

# Monthly water situation report: North-west England

## 1 Summary – May 2024

### 1.1 Rainfall

There were notable spells of heavy rainfall across north-west England throughout May with a few drier periods in-between. The heaviest rainfall was recorded on the 22 May where the Burnbanks rainfall site observed 102% of its long term average (LTA) for May in 24 hours.

Rainfall across north-west England as a whole was classed as notably high for May with 164% of the LTA. The Cumbria and Lancashire (CLA) area observed 172% of the LTA while the Greater Manchester, Merseyside and Cheshire (GMC) area observed 164% of the LTA, both classed as notably high.

Hydrological areas across north-west England recorded rainfall classed between above normal and exceptionally high. Eden and Ribble were classed as exceptionally high, Esk (Cumbria), Esk (Dumfries) and Kent were classed as above normal, and all other hydrological areas were classed as notably high. The highest rainfall (in terms of the LTA) was observed in Eden with 193% of the LTA making it the fourth wettest May since 1871. The lowest rainfall (in terms of the LTA) was in Esk (Dumfries) with 139% of the LTA for May.

Despite May having less extreme total rainfall than in the preceding 2 months, north-west England still recorded the second wettest 3 months of rainfall ending in May since 1871. This is the case for both GMC and CLA areas. Exceptionally high rainfall in the last 3 months was also observed in all the hydrological areas apart from Esk (Dumfries).

This trend continues in both the 6 and 12 month rainfall distributions with all the hydrological areas with exception of Esk (Dumfries) showing exceptionally high rainfall. Esk (Dumfries) has seen notably high rainfall for the last 6 months and above normal rainfall for the last 12 months. The last 6 and 12 months of rainfall were the wettest ending in May since 1871 for the whole of north-west England including both GMC and CLA areas. All Hydrological areas across the north-west England recorded the wettest last 6 month period of rainfall since 1871 apart from Esk (Dumfries), Eden and Derwent as well as their wettest last 12 month period of rainfall since 1871 with the exception of Esk (Dumfries).

## 1.2 Soil moisture deficit and recharge

Soil moisture deficits across north-west England (SMD) had decreased by the end of May when compared with the end of April. This is in response to drier weather at the end of April and the heavy rainfall in the latter half of May resulting in levels falling between 0 and 14mm with the majority of SMDs recorded being 0mm. All recorded SMDs were lower than expected for the time of year.

## 1.3 River flows

Monthly mean river flows across north-west England during May were classed between normal and exceptionally high, mostly decreasing in terms of LTA when compared with flow values recorded during April. Out of the 25 sites 3 were classed as exceptionally high, 6 as notably high, 14 as above normal and 2 as normal.

In response to the heavy rainfall, the highest mean river flow (in terms of the LTA) was observed in Eden with 229% of the LTA and classed as exceptionally high. The lowest mean river flow was in the Lune with 102% of the LTA.

## 1.4 Groundwater levels

Groundwater levels across the north-west England were classed between exceptionally high and normal at the end of May. The groundwater levels at Priors Heyes, Richmond Park and Skirwith remained at the same classification with exceptionally high. They also recorded the highest levels we have on record for the end of May. All other sites recorded as follows:

- Brown Bank Lay-By was classed as notably high increasing from above normal
- Bruntwood Hall classed as above normal decreasing from notably high
- Lea Lane remained at the same classification 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

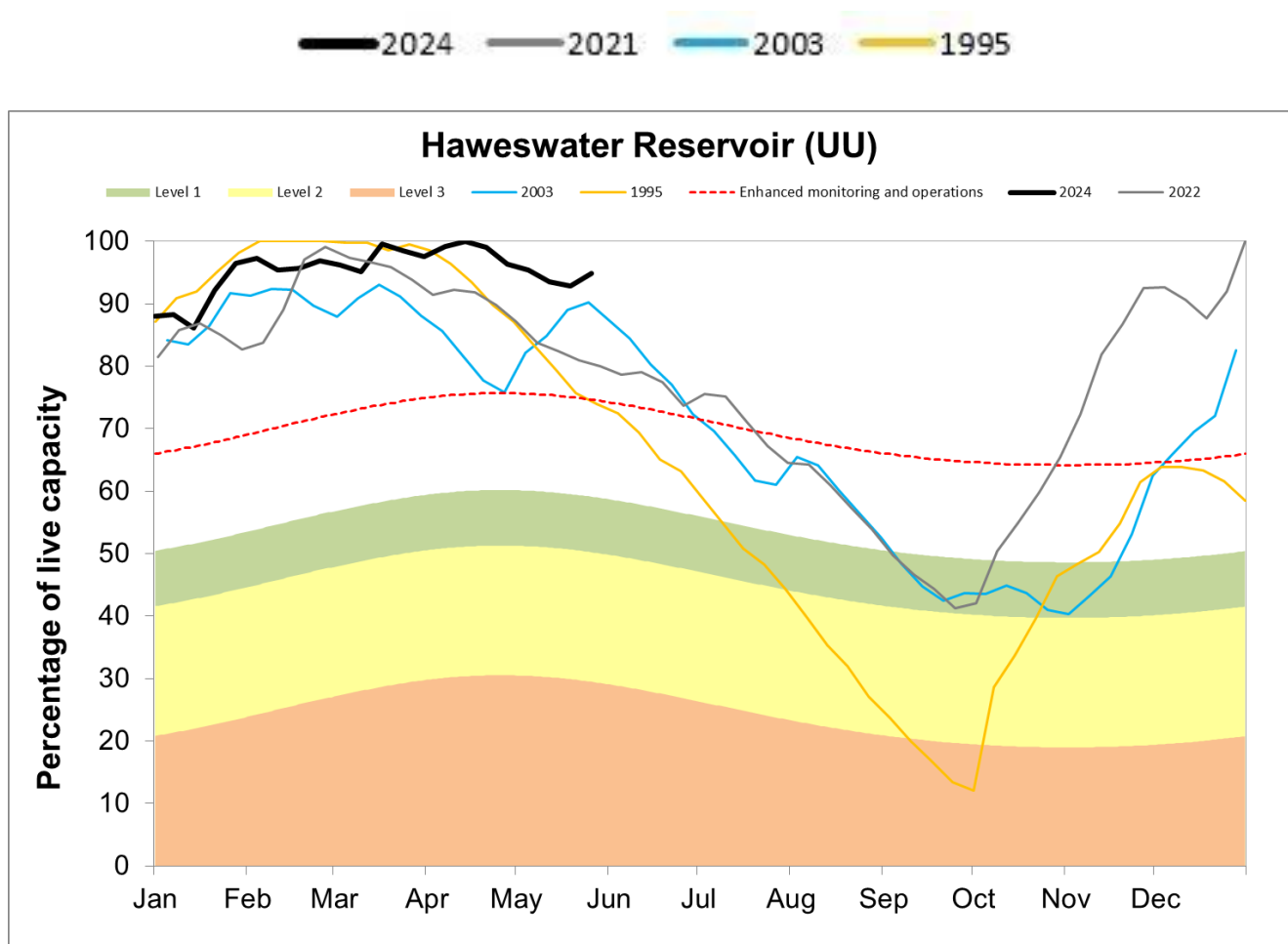
Total reservoir storage for north-west England fell slightly during the first half of May then increased in response to the heavy rainfall resulting in the same 92% storage as at the end of March. This is higher than the average of 86% total storage for the time of year and also higher than the storage of 85% seen at the end of May last year.

At the end of May, the reservoirs with the highest storage (in terms of percentage) were at Crummock Water, Ennerdale Water and Vyrnwy which were all 100% full. The lowest storage was at Rivington Group with 78%. The combined storage at Haweswater and Thirlmere was

95% which is higher than the average storage of 78% at this time of year and also higher than the storage of 82% seen at the end of May last year.

There were a number of reservoirs kept low for maintenance works including Audenshaw No.1, Torside, Woodhead, Anglezarke, High Bullough, Dingle, Jumbles, Harlock, Kitcliffe, Llyn Celyn, Ogden Lower, Ogden Upper, Alston No.2, Ridegate and Cragg.

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)).



