

### Overview

The first two thirds of November 2023 saw Atlantic low-pressure systems dominate. This brought above average temperatures with rain or showers on most days, especially in the West and Northwest. The final third of the month saw high pressure having more of an influence with drier and progressively cooler conditions.

The monthly average river flows for November remained high since last month, with 72% of river flows above the long-term normal for November, while 89% of lake and turlough monitoring stations observed levels above the long-term normal range for this month also. Average monthly groundwater levels increased with 81% of monitoring wells recording levels above the long-term average for November. Similarly, spring outflows were all normal or above for this time of year.

### Rainfall

Most of the monthly rainfall totals across the country were below their 1981-2010 Long-Term Average (LTA). Percentage of monthly rainfall values ranged from 53% (monthly rainfall total of 79.2 mm) at Mace Head, Co Galway to 129% (monthly rainfall total of 172.8 mm) at Knock Airport, Co Mayo. Monthly rainfall totals ranged from 41.2 mm (56% of its LTA) at Casement Aerodrome, Co Dublin to 209.6 mm (123% of its LTA) at Newport, Co Mayo. The month's wettest day was also recorded at Newport, Co Mayo with 45.9 mm on Monday 13th.

The number of rain days ranged from 18 days at Roche's Point, Co Cork to 28 days at Valentia Observatory, Co Kerry. The number of wet days ranged from 12 days at a few stations to 23 days at Valentia Observatory, Co Kerry. The number of very wet days ranged from zero days at both Oak Park, Co Carlow and Casement Aerodrome, Co Dublin to 6 days at Knock Airport, Co Mayo.

### River Flows

The average river flows for November decreased at 59% of river monitoring stations compared to average flows observed in October 2023. Analysis of the monthly average flows at 139 river monitoring sites identified 24 (17%) as 'particularly high', 76 (55%) as 'above normal', 35 (25%) as 'normal' and 4 (3%) were 'below normal'. Geographically, the 'normal' and 'below normal' river flows were mainly observed in the East.

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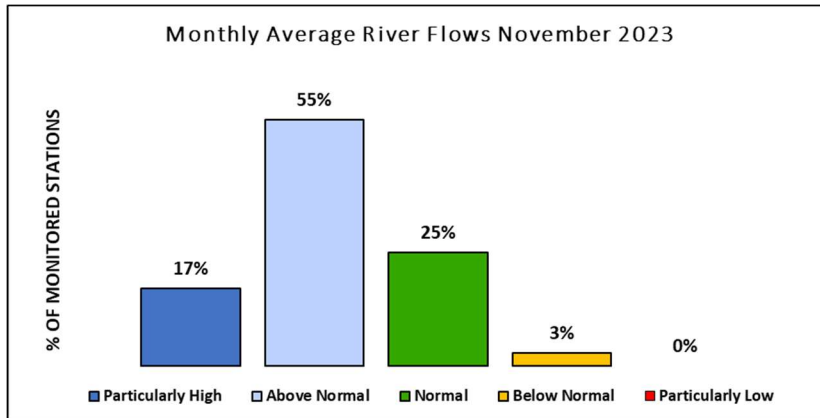


Figure 1: Percentage distribution of river flow monitoring sites within each of the percentile flow categories for November 2023.

### Lake and Turlough Levels

Average water levels for November increased at most of the monitored lakes and turlough sites compared to average levels for October. Analysis of monthly average levels at 34 lakes and 3 turloughs were classified as being ‘particularly high’ at 17 (46%), ‘above normal’ at 16 (43%), ‘normal’ at 4 (11%).

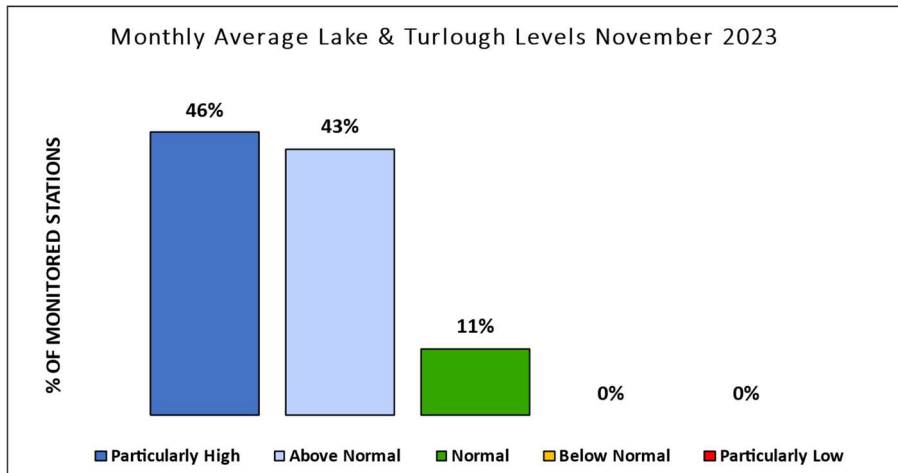


Figure 2: Percentage distribution of lake and turlough level monitoring sites within each of the percentile flow categories for November 2023.

### Groundwater Levels and Spring Flows

Average groundwater levels in November were higher at 79% of monitoring wells compared to average levels observed in October. Groundwater levels for November were classified as being ‘particularly high’ at 31 wells (76%), ‘above normal’ at 2 wells (5%) and ‘normal’ at 8 wells (19%).

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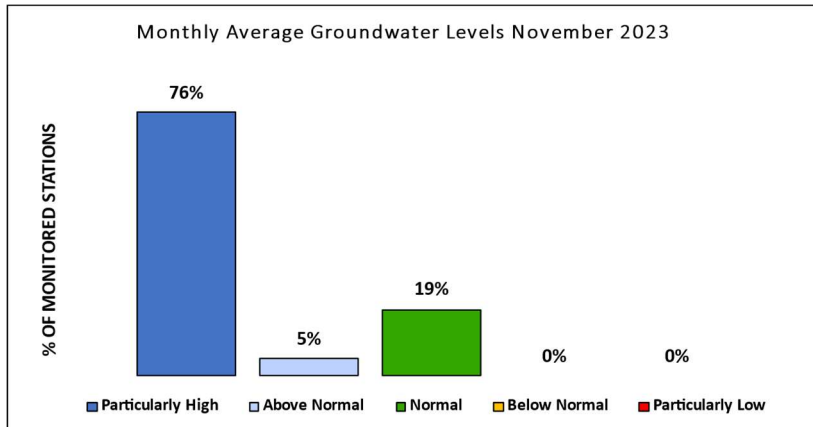


Figure 3: Percentage distribution of groundwater level sites within each of the percentile flow categories for November 2023.

Spring outflows were also monitored at 6 EPA monitoring sites for November. The outflows from these springs were compared to previously recorded November flows and were ‘particularly high’ at 2 monitoring locations, and ‘normal’ at 4 monitoring locations.

# Monthly Hydrology Bulletin: Edition 043: November 2023

## Rainfall

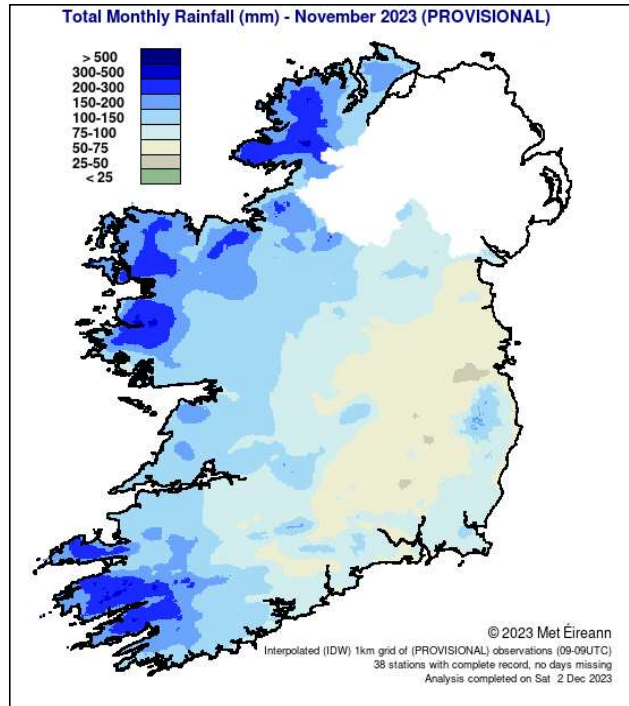


Figure 4: Rainfall map for Ireland November 2023 (Source: Met Eireann.ie).

