

Monthly water situation report: North West England

1 Summary – September 2024

1.1 Rainfall

Rainfall for North West England for September was classed as normal with 113% of the long term average (LTA). The Cumbria and Lancashire (CLA) area observed 95% of the LTA also classed as normal. The Greater Manchester Merseyside and Cheshire (GMC) area observed much heavier rainfall with 198% of the LTA classed as exceptionally high.

During September rainfall across North West England was classed between below normal and exceptionally high. The highest rainfall (in terms of the LTA) was recorded in Cheshire Rivers Group hydrological area with 257% of the LTA classed as exceptionally high. This is the wettest September observed since 1871. The lowest was recorded in the Derwent hydrological area with 61% of the LTA classed as below normal. For the rainfall in the 8 remaining hydrological areas across North West England 2 were classed as notably high, 2 were classed as above normal and 4 as normal with the heavier rainfall being seen further south.

Cumulative rainfall over the last 3 months was classed as between notably high and normal. Due to the extreme rainfall in September the heaviest cumulative rainfall (in terms of the LTA) was observed in the Cheshire Rivers Group hydrological area with 155% of the LTA and the lowest in the Ribble hydrological area with 95% of the LTA.

The 6-month cumulative rainfall totals show rainfall classed between exceptionally high and above normal with the Esk (Cumbria) and Derwent hydrological areas both recording their third wettest 6 month period ending in September since 1871. The highest cumulative rainfall (in terms of LTA) was recorded in the Cheshire Rivers group and Derwent hydrological areas with 146% of the LTA, both classed as exceptionally high. The lowest was recorded in the Wyre and Lune hydrological area with 114% of the LTA classed as above normal.

The 12-month cumulative rainfall totals for hydrological areas in North West England are all classed as exceptionally high with the North West England as a whole recording its second highest rainfall since 1871. GMC and CLA observed their highest and second highest rainfall respectively. Individual hydrological areas that recorded notably high 12-month cumulative rainfall were as follows:

- Wettest since 1871 for:
 - ❖ Esk (Cumbria)
 - ❖ Cheshire Rivers Group

- ❖ Kent
- ❖ Mersey and Irwell
- ❖ Douglas
- Second wettest since 1871 for:
 - ❖ Derwent
 - ❖ Eden
 - ❖ Wyre and Lune
- Third wettest for:
 - ❖ Ribble

1.2 Soil moisture deficit and recharge

Heavy rainfall toward the end of September, especially in GMC, resulted in soil moisture deficits falling between 0 and 25mm by the start of October. Soil moisture deficits rose slightly in Cumbria and decreased slightly in Lancashire. Due to the heavy rainfall GMC soil moisture deficits decreased notably. All areas recorded soil moisture deficits lower than expected for the time of year.

1.3 River flows

Monthly mean river flows for North West England were classed as between normal and exceptionally high. Out of the 16 sites in the CLA area 11 sites were classed as normal, 2 sites above normal and 3 sites (Kirkby in Alt, Bullgill in Ellen and Kirkby Stephen in Eden) are missing due to ongoing data issues and the installation of an eel pass. The lowest flow for North West England was recorded at Seaton Mill with 70% of the LTA classed as normal.

Out of the 9 sites in the GMC area 6 sites were classed as normal, 2 sites above normal and one site as exceptionally high. Due to the record-breaking rainfall in the Cheshire Rivers Group hydrological area the highest flow (in terms of the LTA) was recorded at Ashbrook with 416% of the LTA which is the highest monthly average flow ever recorded at Ashbrook for September.

1.4 Groundwater levels

Groundwater levels for North West England for the end of September were classed between exceptionally high and normal. The Victoria Road site changed classification from normal to above normal and all other sites remained at the same classification as follows:

- Bruntwood Hall at exceptionally high
- Furness Abbey at exceptionally high
- Priors Heyes at exceptionally high
- Skirwith at exceptionally high
- Richmond Park at exceptionally high

- Brown Bank Lay By as notably high
- Primrose Hill at above normal
- Great Musgrave at normal
- Lea Lane at 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

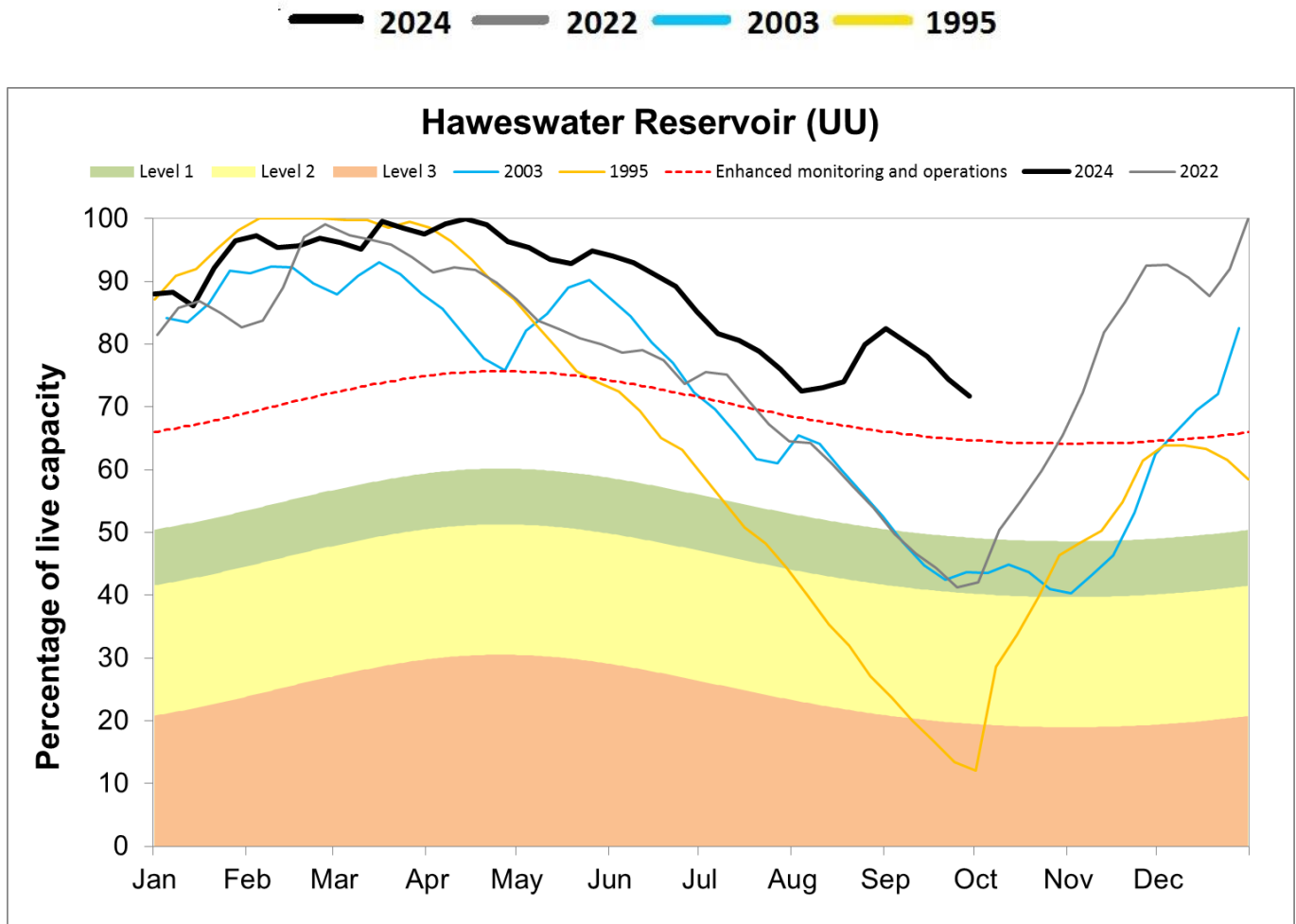
Total reservoir net storage for North West England decreased from 77% at the end of August to 75% at the end of September which is higher than the average of 71% at this time of year but lower than last year when storage was 79%.

At the end of September, reservoir storage (in terms of percentage) was highest at Crummock water which was 100% full and lowest at Longdendale which was 64% full. The combined storage at Haweswater and Thirlmere was 74% which is higher than the average of 61% and the same as last year.

Some of the reservoirs kept low for maintenance work include:

- Audenshaw No.1
- Anglezarke
- High Bullough
- Woodhead
- Torside
- Dingle
- Kitcliffe
- Harlock

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 2022 (Source: United Utilities (UU)).



