Monthly water situation report: Yorkshire Area

1 Summary - December 2024

This month, the rainfall in Yorkshire was above average overall but concentrated into two wet periods. The soils were mostly wet to begin with and were fully saturated by the month's end. Daily mean river flows were mostly normal apart from a high flow period associated with Storm Darragh from days 5 to 9. Groundwater levels rose in all aquifers and reservoir stocks also increased, remaining just above the long term average (LTA).

1.1 Rainfall

The total rainfall in December was above normal in most catchments but within the normal range in the Swale, Ure, Nidd and Esk according to the MET Office Had-UK Grid data set. The monthly rainfall totals ranged from 119% of the LTA in the Nidd to 146% in the Don and Ouse catchments.

Monthly rainfall recorded at our key indicator sites ranged from 56mm at Romanby in the Swale catchment to 291.6mm at Snaizeholme Tow Hill in the Ure catchment.

Most of the month's rain was concentrated around two events: the first being between day 4 and day 7, around the time of Storm Darragh, and the second being the heavy rain on day 31. The second week and days 22 to 30 featured settled conditions.

Rainfall in the west of Yorkshire was heaviest on day 31, comprising a significant storm event in the upper Aire, upper Calder and Colne catchments. Daily totals reached 62% of the December LTA rainfall at Skipton Snaygill in the upper Aire and over 80% at Marsden Butterley Reservoir in the Colne tributary of the Calder catchment.

In the Esk, Rye, Derwent and Hull catchments however, Storm Darragh was more significant. On day 7, 41% and 36% of the month's rain fell at two of our rain gauges.

1.2 Soil moisture deficit

Soils were wet in most areas for the whole of December and by month's end all were completely saturated across Yorkshire. The lower Ouse and Humber regions saw the biggest change, with soil moisture classified as normal for the first week only and showing a reduction in SMD of around 30-40mm by the end of December.

1.3 River flows

Monthly mean flows in the western Pennine catchments were a little below the LTA, between 78% and 97% and classified as normal for December. Further east, catchments most affected by Storm Darragh recorded above normal monthly mean flows, ranging from 124% of the LTA in the Don to 147% of the LTA in the Rye. In the upper Hull catchment, monthly mean flow in the West Beck at Wansford Snakeholm Lock was notably high.

In response to the rainfall pattern, the main period of notably and exceptionally high daily mean flows occurred between days 5 and 9 in the Pennine catchments, Esk, Rye and Derwent. Although gradually receding, flows in the Rye and Derwent remained above normal until mid-month. The Swale, Ure and Don responded moderately to rainfall in the third week with only minor fluctuations elsewhere. During settled weather flows continued to recede in most catchments. Daily mean flows reached below normal for late December by day 28, although still within the rivers' medium flow regime in an annual context. River flows rose sharply with rainfall during day 31, into the normal range or higher, but did not peak until the New Year.

The groundwater-fed West Beck in the Hull catchment at Wansford Snakeholm Lock responded strongly to the winter rise in Chalk groundwater levels. Daily mean flows started the month in the normal range, increased to above normal on day 7 and rose steeply to notably high on day 12. They remained notably high, declining slightly from day 19 and returned to above normal from day 29.

1.4 Groundwater levels

Magnesian Limestone

The groundwater level within the Magnesian Limestone at Brick House Farm increased and was notably high for the time of year.

Millstone Grit

The groundwater level increased within the Millstone Grit at Hill Top Farm and reached normal for the time year. *It should be noted that this observation borehole is used for water abstraction by means of a pump. Therefore, the groundwater level recorded here may be subject to the effects of this.*

Sherwood Sandstone

The groundwater level in the Sherwood Sandstone increased at Great Ouseburn, remaining exceptionally high for the time of year while groundwater levels increased at Riccall Approach Farm, remaining normal for the time of year.

Corallian Limestone

The groundwater level increased within the Corallian Limestone at Sproxton, into the lower part of the normal range for the time of year.

Chalk

The groundwater level increased at Wetwang and reached above normal for the time of year (northern Yorkshire Wolds chalk), while Dalton Estate (central Yorkshire Wolds chalk) increased but remained normal for the time of year.

1.5 Reservoir stocks

The reservoir stocks gradually increased over the course of this month and remained a little higher than the LTA throughout. Overall, they increased by 6.6% of the total capacity.

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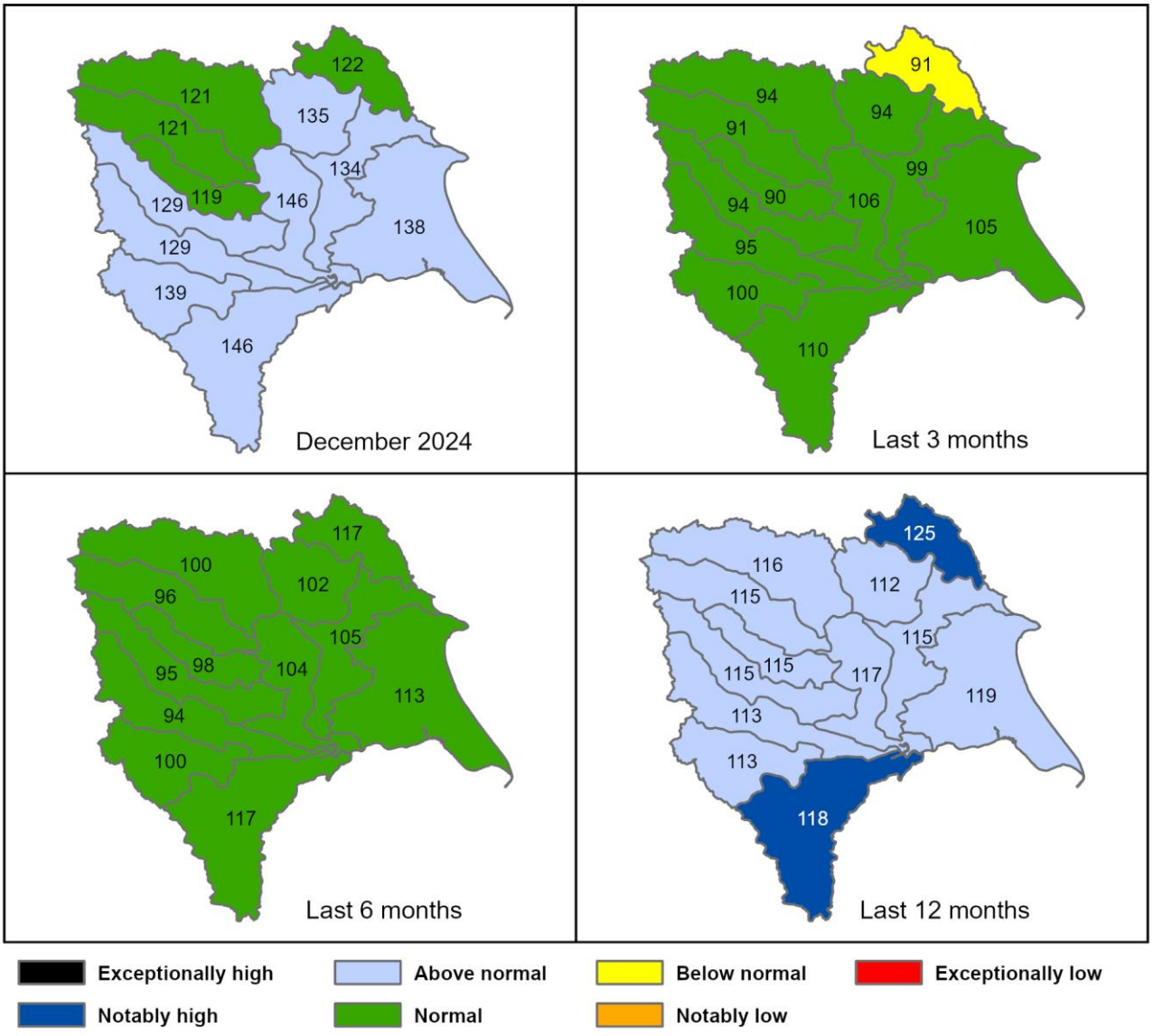
2 Rainfall