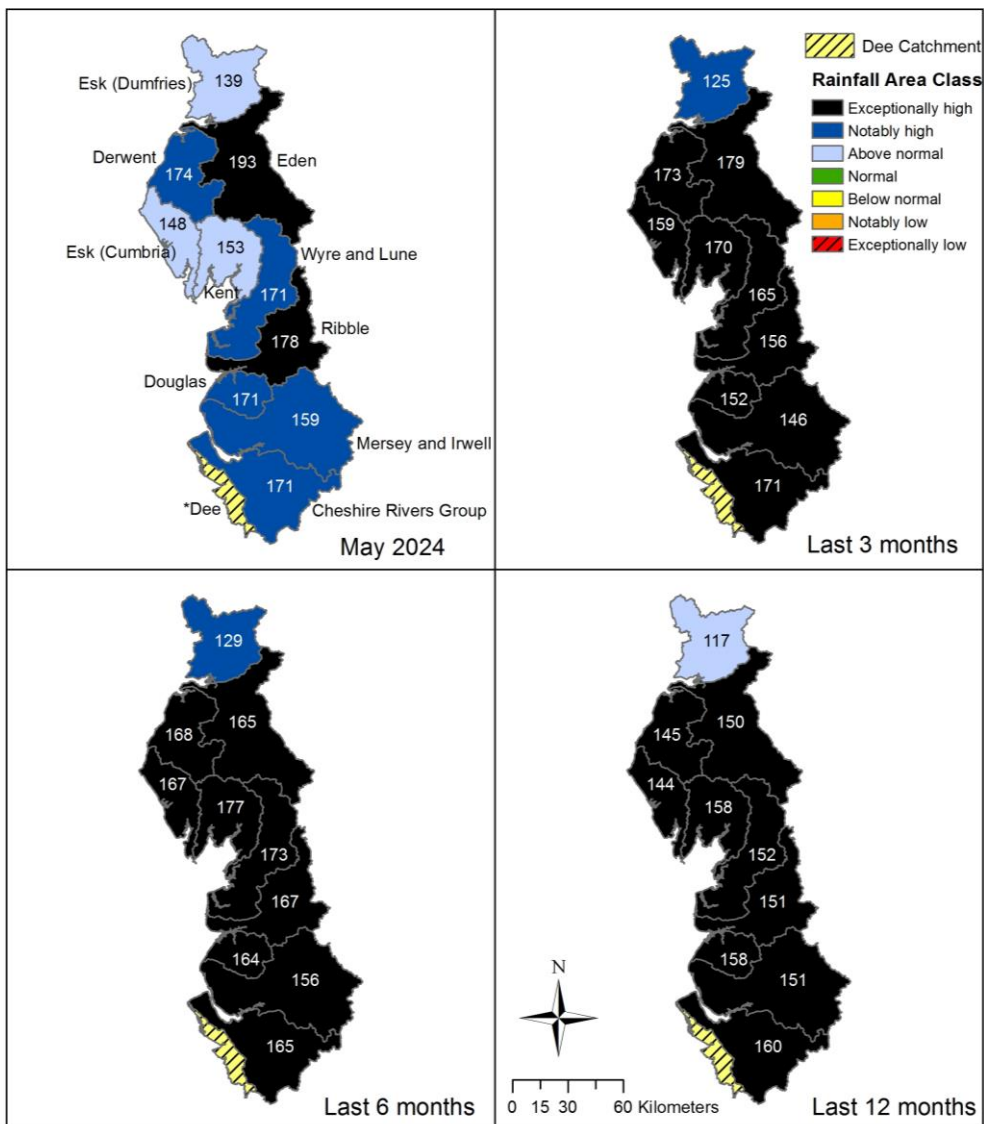
Author: Greater Manchester, Merseyside and Cheshire Hydrology Team,  
[hydrology.GMMYCH@environment-agency.gov.uk](mailto:hydrology.GMMYCH@environment-agency.gov.uk)

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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 May 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.



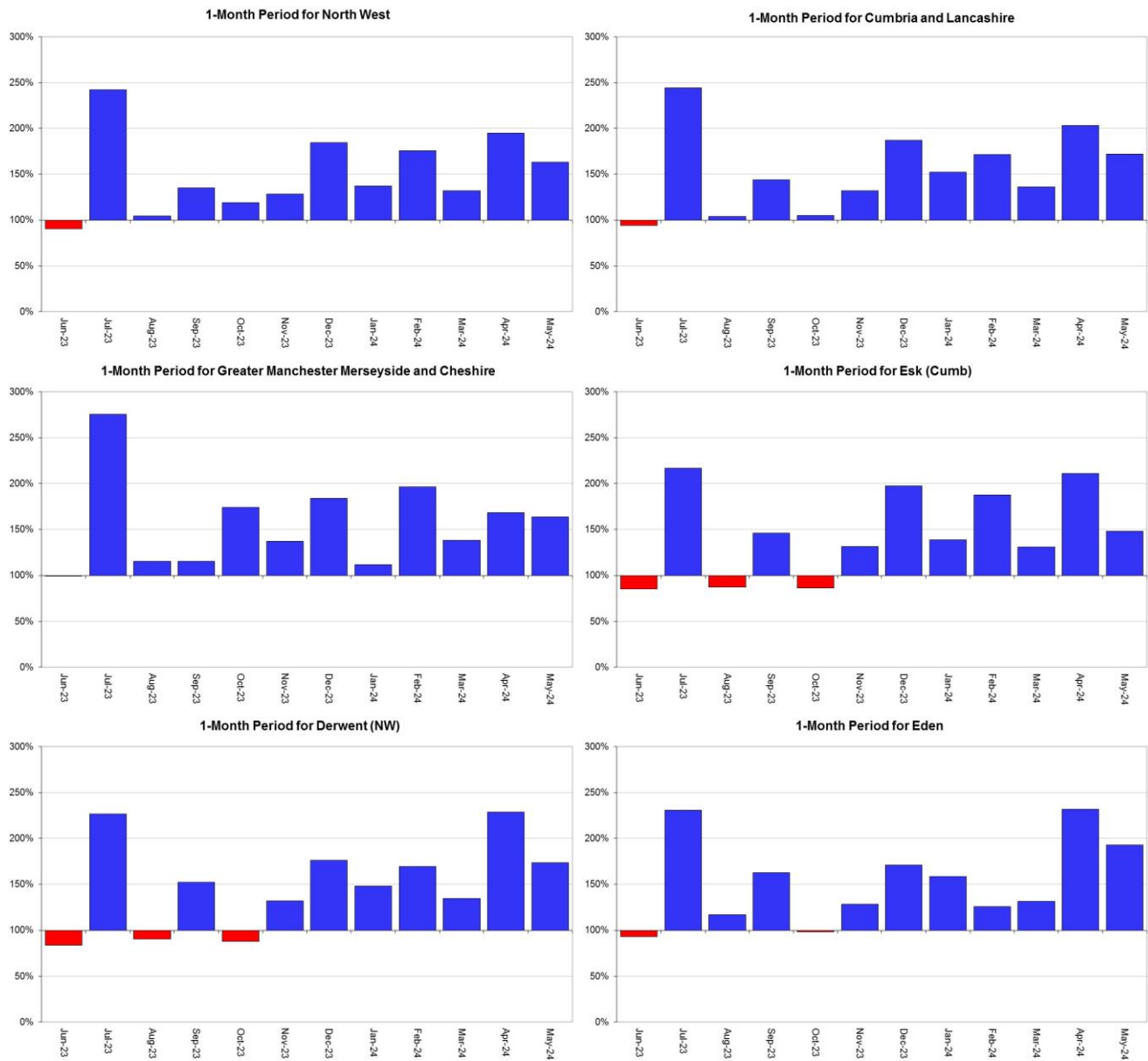
Rainfall data for 2024, extracted from Environment Agency 1km gridded rainfall dataset derived from Environment Agency intensity rain gauges. (Source: Environment Agency. Crown Copyright, 100024198, 2024). Rainfall data prior to 2023, extracted from Met Office HadUK 1km gridded rainfall dataset derived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

## 2.2 Rainfall charts

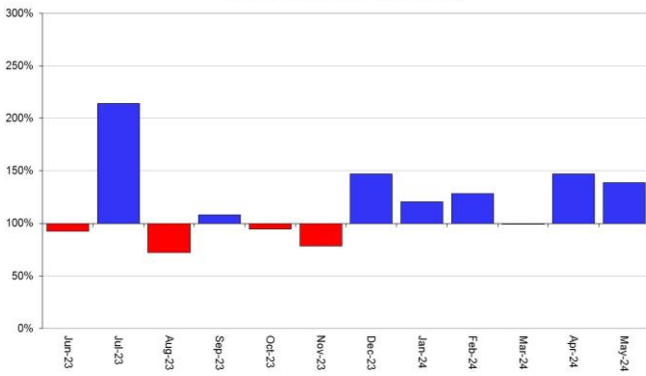
Figure 2.2: Monthly rainfall totals for the past 12 months expressed as a percentage of the 1961 to 1990 long term average for North-west England and its hydrological areas.

