Monthly Water Situation Report

North West England

Summary – October 2019

Table 1. North West England summary of the current water situation.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Current status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rainfall</td>
<td>North West England rainfall was 107% of October’s Long Term Average (LTA), Classed as ‘Normal’ this month.</td>
</tr>
<tr>
<td>Soil Moisture Deficit (SMD)</td>
<td>SMD levels were again low across all of North West England by the end of October, with soils remaining fully saturated in the more southerly areas.</td>
</tr>
<tr>
<td>River Flows</td>
<td>Classed between ‘Normal’ and ‘Exceptionally high’.</td>
</tr>
<tr>
<td>Groundwater Levels</td>
<td>Classed between ‘Normal’ and ‘Exceptionally high’.</td>
</tr>
<tr>
<td>Reservoir Storage</td>
<td>By the end of October, total North West England reservoir storage remained the same as at the end of September i.e. 87%.</td>
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</table>

Rainfall
Rainfall for North West England as a whole was classed as ‘Normal’ for October (107% of the LTA). The Lancashire and Greater Manchester, Merseyside and Cheshire (GMMC) areas experienced a fifth consecutive month of above average rainfall, with Cumbria observing below average rainfall for the first time since June (Figure 3). There was particularly heavy rainfall in the GMMC area during 25 and 26 October resulting in the final monthly total being classified as ‘Above normal’ for October (146% of the LTA for October). The highest rainfall in October (in terms of percentage of the LTA) was observed in the Cheshire Rivers Group (158% of the LTA for October, classed as ‘Above normal’). The lowest rainfall in October was observed in the Esk (Cumbria) hydrological area (67% of the LTA, classed as ‘Below normal’). A fifth consecutive month of above average rainfall across GMMC and Lancashire continued to have a noticeable impact on the 3 and 6 month cumulative rainfall totals; with rainfall in GMMC and parts of Lancashire classed as ‘Exceptionally high’ for the 6 month period (Figure 2). The 6 month cumulative rainfall total for the Cheshire Rivers Group hydrological area ranks as the wettest since 1891, with the same period for the Mersey and Irwell hydrological area ranking as the second wettest since 1891. The 6 month cumulative rainfall total for the GMMC area as a whole ranks as the wettest since 1891.

Soil Moisture Deficit/Recharge
SMD levels were again low across all of North West England by the end of October, with soils remaining fully saturated in the more southerly areas. All areas were observing levels below 10mm by the end of October; with levels slightly below average for the time of year in many areas, but by a much greater margin in the south westerly areas of North West England e.g. the Wirral and Weaver areas (Figure 4).

River Flows
Monthly mean river flows for October were classed between ‘Normal’ and ‘Exceptionally high’ (Figure 5); increasing significantly in GMMC when compared to the preceding month. Following 5 months of above average rainfall in Lancashire and GMMC, combined with the antecedent SMD levels, river flows generally remained above average across these areas; with the Weaver catchment in particular observing flows almost four times the monthly average for October (391% of the LTA for October, classed as ‘Exceptionally high’). River flows were highest (in terms of percentage of the LTA) in the Weaver catchment, and lowest in the Derwent (88% of LTA, classed as ‘Normal’) reflecting the relatively lower rainfall in the Derwent in October (Figure 6). During the evening of 26 October the gauging station at Ashbrook (River Weaver) recorded its highest instantaneous flow value (since the station was relocated from its original site in 1978) and in the early hours of 27 October the gauging station at Rudheath (River Dane) also recorded its highest instantaneous flow value (since 1976); both peaks following heavy rainfall during 25 and 26 October in the Weaver catchment. The high river levels observed around this time led to some localised flooding in Northwich and other parts of Cheshire.

(Summary continued on next page.)
**Groundwater Levels**

Groundwater levels for October were classed between ‘Normal’ and ‘Exceptionally high’, with no changes in classification noted since the end of September (Figure 7). Crow Lady Farm remained classed as ‘Normal’; Skirwith, Brown Bank Lay-By and Bruntwood Hall remained classed as ‘Notably high’; with Richmond Park and Priors Heyes both remaining classed as ‘Exceptionally high’. The levels at Priors Heyes remain high compared to historic levels because the aquifer is recovering from the effects of historically high abstractions.

