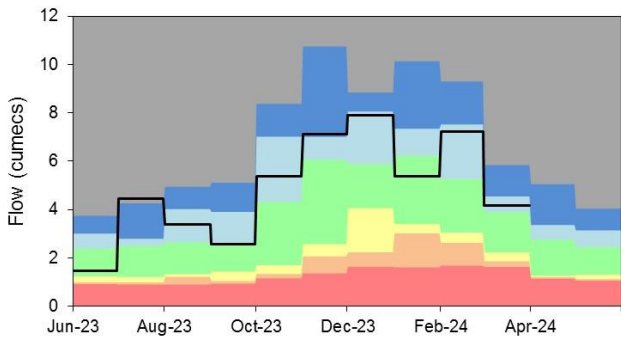
Kirkby Stephen, EDEN (NW)
Ranking derived from data for the period Oct-1971 to Dec-2022



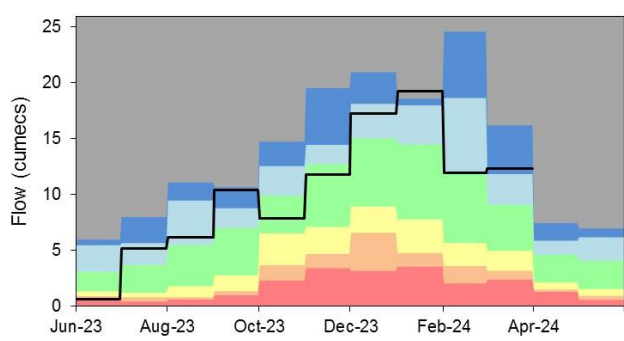
Kirkby, ALT
Ranking derived from data for the period Oct-1977 to Dec-2022



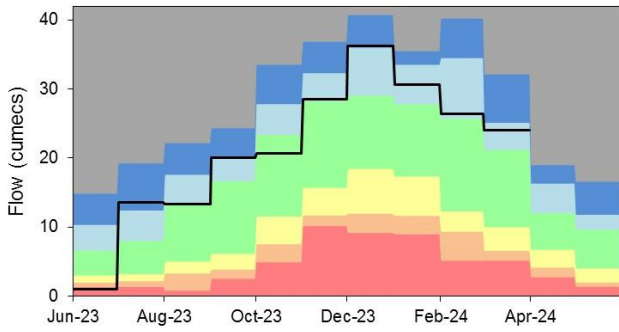
Little Woolden Hall Ultrasonic, GLAZE
Ranking derived from data for the period Jul-1995 to Dec-2022



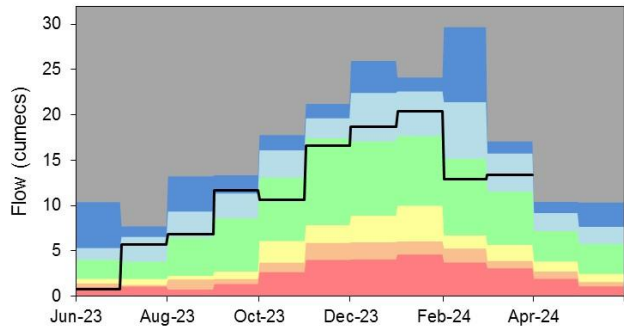
Lunes Bridge, LUNE
Ranking derived from data for the period Dec-1979 to Dec-2022



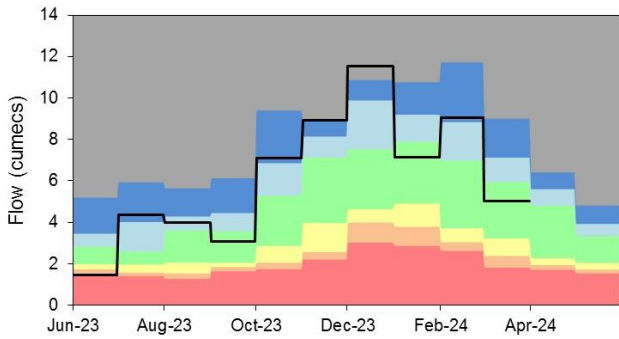
Newby Bridge FMS, LEVEN (NW)
Ranking derived from data for the period Jan-1972 to Dec-2022