■ Above average rainfall

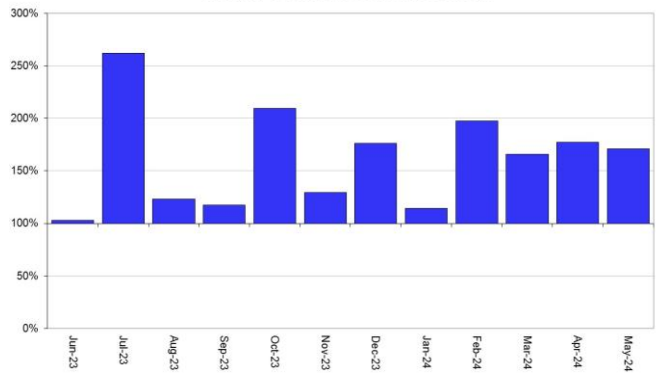
■ Below average rainfall



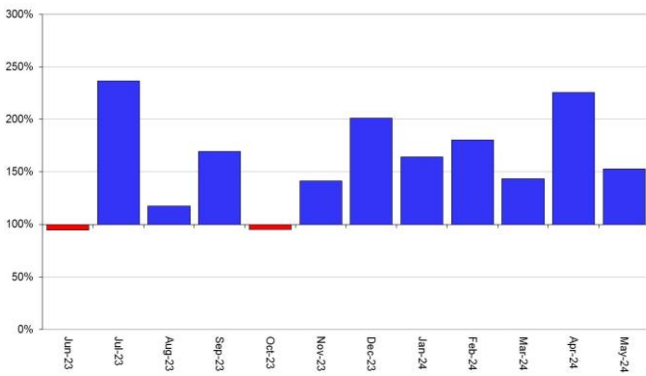
1-Month Period for Esk (Dumfries)



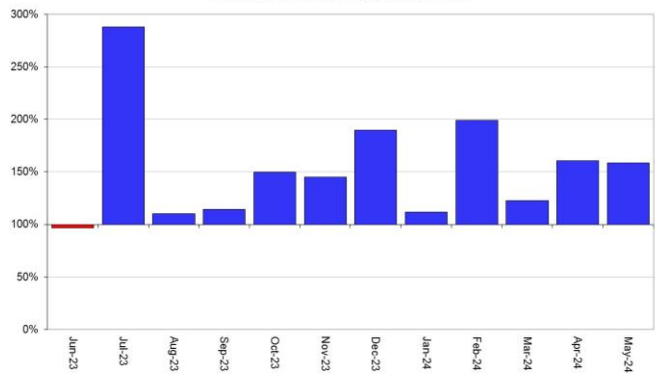
1-Month Period for Cheshire Rivers Group



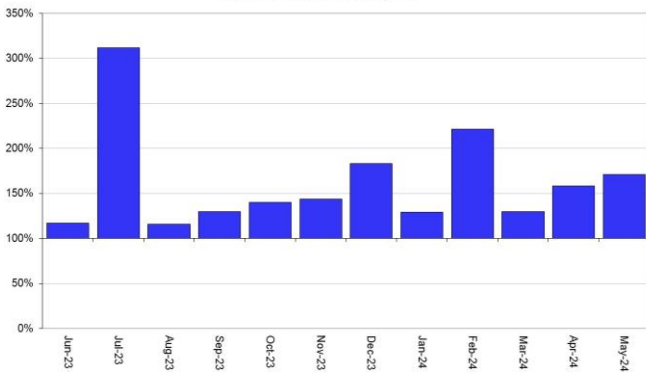
1-Month Period for Kent



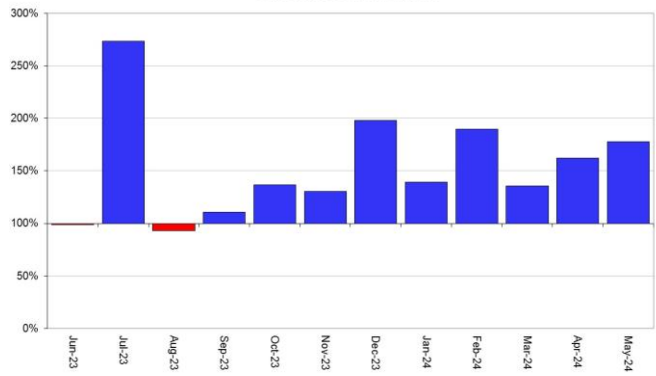
1-Month Period for Mersey and Irwell

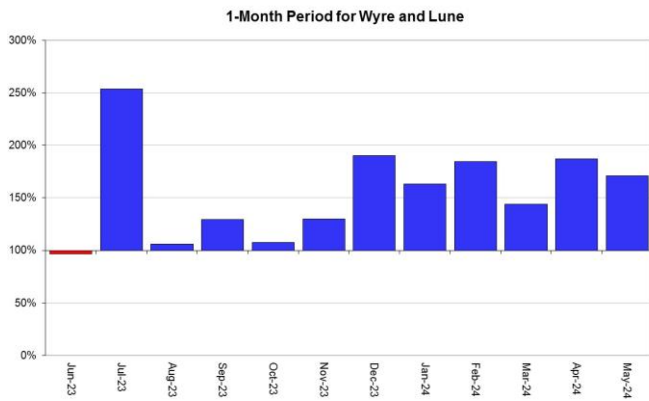


1-Month Period for Douglas



1-Month Period for Ribble



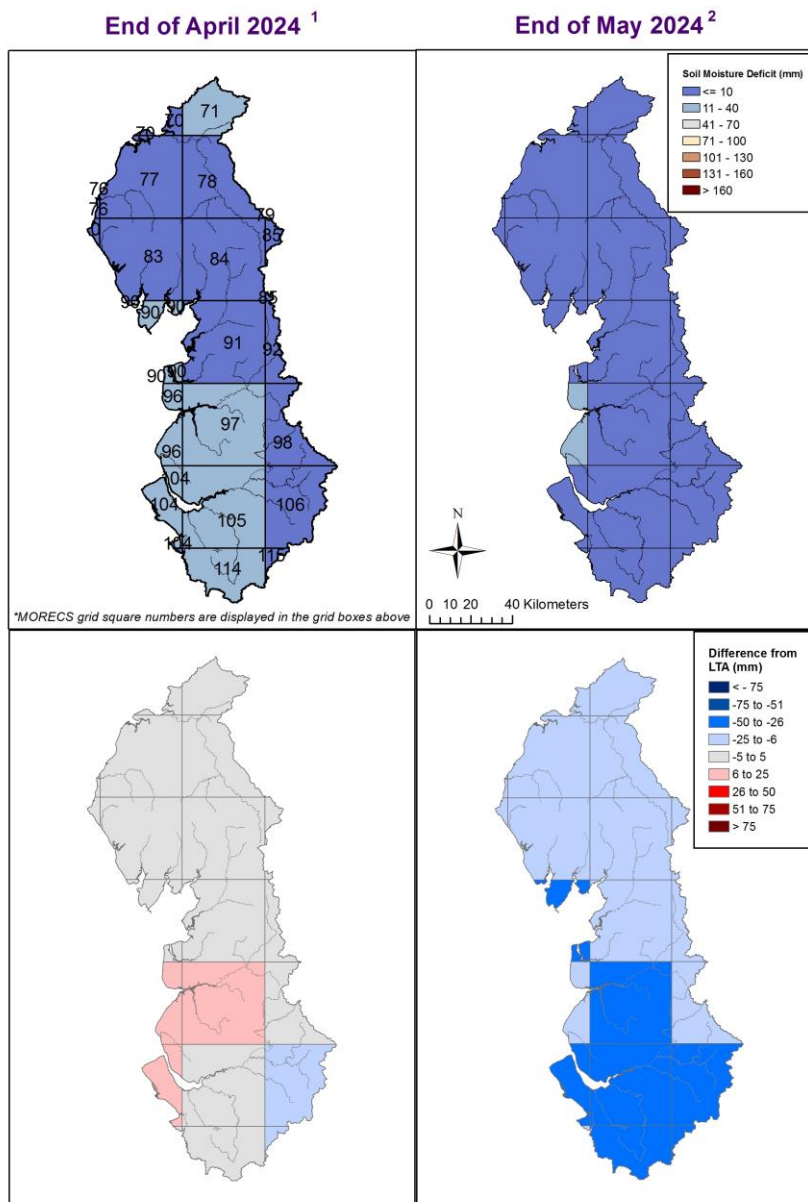


Rainfall data for 2024, extracted from Environment Agency 1km gridded rainfall dataset derived from Environment Agency intensity rain gauges. (Source: Environment Agency. Crown Copyright, 100024198, 2024). Rainfall data prior to 2023, extracted from Met Office HadUK 1km gridded rainfall dataset derived 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 2 May 2024<sup>1</sup> (left panel) and 30 May 2024<sup>2</sup> (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.