2.1 Rainfall map

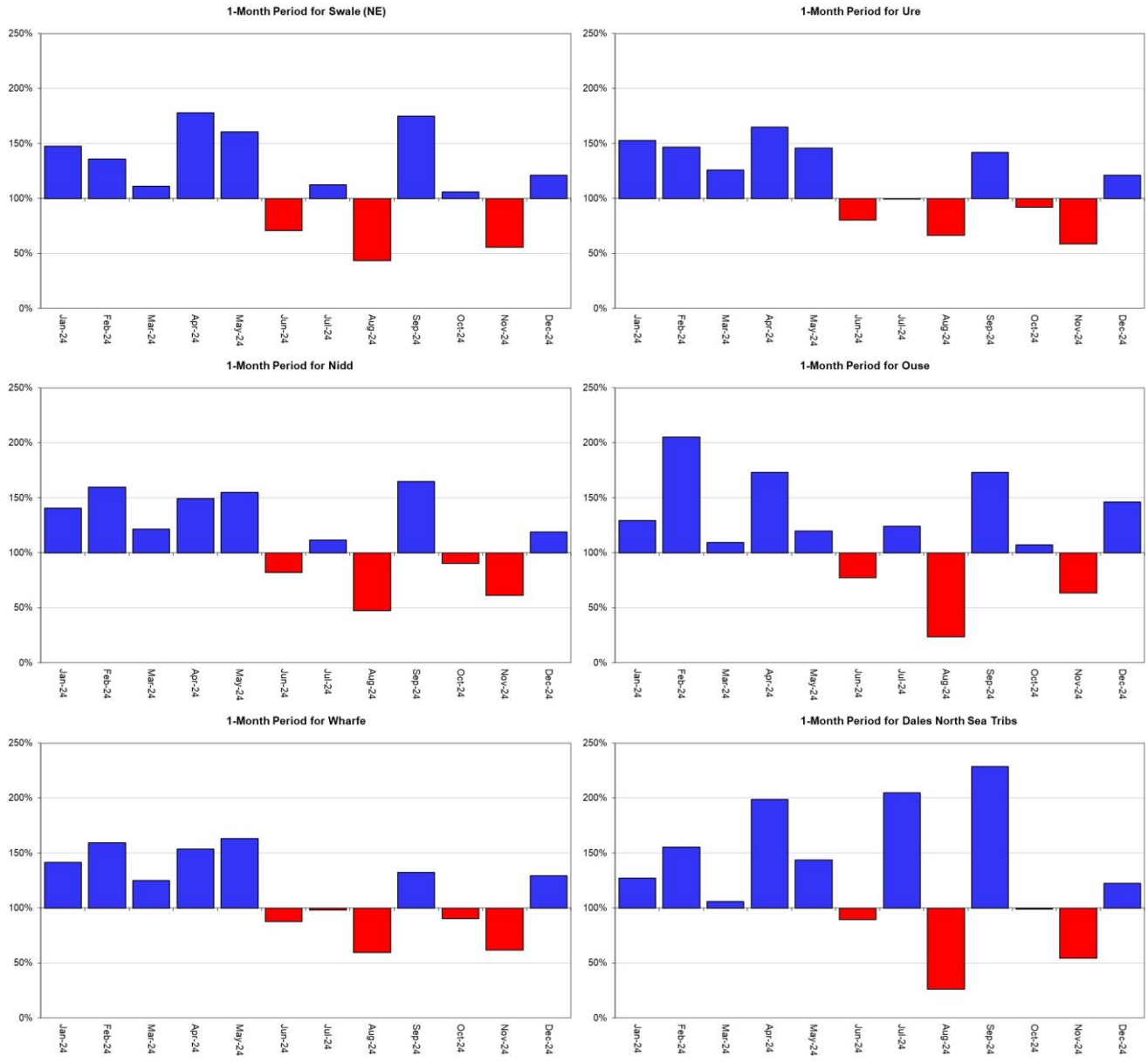
Figure 2.1: Total rainfall for hydrological areas for the current month (up to 31 December 2024), the last 3 months, the last 6 months, and the last 12 months, classed relative to an analysis of respective historic totals. Table available in the appendices with detailed information.