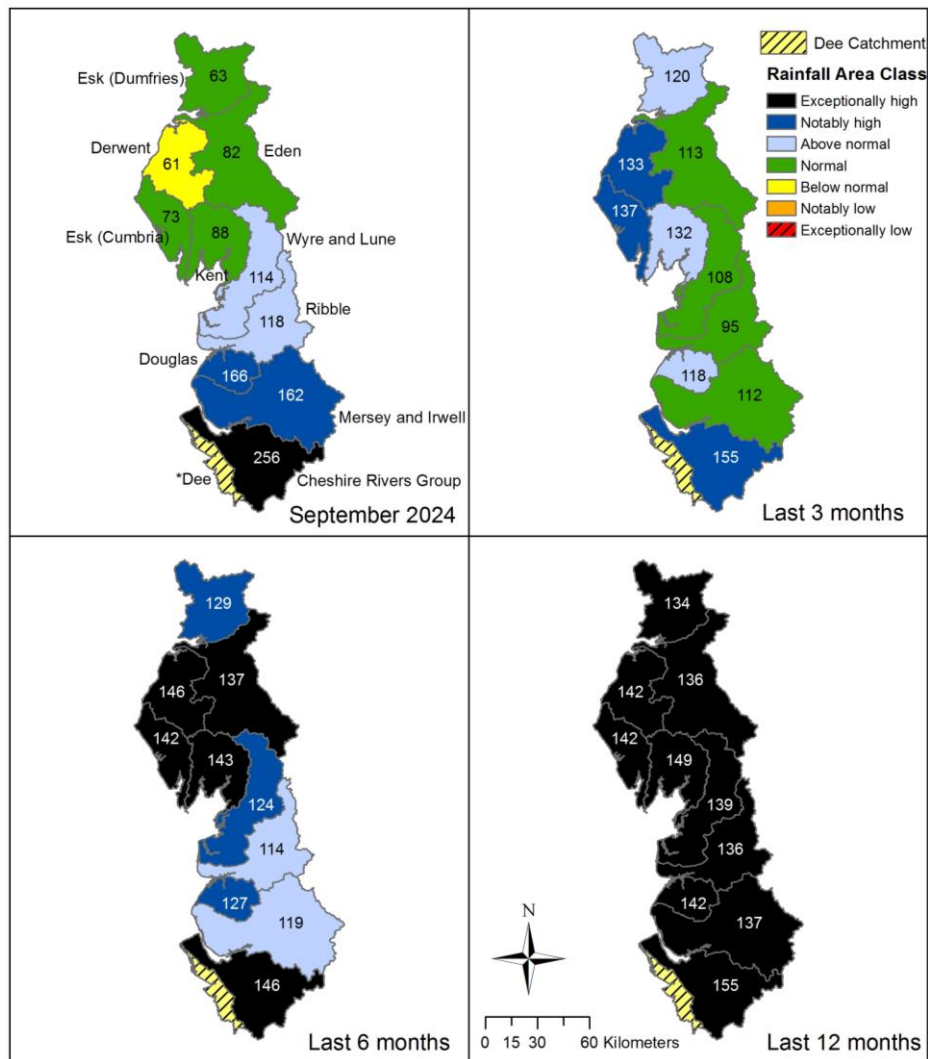
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Author: Greater Manchester Merseyside and Cheshire Hydrology Team,
hydrology.GMMYCH@environment-agency.gov.uk

2 Rainfall

2.1 Rainfall map

Figure 2.1: Total rainfall (as a percentage) for hydrological areas for the current month (up to 30 September 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.

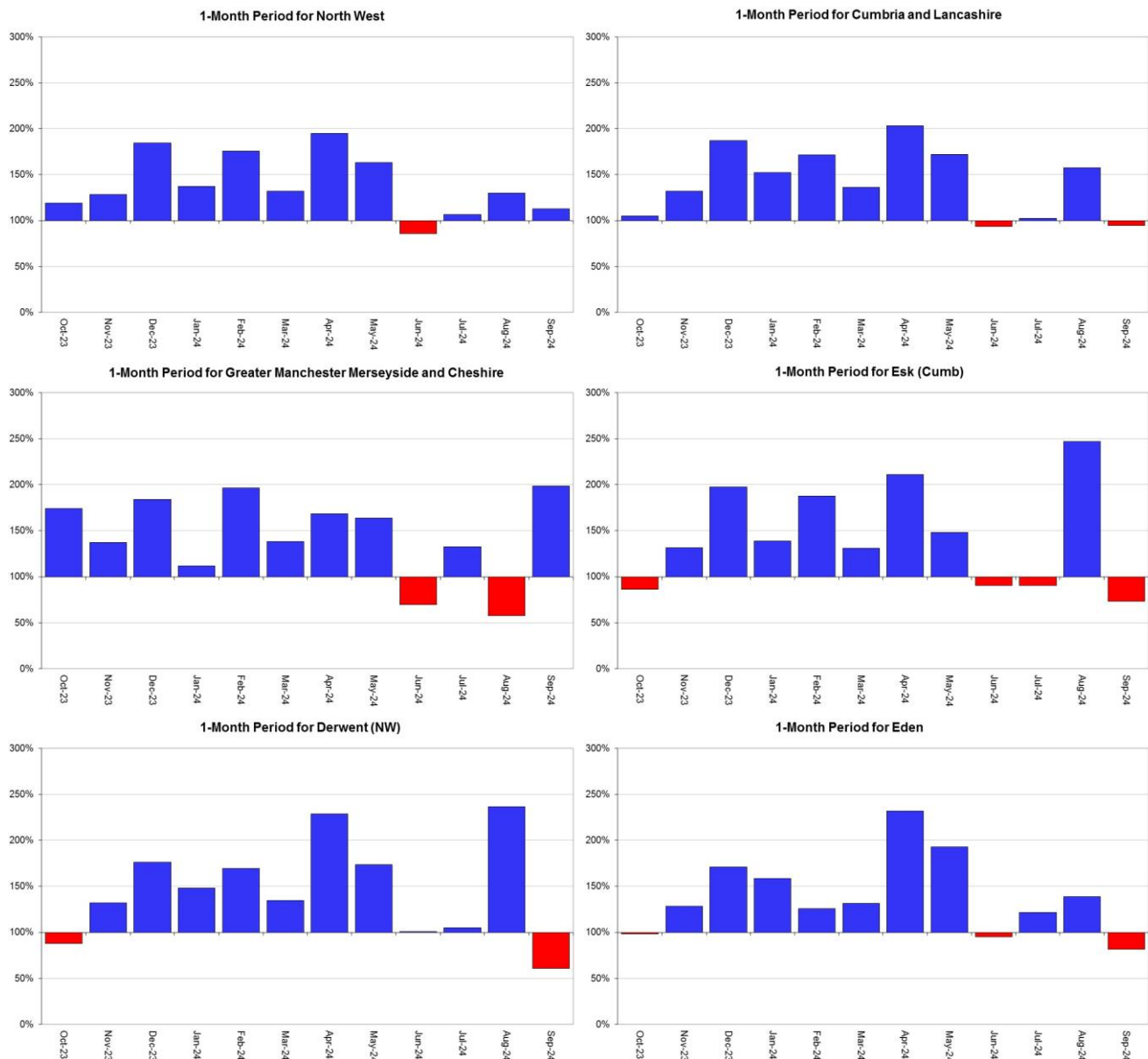


Rainfall data since 2023, extracted from Environment Agency 1km gridded rainfall dataset derived from Environment Agency intensity rain gauges. (Source: Environment Agency. Crown Copyright, 100024198, 2024). Rainfall data prior to 2023, extracted from Met Office HadUK 1km gridded rainfall dataset derived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

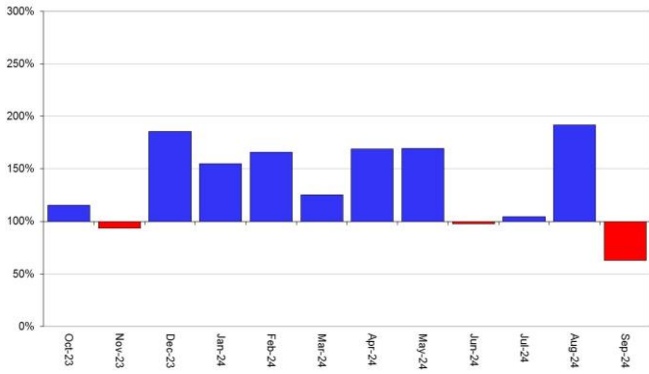
2.2 Rainfall charts

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.

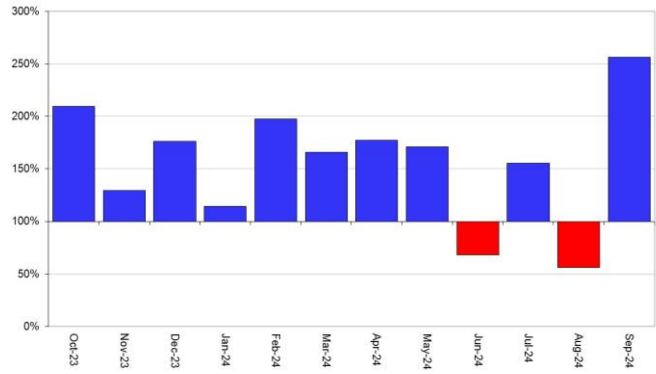
Above average rainfall
 Below average rainfall



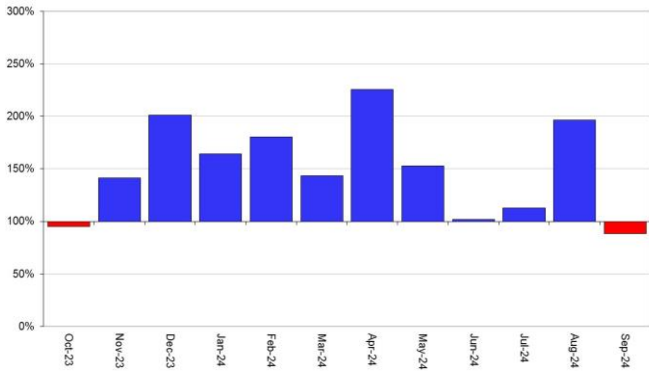
1-Month Period for Esk (Dumfries)



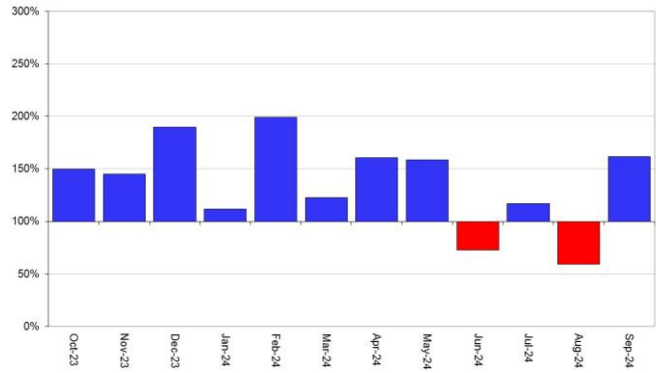
1-Month Period for Cheshire Rivers Group