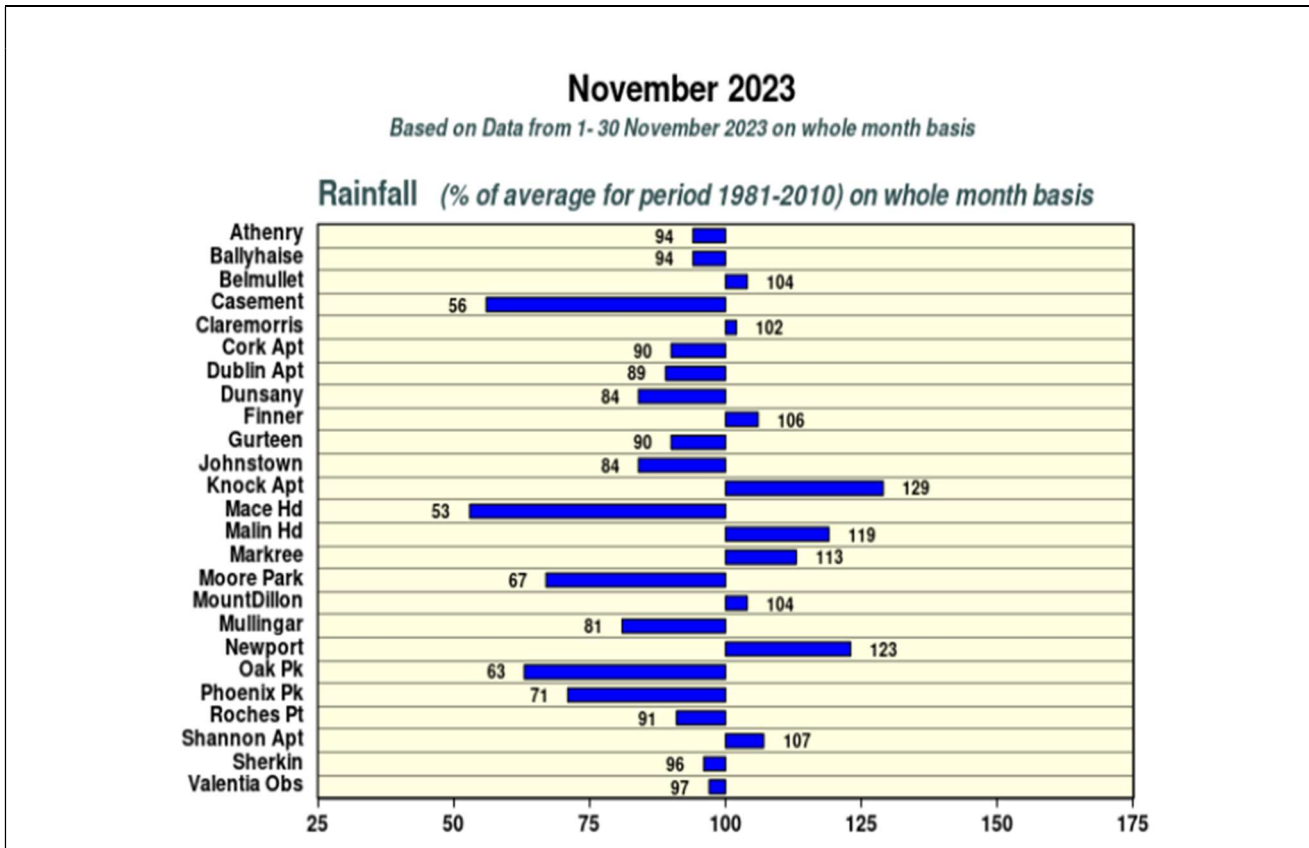


Figure 5: Summary of rainfall at synoptic stations for November 2023, figures indicate the percentage difference from the Long-Term Average rainfall for this month (Source: Met Eireann.ie).

## River Flows

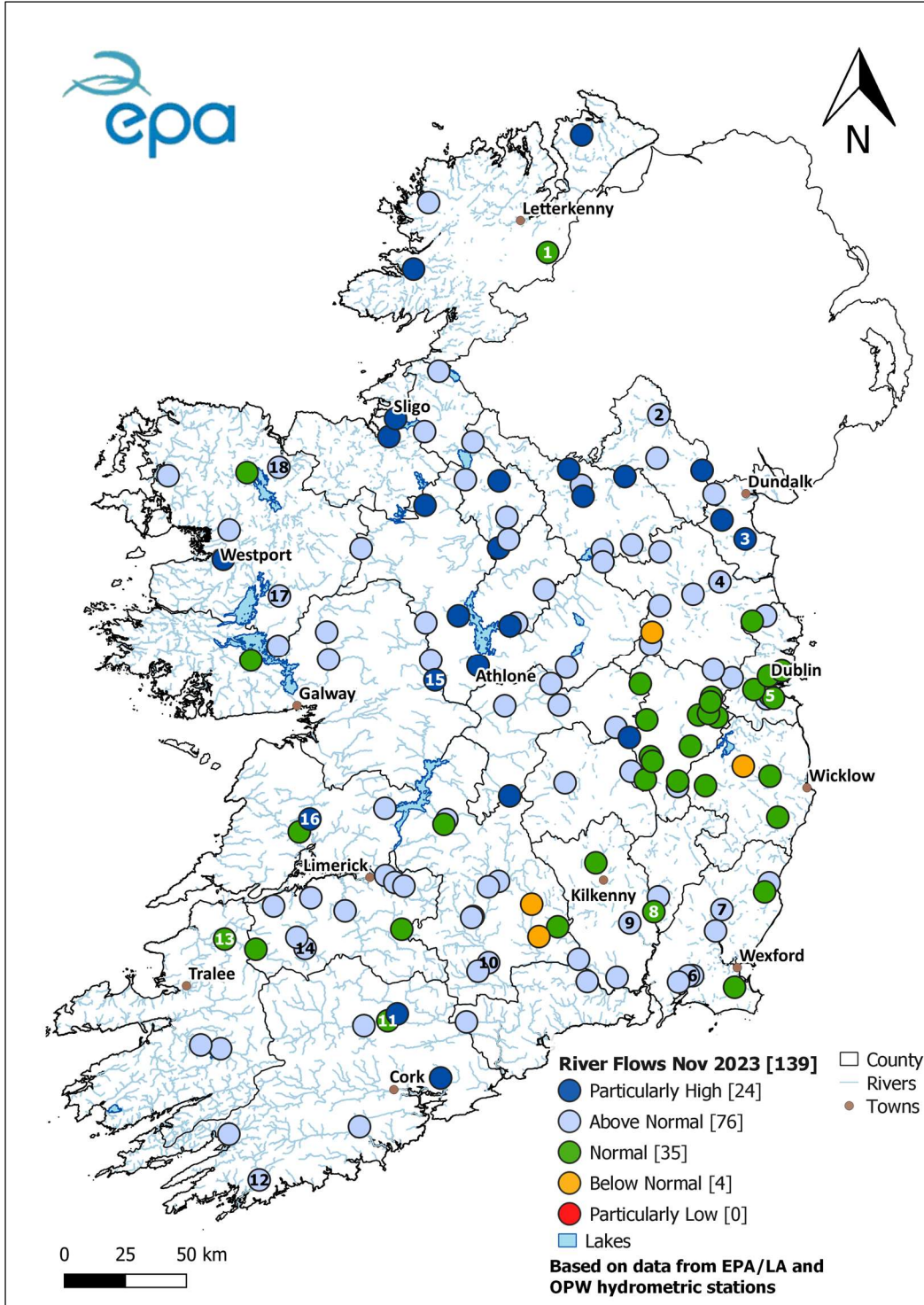


Figure 6: Monthly average river flows for November 2023 relative to historic monthly average flows expressed as percentile of the long-term values of monthly flow. Numbered sites are represented in the hydrographs below. All data are provisional and may be subject to revision (Source: EPA, OPW).