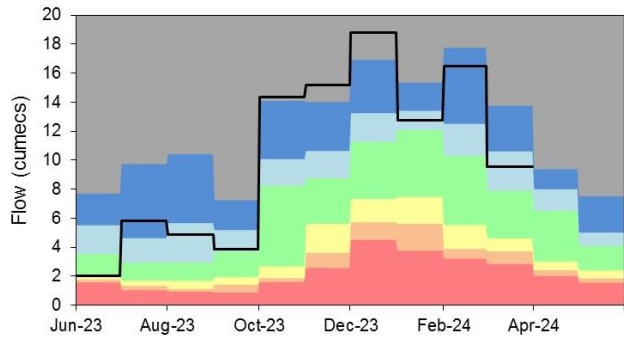
Pooley Bridge, EAMONT
Ranking derived from data for the period Jul-1970 to Dec-2022



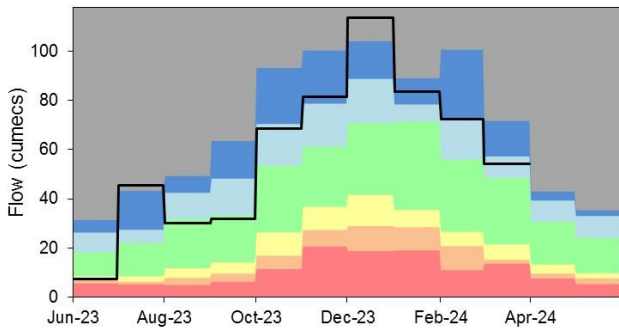
Portwood, TAME
Ranking derived from data for the period Jan-1976 to Dec-2022



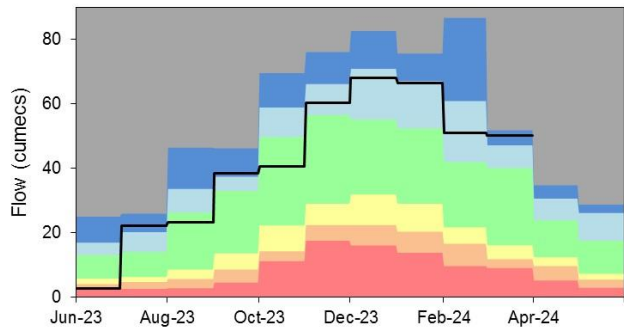
Rudheath, DANE
Ranking derived from data for the period Jan-1976 to Dec-2022



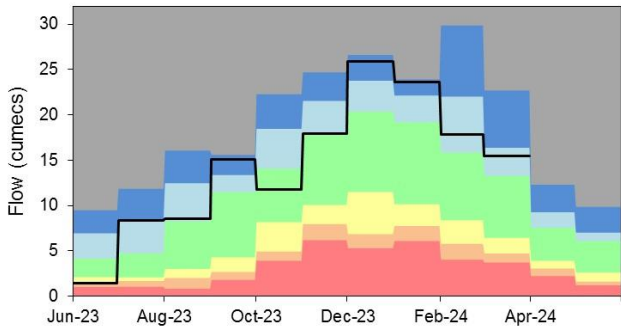
Samlesbury Pgs, RIBBLE (NW)
Ranking derived from data for the period May-1960 to Dec-2022



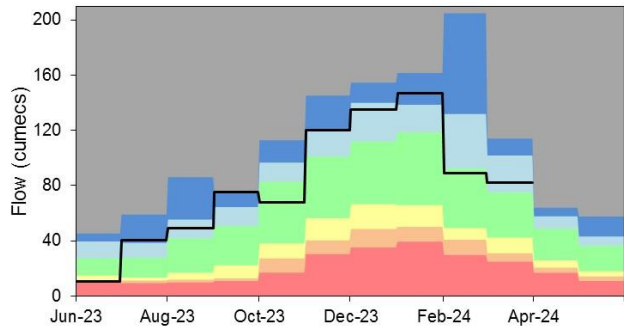
Seaton Mill, DERWENT (NW)
Ranking derived from data for the period Sep-1960 to Dec-2022