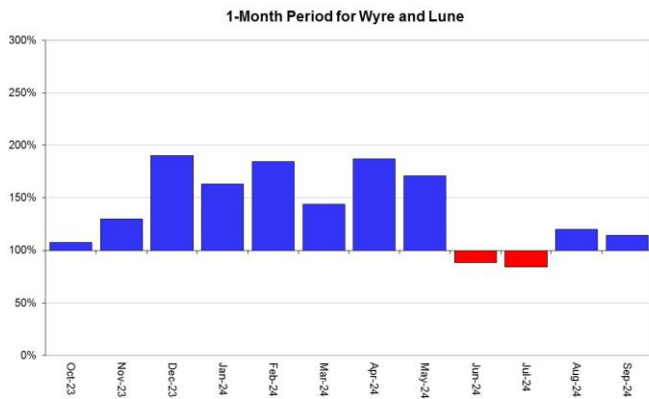
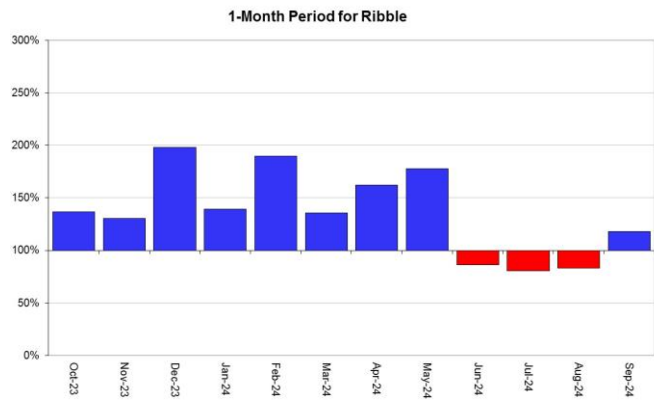
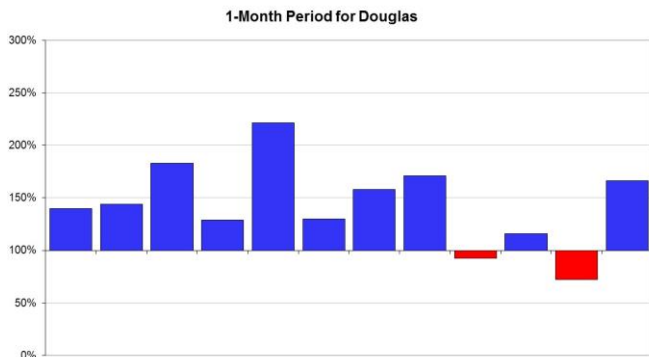


1-Month Period for Kent



1-Month Period for Mersey and Irwell



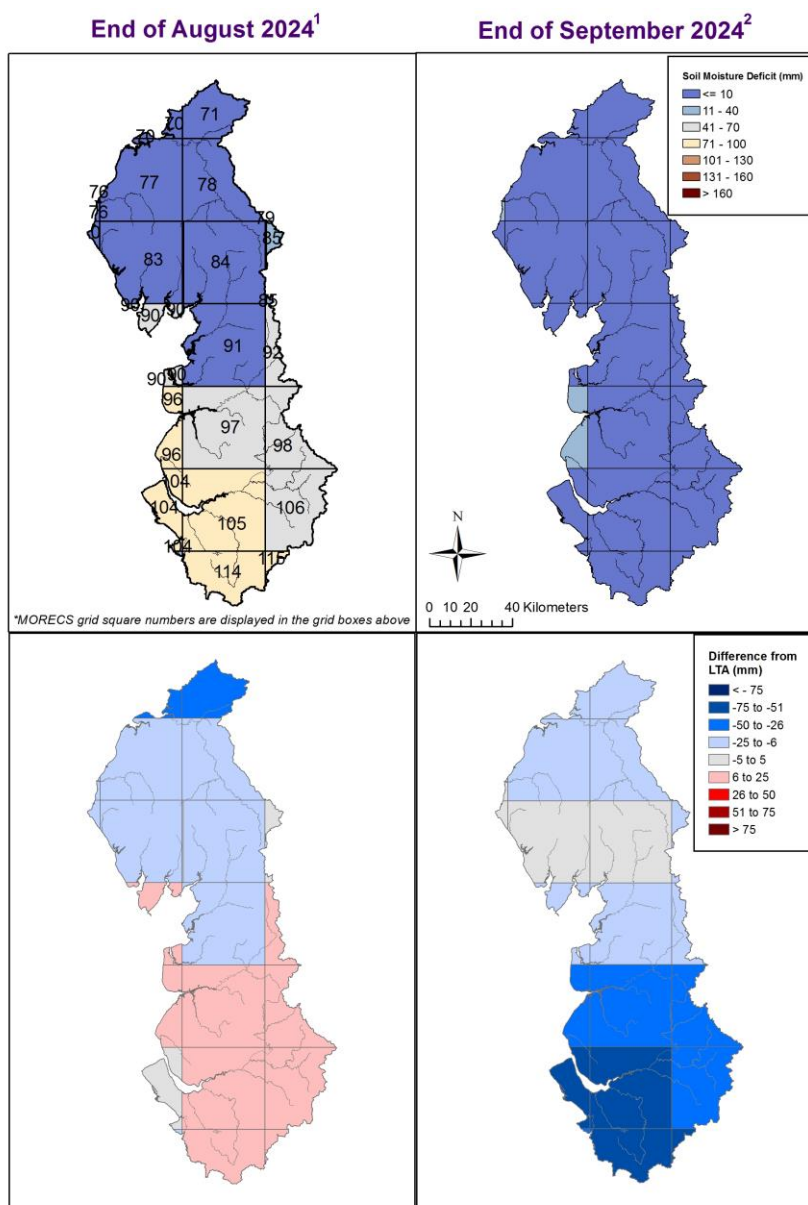


Rainfall data since 2023, extracted from Environment Agency 1km gridded rainfall dataset derived from Environment Agency intensity rain gauges. (Source: Environment Agency. Crown Copyright, 100024198, 2024). Rainfall data prior to 2023, extracted from Met Office HadUK 1km gridded rainfall dataset derived 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 28 August 2024¹ (left panel) and 30 September 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.

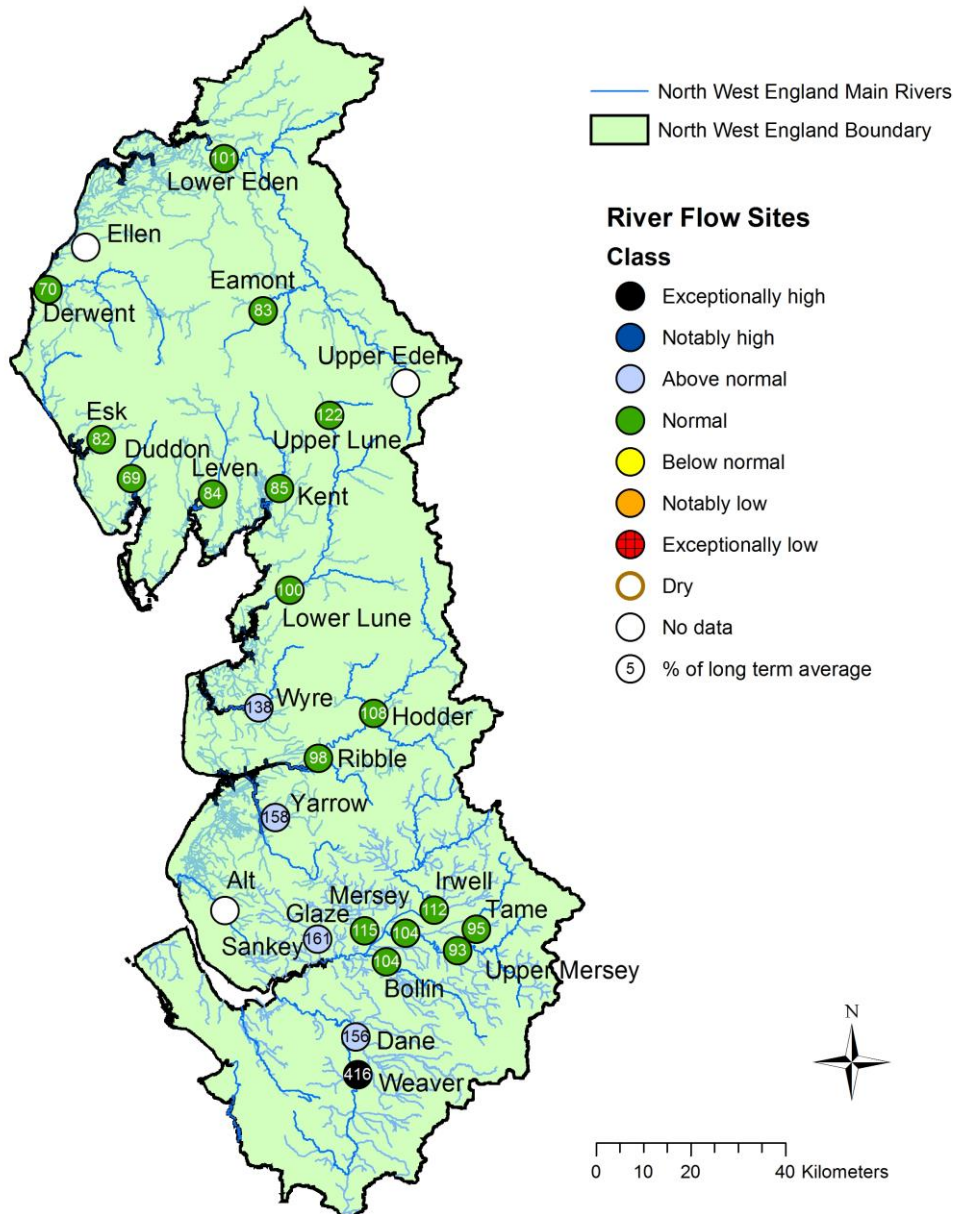


(Source: Met Office. Crown copyright, 2024). All rights reserved. Environment Agency, 100024198, 2024.

