Monthly water situation report: Lincolnshire and Northamptonshire Area

1 Summary - March 2024

Following an exceptionally wet February, March returned above normal levels of rainfall with an averaged total of 61 mm, which was 127% of the Long-term average (LTA) for Lincolnshire and Northamptonshire. Soil moisture deficits (SMD) responded in line with the rainfall received over March and levels slightly increased in all the six catchments from exceptionally low to below normal levels. Due to the record-breaking rainfall totals over winter, river flows at most sites continues to be exceptionally high. Month mean river flows were between 112% and 282% of the LTA. In response to above normal levels of rainfall across the region in March, groundwater levels showed a slight decline but all classified as notably high to exceptionally still. Reservoir levels across the region remained healthy and are above their normal operating curves with the exemption of Rutland which remained slightly below target.

1.1 Rainfall

The Lincolnshire and Northamptonshire area received an average of 61 mm of rainfall in March which was 127% of the long-term average. Precipitation fell in a somewhat evenly distributed manner through the month; however the lowest rainfall totals were recorded in the first week of the month. Rainfall totals were classified as above normal across the six hydrological areas; with all catchments being over 100% of the LTA. The highest rainfall totals were in Upper Welland and Nene catchments with 74.3 mm, 149% of the LTA. The exceptionally high rainfall totals of October 2023, December 2023 and the record breaking rainfall totals received in February 2024 are still having an impact on the long term analysis with the last 3 months, the last 6 months and the last 12 months rainfall totals in most catchments still being exceptionally high during these periods.

1.2 Soil moisture deficit and recharge

At the end of March, SMD was at below normal levels in all the six catchments. SMD responded in line with the rainfall received over March. Compared to the LTA, SMD have slightly increased from exceptionally low levels to below normal in March in the region. This was due to temperatures increasing as we move from Winter to Spring. The area as a whole ended the month with an SMD of 3.5 mm, in comparison to 2 mm at the end of February.

1.3 River flows

In March, monthly river flows have remained exceptionally high for a number of monitoring sites, particularly those in the south of the region. Other monitoring sites in the North show flows ranging from normal to notably high levels. The monthly mean flows ranged between 112% and 282% of the LTA. An exceptionally wet winter, resulting in high groundwater and low levels of SMD meant that most river flow sites stayed at exceptionally high levels even though March's rainfall was classified as above normal.

1.4 Groundwater levels

As a result of the exceptionally wet winter, the majority of groundwater sites started March at exceptionally high levels for the time of year. Following the above normal levels of rainfall throughout March, most sites have seen groundwater levels slightly decline; but still remain at notably high to exceptionally high levels at indicator sites with data. The groundwater levels at Hanthorpe, Grange Farm Aswarby, and Grainsby remained exceptionally high, showing no change in banding since December 2023. It is normal for groundwater levels to start declining slowly as we move out of winter into spring.

1.5 Reservoir stocks

With the exception of Rutland, all reservoirs in the area ended the month above their normal operating curves. Levels at Rutland was 1% below target curve in March compared with 2% below target curve last month.

1.6 Environmental impact

All transfer schemes remained off throughout March. There were no cessation notices issued due to the high flows. There were10 flood alerts and 1 flood warning.

1.7 Forward look

1.7.1 Probabilistic ensemble projections for river flows at key sites

June 2024: Nene Northampton and Nene Wansford both show an increased probability of normal flows with none of modelled rainfall scenarios showing below normal, notably or exceptionally low levels.

September 2024: There is an increased probability of normal or higher flows with none of modelled rainfall scenarios showing exceptionally low levels.

1.7.2 Probabilistic ensemble projections for groundwater levels in key aquifers

September 2024: All sites are showing an increased probability of groundwater levels being normal or higher with none of modelled rainfall scenarios showing notably or exceptionally low levels.

March 2025: All sites are showing a decreased probability of groundwater levels being notably low or exceptionally low.

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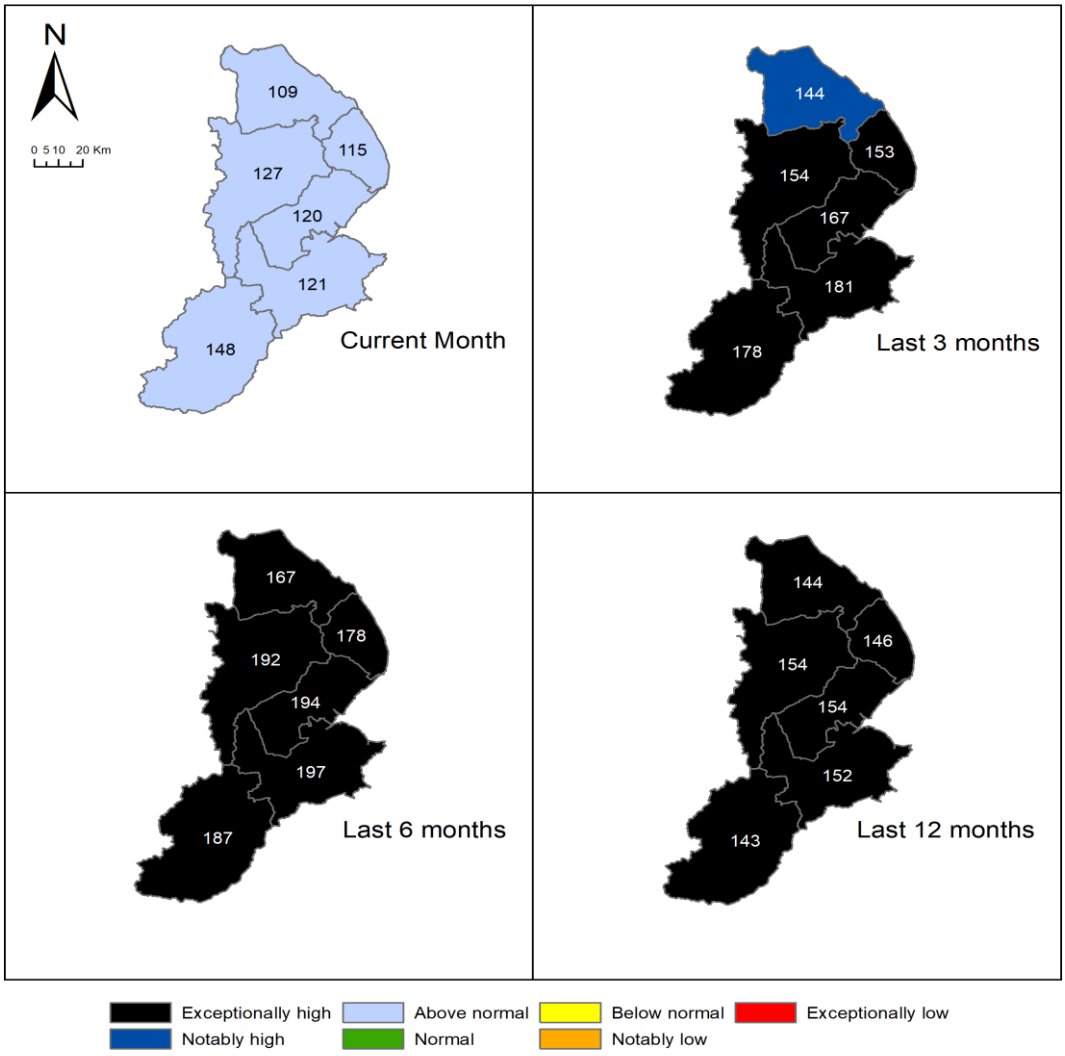
2 Rainfall