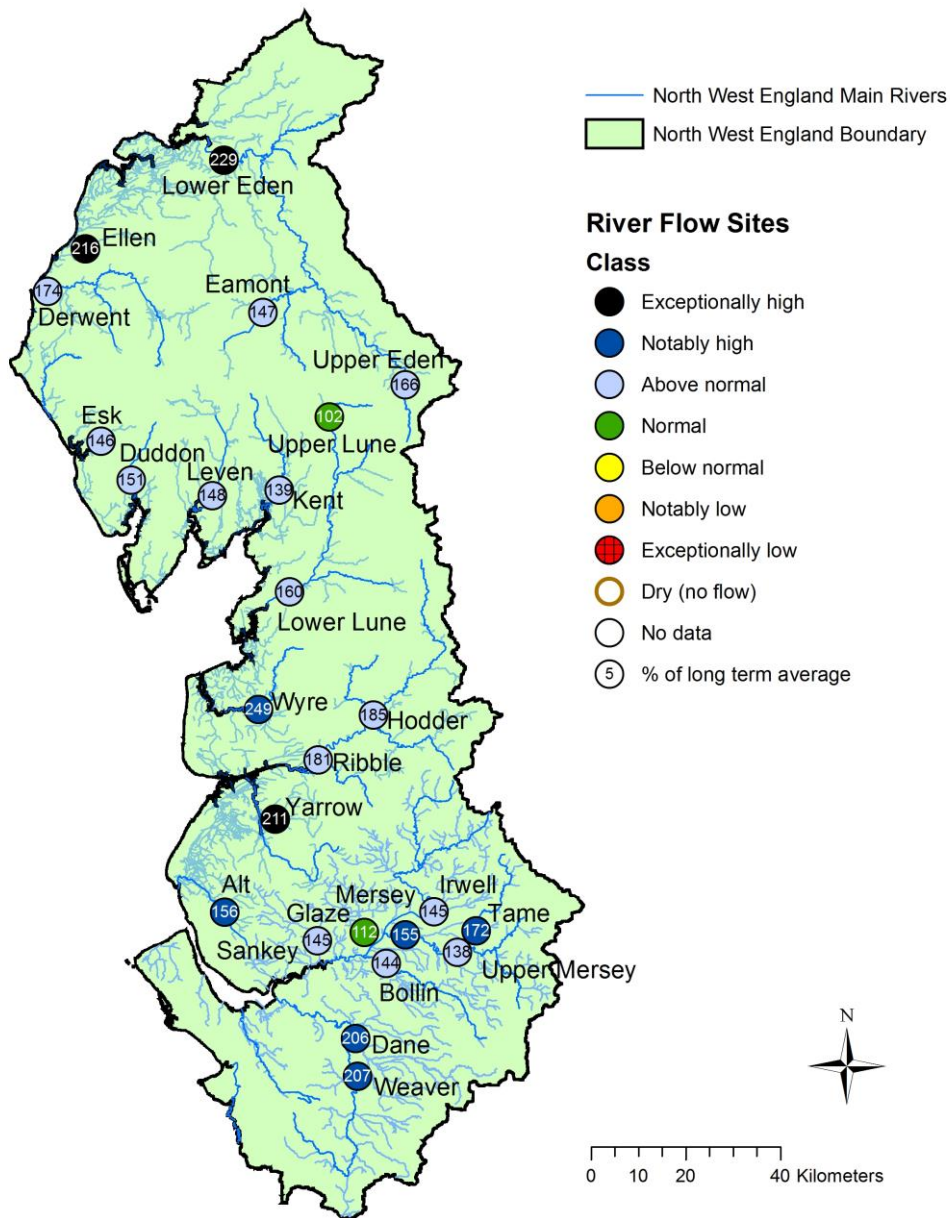
(Source: Met Office. Crown copyright, 2024). All rights reserved. Environment Agency, 100024198, 2024.



# 4 River flows

## 4.1 River flows map

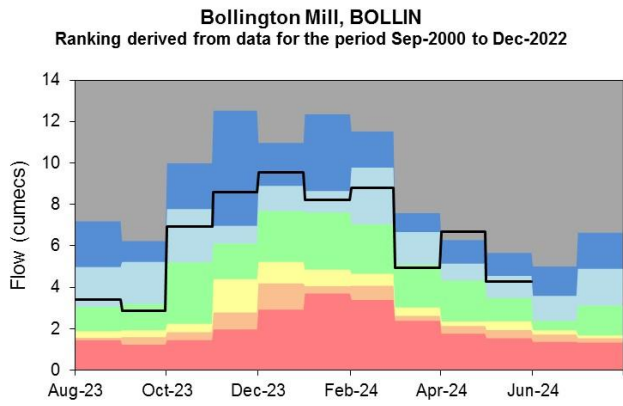
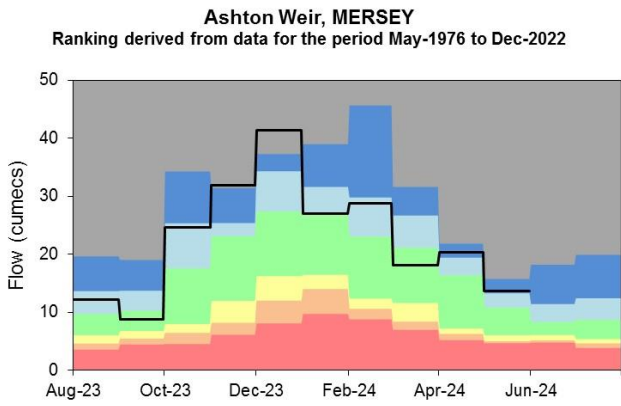
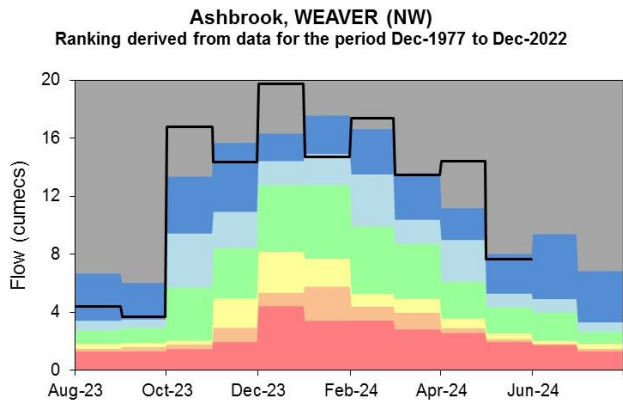
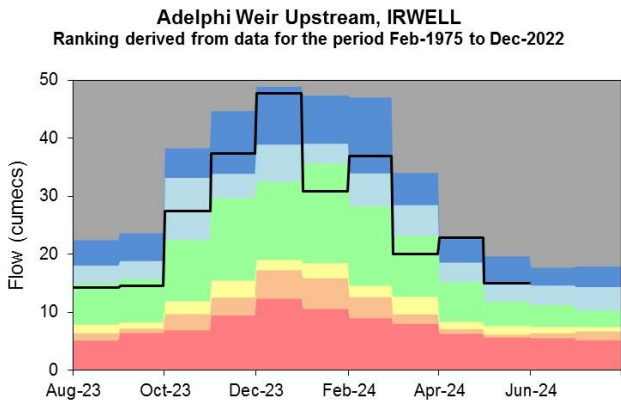
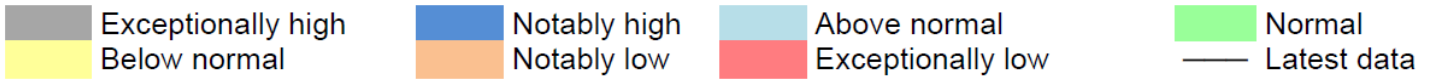
Figure 4.1: Monthly mean river flow for indicator sites for May 2024, expressed as a percentage of the respective long term average and classed relative to an analysis of historic May monthly means. Table available in the appendices with detailed information.