4 River flows

4.1 River flows map

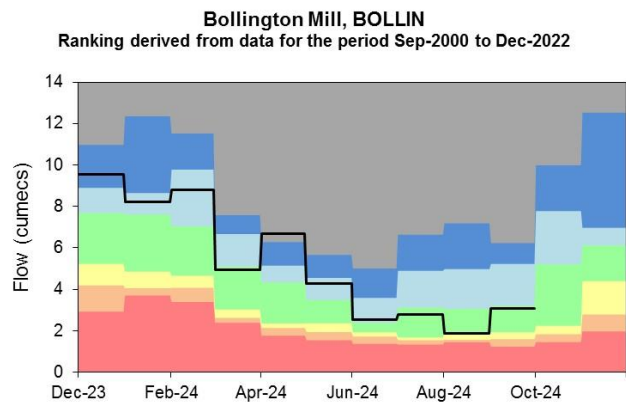
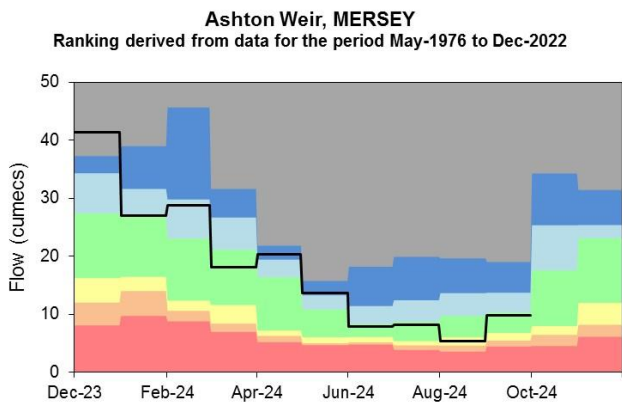
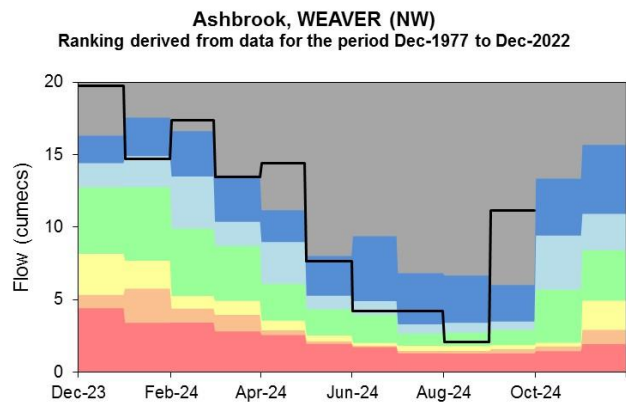
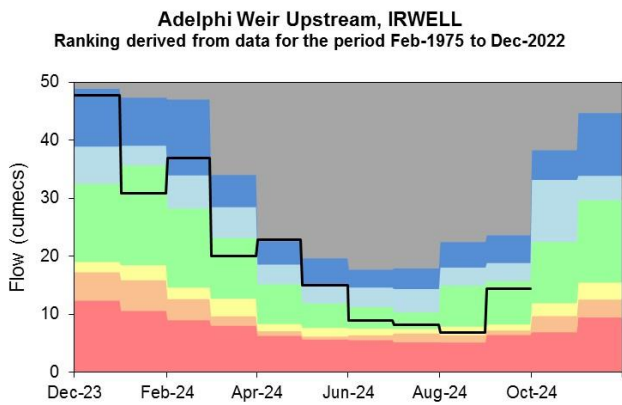
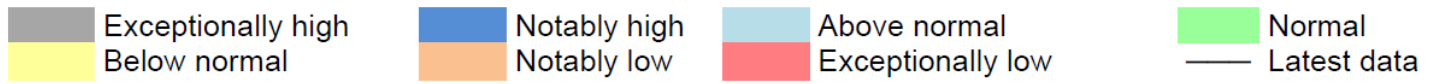
Figure 4.1: Monthly mean river flow for indicator sites for September 2024, expressed as a percentage of the respective long term average and classed relative to an analysis of historic September monthly means. Table available in the appendices with detailed information.



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

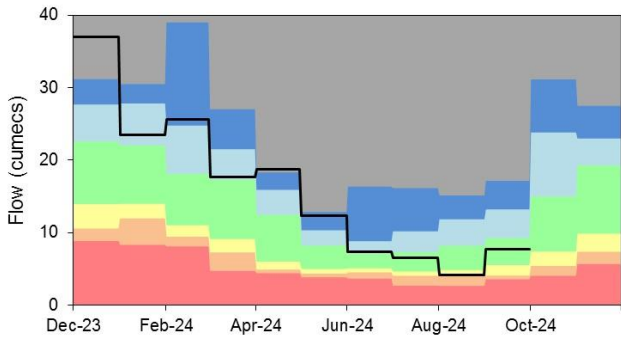
4.2 River flow charts

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



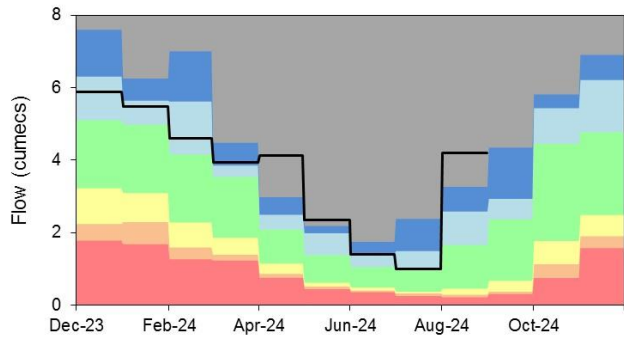
Brinksway, MERSEY

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



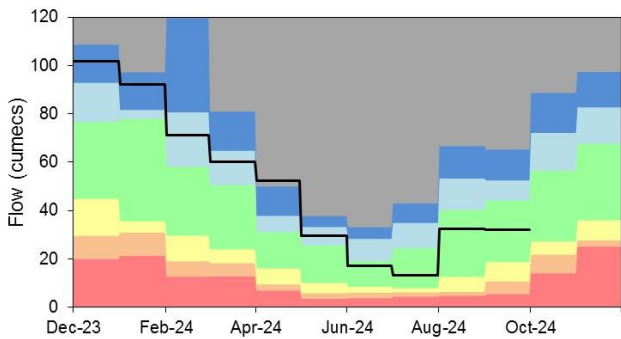
Bullgill, ELLEN

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



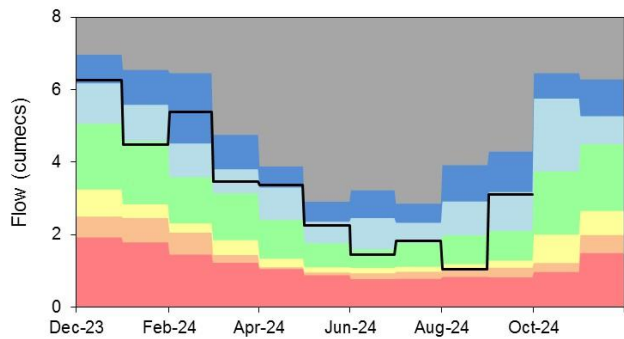
Caton, LUNE

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



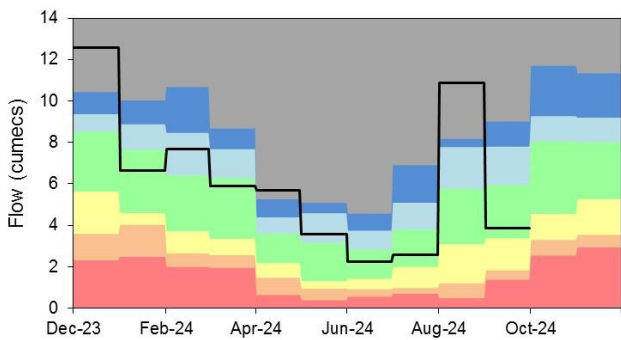
Causey Bridges, SANKEY

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



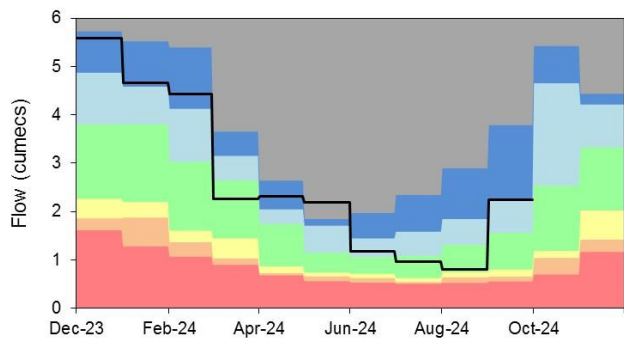
Crople How, ESK (NW)

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

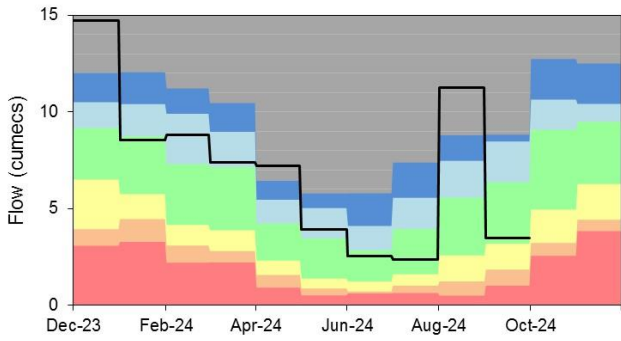


Croston, YARROW

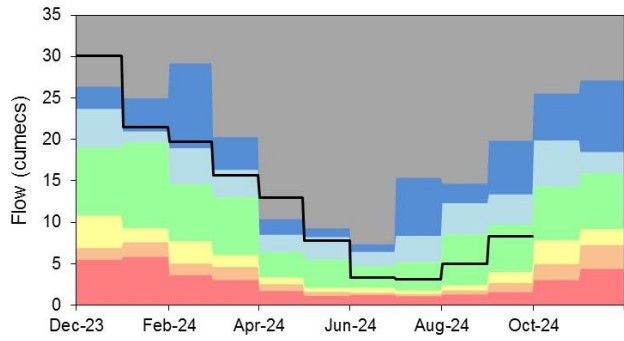
Ranking derived from data for the period Jan-1976 to Dec-2022