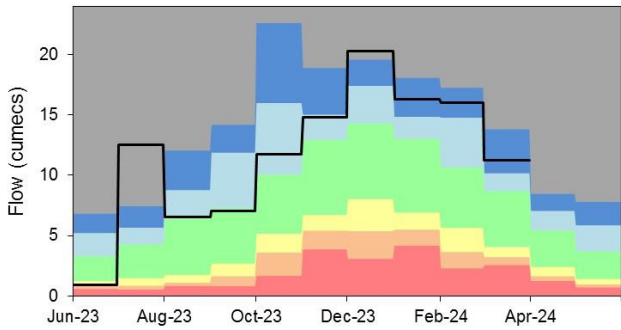
Sedgwick, KENT
Ranking derived from data for the period Nov-1968 to Dec-2022



Sheepmount, EDEN (NW)
Ranking derived from data for the period Oct-1967 to Dec-2022



St Michaels FMS, WYRE
Ranking derived from data for the period Oct-1963 to Dec-2022

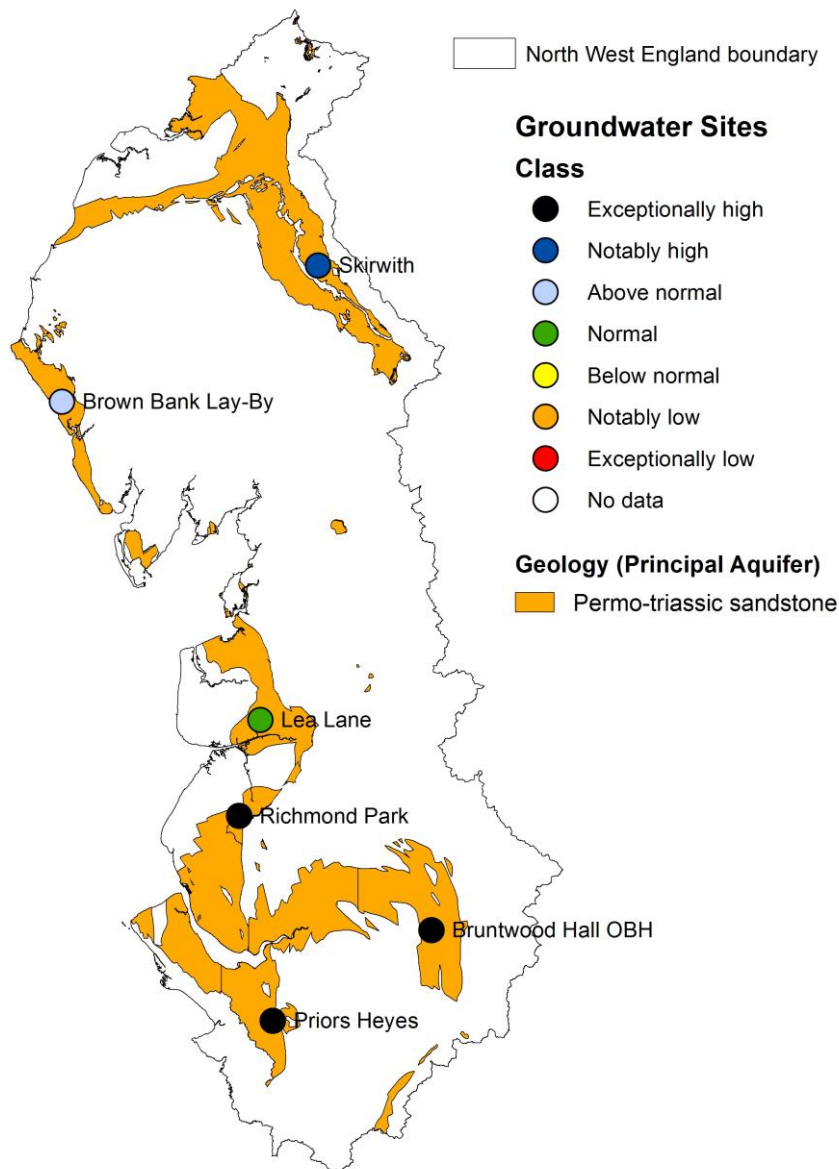


Source: Environment Agency.