2.1 Rainfall map

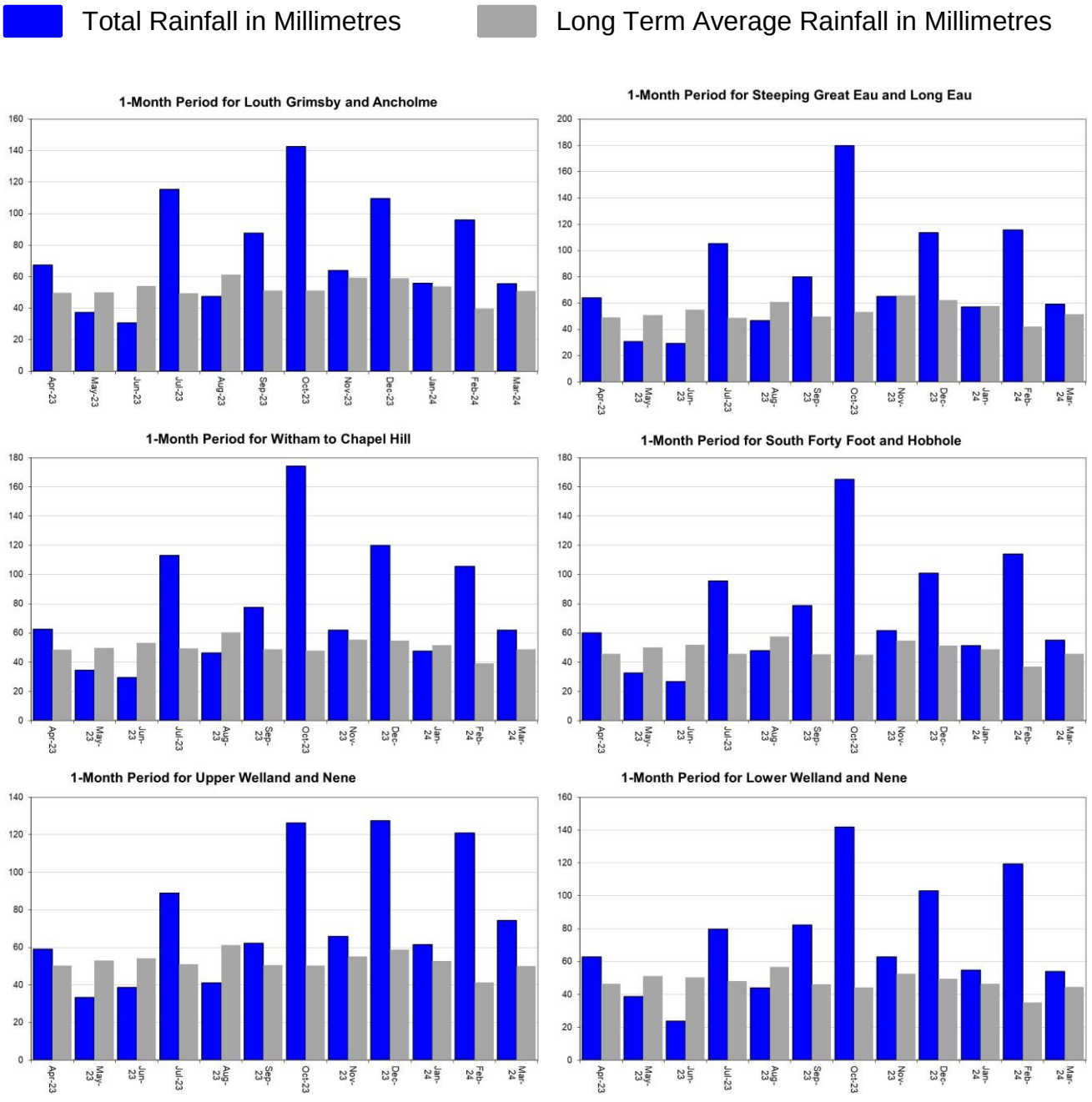
Figure 2.1: Total rainfall for hydrological areas across Lincolnshire and Northamptonshire, expressed as a percentage of long term average rainfall for the current month (up to 31 March 2024), the last 3 months, the last 6 months, and the last 12 months. Category classes are based on an analysis of respective historic totals. Table available in the appendices with detailed information.



HadUK data based on the Met Office 1km gridded rainfall dataset derived from rain gauges (Source: Met Office. Crown copyright, 2024). 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, 2024.