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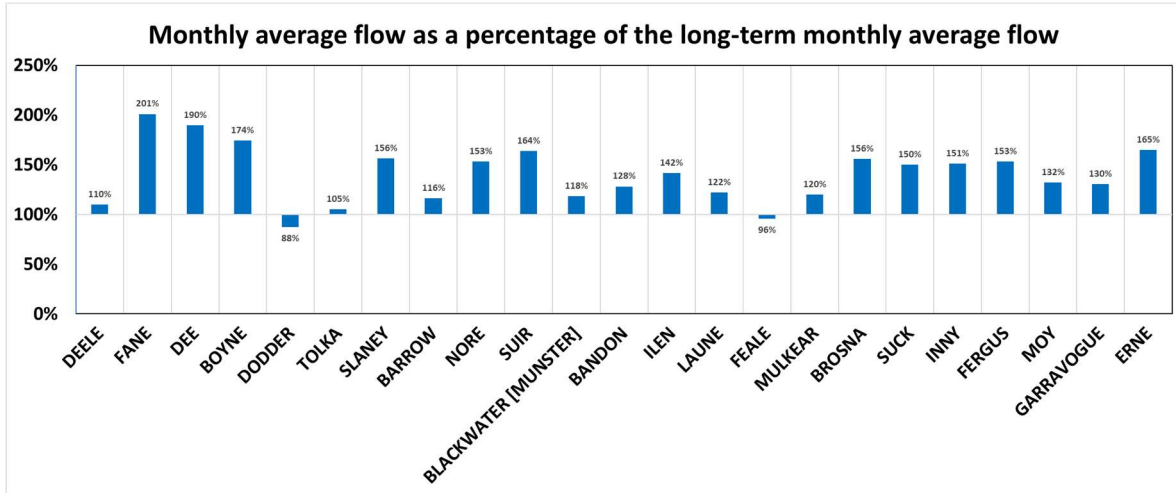
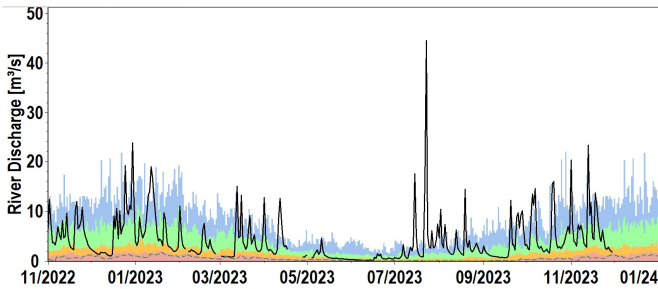


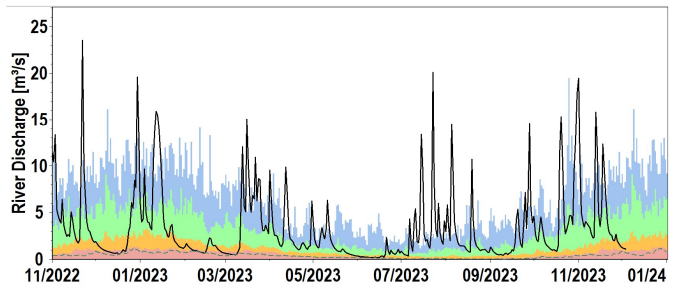
Figure 7: November 2023 average flows as a percentage of the long-term monthly average flow for this month at a selected number of stations. All data are provisional and may be subject to revision (Source: EPA, OPW).

## Flow Hydrographs for Selected Rivers

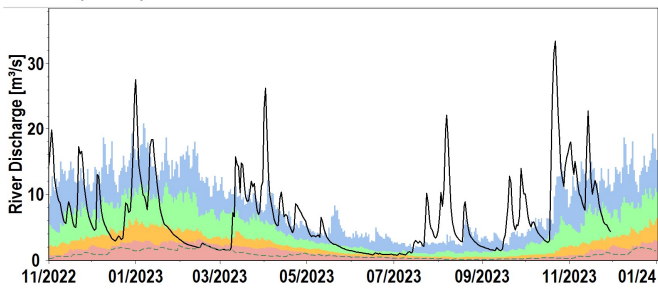
### 1. DEELE (Donegal)



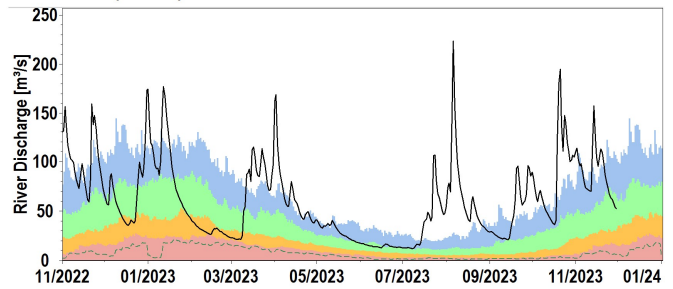
### 2. BLACKWATER [MONAGHAN]



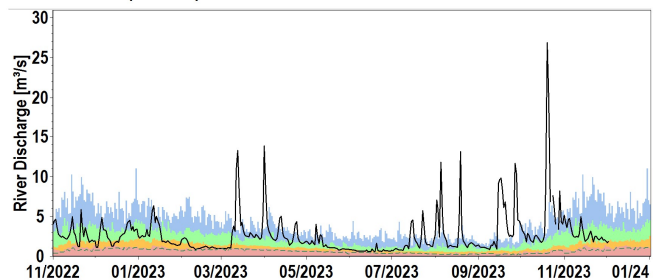
### 3. DEE (Louth)



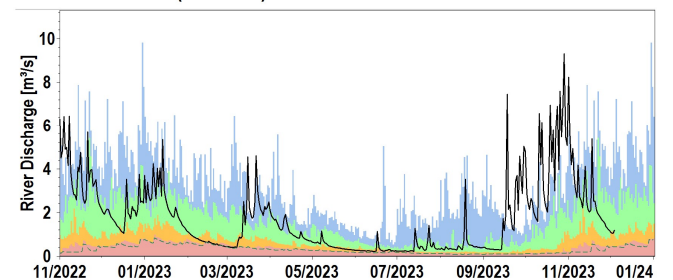
### 4. BOYNE (Meath)



### 5. DODDER (Dublin)

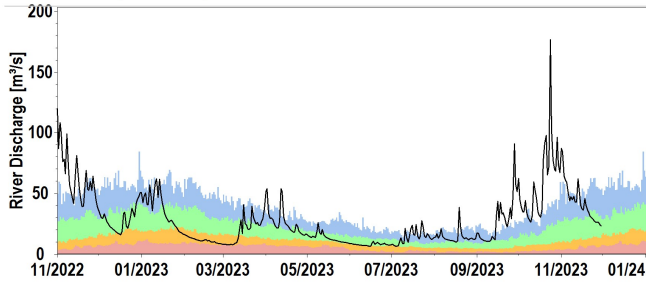


### 6. MULMONTRY (Wexford)

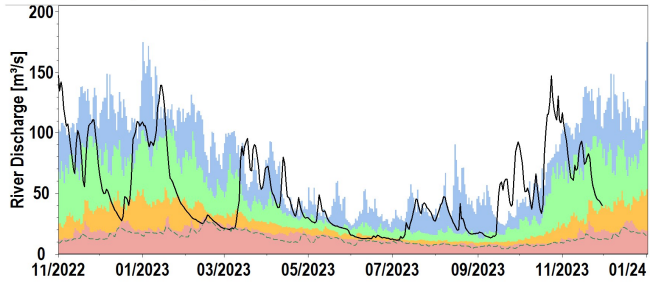


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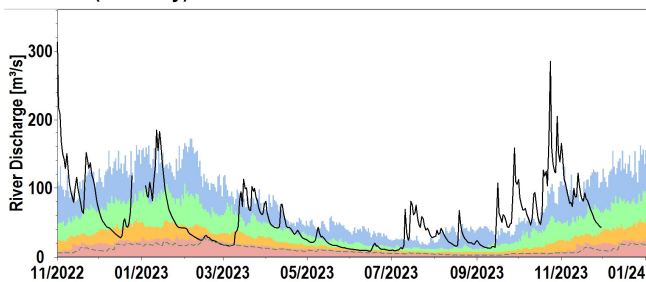
**7. SLANEY (Wexford)**