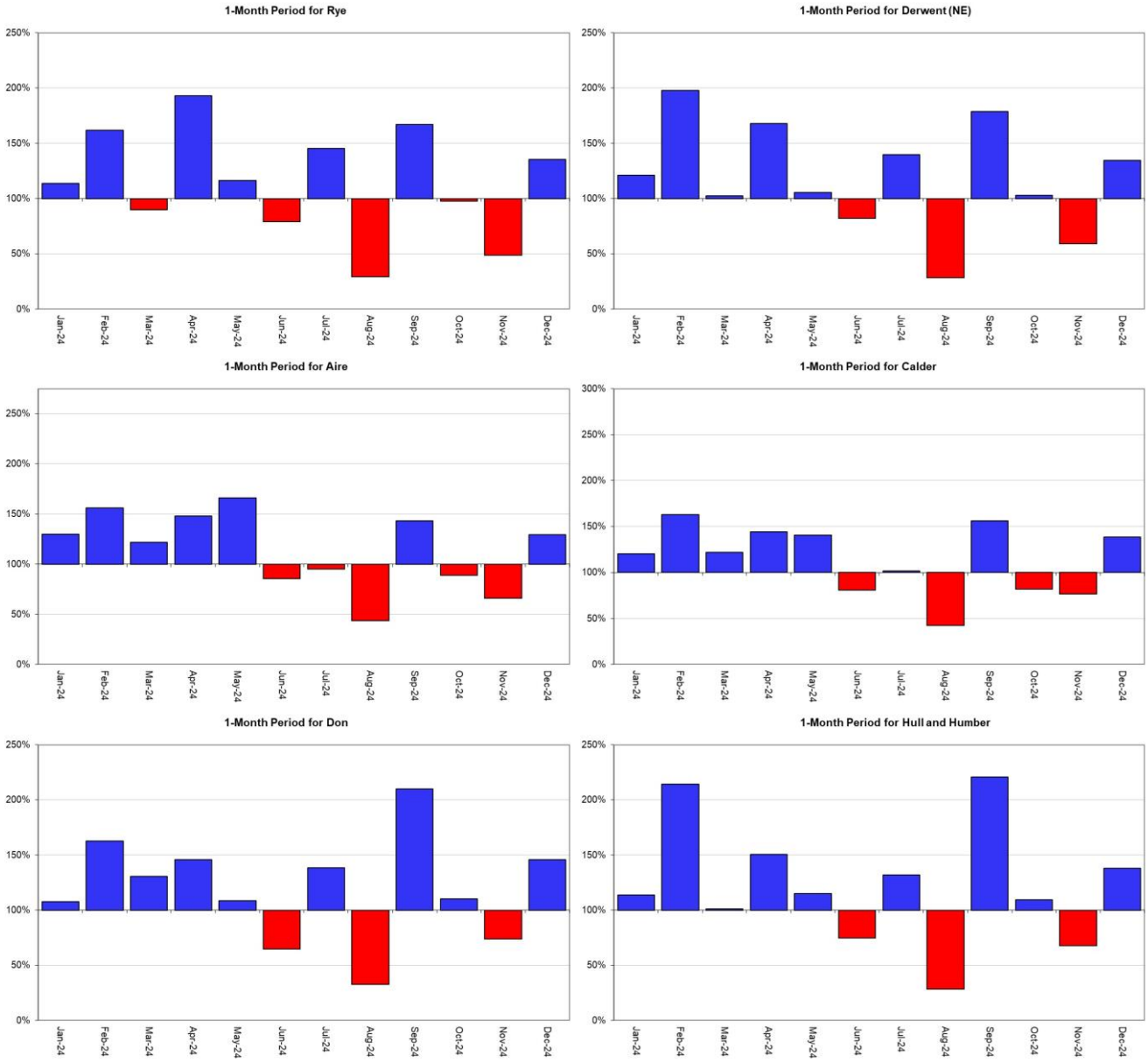


HadUK data based on the Met Office 1km gridded rainfall dataset derived from rain gauges (Source: Met Office. Crown copyright, 2025). Provisional data based on Environment Agency 1km gridded rainfall dataset derived from Environment Agency intensity rain gauges. Crown copyright. All rights reserved. Environment Agency, 100024198, 2025.

2.2 Rainfall charts

Figure 2.2: Monthly rainfall totals for the past 24 months as a percentage of the 1961 to 1990 long term average for each region and for England.



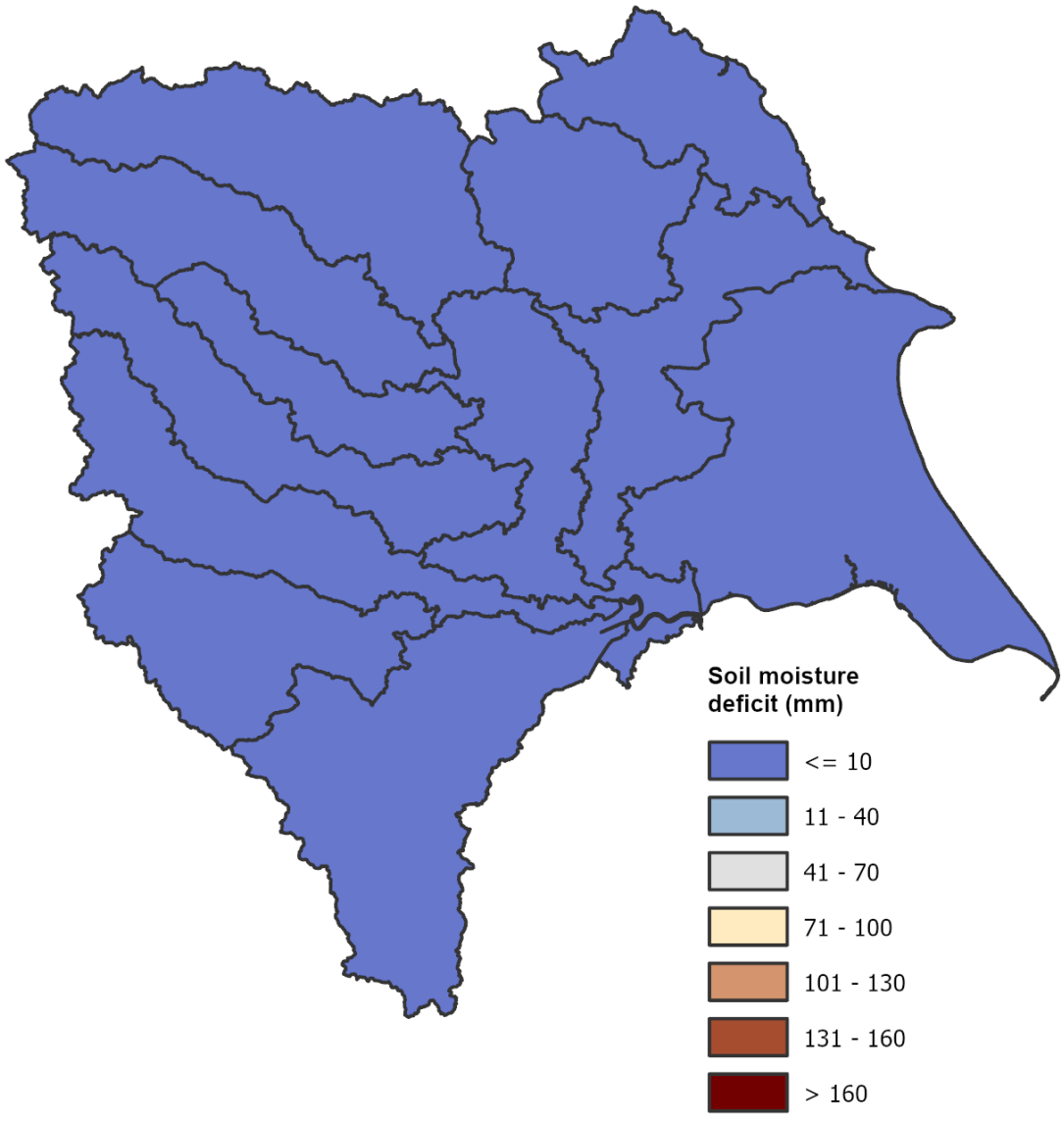


Rainfall data for 2024, extracted from Environment Agency 1km gridded rainfall dataset derived from Environment Agency intensity rain gauges. (Source: Environment Agency. Crown Copyright, 100024198, 2025). Rainfall data prior to 2023, extracted from Met Office HadUK 1km gridded rainfall dataset derived from registered rain gauges (Source: Met Office. Crown copyright, 2025).