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

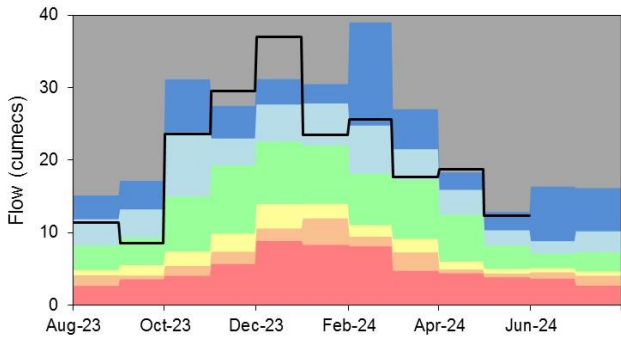
## 4.2 River flow charts

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



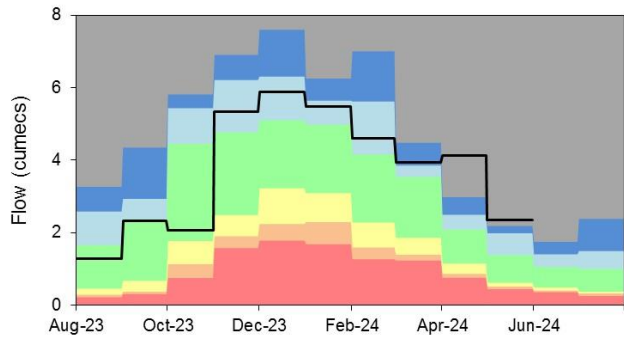
**Brinksway, MERSEY**

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



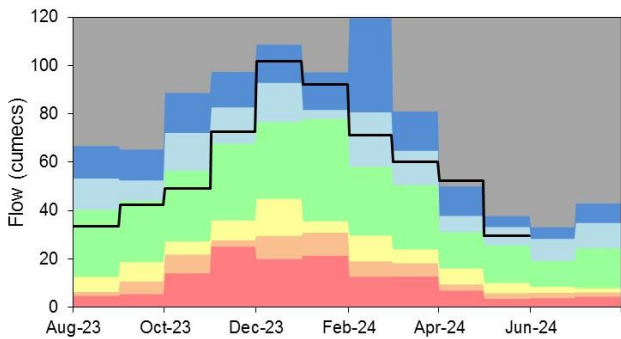
**Bullgill, ELLEN**

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



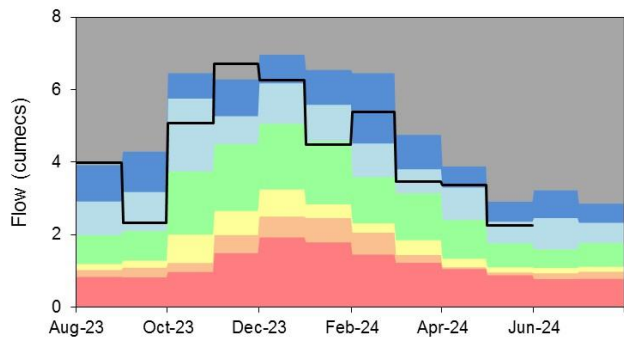
**Caton, LUNE**

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



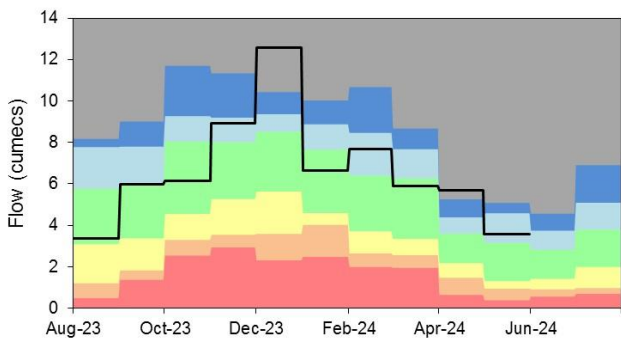
**Causey Bridges, SANKEY**

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



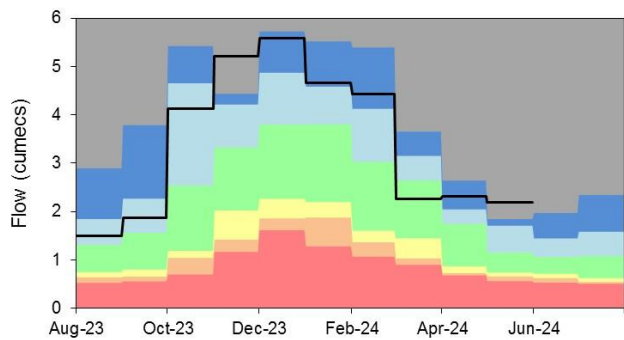
**Crople How, ESK (NW)**

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

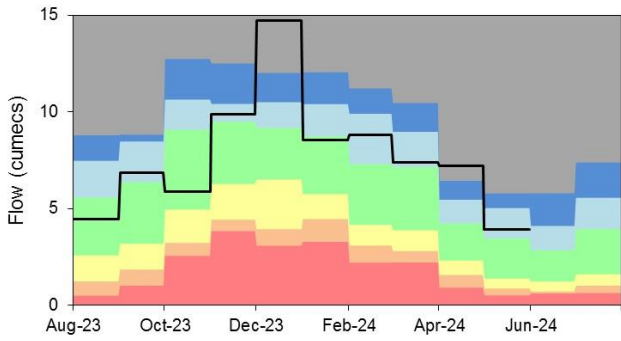


**Croston, YARROW**

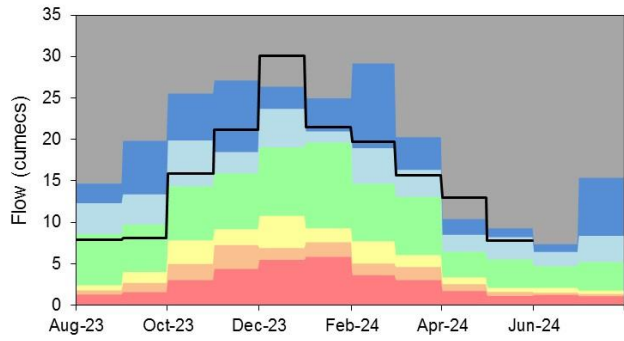
Ranking derived from data for the period Jan-1976 to Dec-2022



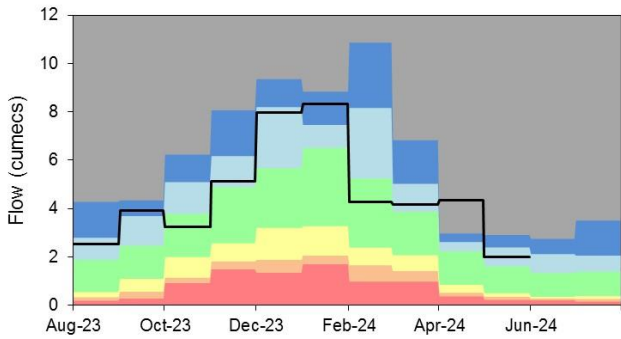
**Duddon Hall, DUDDON**  
Ranking derived from data for the period Mar-1968 to Dec-2022



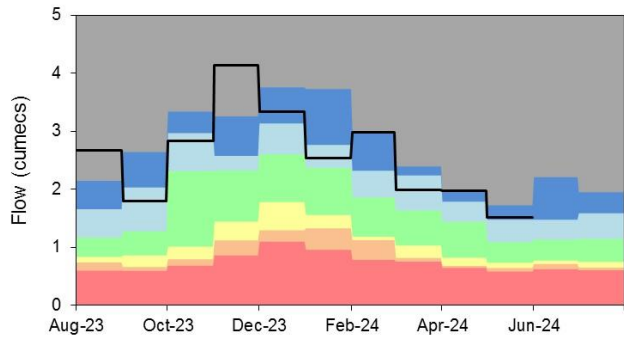
**Hodder Place, HODDER**  
Ranking derived from data for the period Jan-1976 to Dec-2022



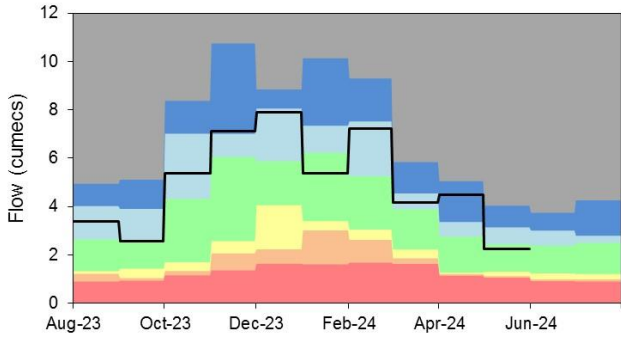
**Kirkby Stephen, EDEN (NW)**  
Ranking derived from data for the period Oct-1971 to Dec-2022



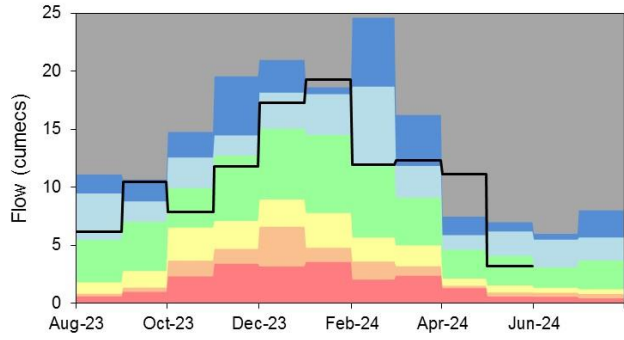
**Kirkby, ALT**  
Ranking derived from data for the period Oct-1977 to Dec-2022



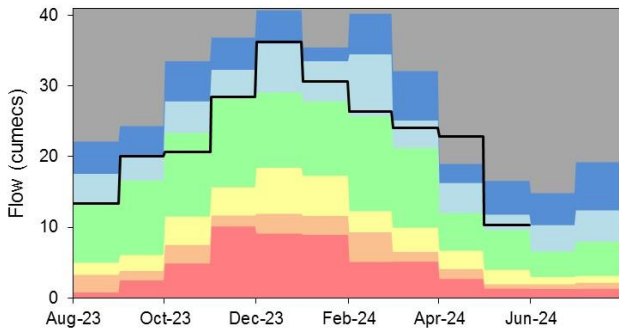
**Little Woolden Hall Ultrasonic, GLAZE**  
Ranking derived from data for the period Jul-1995 to Dec-2022



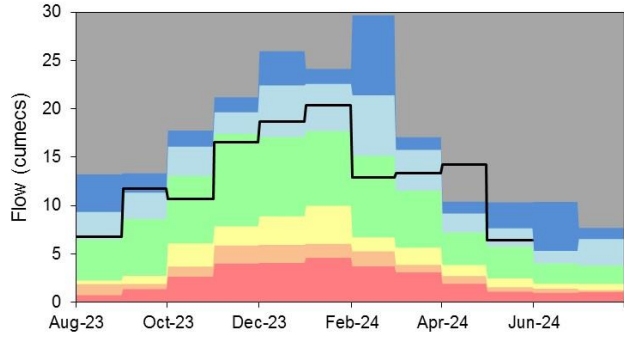
**Lunes Bridge, LUNE**  
Ranking derived from data for the period Dec-1979 to Dec-2022