5 Groundwater levels

5.1 Groundwater levels map

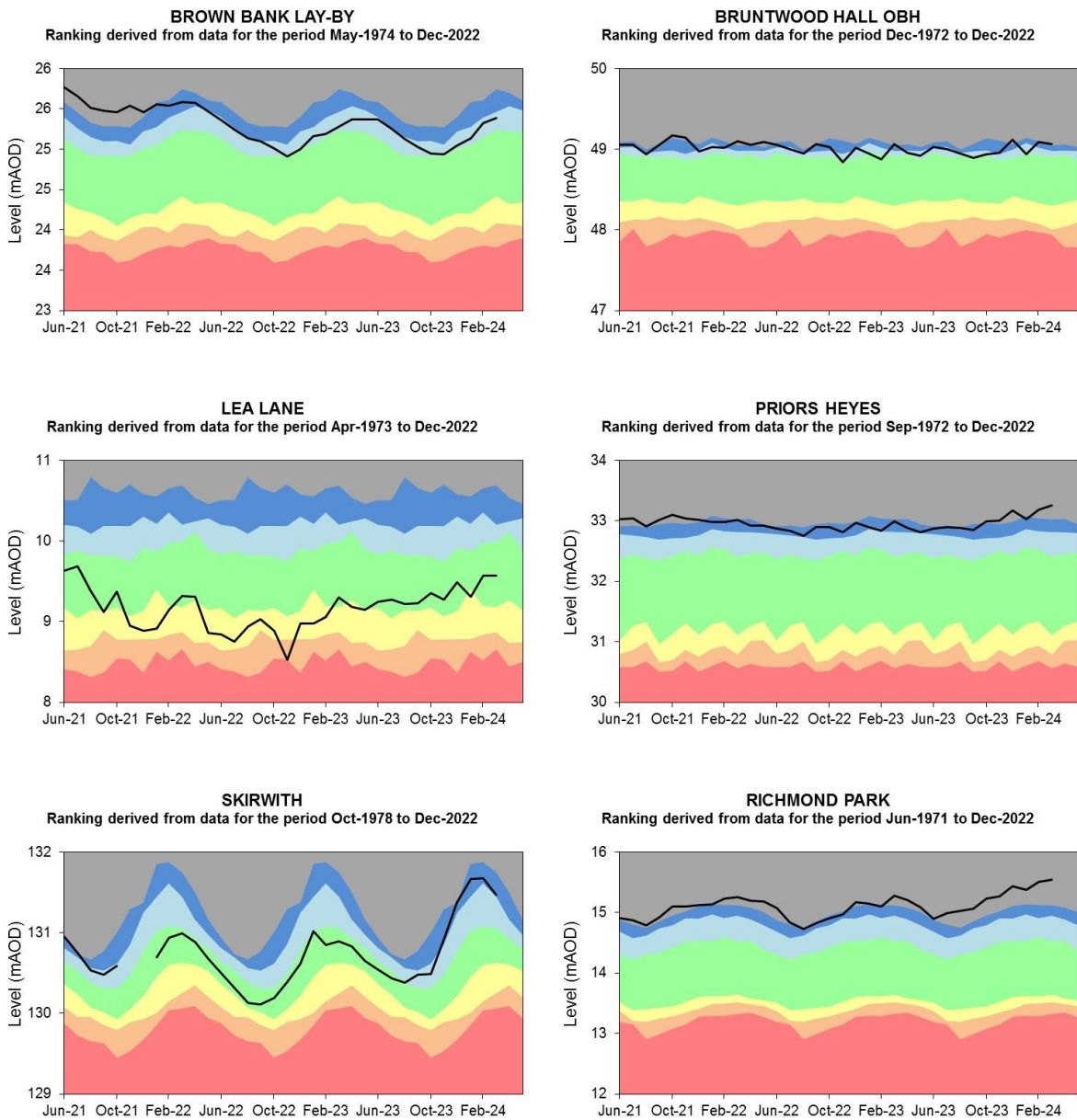
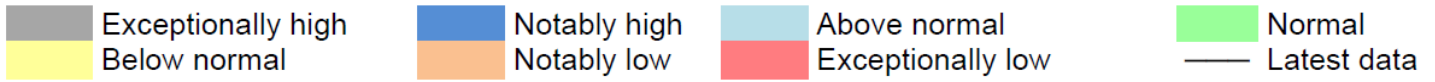
Figure 5.1: Groundwater levels for indicator sites at the end of March 2024, classed relative to an analysis of respective historic March levels. Table available in the appendices with detailed information.