2.2 Rainfall charts

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

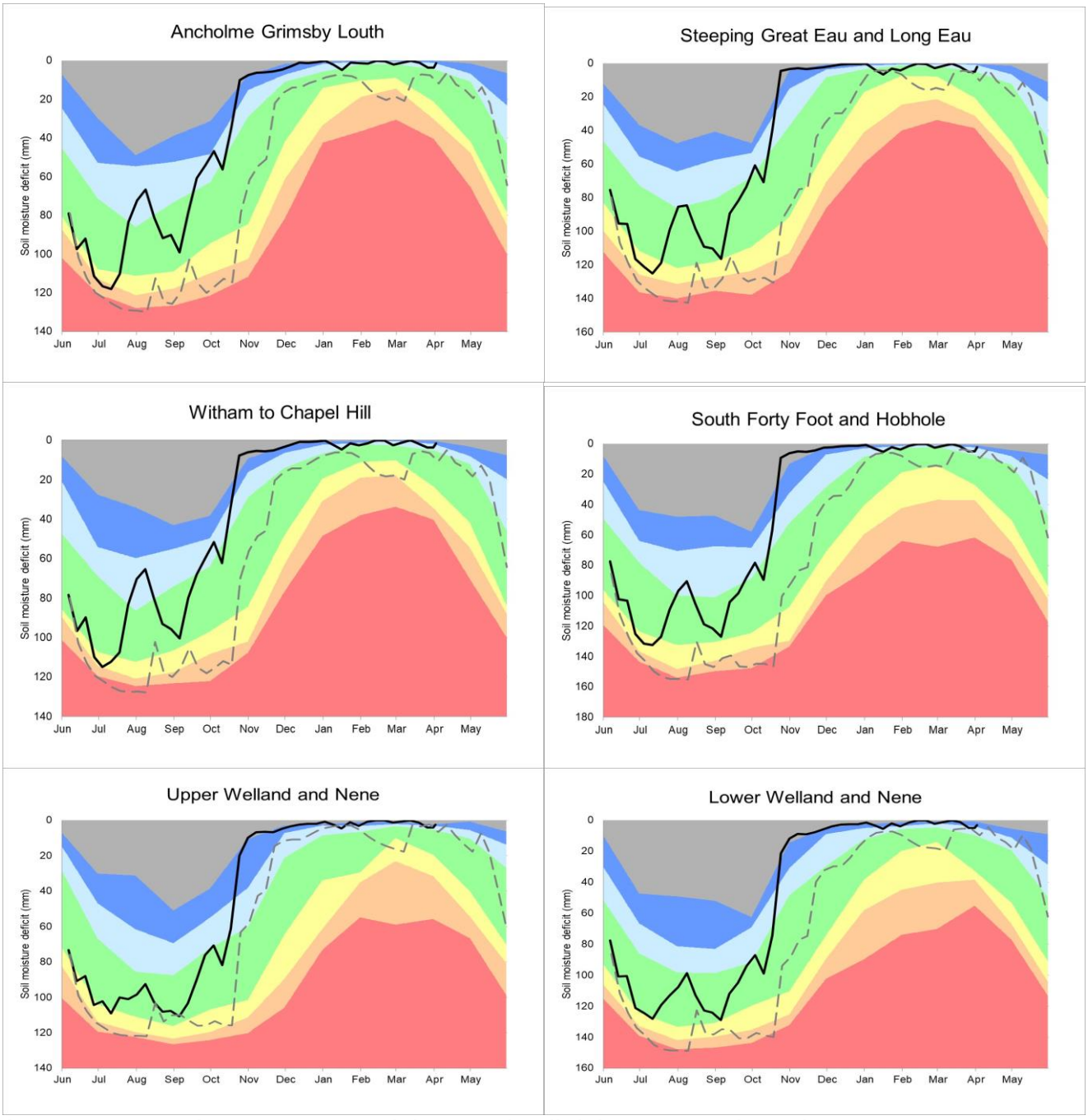


HadUK rainfall data. (Source: Met Office. Crown copyright, 2024).

3 Soil moisture deficit

3.1 Soil moisture deficit charts

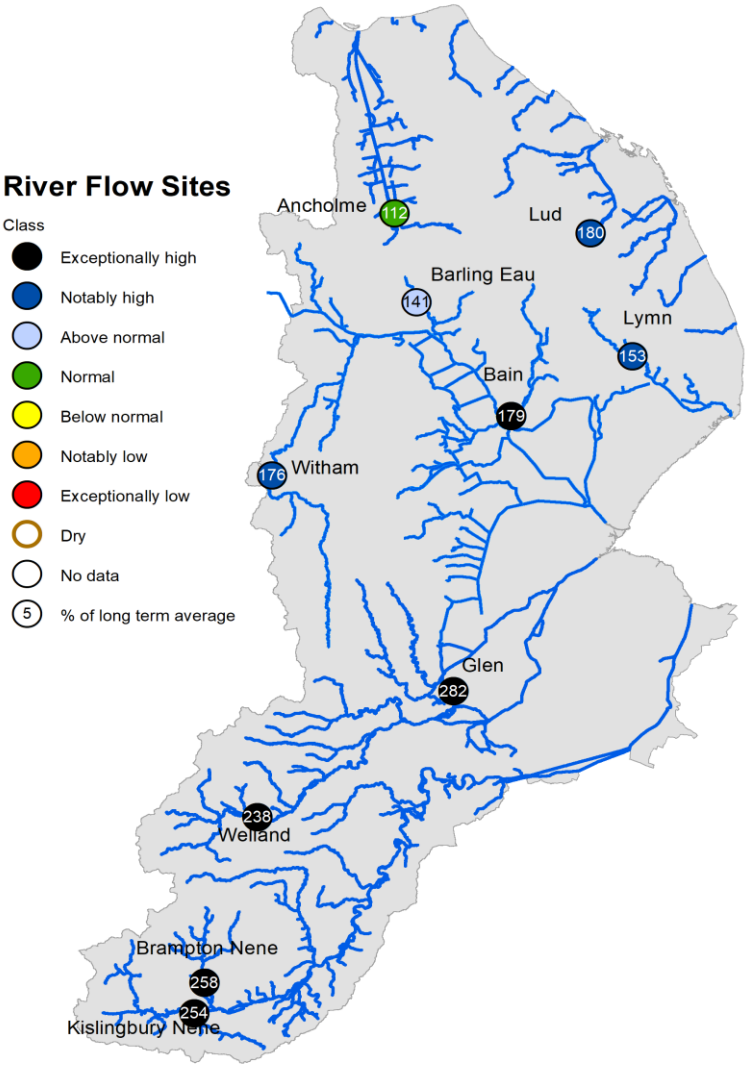
Figure 3.1: Latest soil moisture deficit compared to an analysis of historic 1961 to 1990 long term data set. Weekly MORECS data for real land use.