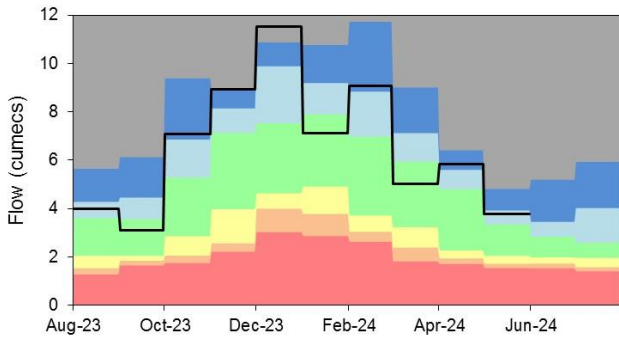
**Newby Bridge FMS, LEVEN (NW)**  
Ranking derived from data for the period Jan-1972 to Dec-2022



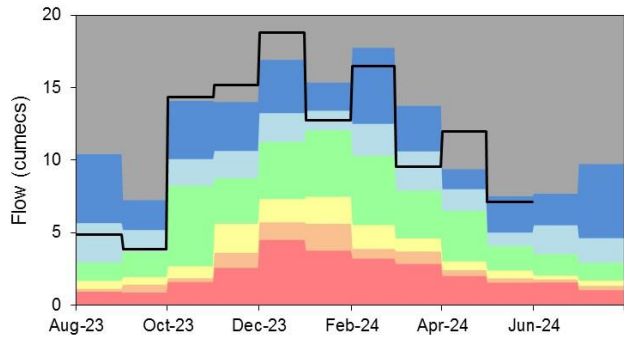
**Pooley Bridge, EAMONT**  
Ranking derived from data for the period Jul-1970 to Dec-2022



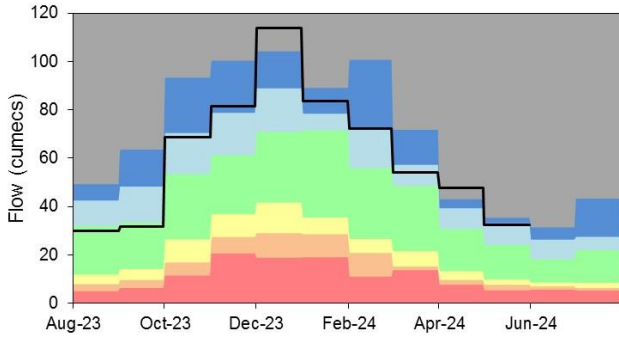
**Portwood, TAME**  
Ranking derived from data for the period Jan-1976 to Dec-2022



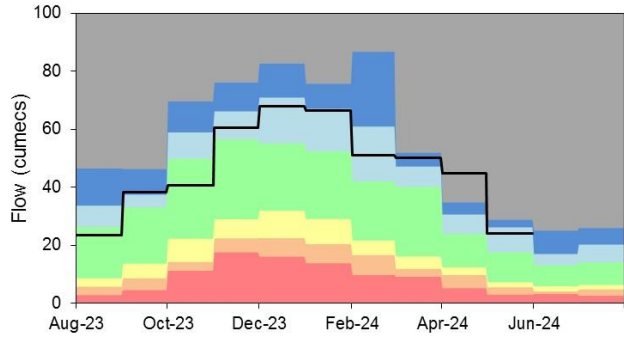
**Rudheath, DANE**  
Ranking derived from data for the period Jan-1976 to Dec-2022



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

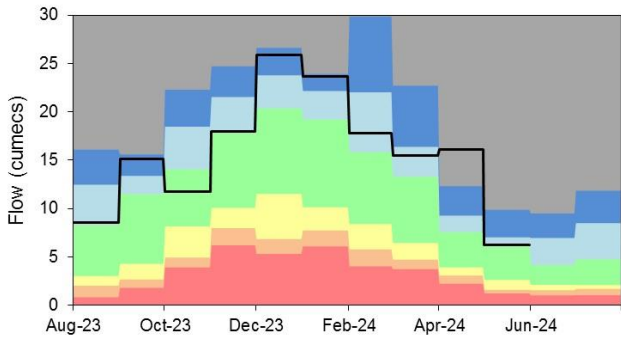


**Seaton Mill, DERWENT (NW)**  
Ranking derived from data for the period Sep-1960 to Dec-2022



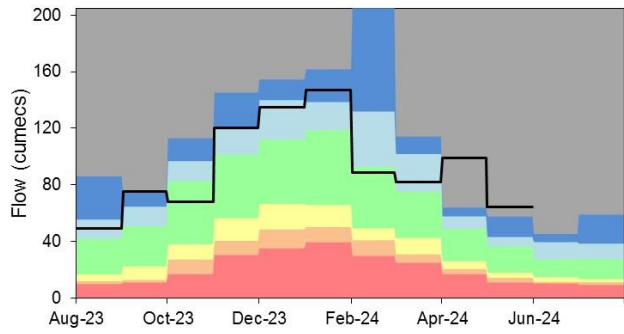
**Sedgwick, KENT**

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



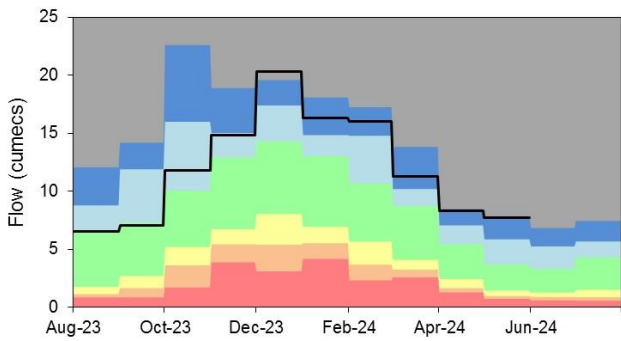
**Sheepmount, EDEN (NW)**

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

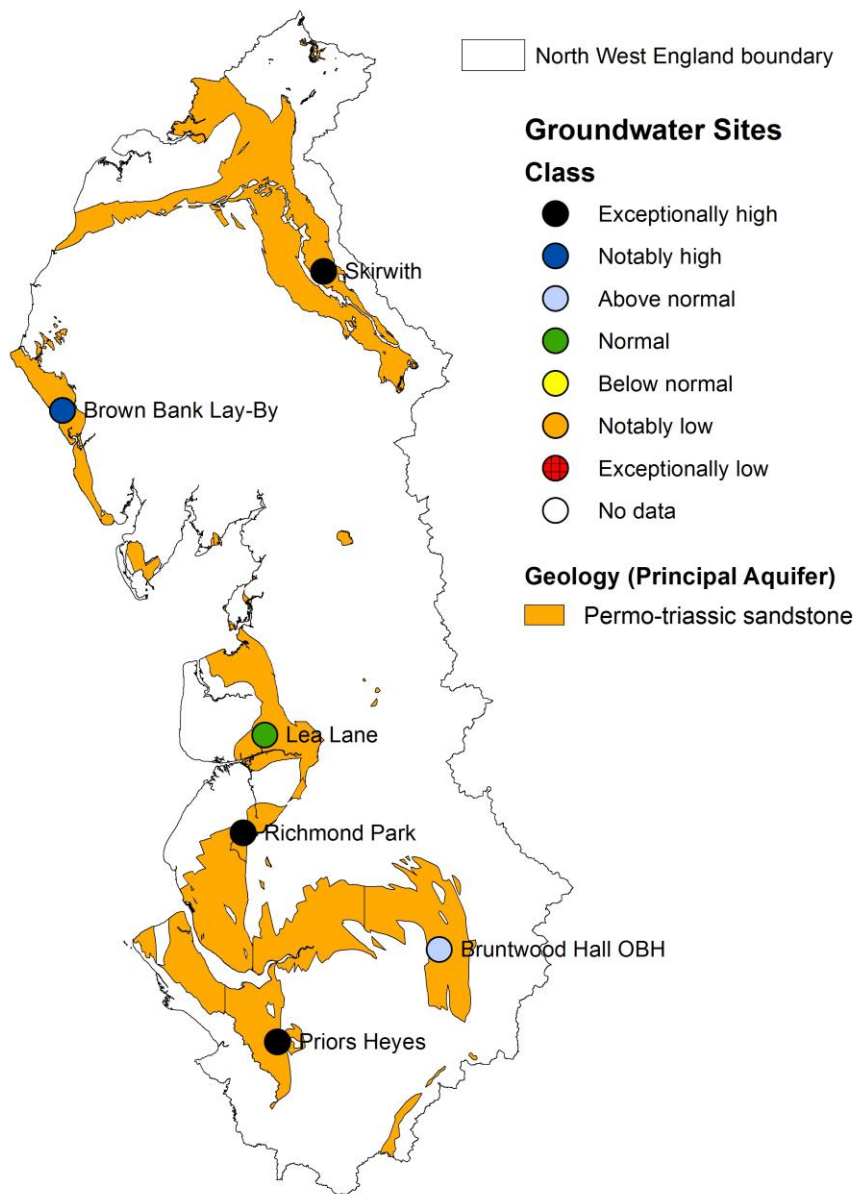


Source: Environment Agency.