(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. 34 months compared to an analysis of historic end of month levels and long term maximum and minimum levels.

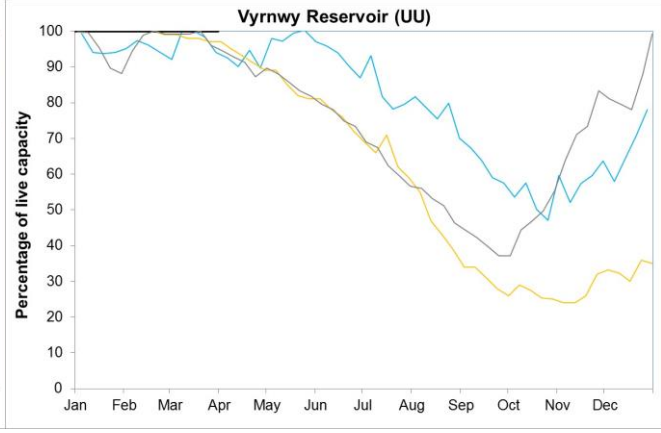
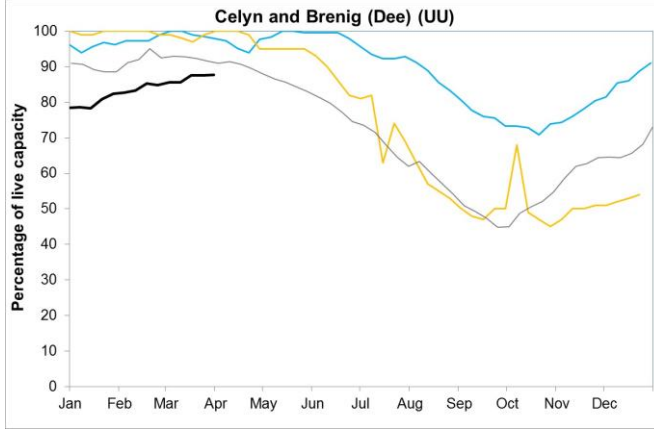
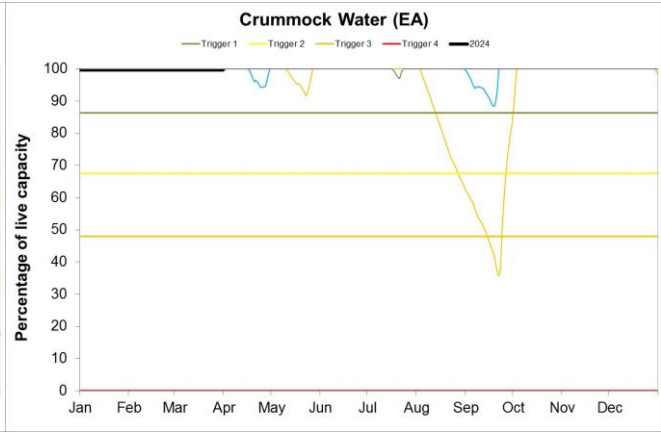
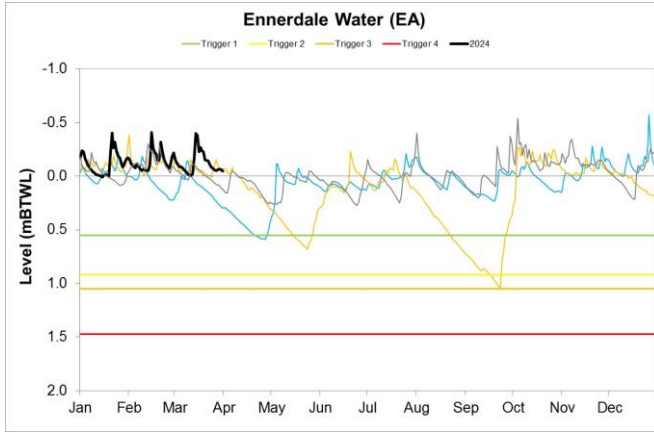
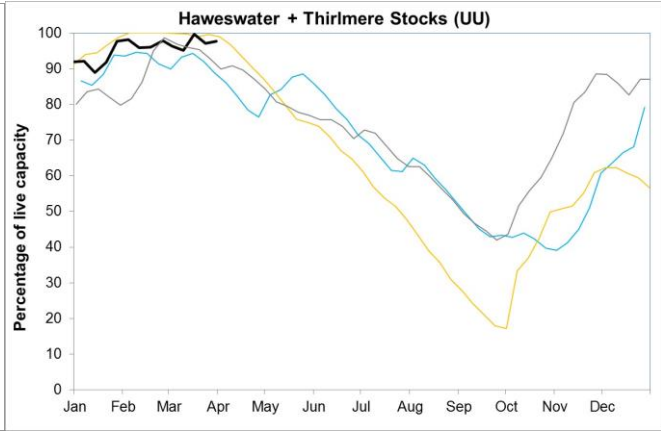
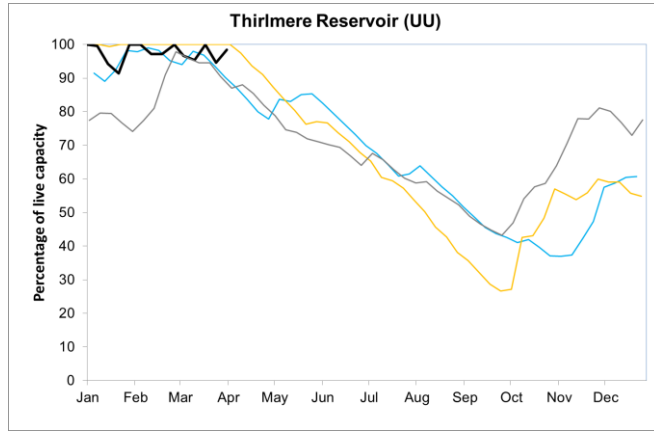