4 River flows

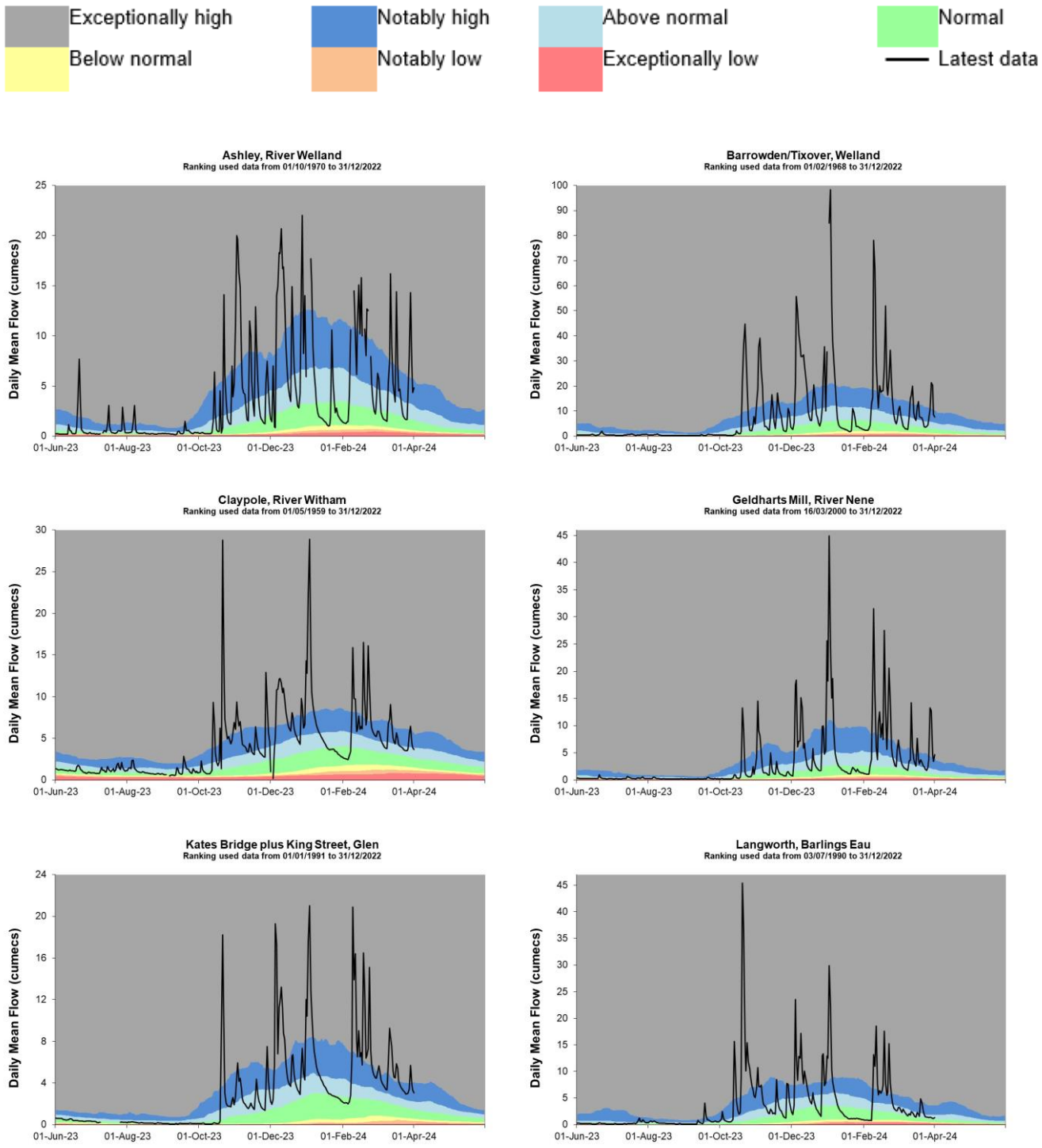
4.1 River flows map

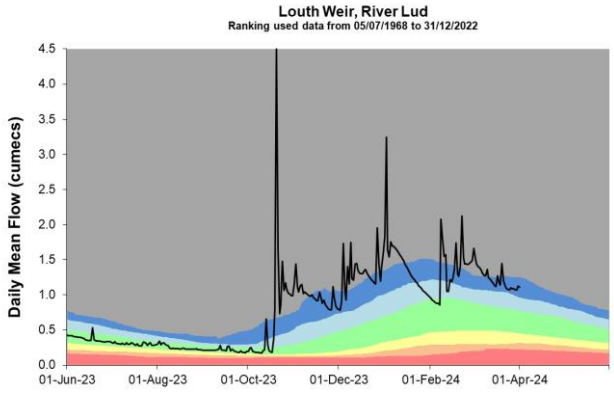
Figure 4.1: Monthly mean river flow for indicator sites for March 2024, expressed as a percentage of the respective long term average and classed relative to an analysis of historic March monthly means Table available in the appendices with detailed information.

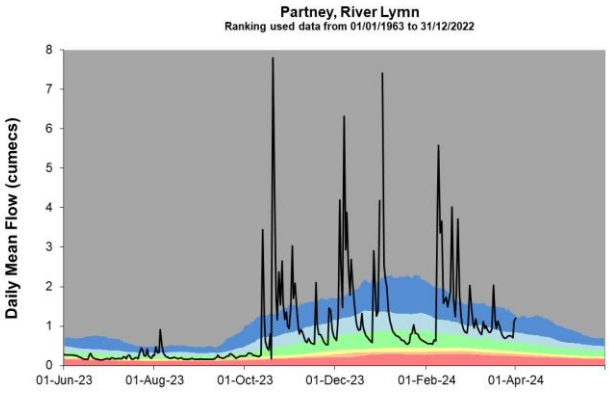


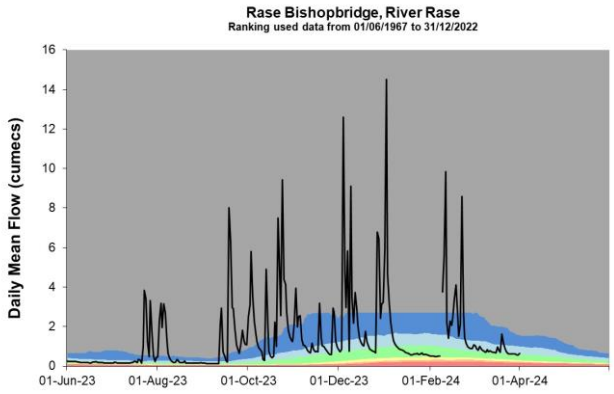
4.2 River flow charts

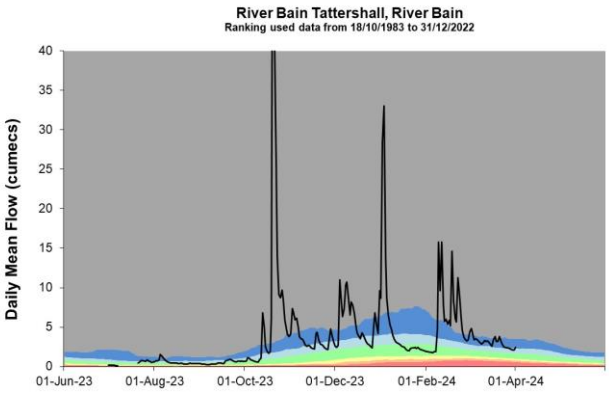
Figure 4.2: Daily mean river flow for index sites over the past year, compared to an analysis of historic daily mean flows, and long term maximum and minimum flows.