3 Soil moisture deficit

3.1 Soil moisture deficit map

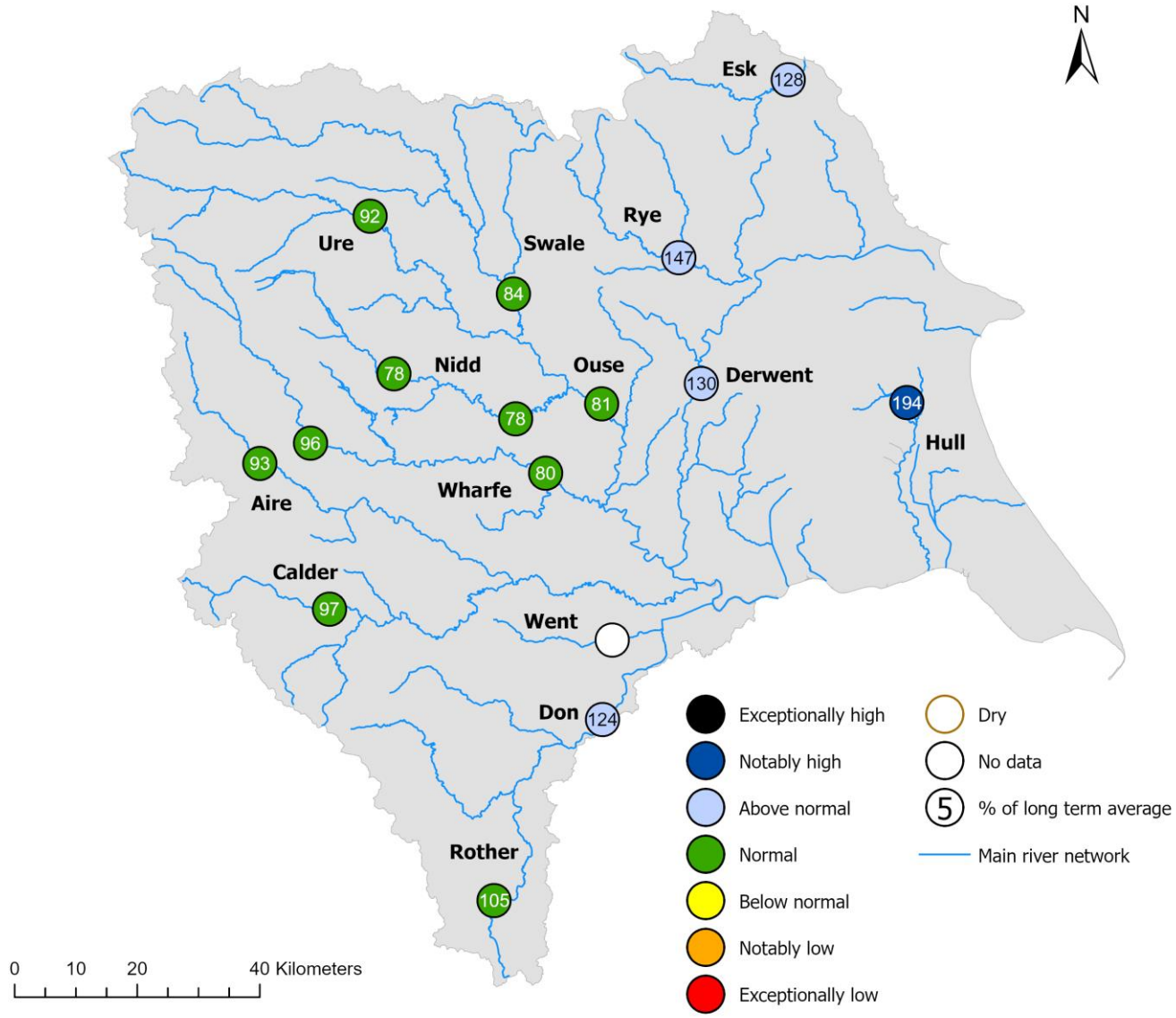
Figure 3.1: Soil moisture deficits for weeks ending 31 December 2024. MORECS data for real land use.