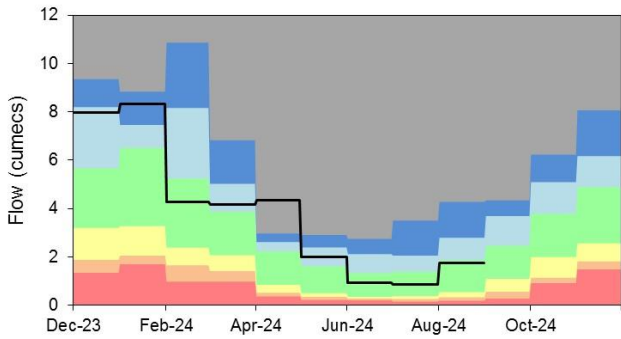
Duddon Hall, DUDDON
Ranking derived from data for the period Mar-1968 to Dec-2022



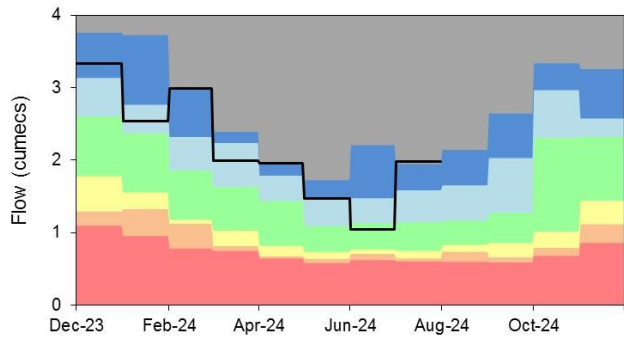
Hodder Place, HODDER
Ranking derived from data for the period Jan-1976 to Dec-2022



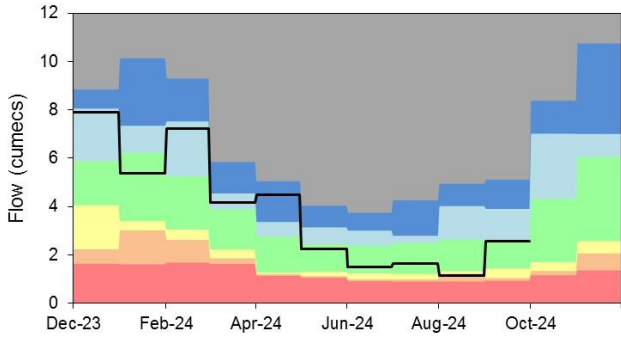
Kirkby Stephen, EDEN (NW)
Ranking derived from data for the period Oct-1971 to Dec-2022



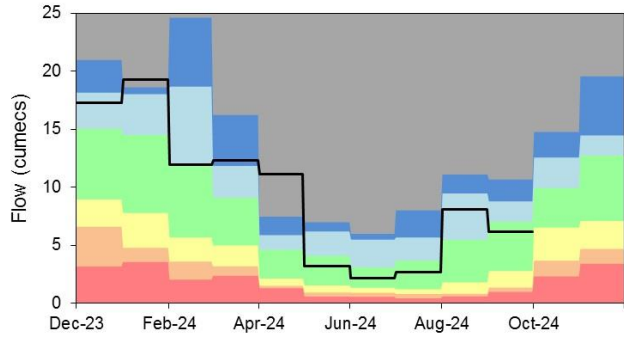
Kirkby, ALT
Ranking derived from data for the period Oct-1977 to Dec-2022



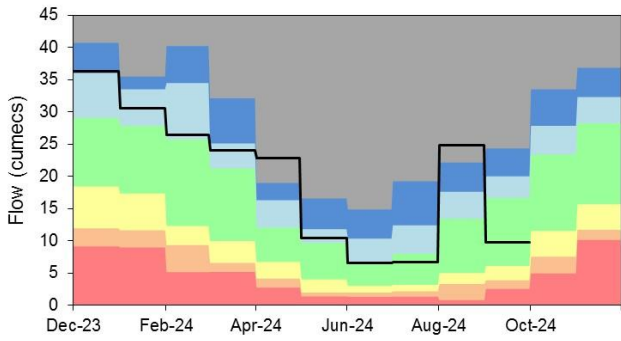
Little Woolden Hall Ultrasonic, GLAZE
Ranking derived from data for the period Jul-1995 to Dec-2022



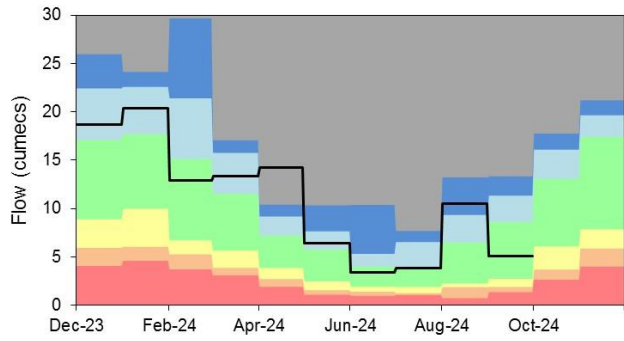
Lunes Bridge, LUNE
Ranking derived from data for the period Dec-1979 to Dec-2022



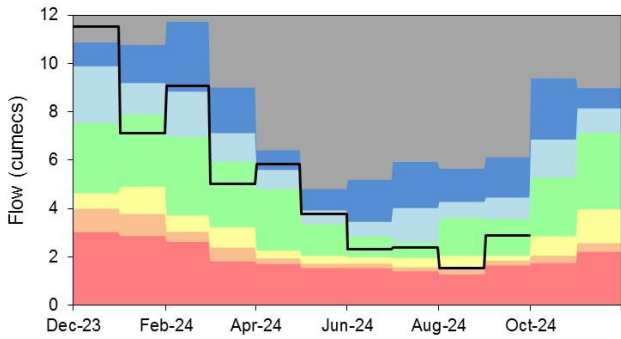
Newby Bridge FMS, LEVEN (NW)
Ranking derived from data for the period Jan-1972 to Dec-2022



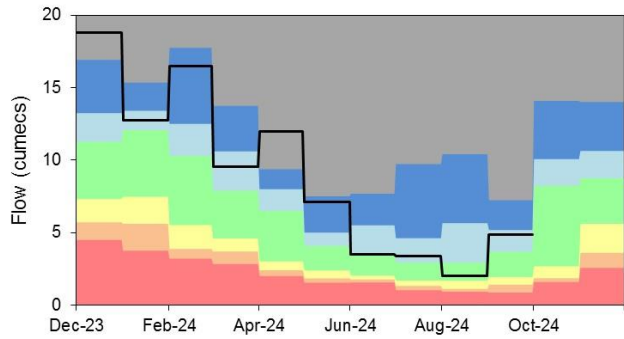
Pooley Bridge, EAMONT
Ranking derived from data for the period Jul-1970 to Dec-2022



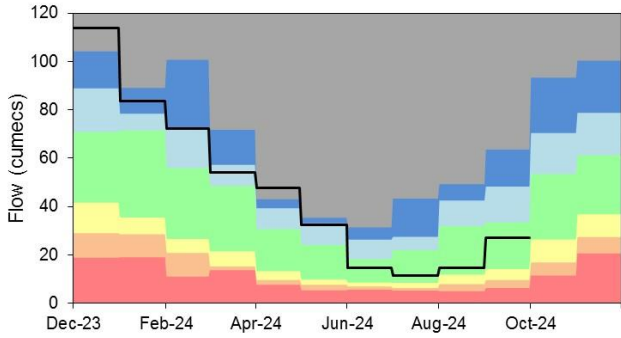
Portwood, TAME
Ranking derived from data for the period Jan-1976 to Dec-2022



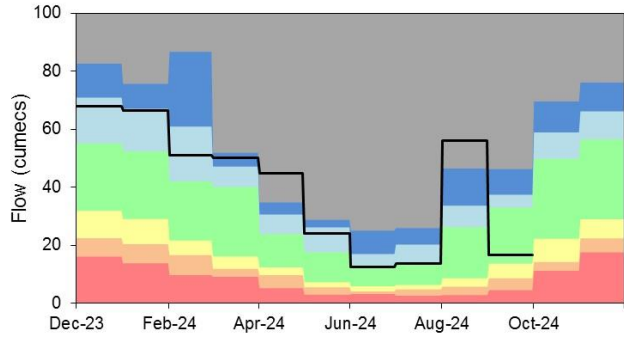
Rudheath, DANE
Ranking derived from data for the period Jan-1976 to Dec-2022



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

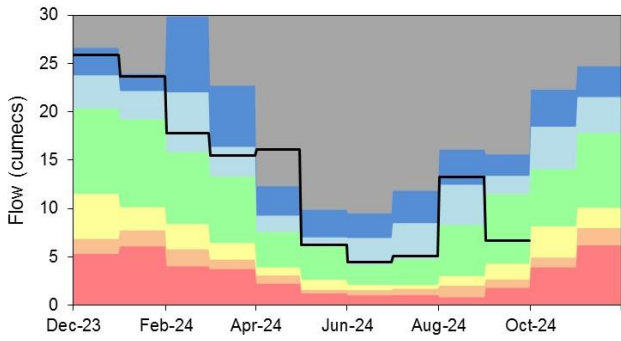


Seaton Mill, DERWENT (NW)
Ranking derived from data for the period Sep-1960 to Dec-2022



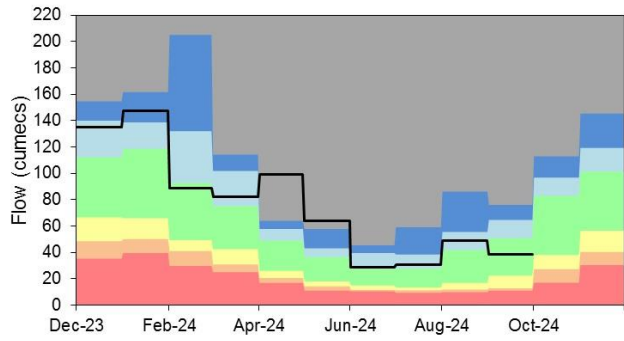
Sedgwick, KENT

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



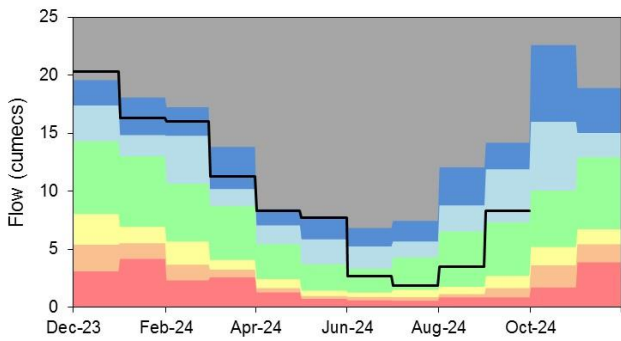
Sheepmount, EDEN (NW)