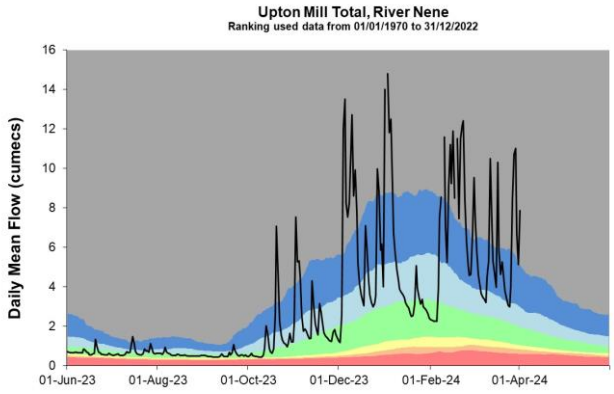


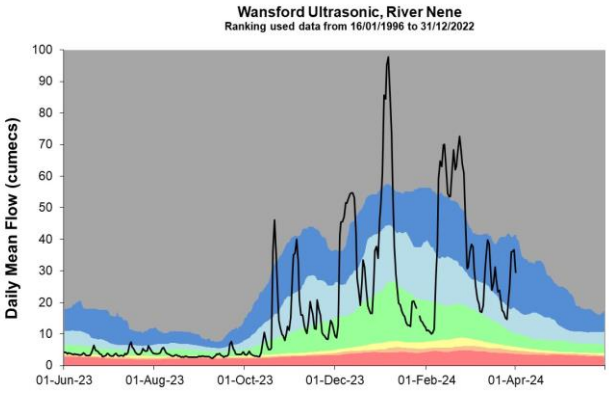










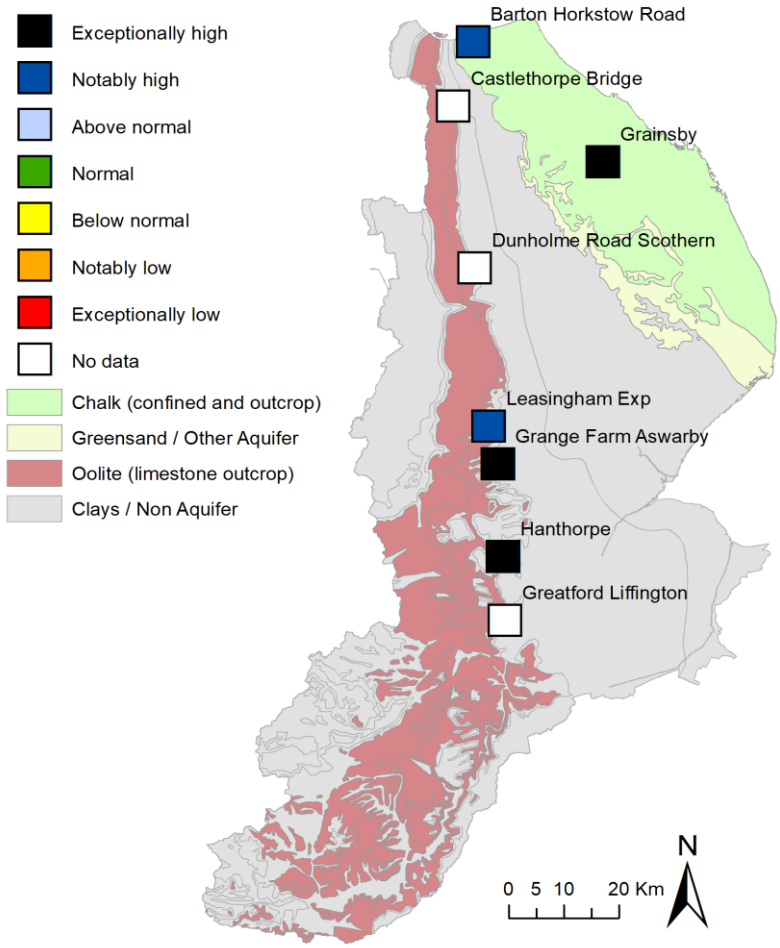


Source: Environment Agency.

5 Groundwater levels

5.1 Groundwater levels map

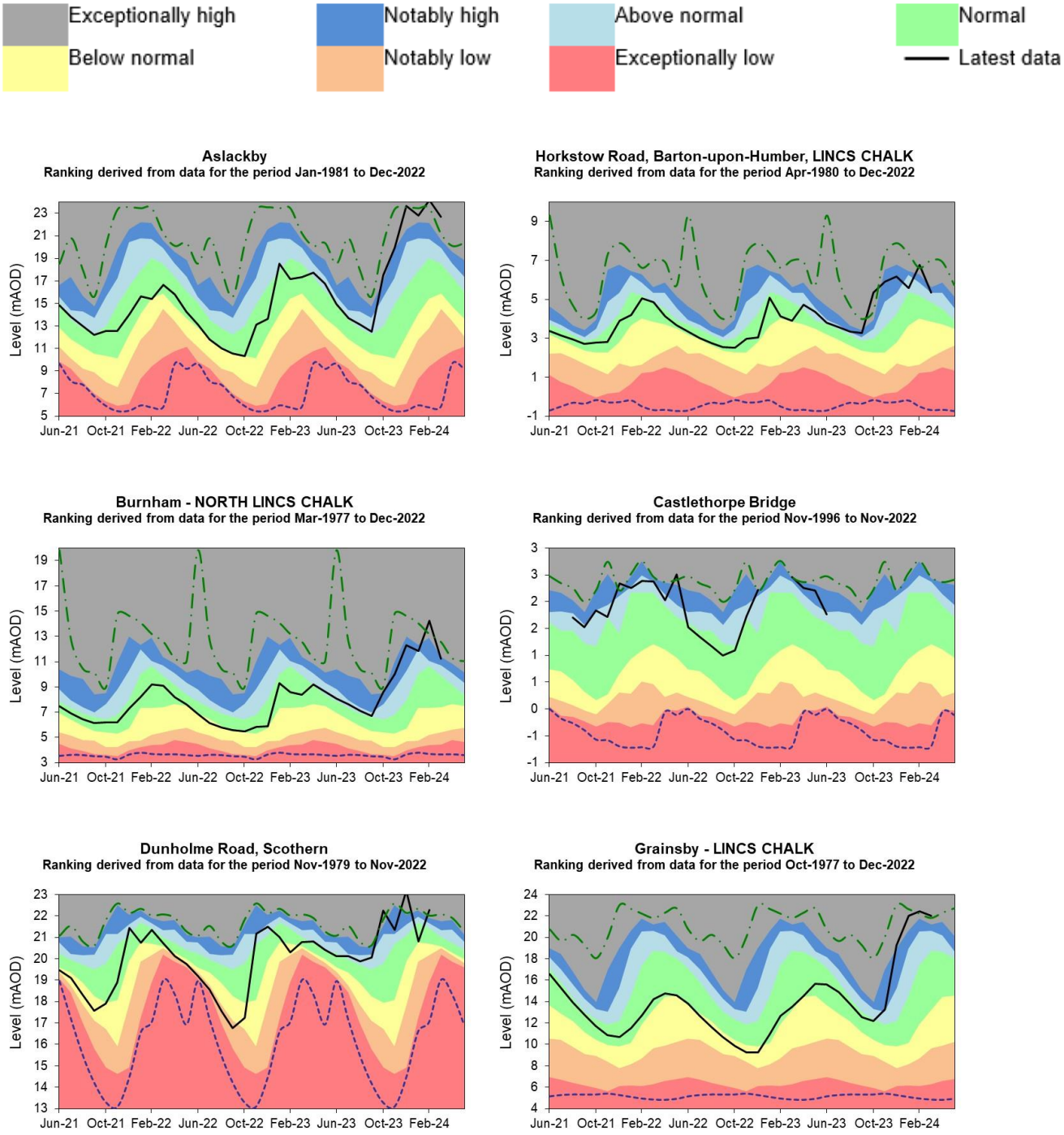
Figure 5.1: Groundwater levels for indicator sites at the end of March 2024, classed relative to an analysis of respective historic March levels. Table available in the appendices with detailed information.