4 River flows

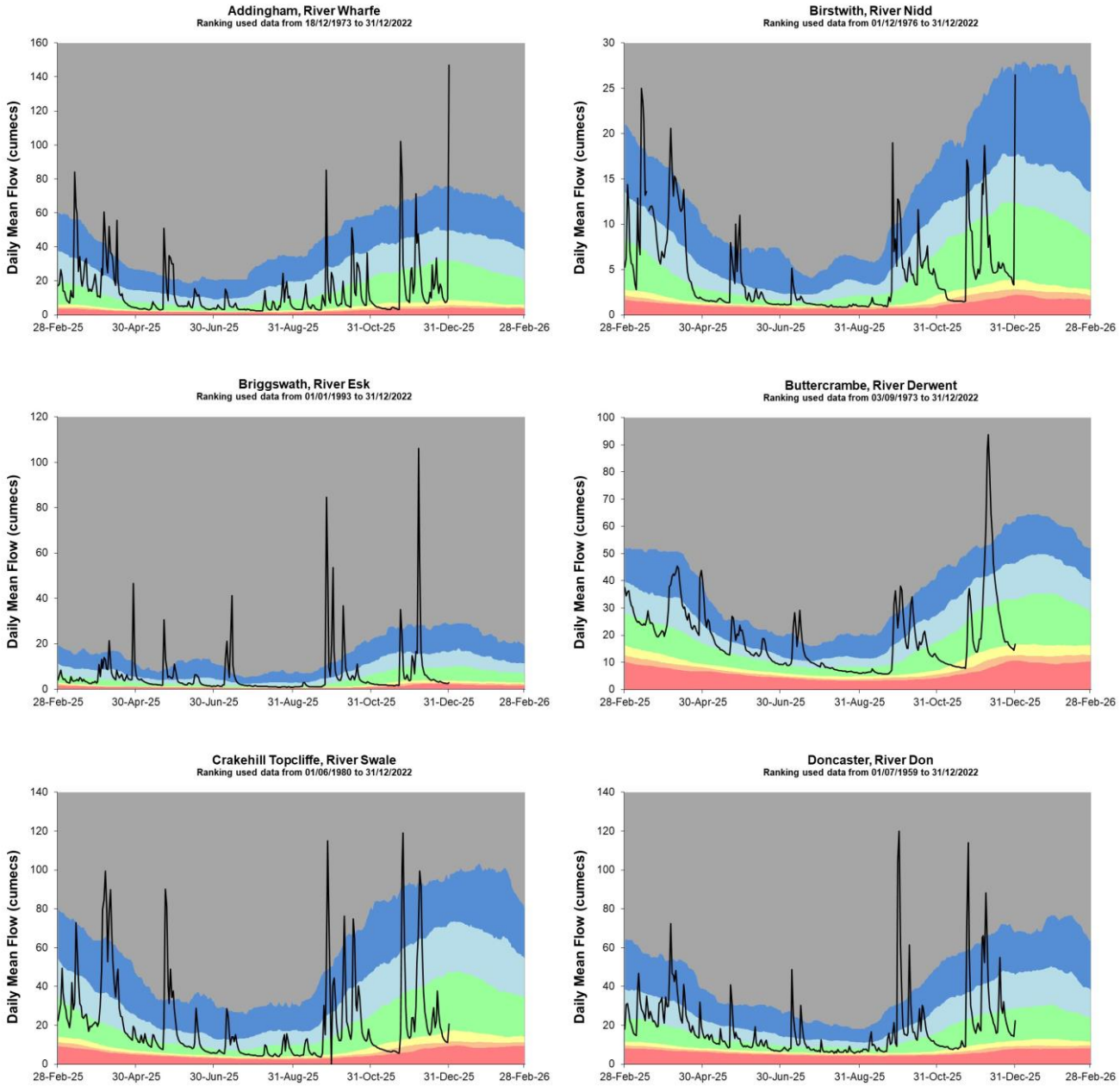
4.1 River flows map

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

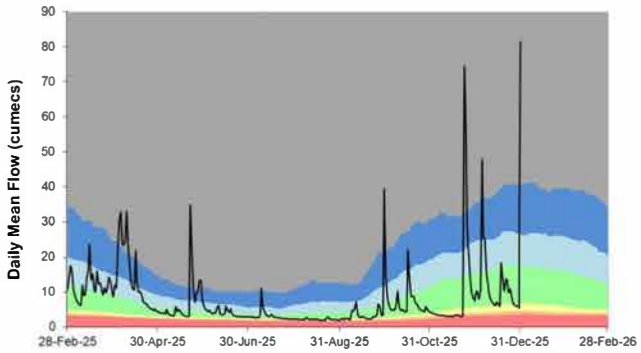


4.2 River flow charts

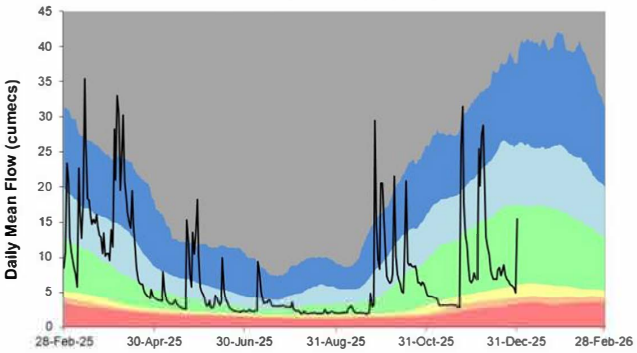
Figure 4.2: Daily mean river flow for index sites over the past year, compared to an analysis of historic daily mean flows.



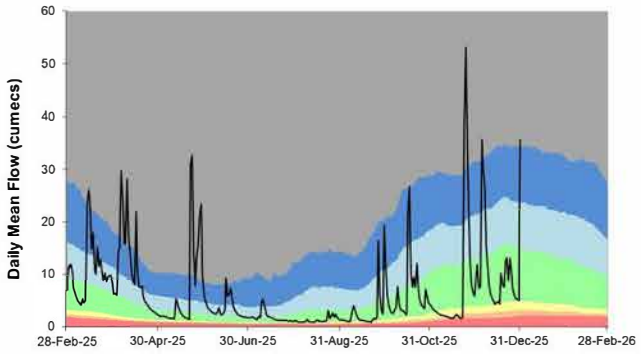
Elland, River Calder
Ranking used data from 01/07/1971 to 31/12/2022



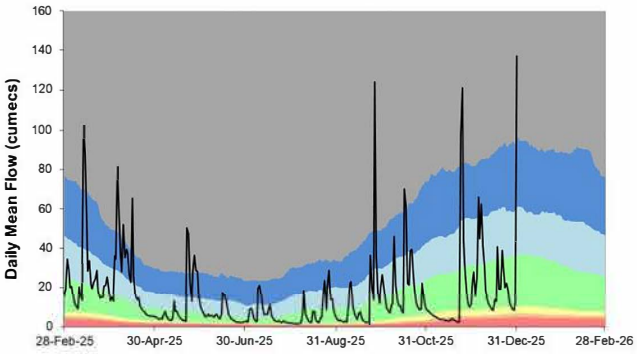
Hunsingore, River Nidd
Ranking used data from 01/10/1968 to 31/12/2022



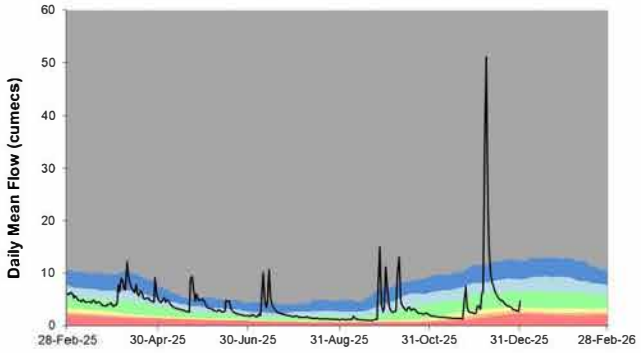
Kildwick, River Aire
Ranking used data from 01/08/1971 to 31/12/2022



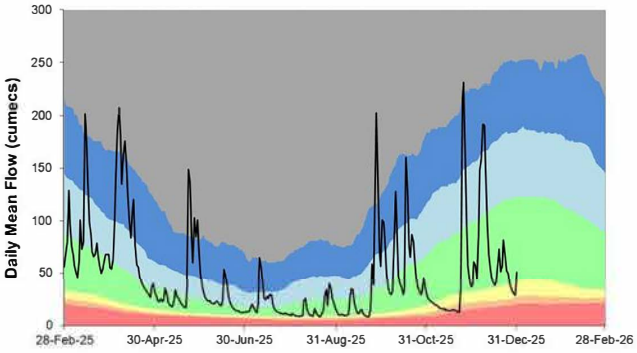
Kilgram Bridge, River Ure
Ranking used data from 01/08/1971 to 31/12/2022