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

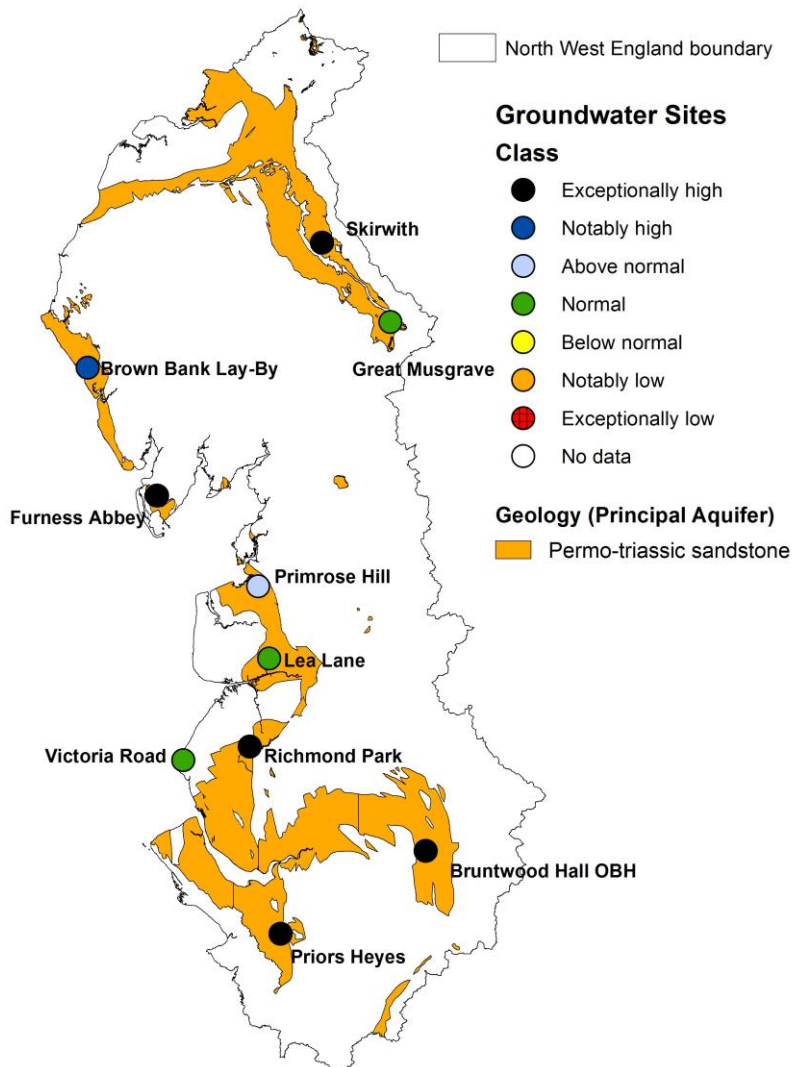


Source: Environment Agency.

5 Groundwater levels

5.1 Groundwater levels map

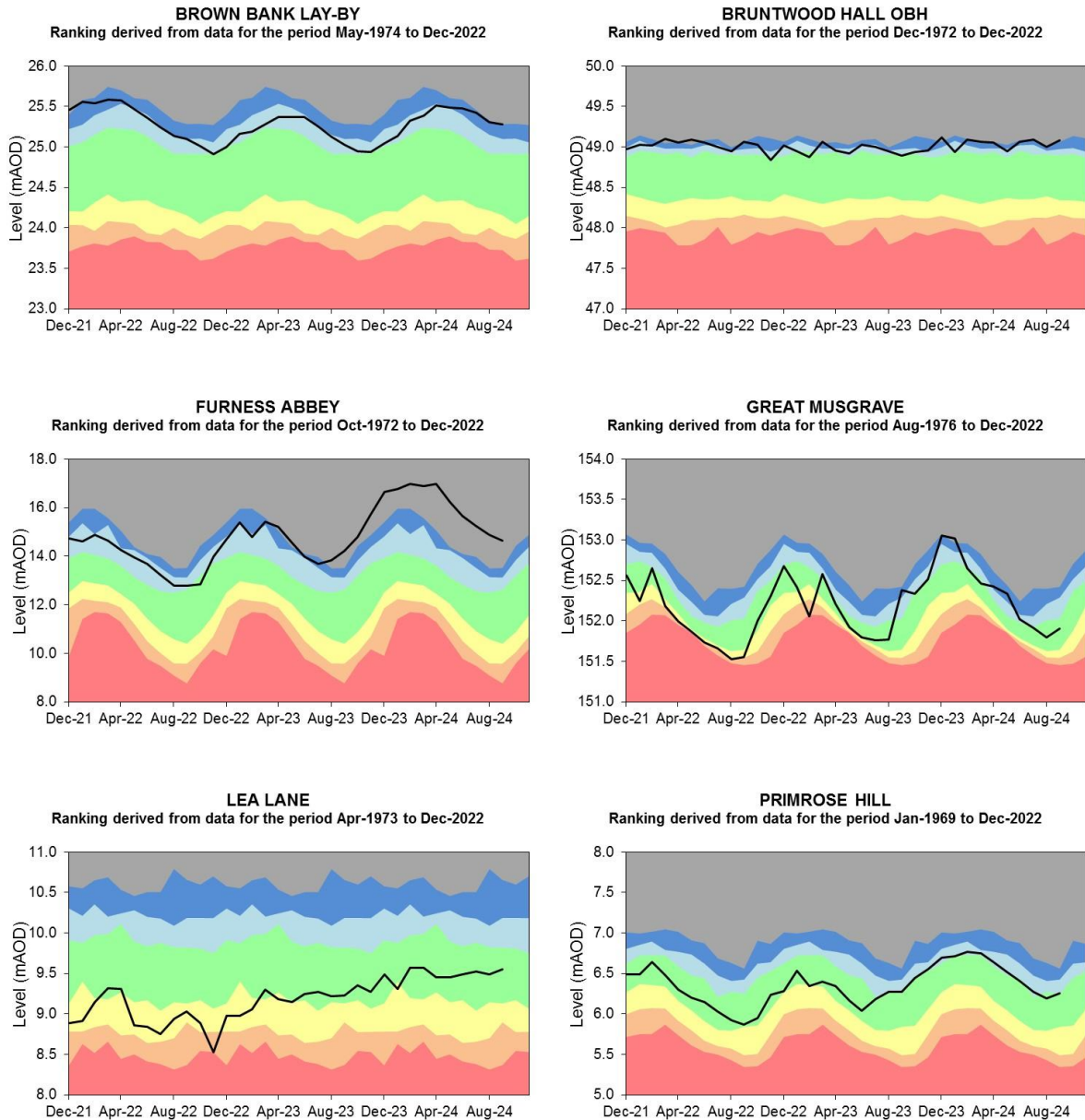
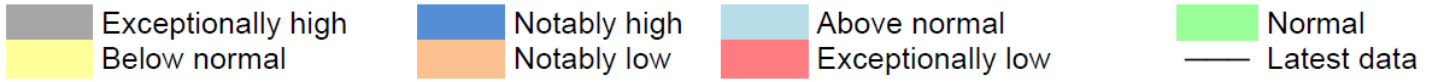
Figure 5.1: Groundwater levels for indicator sites at the end of September 2024, classed relative to an analysis of respective historic September levels. Table available in the appendices with detailed information. Please note Victoria Road Borehole sits within a superficial deposit as opposed to a bedrock aquifer. This is why the geology type is not marked on the map.



(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.

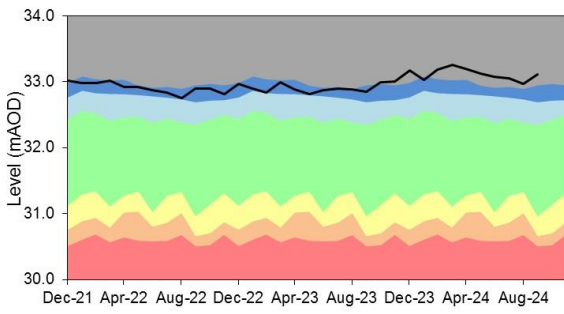
5.2 Groundwater level charts

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.



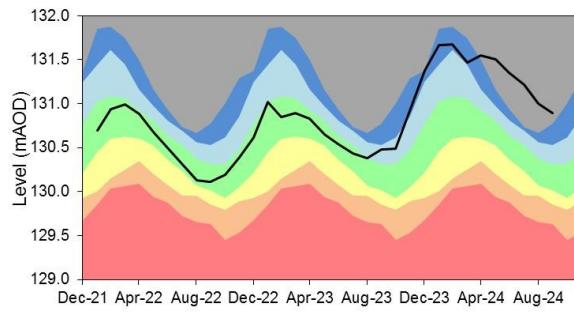
PRIORS HEYES

Ranking derived from data for the period Sep-1972 to Dec-2022



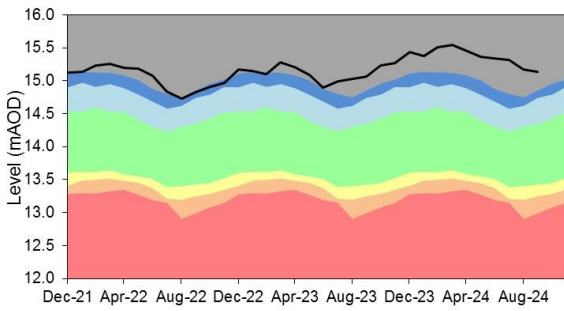
SKIRWITH

Ranking derived from data for the period Oct-1978 to Dec-2022



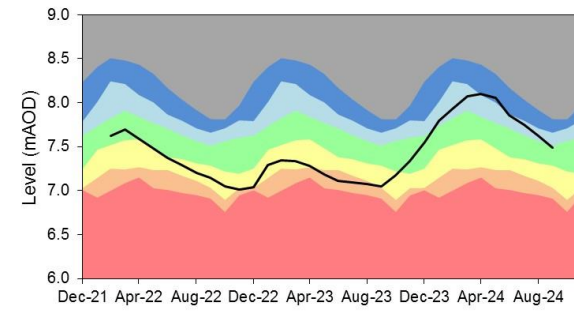
RICHMOND PARK

Ranking derived from data for the period Jun-1971 to Dec-2022



VICTORIA ROAD

Ranking derived from data for the period Jun-1999 to Dec-2022



Source: Environment Agency, 2024.