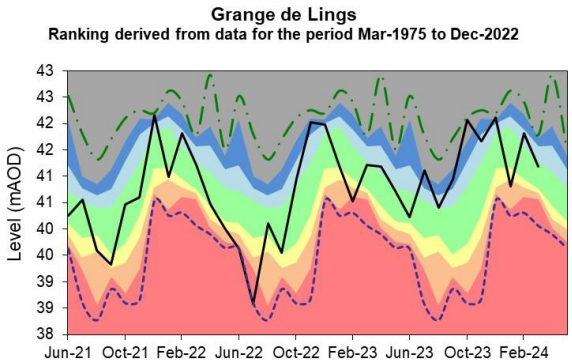


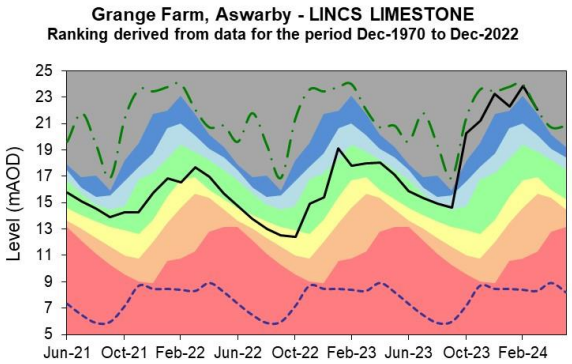
(Source: Environment Agency). Geological map reproduced with kind permission from UK Groundwater Forum, BGS copyright NERC. Crown copyright. All rights reserved. Environment Agency, 100024198, 2024.

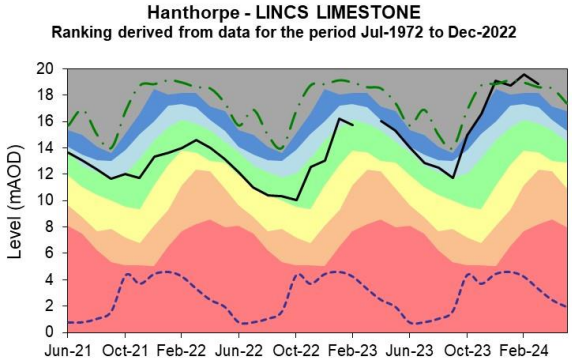
5.2 Groundwater level charts

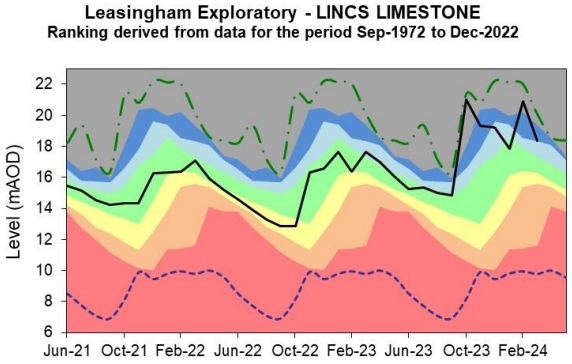
Figure 5.2: End of month groundwater levels at index groundwater level sites for major aquifers. 22 months compared to an analysis of historic end of month levels and long term maximum and minimum levels.







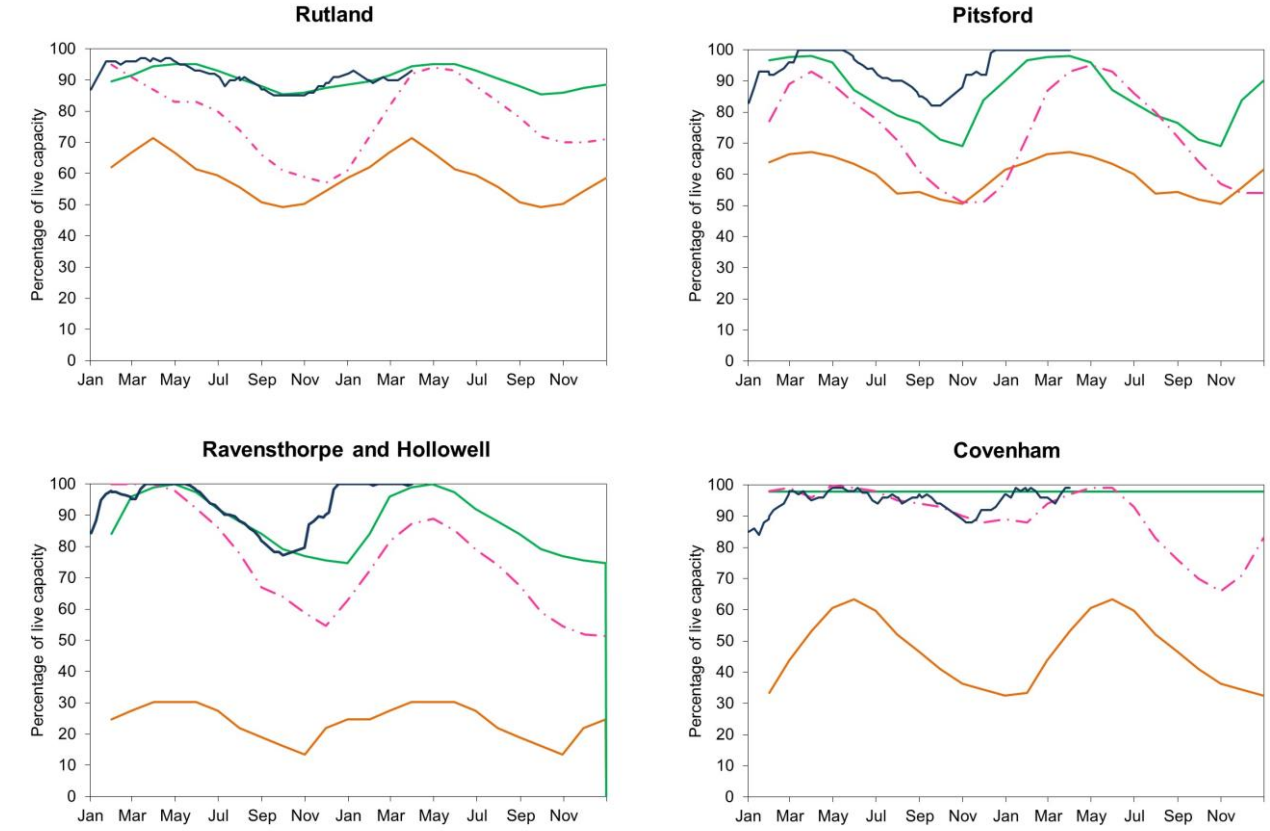




Source: Environment Agency, 2024.