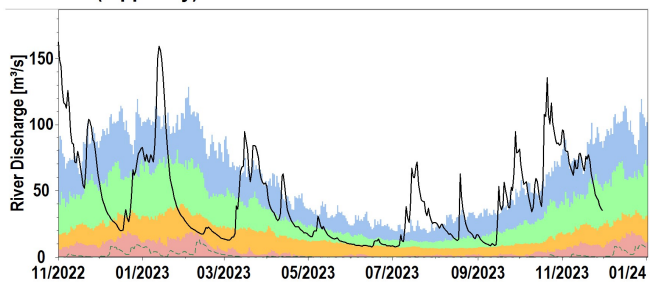
**8. BARROW (Carlow)**



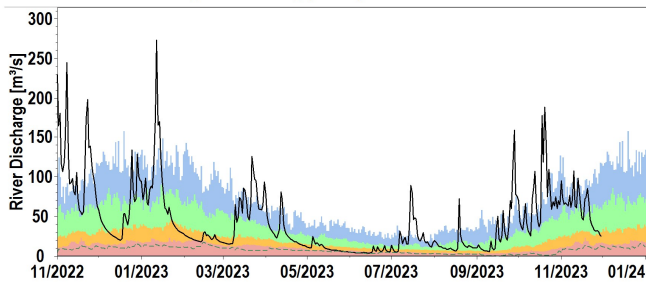
**9. NORE (Kilkenny)**



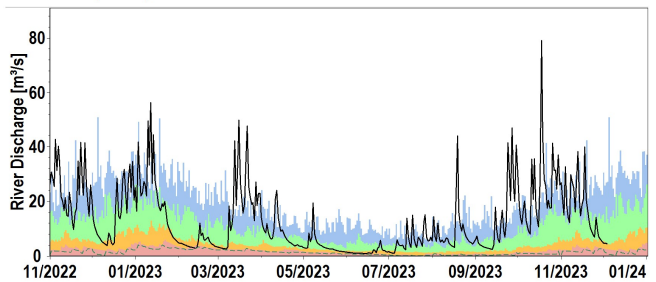
**10. SUIR (Tipperary)**



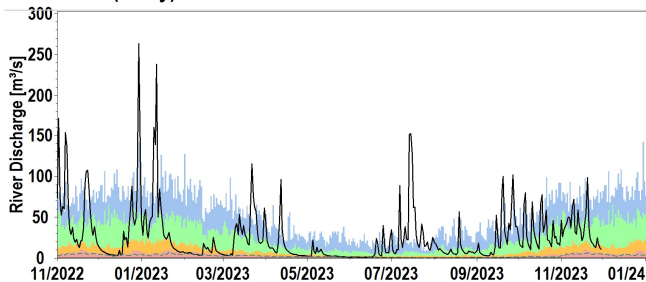
**11. BLACKWATER [MUNSTER] (Cork)**



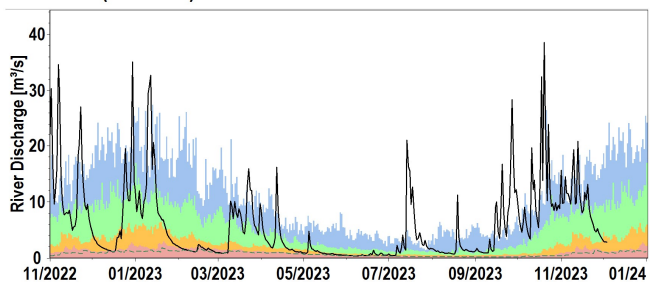
**12. ILEN (Cork)**



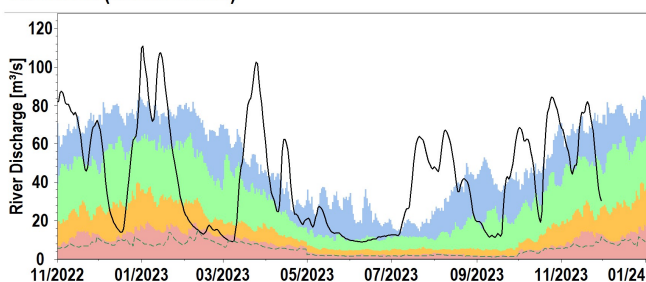
**13. FEALE (Kerry)**



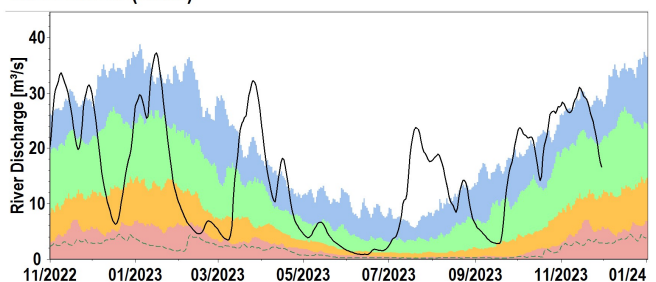
**14. DEEL (Limerick)**



**15. SUCK (Roscommon)**

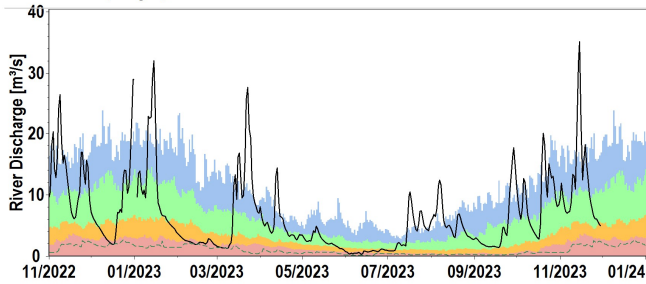


**16. FERGUS (Clare)**



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17. ROBE (Mayo)



18. MOY (Mayo)

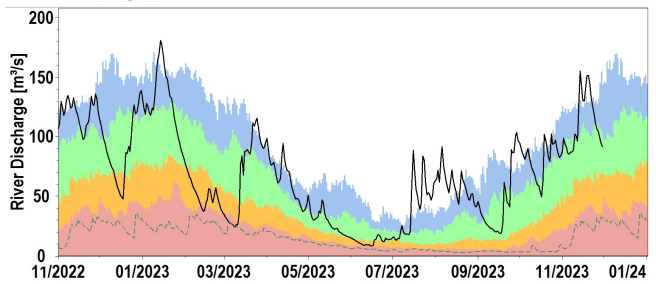




Figure 8: Daily average river flows measured in cubic metres per second relative to historic daily average flows expressed as percentile of the long-term values of each day and long-term minimum flows. All data are provisional and may be subject to revision (Source: EPA, OPW).