**Reservoir Storage/Water Resource Zone Stocks**

During October, reservoir stocks for North West England rose slightly until the middle of the month and then started to fall; remaining unchanged by the month end when compared to the end of September, at 87% (Figure 10). At the end of October, reservoir stock (in terms of percentage) remained highest at Vyrnwy (100%) and lowest at Longdendale (77%). The reservoir stock at Haweswater followed a similar pattern to the total reservoir stocks for North West England and ended the month just 1% higher than at the end of September, i.e. 78% (Figure 1); with Ennerdale and Crummock both full and spilling throughout the month. The combined storage at Haweswater and Thirlmere was slightly above average for the time of year (78% compared to an average of 74%) and 9% higher than this time last year. Audenshaw No 1, Hollingworth Lake, Kitcliffe, Rhodeswood and Torside were among the reservoirs kept low for maintenance works.

![Figure 1: Storage in Haweswater reservoir including the drought triggers for the reservoir and storage for representative years; 1995, 2003, 2010 and 2018.](image)
Picture 1: River Kent, downstream of the weir at Staveley on 11 October 2019 at 12:30. Photo taken by a member of the Cumbria and Lancashire Hydrology Team. The flow at this time was equivalent to Q5.

Contact details: CLA & GMC Hydrology Team

(Report continued on next page.)
Figure 2. Total rainfall (as a percentage) for hydrological areas across North West England for the current month, the last three months, the last six months, and the last 12 months, classed relative to an analysis of respective historic totals. HadUK data based on the Met Office 1km gridded rainfall dataset derived from rain gauges (Source: Met Office © Crown Copyright 2019). Provisional data based on Environment Agency 1km gridded rainfall dataset derived from Environment Agency intensity rain gauges
Rainfall

Above average rainfall

Below average rainfall

1-Month Period for North-West England

1-Month Period for Cumbria and Lancashire (Cumbria)

1-Month Period for Cumbria and Lancashire (Lancashire)

1-Month Period for Greater Manchester, Merseyside and Cheshire

1-Month Period for Esk (Cumb)

1-Month Period for Derwent (NW)

1-Month Period for Eden

1-Month Period for Esk (Dumfries)
Rainfall

Above average rainfall

Below average rainfall

Figure 3: Monthly rainfall totals for the past 12 months expressed as a percentage of the long term average (1961-90), for North West England and its hydrological areas using HadUK data based on the Met Office 1km gridded rainfall dataset derived from rain gauges (Source: Met Office © Crown Copyright 2019). Provisional data based on Environment Agency 1km gridded rainfall dataset derived from Environment Agency intensity rain gauges.
Figure 4: Soil moisture deficits for weeks ending 1 October 2019\(^1\) (left panel) and 29 October 2019\(^2\) (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, 2019).
Figure 5: Monthly mean river flow for this month, expressed as a percentage of the month's long term average and classed relative to analysis of historic monthly means (Source: Environment Agency).
River Flow

- Exceptionally high
- Notably high
- Above normal
- Normal
- Below normal
- Notably low
- Exceptionally low

Latest data

Ashbrook, WEAVER (NW)
Ranking derived from data for the period Dec-1977 to Dec-2017

Ashton Weir, MERSEY
Ranking derived from data for the period May-1976 to Dec-2017

Caton, LUNE
Ranking derived from data for the period Jan-1959 to Dec-2017

Newby Bridge FMS, LEVEN (NW)
Ranking derived from data for the period Jan-1972 to Dec-2017

Seaton Mill, DERWENT (NW)
Ranking derived from data for the period Sep-1960 to Dec-2017

Pooley Bridge Upstream, EAMONT
Ranking derived from data for the period Jul-1970 to Dec-2017
River Flow