6 Reservoir stocks

Figure 6.1: End of month regional reservoir stocks compared to the normal operating curve, drought curve and dry 1995-1996 stocks. Note: Historic records of individual reservoirs and reservoir groups making up the regional values vary in length

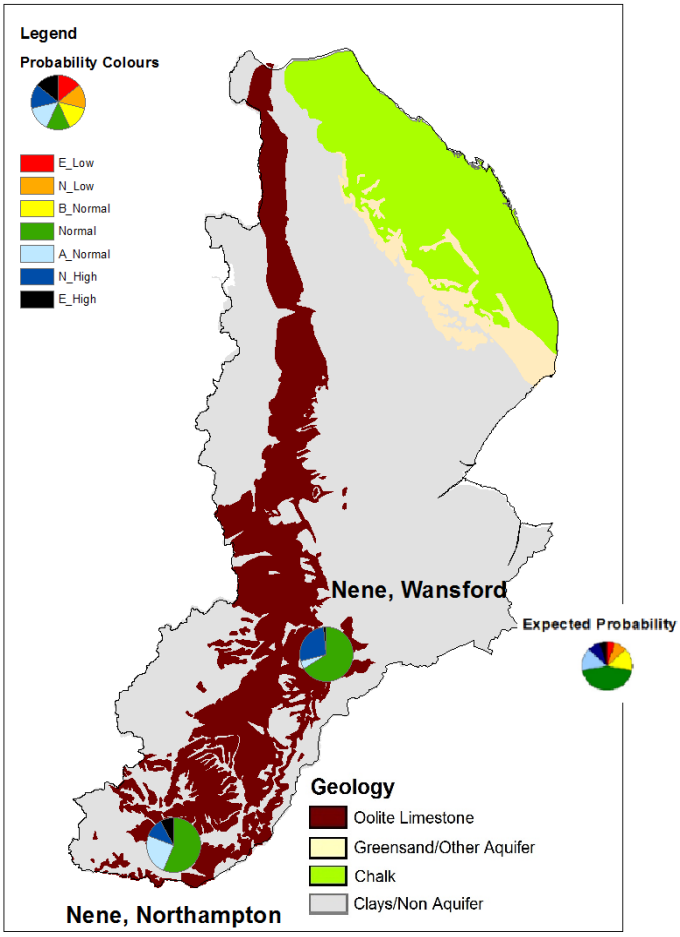


(Source: water companies).

7 Forward Look

7.1 Probabilistic ensemble projection of river flows at key sites in June 2024

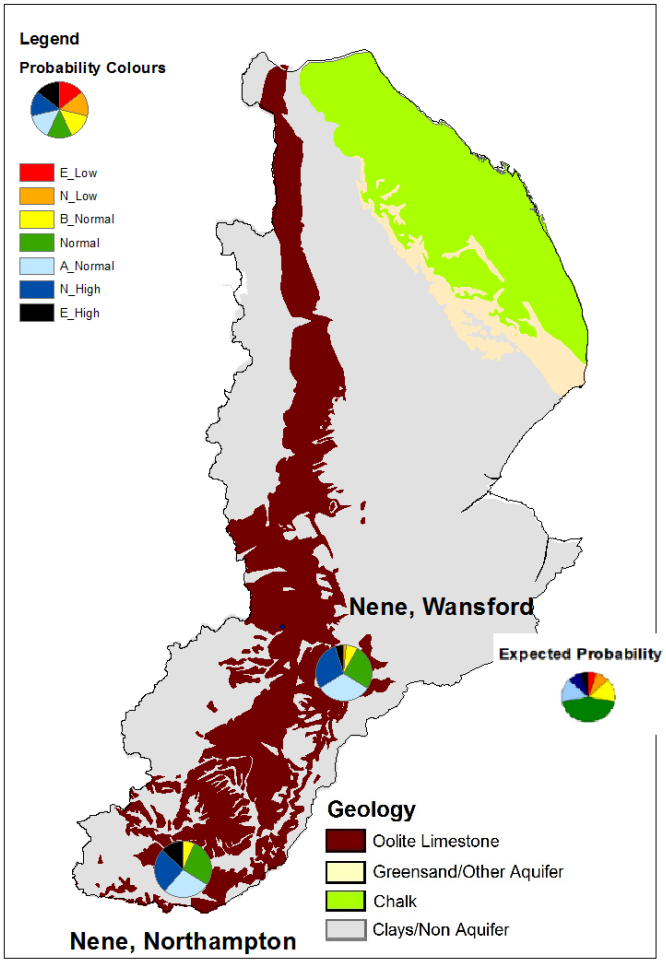
Table available in the appendices with detailed information. Exceptionally high or low levels are those which would typically occur 5% of the time within the historic record. Notably high or low levels are those which would typically occur 8% of the time. Above normal or below normal levels are those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



Pie charts indicate probability, based on climatology, of the surface water flow at each site being, for example, exceptionally low for the time of year. (Source: Centre for Ecology and Hydrology, Environment Agency) Geological map reproduced with kind permission from UK Groundwater Forum, BGS © NERC. Crown copyright. All rights reserved. Environment Agency, 100026380, 2024.

7.2 Probabilistic ensemble projection of river flows at key sites in September 2024

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



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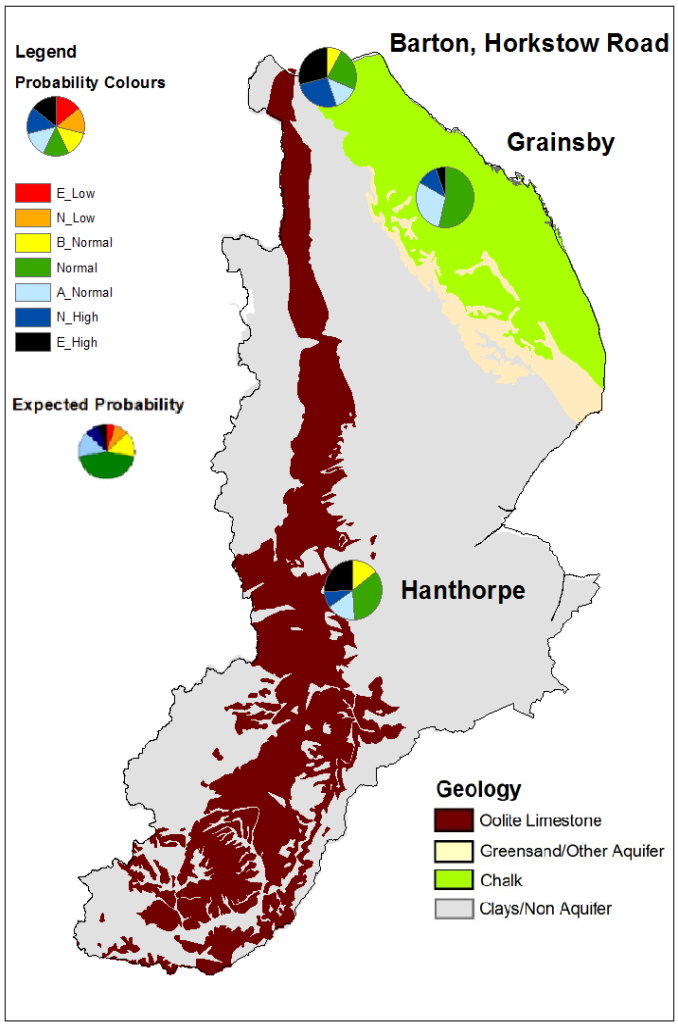
7.3 Probabilistic ensemble projection of groundwater levels at key sites in September 2024