Explanation - Classes						
Particularly Low	Below Normal	Normal	Above Normal	Particularly High	Daily Mean Flow	Lowest Daily Mean Flow
<95%tile daily average flow	>95%tile <70%tile daily average flow	>70 %tile <30%tile daily average flow	>30%tile 10%tile daily average flow	>10%tile daily average flow		



## Lake and Turlough Levels

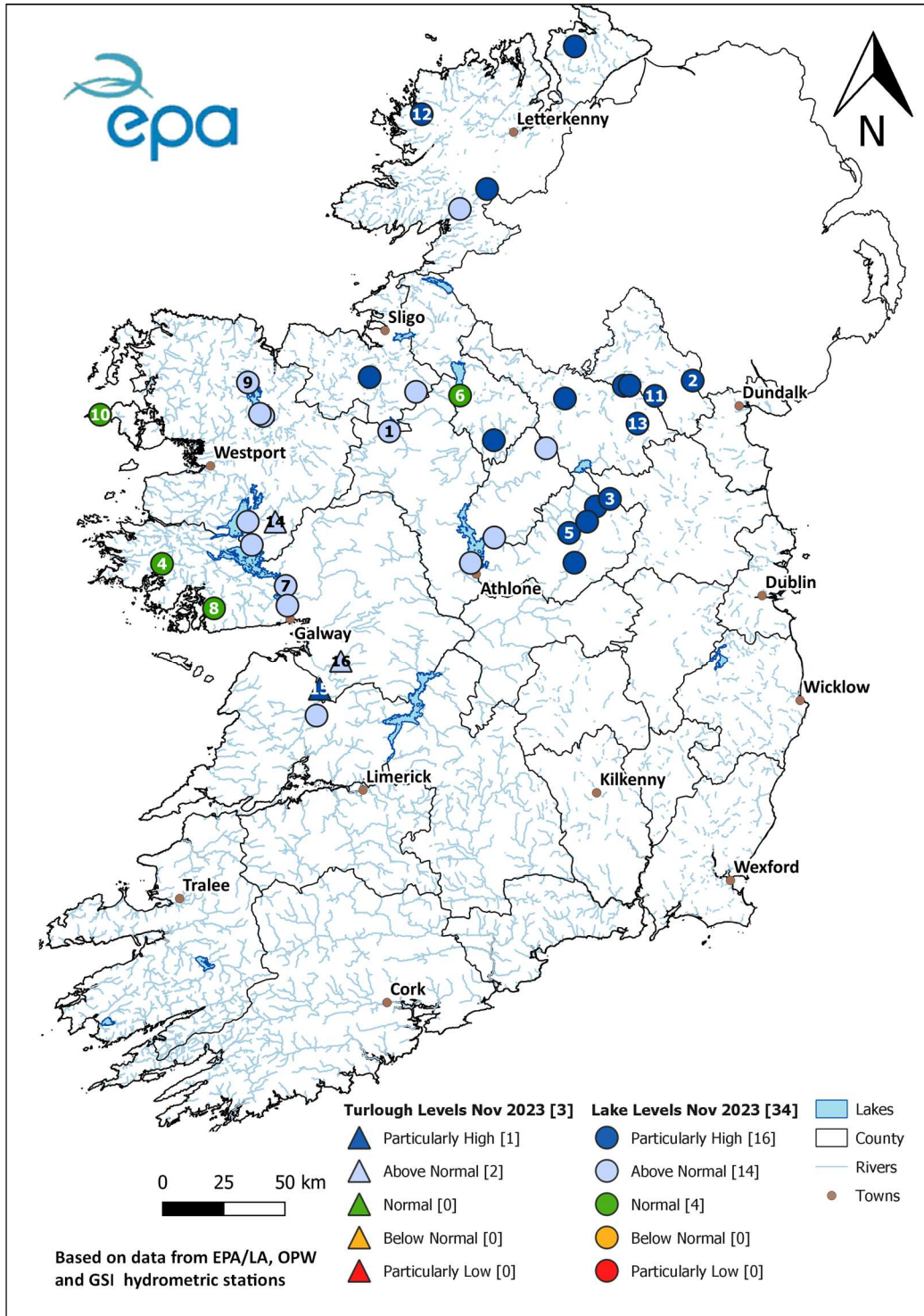
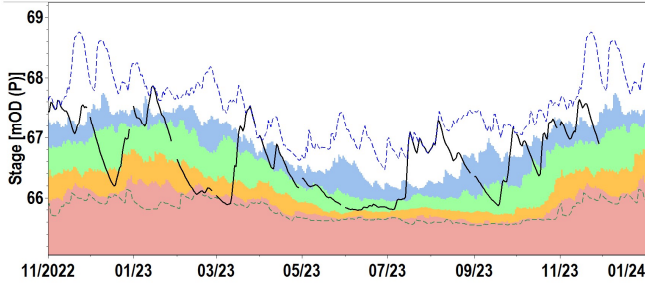


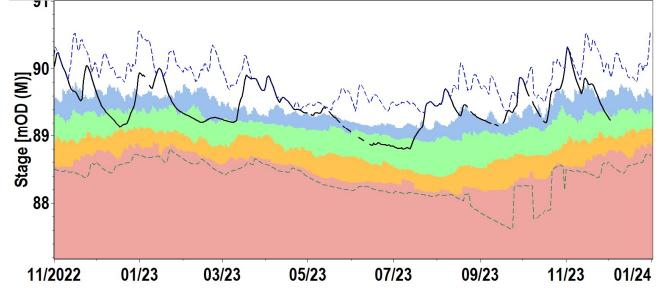
Figure 9: Monthly average lake & turlough levels for November 2023 relative to historic monthly average levels expressed as percentile of the long-term values for this month. Numbered sites are represented in the hydrographs below. All data are provisional and may be subject to revision (Source: EPA, OPW and GSI).

## Water Level Hydrographs for Selected Lakes and Turloughs

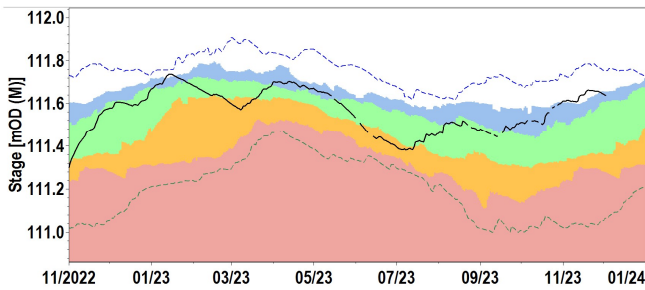
1. L. GARA (Sligo)



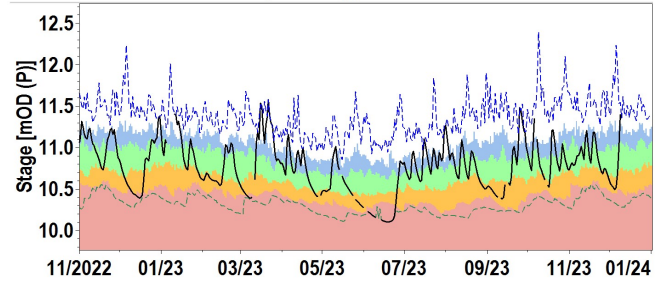
2. L. MUCKNO (Monaghan)



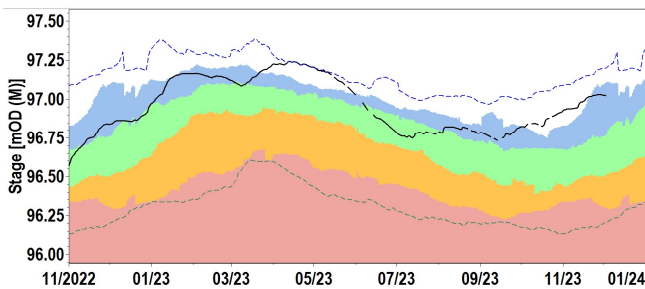
3. L. BANE (Meath)