6 Reservoir storage

Figure 6.1: The location of reservoirs that comprise the supply districts across North-west England and selected individual reservoirs.

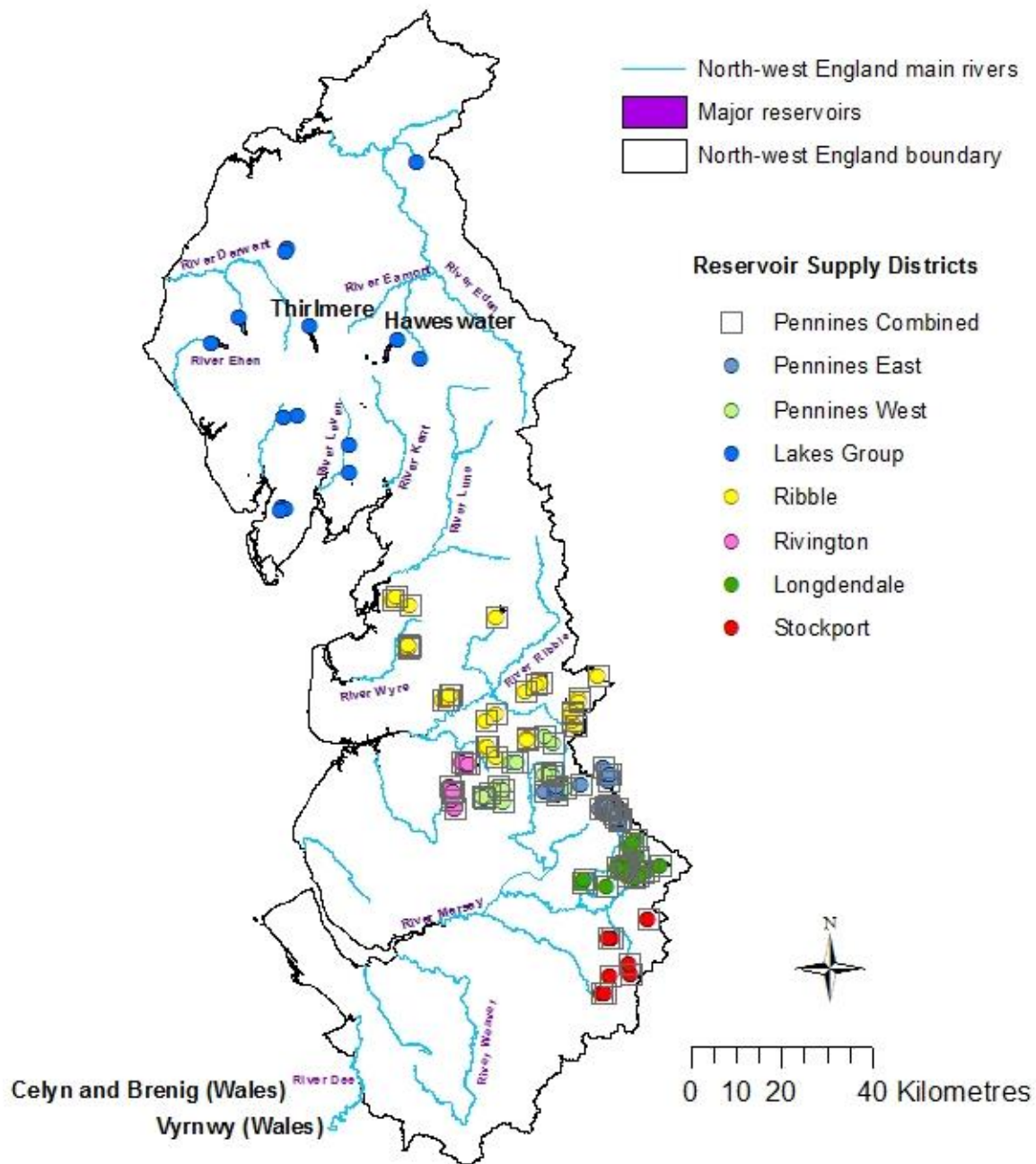
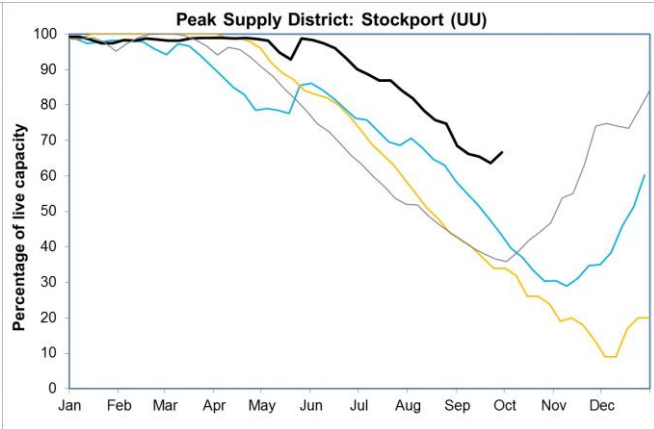
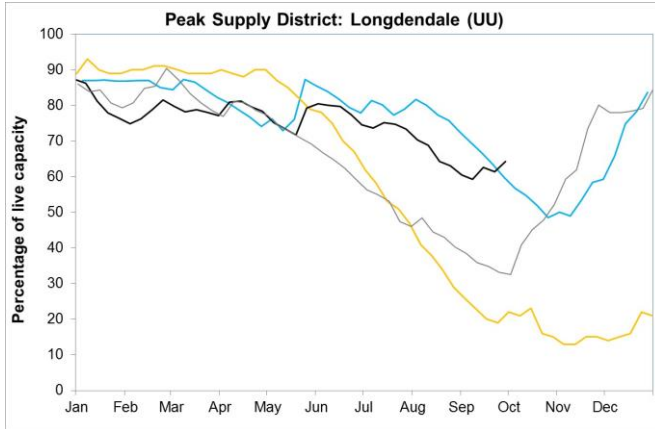
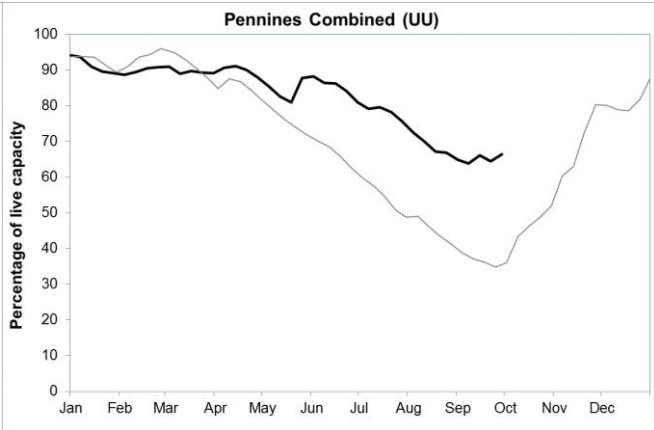
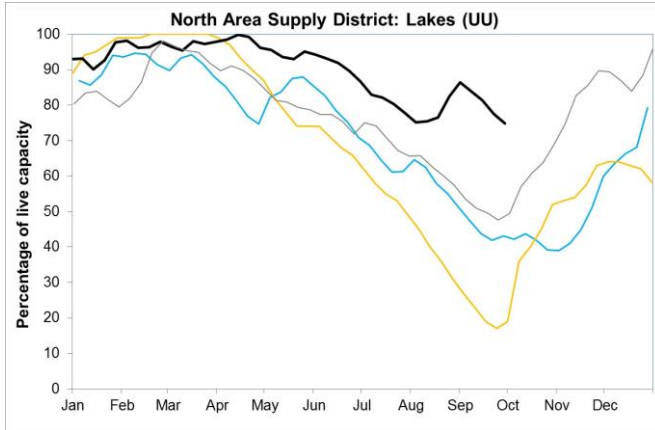
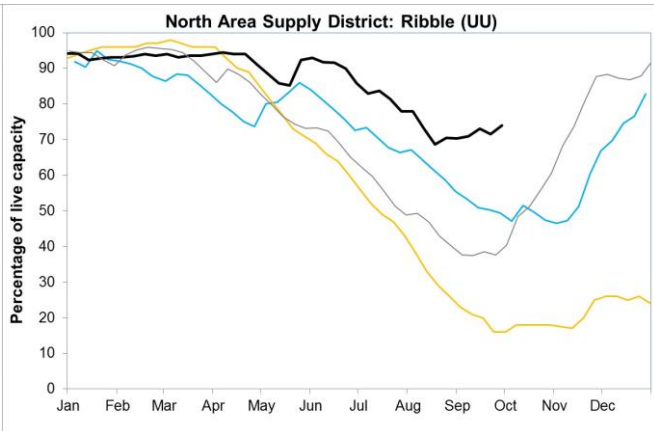
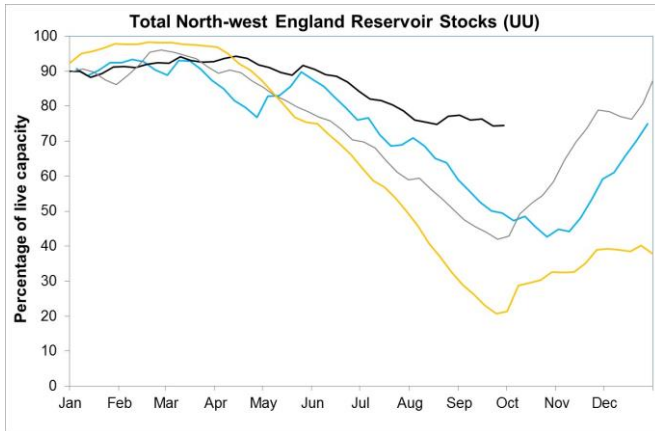
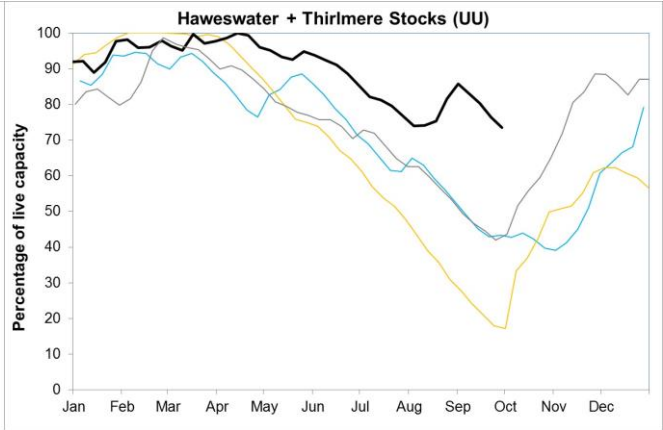
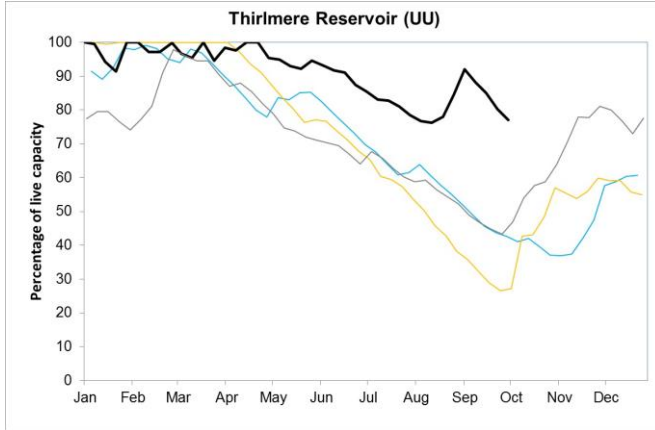
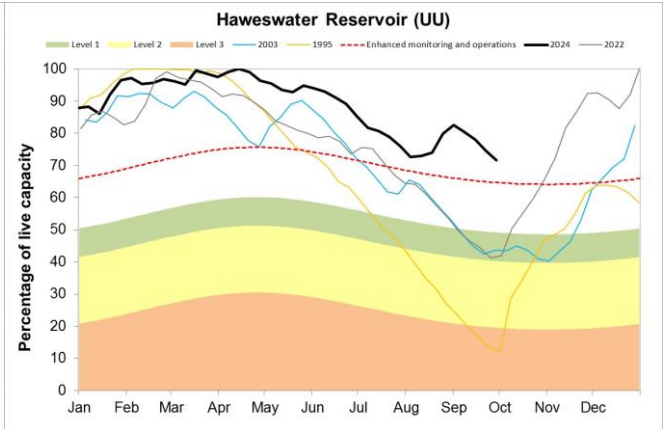
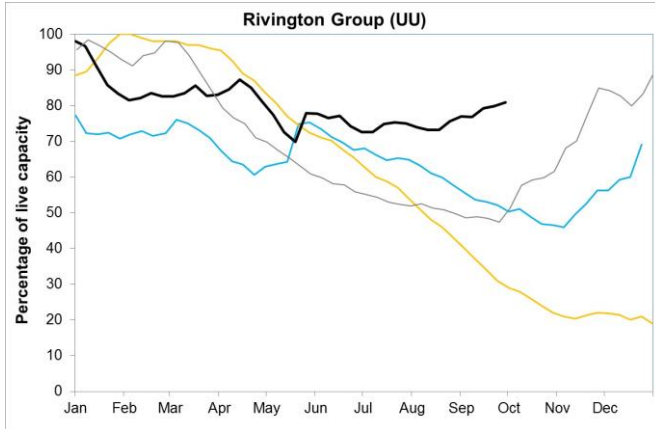
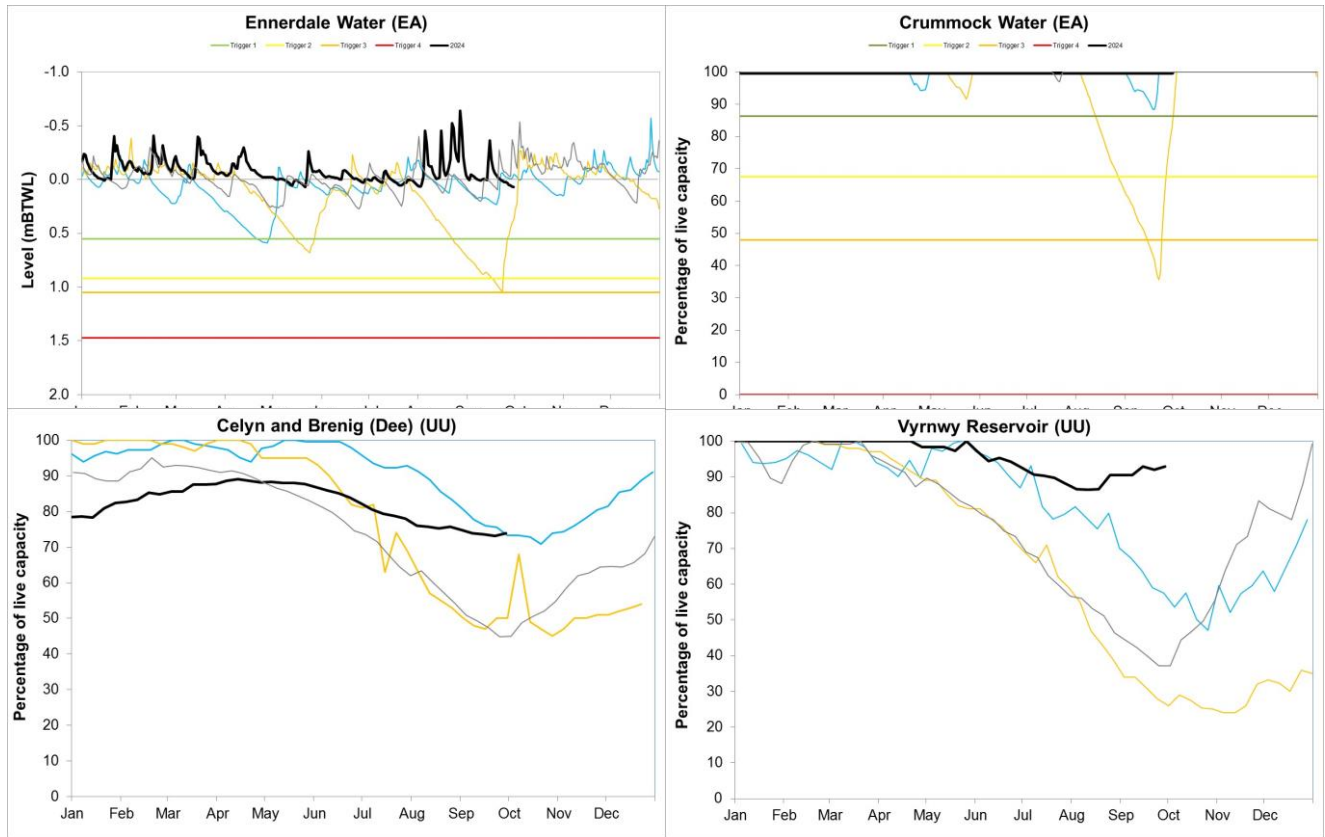