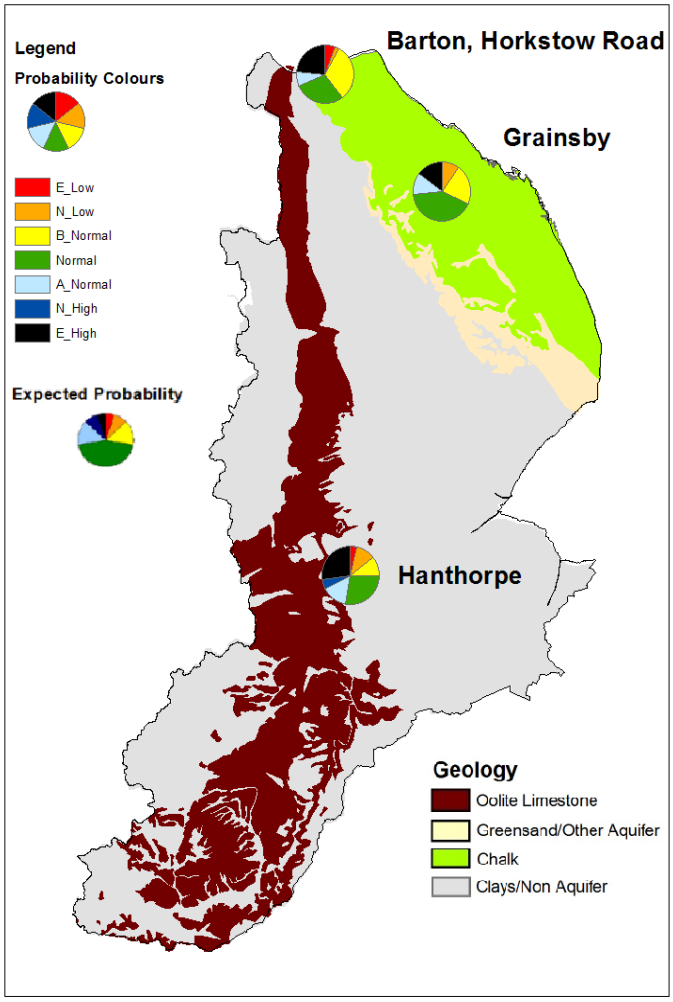
Table available in the appendices with detailed information. Exceptionally high or low levels are those which would typically occur 5% of the time within the historic record. Notably high or low levels are those which would typically occur 8% of the time. Above normal or below normal levels are those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



Pie charts indicate probability, based on climatology, of the groundwater level at each site being, for example, exceptionally low for the time of year. (Source: Environment Agency) Geological map reproduced with kind permission from UK Groundwater Forum, BGS © NERC. Crown copyright. All rights reserved. Environment Agency, 100026380, 2024

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

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



Pie charts indicate probability, based on climatology, of the groundwater level at each site being, for example, exceptionally low for the time of year. (Source: Environment Agency) Geological map reproduced with kind permission from UK Groundwater Forum, BGS © NERC. Crown copyright. All rights reserved. Environment Agency, 100026380, 2024

8 Glossary

8.1 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).

8.2 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.

9 Appendices

9.1 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
Louth Grimsby And Ancholme	109	Above Normal	Notably high	Exceptionally high	Exceptionally high
Lower Welland And Nene	121	Above Normal	Exceptionally high	Exceptionally high	Exceptionally high
South Forty Foot And Hobhole	120	Above Normal	Exceptionally high	Exceptionally high	Exceptionally high
Steeping Great Eau And Long Eau	115	Above Normal	Exceptionally high	Exceptionally high	Exceptionally high
Upper Welland And Nene	149	Above Normal	Exceptionally high	Exceptionally high	Exceptionally high
Witham To Chapel Hill	127	Above Normal	Exceptionally high	Exceptionally high	Exceptionally high

9.2 River flows table

Site name	River	Catchment	Mar 2024 band	Feb 2024 band
Ashley	Welland Mkt.harb-rockinghm	Welland Rockingham	Exceptionally high	Exceptionally high
Barrowden/tixover	Welland (rockingham To Stamford)	Welland Stamford	Exceptionally high	Exceptionally high
Claypole	Upper Witham	Witham Bargate Upper	Notably high	Exceptionally high
Geldharts Mill	Nene (brampton Branch)	Nene Brampton Bridge	Exceptionally high	Exceptionally high
Kates Bridge Plus King Street	Glen (an)	Welland and Glen	Exceptionally high	Exceptionally high
Langworth	Barlings Eau	Barlings Eau	Above normal	Exceptionally high
Louth Weir	Lud	Louth Canal	Notably high	Notably high
Partney	Lymn & Steeping	Lymn Steeping	Notably high	Exceptionally high
Rase Bishopbridge	Ancholme	Ancholme W Mid	Normal	Exceptionally high
Upton Mill Total	Nene (kislingbury Branch)	Nene Kislingbry Bridge	Exceptionally high	Exceptionally high

Wansford Combined	Nene (wollaston To Wansford)	Nene Wansford	Notably high	Exceptionally high

9.3 Groundwater table

Site name	Aquifer	End of Mar 2024 band	End of Feb 2024 band
Barton-upon-humber	Grimsby Ancholme Louth Chalk	Notably high	Exceptionally high
Castlethorpe Bridge	Grimsby Ancholme Louth Limestone		
Dunholme Road, Scothern	Grimsby Ancholme Louth Limestone		Exceptionally high
Grainsby	Grimsby Ancholme Louth Chalk	Exceptionally high	Exceptionally high
Grange Farm, Aswarby	Central Lincs Limestone?	Exceptionally high	Exceptionally high
Hanthorpe	Cornbrash (south)	Exceptionally high	Exceptionally high
Leasingham Exploratory	Blisworth Limestone Rutland Formation (south)?	Notably high	Exceptionally high

9.4 Ensemble projections tables

9.4.1 Probabilistic ensemble projection of river flows at key sites in June 2024

Percentage of pie chart for each band

Site	Nene Nton	Nene Wansford
Exceptionally low	0.0	0.0
Notably low	0.0	0.0
Below normal	0.0	0.0
Normal	56.5	66.1
Above normal	24.2	4.8
Notably high	11.3	27.4
Exceptionally high	8.1	1.6

9.4.2 Probabilistic ensemble projection of river flows at key sites in September 2024

Percentage of pie chart for each band

Site	Nene Nton	Nene Wansford
Exceptionally low	0.0	0.0
Notably low	0.0	1.6
Below normal	6.5	6.5
Normal	27.4	25.8
Above normal	27.4	32.3
Notably high	25.8	29.0
Exceptionally high	12.9	4.8

9.4.3 Probabilistic ensemble projection of groundwater levels at key sites in September 2024

Percentage of pie chart for each band

Site	Grainsby	Hanthorpe	Horkstow
Exceptionally low	0.0	0.0	0.0
Notably low	0.0	0.0	0.0
Below normal	0.0	14.5	7.9
Normal	53.7	34.5	23.7
Above normal	29.3	16.4	13.2
Notably high	12.2	9.1	26.3
Exceptionally high	4.9	25.5	28.9

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

Percentage of pie chart for each band

Site	Grainsby	Hanthorpe	Horkstow
Exceptionally low	0.0	3.6	5.3
Notably low	9.8	10.9	2.6
Below normal	22.0	10.9	31.6
Normal	41.5	27.3	28.9
Above normal	12.2	14.5	7.9
Notably high	0.0	5.5	0.0
Exceptionally high	14.6	27.3	23.7