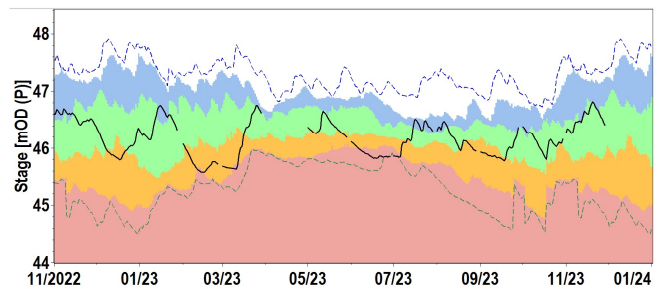
4. DERRYCLARE L. (Galway)



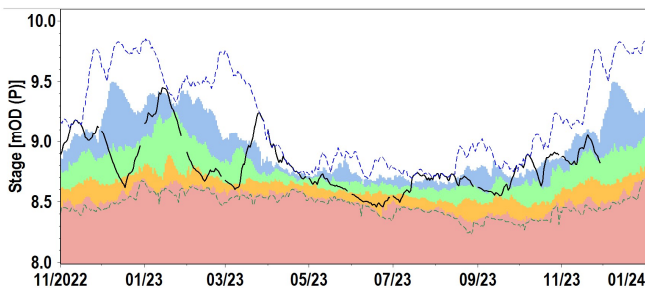
5. L. OWEL (Westmeath)



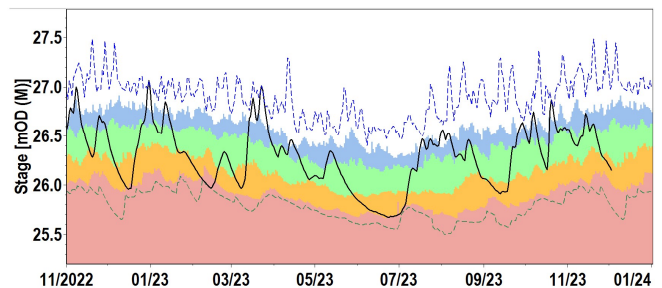
6. L.ALLEN (Leitrim)



7. L.CORRIB (Galway)

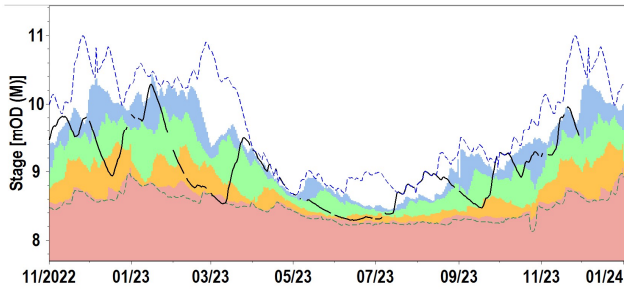


8. GLENICMURRIN LAKE (Galway)

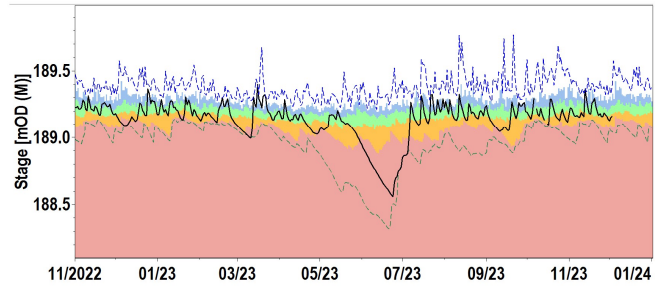


# Monthly Hydrology Bulletin: Edition 043: November 2023

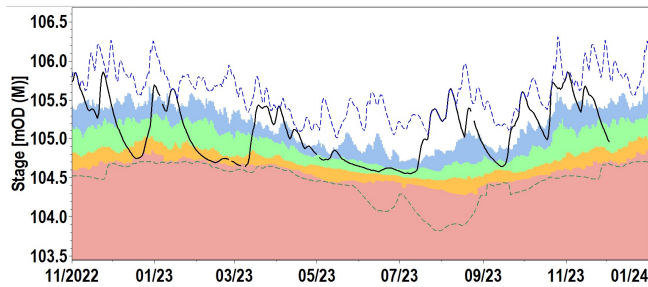
## 9. L.CONN (Mayo)



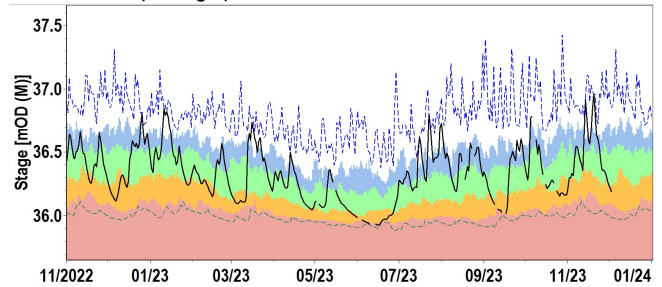
## 10. L. ACCORMORE (Mayo)



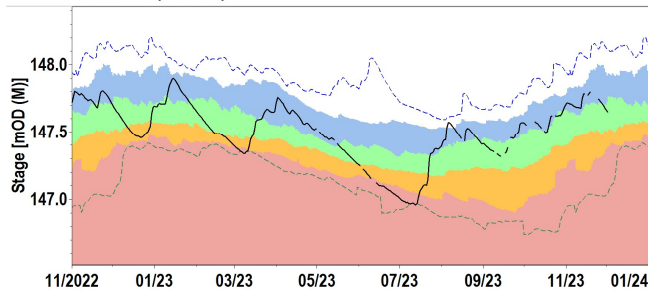
## 11. L.BAWN (Monaghan)



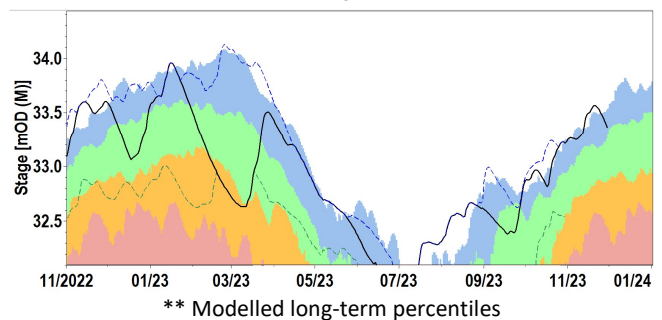
## 12. L.ANURE (Donegal)



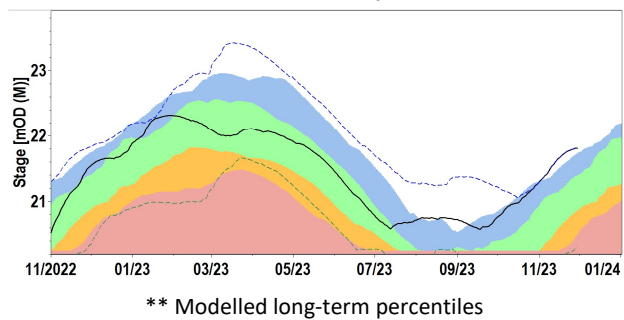
## 13. SKEAGH L. (Cavan)



## 14. SKEALOGHAN TURLOUGH (Mayo)



## 15. TERMON SOUTH TURLOUGH (Galway)



## 16. BLACKROCK TURLOUGH (Galway)

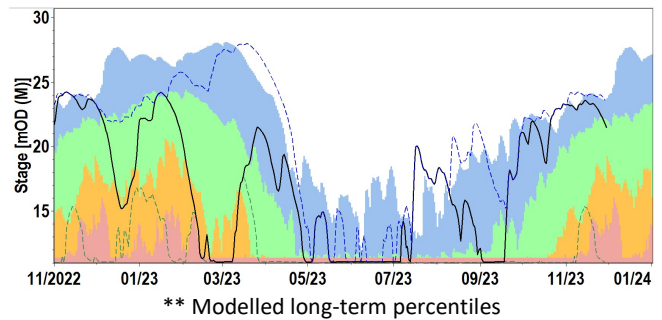
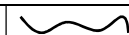




Figure 10: Observed daily mean lake and turlough levels (black trace) measured in meters above ordnance datum compared to the 10%tile, 30%tile, 70%tile and 95%tile for each month for the period of record and observed long-term maximum and minimum levels. Note historic percentiles for turloughs are based on modelled data. All data are provisional and may be subject to revision (Source: EPA, OPW, GSI, TCD, IT Carlow).