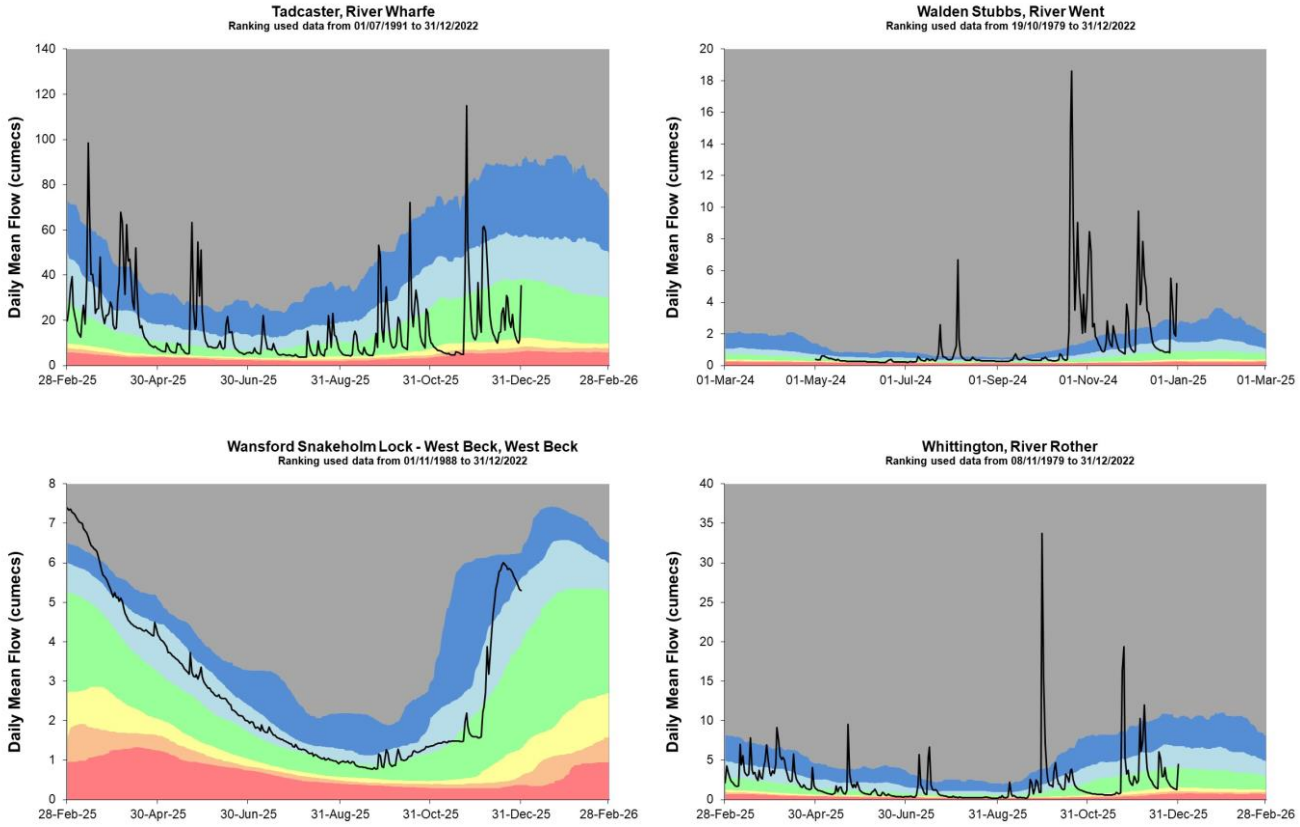


Ness, River Rye
Ranking used data from 01/09/1974 to 31/12/2022



Skelton, River Ouse
Ranking used data from 18/09/1969 to 31/12/2022

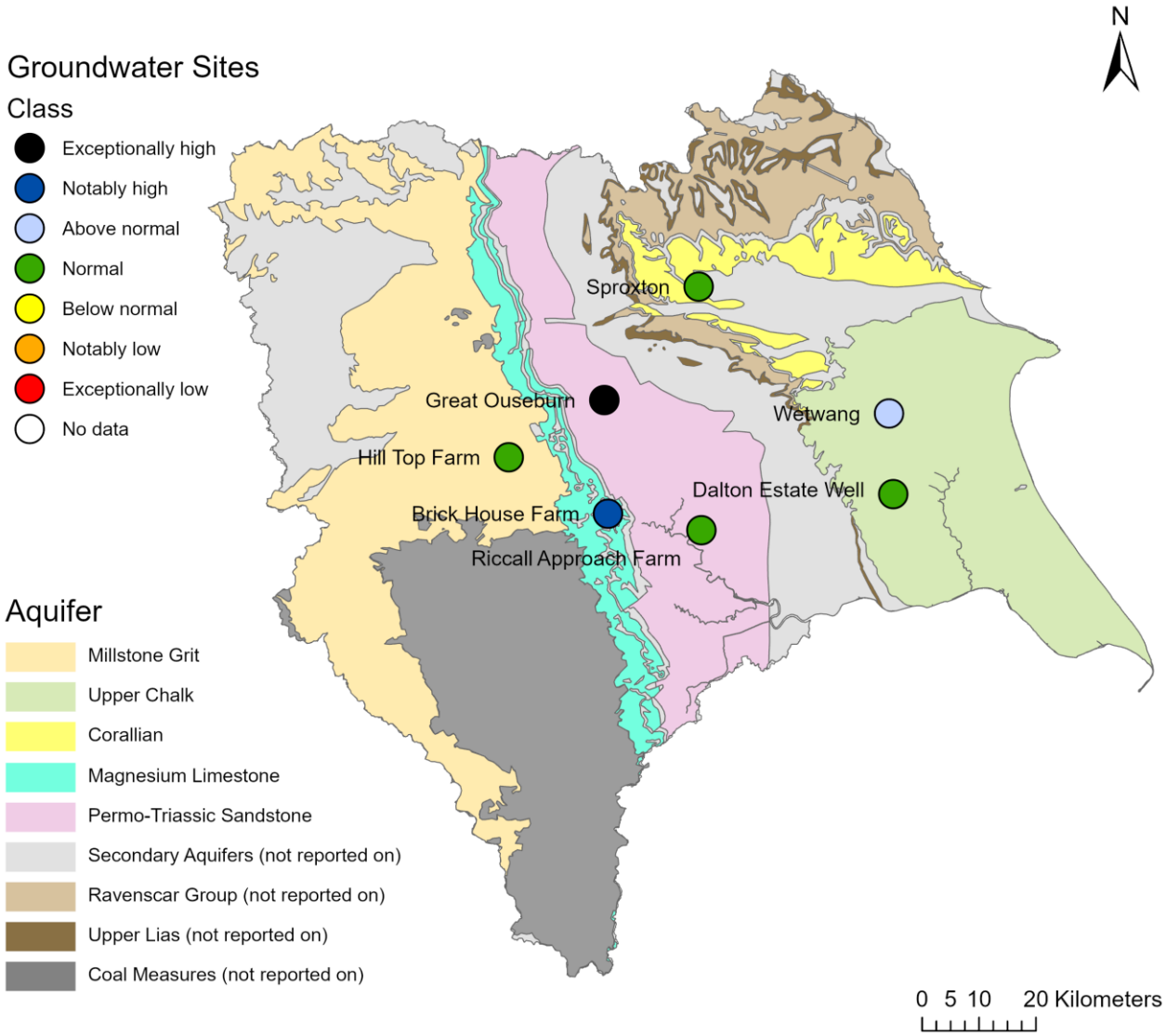




5 Groundwater levels

5.1 Groundwater levels map

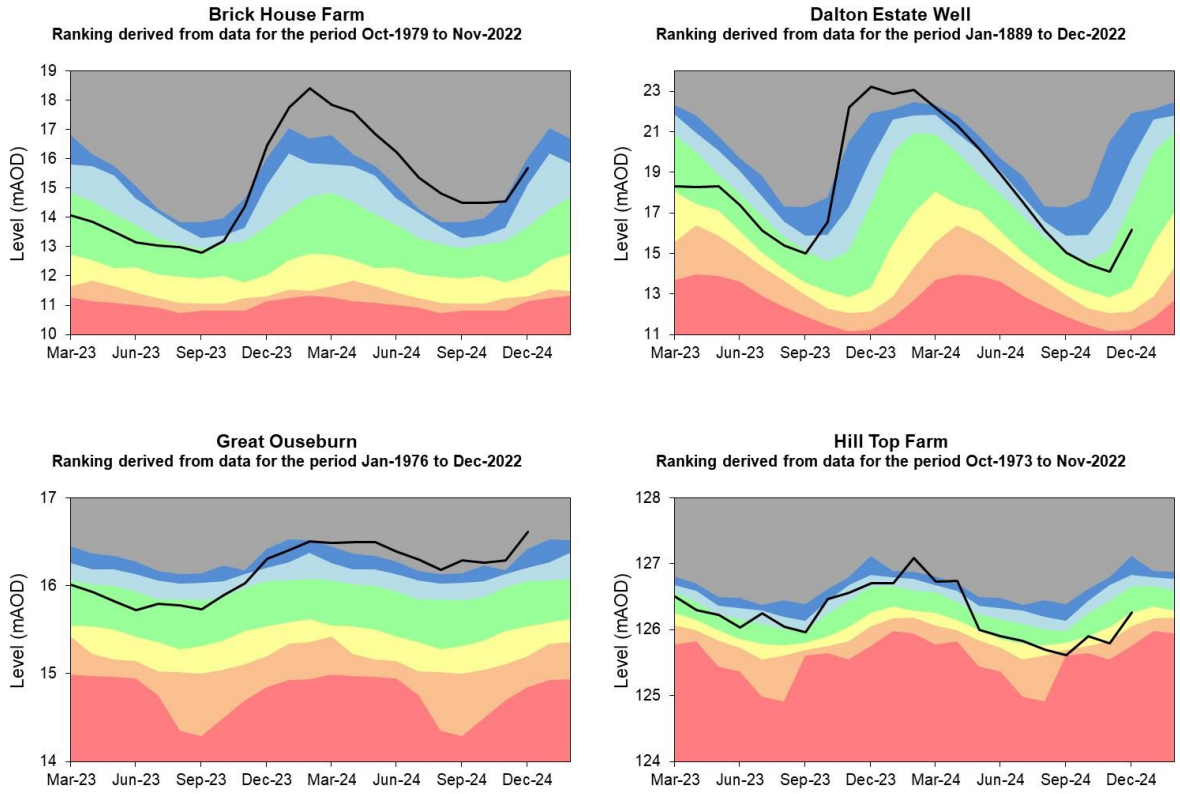
Figure 5.1: Groundwater levels for indicator sites at the end of December 2024, classed relative to an analysis of respective historic December levels. Table available in the appendices with detailed information.