# 5 Groundwater levels

## 5.1 Groundwater levels map

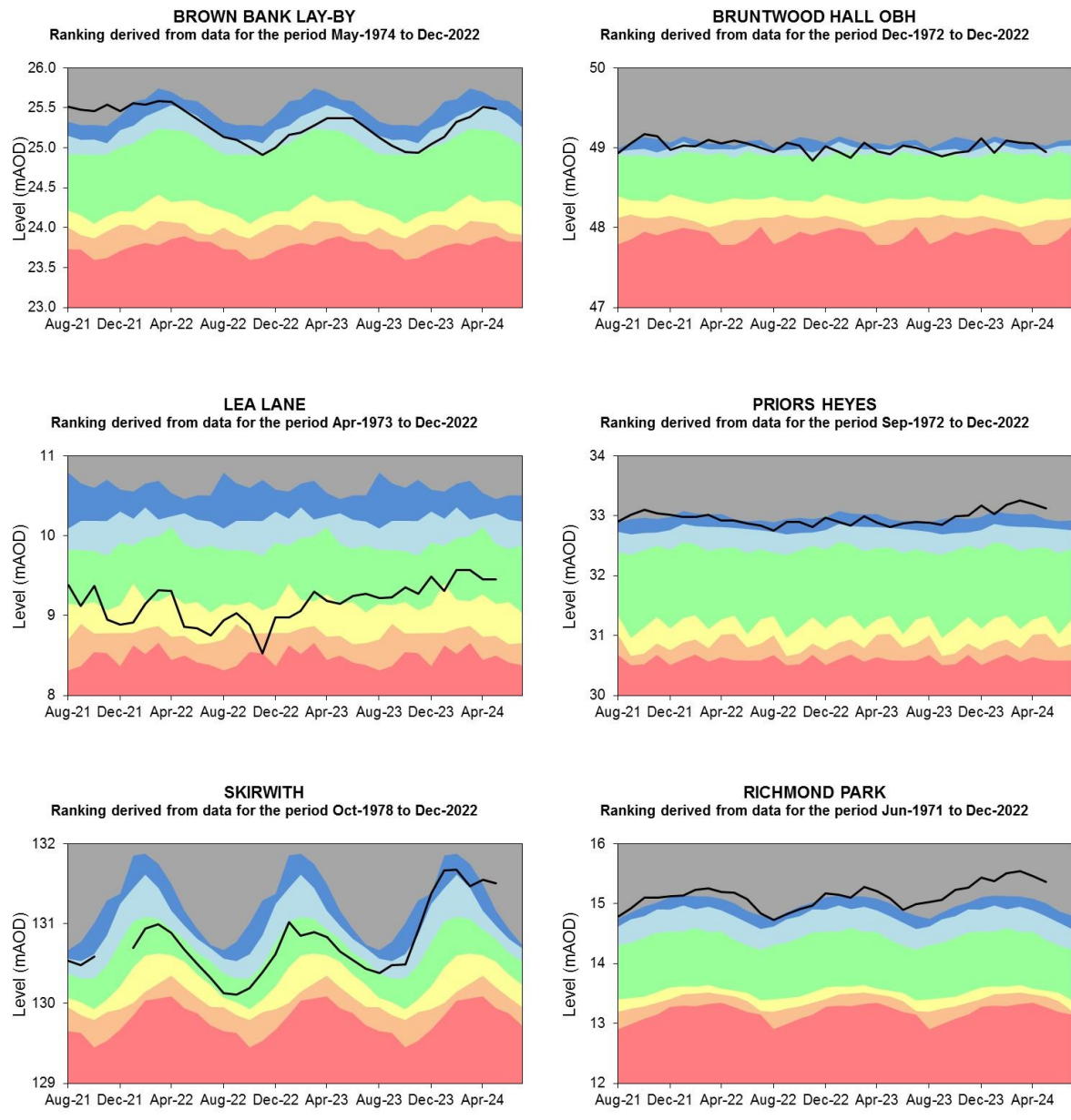
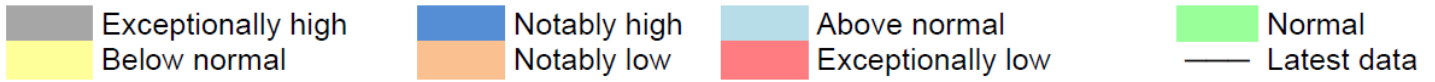
Figure 5.1: Groundwater levels for indicator sites at the end of May 2024, classed relative to an analysis of respective historic May levels. Table available in the appendices with detailed information.



(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.

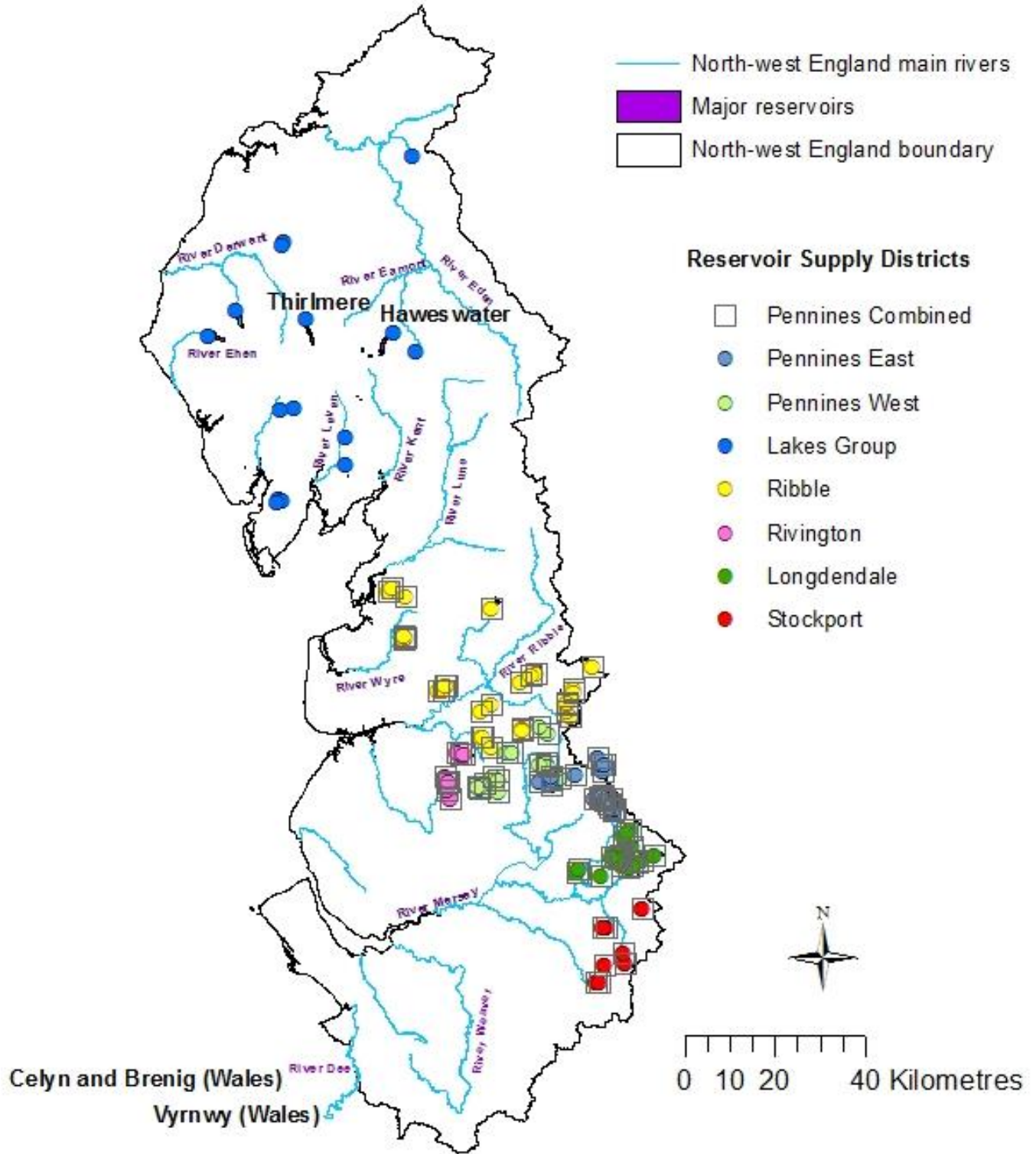


Source: Environment Agency, 2024.