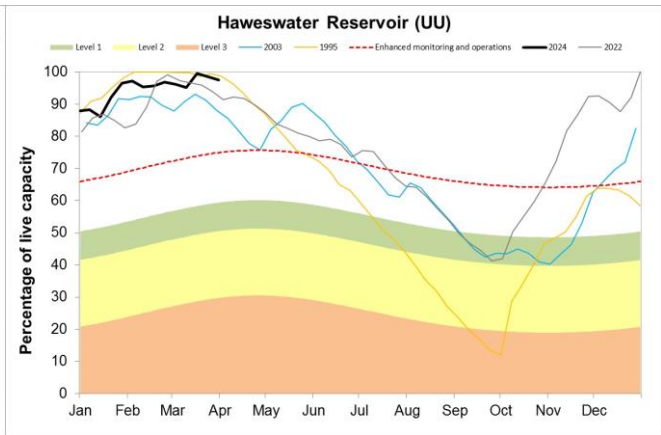
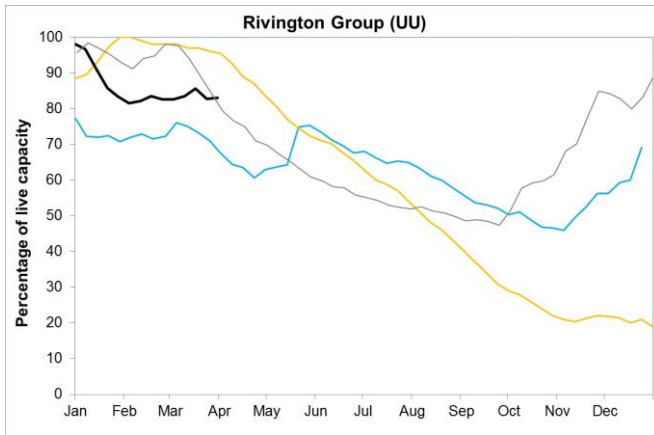


Source: Environment Agency, 2024.

Figure 6.2: End of month reservoir storage for supply districts across North-west England and selected individual reservoirs for current year (2024) and representative years: 1995, 2003 and 2022. Note: Historic records of individual reservoirs and reservoir groups making up the regional values vary in length.