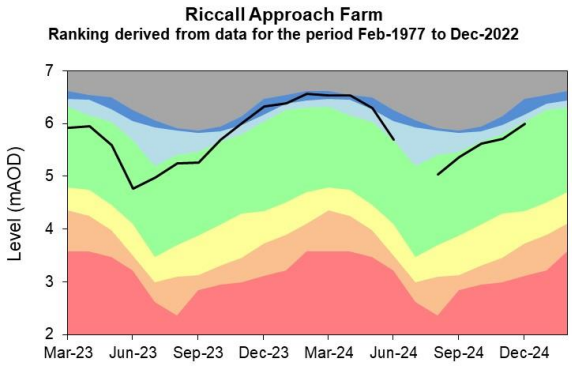


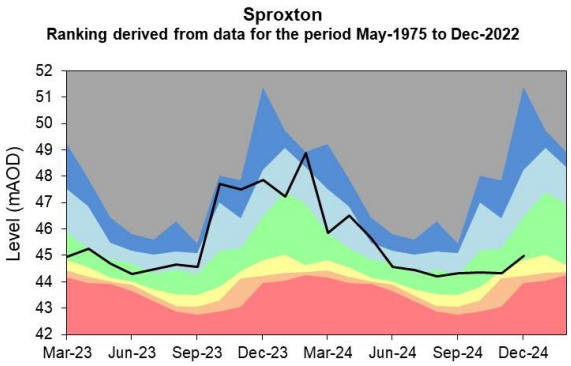
(Source: Environment Agency). Geological map reproduced with kind permission from UK Groundwater Forum, BGS copyright NERC. Crown copyright. All rights reserved. Environment Agency, 100024198, 2025.

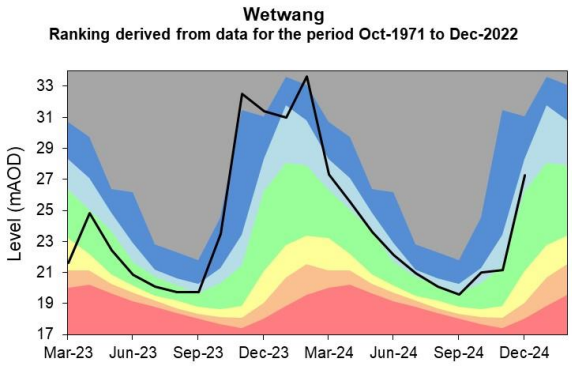
5.2 Groundwater level charts

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.