Explanation - Classes							
Particularly Low	Below Normal	Normal	Above Normal	Particularly High			
<95%tile daily average level	>95%tile <70%tile daily average level	>70 %tile <30%tile daily average level	>30%tile <10%tile daily average level	>10%tile daily average level	Daily Mean Level mOD	Highest Daily Mean Level mOD	Lowest Daily Mean Level mOD

## Groundwater Levels and Spring Flows

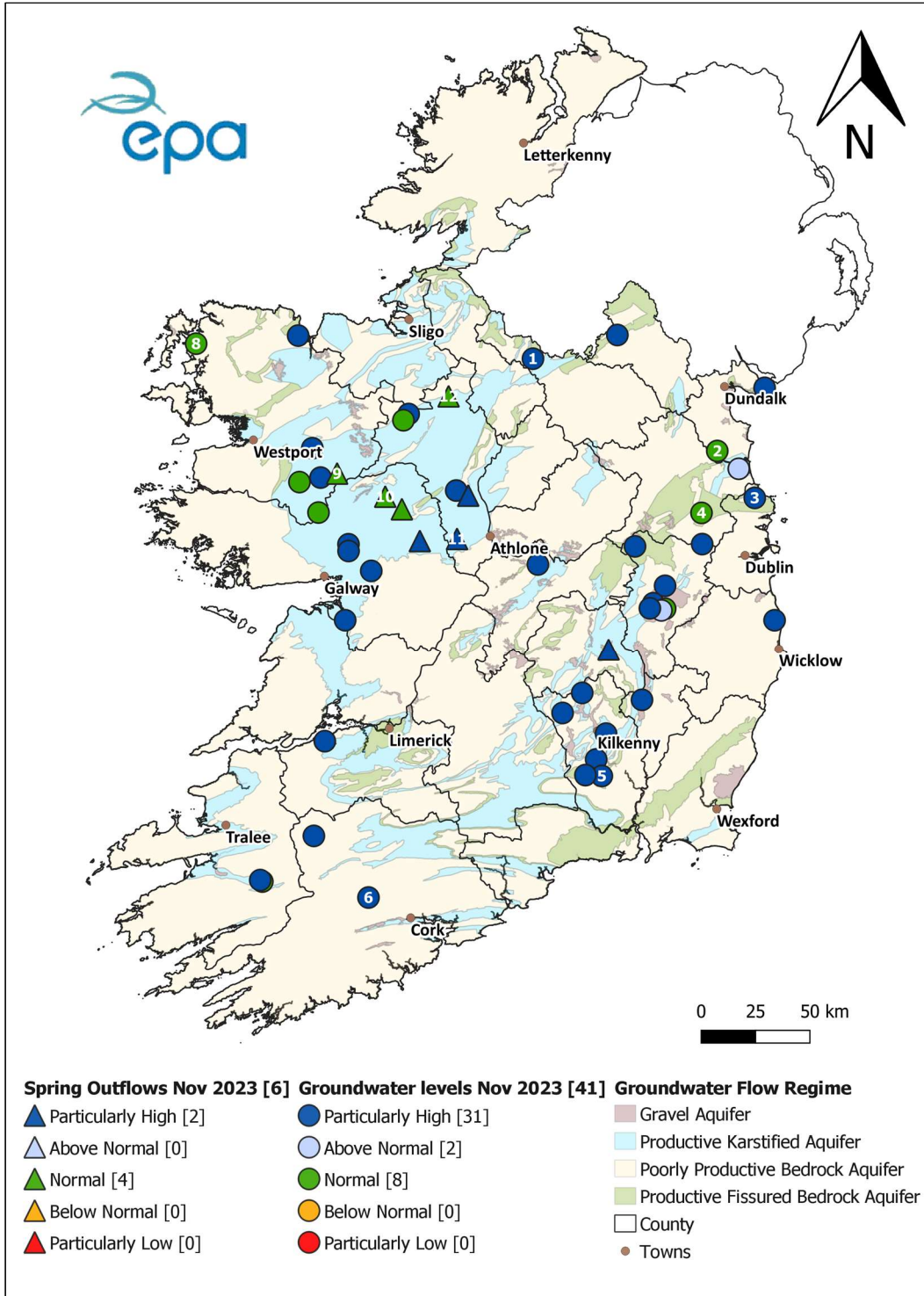
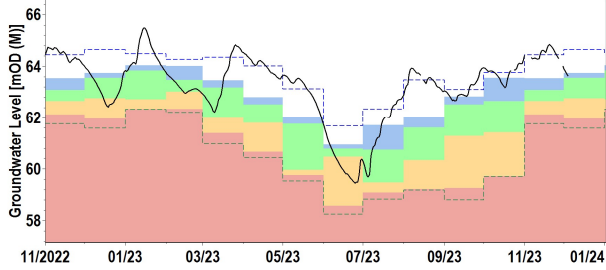


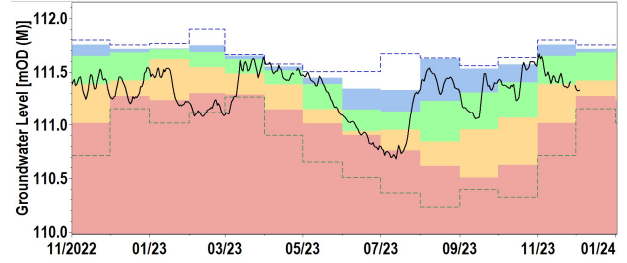
Figure 11: Groundwater level and Spring Flow status for November 2023, relative to historic monthly groundwater levels. Numbered sites are represented in the hydrographs below. All data are provisional and may be subject to revision (Source: EPA).

## Groundwater and Spring Hydrographs

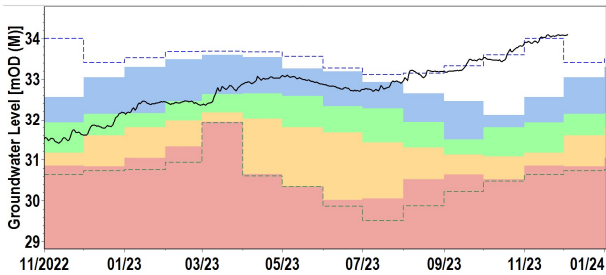
1. BAWN BOY WORKHOUSE (Cavan)



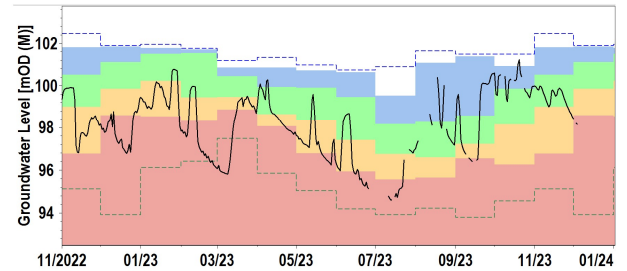
2. Mattock MK1 Deep (Meath)



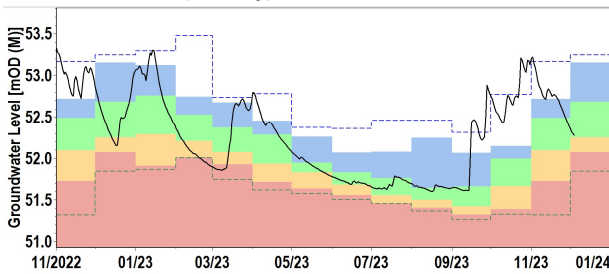
3. BOG OF THE RING OW3D (Fingal)