— 2003 — 1995 — 2024 — 2022





Source: (UU) United Utilities, (EA) The Environment Agency.

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	Mar 2024 rainfall % of long term average 1961 to 1990	Mar 2024 band	Jan 2024 to March cumulative band	Oct 2023 to March cumulative band	Apr 2023 to March cumulative band
Cheshire Rivers Group	166	Notably High	Exceptionally high	Exceptionally high	Exceptionally high
Derwent (NW)	135	Above Normal	Notably high	Exceptionally high	Exceptionally high
Douglas	130	Above Normal	Exceptionally high	Exceptionally high	Exceptionally high
Eden	132	Above Normal	Notably high	Exceptionally high	Exceptionally high
Esk (Cumbria)	131	Above Normal	Exceptionally high	Exceptionally high	Exceptionally high
Esk (Dumfries)	100	Normal	Above normal	Normal	Normal
Kent	144	Above Normal	Exceptionally high	Exceptionally high	Exceptionally high
Mersey And Irwell	123	Above Normal	Notably high	Exceptionally high	Exceptionally high
Ribble	136	Above Normal	Exceptionally high	Exceptionally high	Exceptionally high

Wyre And Lune	144	Notably High	Exceptionally high	Exceptionally high	Exceptionally high
North West	132	Above Normal	Exceptionally high	Exceptionally high	Exceptionally high

8.2 River flows table

Site name	River	Catchment	Mar 2024 band	Feb 2024 band
Adelphi Weir Upstream	Irwell	Irwell (Croal to Irk)	Normal	Notably high
Ashbrook	Weaver (NW)	Weaver Upper	Notably high	Exceptionally high
Ashton Weir	Mersey	Mersey Non Tidal	Normal	Above normal
Bollington Mill	Bollin	Bollin	Normal	Above normal
Brinksway	Mersey	Mersey Upper	Above normal	Notably high
Bullgill	Ellen	Ellen Lower	Notably high	Above normal
Caton	Lune	Lune Lower Tidal	Above normal	Above normal
Causey Bridges	Sankey	Sankey Non Tidal	Above normal	Notably high
Crople How	Esk (NW)	Esk (South West Lakes)	Normal	Above normal
Croston	Yarrow	Yarrow Lower	Normal	Notably high
Duddon Hall	Duddon	Duddon	Above normal	Above normal
Hodder Place	Hodder	Hodder Lower	Above normal	Notably high
Kirkby	Alt	Alt	Above normal	Notably high

Kirkby Stephen	Eden (NW)	Eden Cumbria Upper	Above normal	Normal
Little Woolden Hall Ultrasonic	Glaze	Glaze	Above normal	Above normal
Lunes Bridge	Lune	Lune Upper	Notably high	Normal
Newby Bridge Fms	Leven (NW)	Leven Cumbria	Above normal	Above normal
Pooley Bridge	Eamont	Eamont	Above normal	Normal
Portwood	Tame	Tame	Normal	Notably high
Rudheath	Dane	Dane	Above normal	Notably high
Samlesbury Pgs	Ribble (NW)	Ribble Lower	Above normal	Above normal
Seaton Mill	Derwent (NW)	Derwent Cumbria Lower	Notably high	Above normal
Sedgwick	Kent	Levens Bridge	Above normal	Above normal
Sheepmount	Eden (NW)	Eden Cumbria Lower	Above normal	Normal
St Michaels Fms	Wyre	Brock	Notably high	Notably high

8.3 Groundwater table

Site name	Aquifer	End of Mar 2024 band	End of Feb 2024 band
Brown Bank Lay-by	West Cumbria Permo-triassic Sandstone	Above normal	Above normal
Bruntwood Hall Obh	East Cheshire Permo-triassic Sandstone	Exceptionally high	Notably high
Lea Lane	Fylde Permo-triassic Sandstone	Normal	Normal
Priors Heyes	West Cheshire Permo-triassic Sandstone	Exceptionally high	Exceptionally high
Richmond Park	Rufford Permo-triassic Sandstone	Exceptionally high	Exceptionally high
Skirwith	Carlisle Basin Permo-triassic Sandstone	Notably high	Notably high