Figure 6: Monthly mean river flows for the past 10 months for sites across North West England (Source: Environment Agency). Flow for Seaton Mill has been estimated due to uncertainty in the current rating.
Figure 7: Groundwater levels at the end of the month classed relative to an analysis of historic groundwater levels for the same month (Source: Environment Agency). Geological map reproduced with kind permission from the UK Groundwater Forum, British Geological Survey (BGS) © Natural Environment Research Council (NERC).
Groundwater Levels

Exceptionally high
Notably high
Above normal
Normal
Below normal
Notably low
Exceptionally low

Figure 8: End of month groundwater levels for the past 34 months for North West England groundwater sites (Source: Environment Agency).
Figure 9: The location of reservoirs that comprise the supply districts across North West England and selected individual reservoirs.
Reservoir Stocks

Total North West England Reservoir Stocks

North Area Supply District: Ribble

North Area Supply District: Lakes

Pennines Combined

Peak Supply District: Longdendale

Peak Supply District: Stockport

Rivington Group

Haweswater Reservoir
Reservoir Stocks

Figure 10: End of month reservoir stocks for supply districts across North West England and selected individual reservoirs for current and representative years; 1995, 2003, 2010 and 2018 (Source: United Utilities).
# Glossary

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
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<tbody>
<tr>
<td>Aquifer</td>
<td>A geological formation able to store and transmit water.</td>
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<tr>
<td>Areal average rainfall</td>
<td>The estimated average depth of rainfall over a defined area. Expressed in depth of water (mm).</td>
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<tr>
<td>Artesian</td>
<td>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.</td>
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<tr>
<td>Artesian Borehole</td>
<td>Borehole where the level of groundwater is above the top of the borehole and groundwater flows out of the borehole when unsealed.</td>
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<tr>
<td>Effective rainfall</td>
<td>The rainfall available to percolate into the soil or produce river flow. Expressed in depth of water (mm).</td>
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<tr>
<td>Flood Alert/Flood warning</td>
<td>Three levels of warnings may be issued by the Environment Agency. Flood Alerts indicate flooding is possible. Flood Warnings indicate severe flooding.</td>
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<tr>
<td>Groundwater</td>
<td>The water found in an aquifer</td>
</tr>
<tr>
<td>Long Term Average (LTA)</td>
<td>The arithmetic mean calculated from the historic record, usually based on the period 1961-1990. However, the period used may vary by parameter being reported on (see figure captions for details).</td>
</tr>
<tr>
<td>MORECS</td>
<td>Met Office Rainfall and Evaporation Calculation System. This is a generic name for Met Office services involving the routine calculation of soil moisture and evaporation for Great Britain and uses a grid of 40 x 40 km squares.</td>
</tr>
<tr>
<td>Naturalised Flow</td>
<td>River flow with the impacts of artificial influences removed. Artificial influences may include abstractions, discharges, transfers, augmentation and impoundments.</td>
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<tr>
<td>NCIC</td>
<td>National Climate Information Centre. NCIC area monthly rainfall totals are derived using the Met Office 5 km gridded dataset, which uses rain gauge observations.</td>
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<tr>
<td>Recharge</td>
<td>The process of increasing the water stored in the saturated zone of an aquifer. Expressed in depth of water (mm).</td>
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<tr>
<td>Reservoir gross capacity</td>
<td>The total capacity of a reservoir.</td>
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<tr>
<td>Reservoir live capacity</td>
<td>The reservoir capacity normally usable for storage to meet established reservoir operating requirements.</td>
</tr>
<tr>
<td>Soil moisture deficit (SMD)</td>
<td>The difference between the amount of water actually in the soil and the amount of water that the soil can hold. Expressed in depth of water (mm).</td>
</tr>
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</table>

## Categories for rainfall, river flows, groundwater levels

- **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

## Units

- **mAOD**: Metres Above Ordnance Datum (mean sea level at Newlyn Cornwall).
- **mBTWL**: meters Below Top Water Level

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