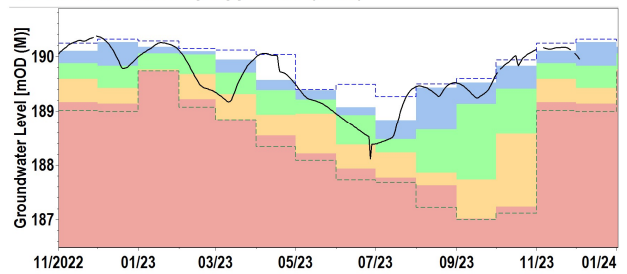
4. DUNSHAUGHLIN PW6 (Meath)



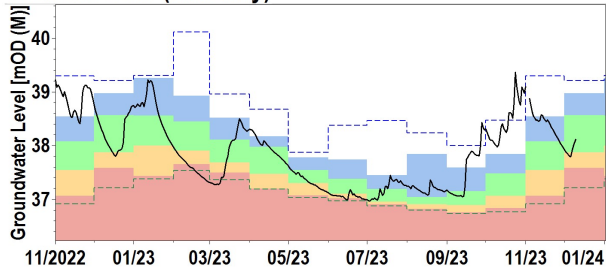
5. KNOCKTOPHER (Kilkenny)



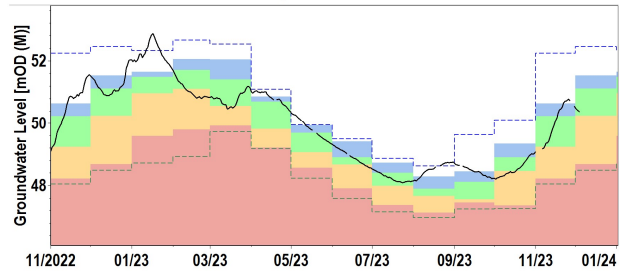
6. DRIPSEY DR1 Deep Upper Site (Cork)



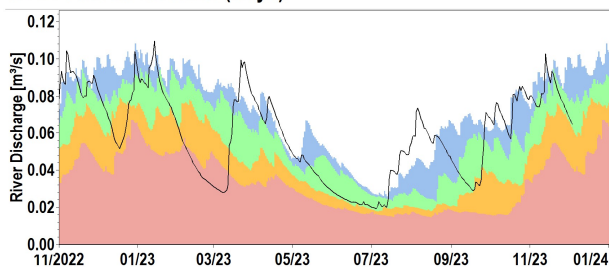
7. RATHDUFF (Kilkenny)



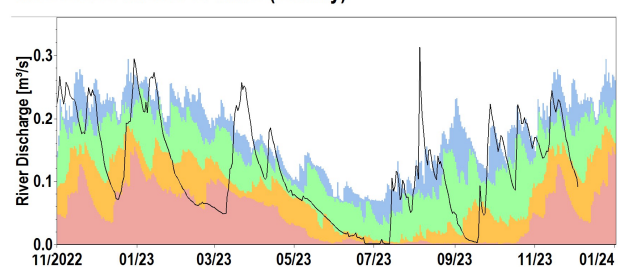
8. Glencastle - (GC1 Deep) (Mayo)



9. BALLINDINE SPRING (Mayo)

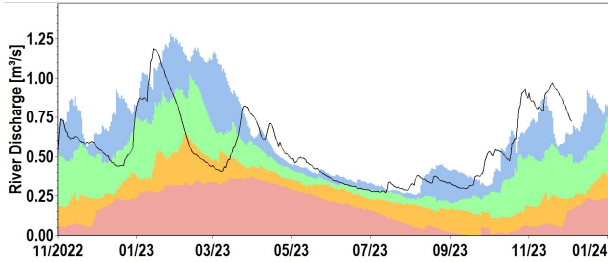


10. GORTGARROW SPRING (Galway)



# Monthly Hydrology Bulletin: Edition 043: November 2023

11. KILLEGLAN SPRING (Roscommon)



12. ROCKINGHAM (Roscommon)

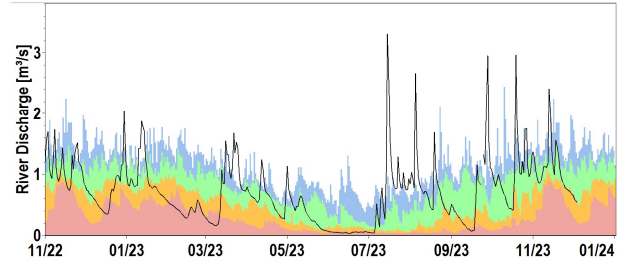
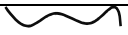




Figure 12: Daily mean groundwater levels (black trace) measured in meters above ordnance datum compared to the 10%tile, 30%tile, 70%tile and 95%tile for each month for the period of record and long-term maximum and minimum levels. All data are provisional and may be subject to revision (Source: EPA).

Explanation - Classes							
Particularly Low	Below Normal	Normal	Above Normal	Particularly High	Daily Mean Level mOD	Highest Month Mean Level mOD	Lowest Month Mean Level mOD
<95%tile monthly average level	>95%tile <70%tile monthly average level	>70 %tile <30%tile monthly average level	>30%tile <10%tile monthly average level	>10%tile monthly average level			

## Glossary of terms

Aquifer Type	An aquifer is an underground body of water bearing rock or unconsolidated materials (gravel or sand) from which groundwater can be extracted in useful amounts. For the purposes of this report they have been grouped into four aquifer categories as follows: <ul style="list-style-type: none"> <li>➤ Karstic (Rk and Lk) aquifers;</li> <li>➤ Gravel (Rg and Lg) aquifers;</li> <li>➤ Productive fractured bedrock (Rf and Lm) aquifers;</li> <li>➤ Poorly productive bedrock (LI, PI and Pu) aquifers.</li> </ul>
Dry spell	A dry spell is a period of 15 or more consecutive days to none of which is credited 1.0 mm or more of precipitation (i.e. daily tot < 1.0 mm).
Long term average (LTA)	The arithmetic mean calculated from historic record. For rainfall, the period 1981 to 2010 is used. For other parameters, such as groundwater levels, lake levels and river flow the period may vary according to data availability.
mOD (M or P)	Groundwater levels or lake levels above ordnance datum. In most cases this is relative to mean sea level at Malin (M) but in some cases is relative to Poolbeg (P).
Long-term monthly average	The arithmetic mean calculated from historic record of all monthly averages.
Percentile Level/Flow	Level or flow that is equalled or exceeded the stated percent of the time, e.g. 30%tile is the level or flow that is equalled or exceeded 30 percent of the time.
Very Wet Days	A very wet day is a day with 10.0 mm or more of rainfall.
Wet Days	A wet day is a day with 1.0 mm or more of rainfall.
Dry Spell	A dry spell is a period of 15 or more consecutive days to none of which is credited 1.0mm or more of precipitation (i.e. daily tot < 1.0 mm).
Absolute Drought	An absolute drought is a period of 15 or more consecutive days to none of which is credited 0.2 mm or more of precipitation.
Partial Drought	A partial drought is a period of at least 29 consecutive days, the mean daily rainfall of which does not exceed 0.2 mm

## Description of flow and level percentile classifications

Particularly High	>10%tile exceedance	Monthly level or flow that can occur 10% of the time
Above Normal	>30%tile <10%tile exceedance	Monthly level or flow that can occur 20% of the time
Normal	>70%tile <30%tile exceedance	Monthly level or flow that can occur 40% of the time
Below Normal	>95%tile <70%tile exceedance	Monthly level or flow that can occur 20% of the time
Particularly Low	<95%tile exceedance	Monthly level or flow that can occur 5% of the time

## Useful links

Access to EPA/LA Hydrometric data on [HydroNet](#)

Access to provisional water level only data from OPW hydrometric stations on [waterLevel.ie](#)

Access to archived water level and flow data from OPW hydrometric stations on [HydroData](#)

Access to turlough and borehole level data from GSI hydrometric stations on [gwlevel.ie](#)

Access to this month's Met Éireann and historic [weather statements](#).