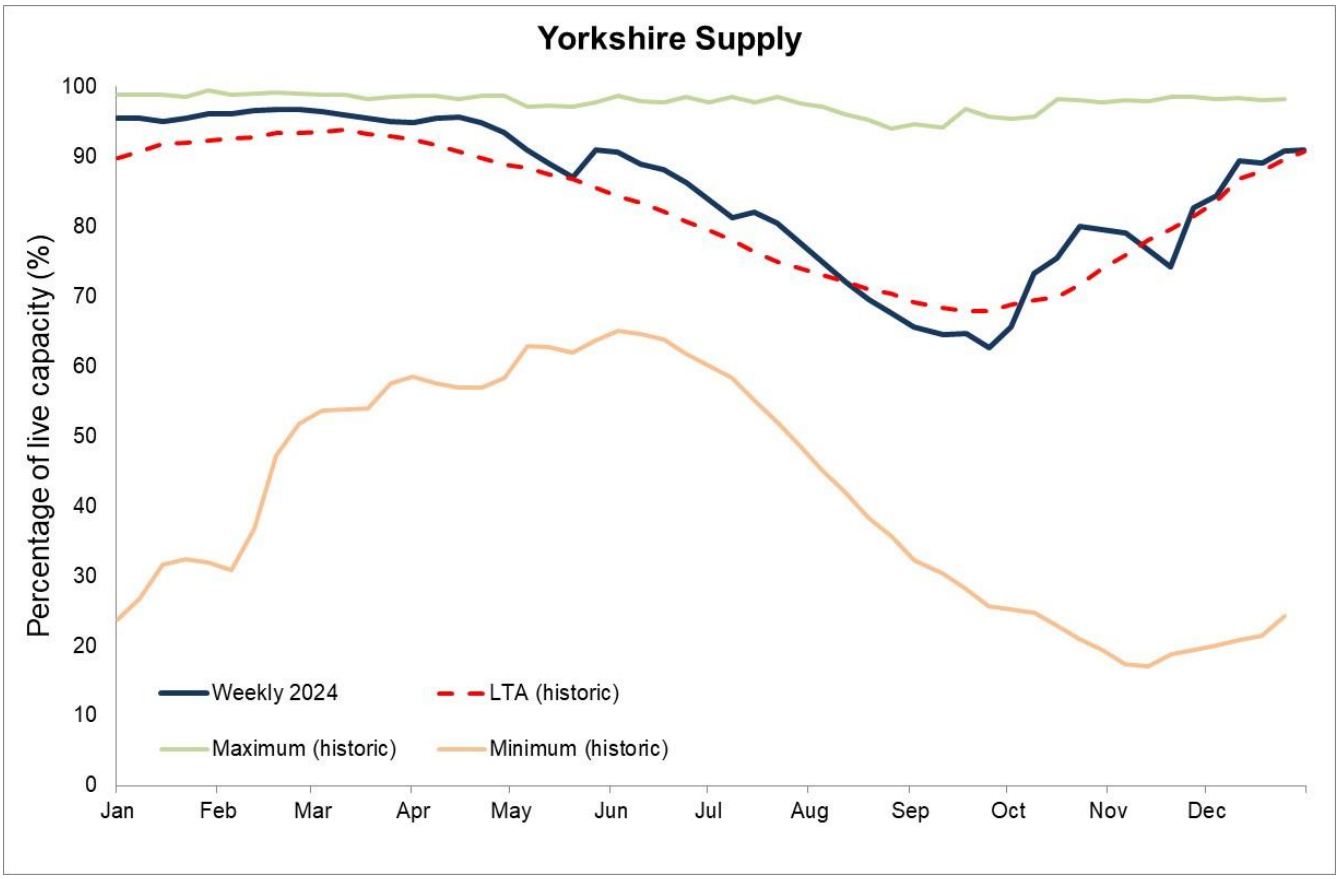




 N.B. Hill Top Farm observation borehole is used for abstraction. Therefore the groundwater level record will be directly affected by pumping.

6 Reservoir stocks

Figure 6.1: End of month regional reservoir stocks compared to long term maximum, minimum and average stocks. Note: Historic records of individual reservoirs and reservoir groups making up the regional values vary in length.



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	Dec 2024 rainfall % of long term average 1961 to 1990	Dec 2024 band	Oct 2024 to December cumulative band	Jul 2024 to December cumulative band	Jan 2024 to December cumulative band
Aire	129	Above Normal	Normal	Normal	Above normal
Calder	139	Above Normal	Normal	Normal	Above normal
Dales North Sea Tribs	122	Normal	Below normal	Normal	Notably high
Derwent (ne)	134	Above Normal	Normal	Normal	Above normal
Don	146	Above Normal	Normal	Normal	Notably high
Hull And Humber	138	Above Normal	Normal	Normal	Above normal
Nidd	119	Normal	Normal	Normal	Above normal
Ouse	146	Above Normal	Normal	Normal	Above normal
Rye	136	Above Normal	Normal	Normal	Above normal
Swale (ne)	121	Normal	Normal	Normal	Above normal

Ure	121	Normal	Normal	Normal	Above normal
Wharfe	129	Above Normal	Normal	Normal	Above normal

8.2 River flows table

Site name	River	Catchment	Dec 2024 band	Nov 2024 band
Addingham	Wharfe	Wharfe Middle	Normal	Below normal
Birstwith	Nidd	Nidd Middle	Normal	Below normal
Briggswath	Esk	Esk Yorks	Above normal	Notably low
Buttercrambe	Derwent	Derwent Yorks Middle	Above normal	Normal
Crakehill Topcliffe	Swale	Swale Lower	Normal	Normal
Doncaster	Don	Don Lower	Above normal	Normal
Elland	Calder	Calder Yorks Upper	Normal	Normal
Hunsingore	Nidd	Nidd Lower	Normal	Normal
Kildwick	Aire	Aire Upper	Normal	Normal
Kilgram Bridge	Ure	Ure Middle	Normal	Below normal
Ness	Rye	Rye	Above normal	Below normal
Skelton	Ouse	Ouse Yorks	Normal	Normal
Tadcaster	Wharfe	Wharfe Lower	Normal	Below normal
Walden Stubbs	Went	Don Lower		

Wansford Snakeholm Lock	West Beck	Hull Upper	Notably high	Normal
Whittington	Rother	Rother Yorks	Normal	Normal

8.3 Groundwater table

Site name	Aquifer	End of Dec 2024 band	End of Nov 2024 band
Brick House Farm	Wharfe Magnesian Limestone	Notably high	Notably high
Dalton Estate Well	Hull and East Riding Chalk	Normal	Normal
Great Ouseburn	Sherwood Sandstone	Exceptionally high	Exceptionally high
Hill Top Farm	Millstone Grit and Carboniferous Limestone	Normal	Notably low
Riccall Approach Farm	Sherwood Sandstone	Normal	Normal
Sproxton	Sherwood Sandstone	Normal	Below normal
Wetwang	Hull and East Riding Chalk	Above normal	Normal