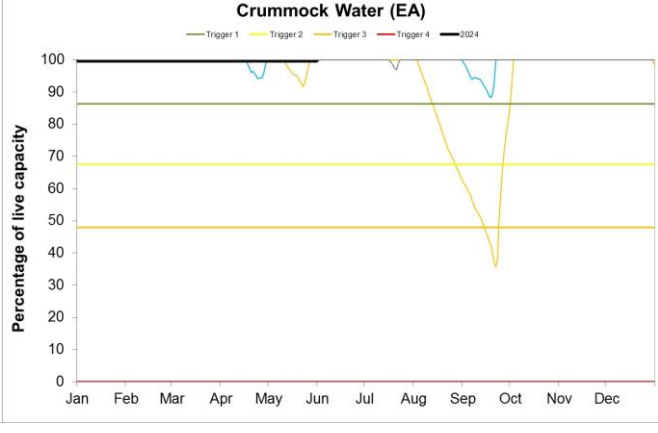
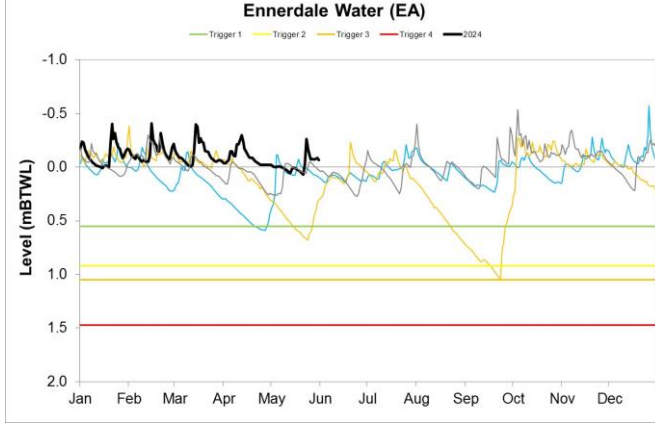
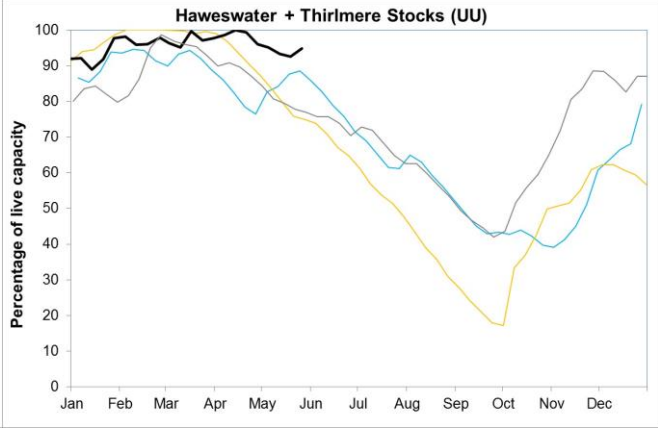
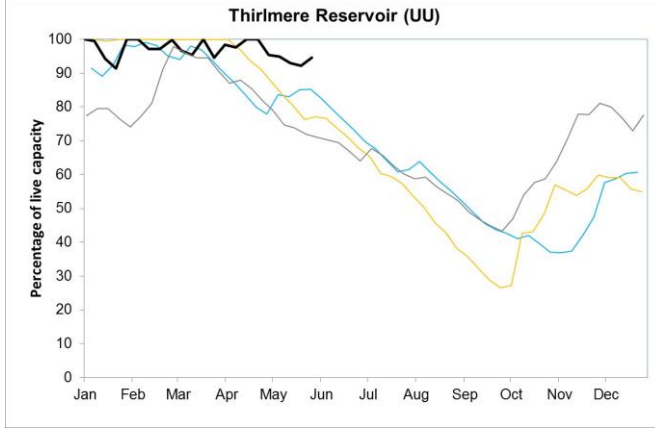
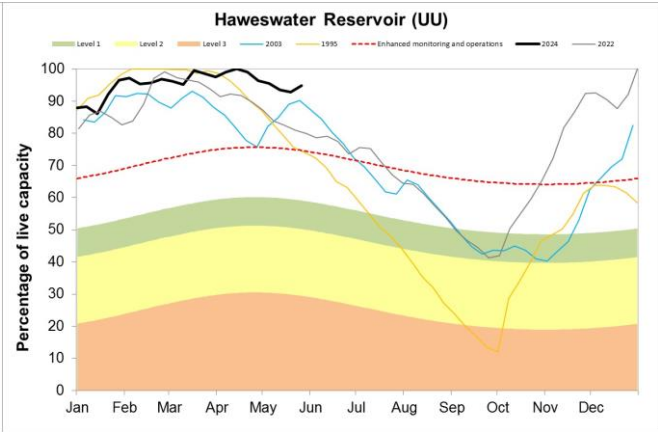
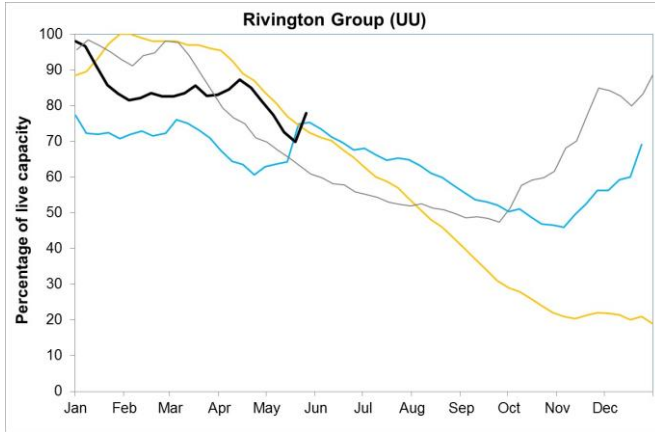


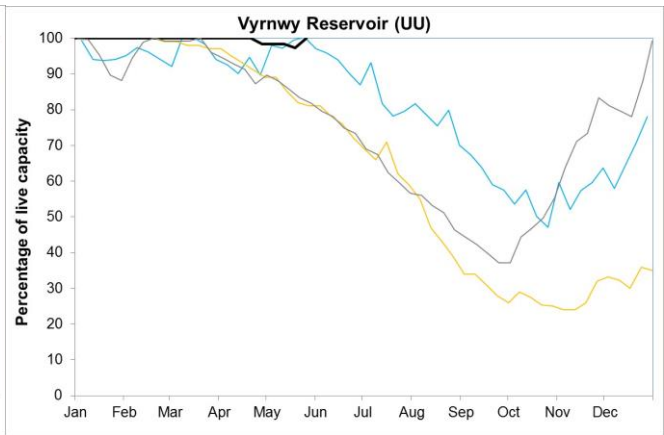
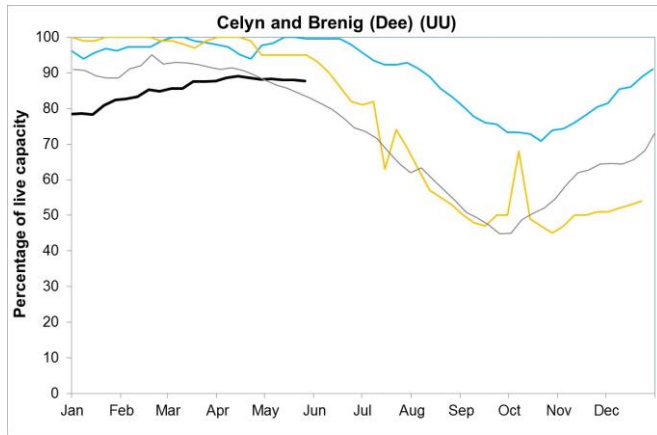
# 6 Reservoir storage

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









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 ( $\text{m}^3\text{s}^{-1}$ ).

#### **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	May 2024 rainfall % of long term average 1961 to 1990	May 2024 band	Mar 2024 to May cumulative band	Dec 2023 to May cumulative band	Jun 2023 to May cumulative band
Cheshire Rivers Group	171	Notably High	Exceptionally high	Exceptionally high	Exceptionally high
Derwent (NW)	174	Notably High	Exceptionally high	Exceptionally high	Exceptionally high
Douglas	171	Notably High	Exceptionally high	Exceptionally high	Exceptionally high
Eden	193	Exceptionally High	Exceptionally high	Exceptionally high	Exceptionally high
Esk (Cumbria)	148	Above Normal	Exceptionally high	Exceptionally high	Exceptionally high
Esk (Dumfries)	139	Above Normal	Notably high	Notably high	Above normal
Kent	153	Above Normal	Exceptionally high	Exceptionally high	Exceptionally high
Mersey And Irwell	159	Notably High	Exceptionally high	Exceptionally high	Exceptionally high
Ribble	178	Exceptionally High	Exceptionally high	Exceptionally high	Exceptionally high



Wyre And Lune	171	Notably High	Exceptionally high	Exceptionally high	Exceptionally high
North West	164	Notably High	Exceptionally high	Exceptionally high	Exceptionally high

## 8.2 River flows table

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

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

St Michaels Fms	Wyre	Brock	Notably high	Notably high
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### 8.3 Groundwater table

Site name	Aquifer	End of May 2024 band	End of Apr 2024 band
Brown Bank Lay-by	West Cumbria Permo-triassic Sandstone	Notably high	Above normal
Bruntwood Hall Obh	East Cheshire Permo-triassic Sandstone	Above normal	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	Exceptionally high	Exceptionally high