Figure 6.2: End of month reservoir storage for supply districts across North-west England and selected individual reservoirs for current year (2024) and representative years: 1995, 2003 and 2022. Note: Historic records of individual reservoirs and reservoir groups making up the regional values vary in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

— 1995
 — 2003
 — 2022
 — 2024







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	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
Cheshire Rivers Group	256	Exceptionally High	Notably high	Exceptionally high	Exceptionally high
Derwent (NW)	61	Below Normal	Notably high	Exceptionally high	Exceptionally high
Douglas	166	Notably High	Above normal	Notably high	Exceptionally high
Eden	82	Normal	Normal	Exceptionally high	Exceptionally high
Esk (Cumbria)	73	Normal	Notably high	Exceptionally high	Exceptionally high
Esk (Dumfries)	63	Normal	Above normal	Notably high	Exceptionally high
Kent	88	Normal	Above normal	Exceptionally high	Exceptionally high
Mersey And Irwell	162	Notably High	Normal	Above normal	Exceptionally high
Ribble	118	Above Normal	Normal	Above normal	Exceptionally high

Wyre And Lune	114	Above Normal	Normal	Notably high	Exceptionally high
North West	113	Normal	Above normal	Exceptionally high	Exceptionally high

8.2 River flows table

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

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

8.3 Groundwater table

Site name	Aquifer	End of Sep 2024 band	End of Aug 2024 band
Brown Bank Lay-by	West Cumbria Permo-triassic Sandstone	Notably high	Notably high
Bruntwood Hall Obh	East Cheshire Permo-triassic Sandstone	Exceptionally high	Exceptionally high
Furness Abbey	Furness Permo-triassic Sandstone	Exceptionally high	Exceptionally high
Great Musgrave	Eden Valley And Carlisle Basin Permo-triassic Sandstone	Normal	Normal
Lea Lane	Fylde Permo-triassic Sandstone	Normal	Normal
Priors Heyes	West Cheshire Permo-triassic Sandstone	Exceptionally high	Exceptionally high
Primrose Hill	Fylde Permo-triassic Sandstone	Above normal	Normal
Richmond Park	Rufford Permo-triassic Sandstone	Exceptionally high	Exceptionally high

Skirwith	Eden Valley And Carlisle Basin Permo-triassic Sandstone	Exceptionally high	Exceptionally high
Victoria Road Entrance	West Lancashire Quarternary Sand And Gravel Superficial Deposits	Normal	Above normal